THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c., &c.

EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

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FROM JANUARY TO JUNE, 1854.

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VOL. II.—JANUARY, 1854.—No. I.

Art. I.—THE VARIOUS MODES IN WHICH COAL IS WORKED IN ENGLAND, AND AN EXAMINATION OF THE PRACTICE IN DIFFERENT DISTRICTS.*—No. II.—By J. Kenyon Blackwell, Government Inspector.

SPECIAL CASES OF DEPARTURE FROM CORRECT PRINCIPLES IN SOUTH WALES.

The same remarks may be made with reference to the mines of South Wales which have already been made with regard to those of Lancashire, namely, that although the state of many exhibits all the precautions and improvements which can be derived from long experience and carefully applied skill, yet that there are also numerous others of which the condition is very defective and dangerous. The same faults, the existence of which in Lancashire has already been pointed out, may be found in this district. The following require to be spoken of specially :—

In some mines a general systematic arrangement in the ways and ventilation, which is absolutely necessary to safe and economic working, is entirely wanting.

The men employed are not provided with pure air to the extent which would be possible by splitting, and by a perfect system of air courses ; nor are the ingoing columns of air kept secure, up to the point where they reach the men.

The mines are not divided into isolated districts, as they might be, for the purpose of rendering the wastes and goaves less dangerous.

The return air, or air which has passed through wastes or goaves containing fire-damp, is brought again into contact with naked lights, and into the main wagon ways of the mines.

The want of proper air courses, and neglect of the use of the

* From a Paper presented to both Houses of Parliament.

Davy lamp, render pillar working dangerous and often impracticable, causing a great loss of mineral.

The means of producing an adequate ventilation are sometimes misapplied, particularly in cases in which the furnace used is placed on the surface, where it can only rarefy a small fractional portion of the column of air which has to be set in motion; its power even in such a case being often further diminished by the small size of the tunnel and stack connected with it, through which all the air it moves must pass.

SYSTEM IN SHROPSHIRE.

In Shropshire, from the nature of the coals and ironstones, their roofs and other peculiarities, the most perfect instances of what is termed long work may probably be found. Seams of considerable thickness are there worked in one long wall of great extent. The roads or ways of the mine are maintained by the rebuilding or stowing of those portions of the seam which are of no value, or of the fallen roof. These roads are carried to the face of the works in the whole coal, in directions radiating from the shafts to which the mineral has to be brought, and they progress as those works become more distant.

The economic and large production of mineral which can be obtained from coals worked under this system, (in which the coal is all removed as the workings progress, and no expense is incurred in driving out the roads), would no doubt cause its more general adoption in other districts, but many seams on account of their tender nature and liability to crush (from their cubical structure or the strongly defined faces which intersect them) will not resist the heavy grinding pressure which roofs of a certain character throw on the face of a long wall. In many places also, where the coals will stand in a wall, roofs are found which are so weak as to render it necessary to drive the roads or ways to an outside in the whole coal, leaving a portion of the seam overhead in these roads, and to work the coal only in returning.

The ventilation of works of the long wall form is easy; and on account of their lesser extent in general (owing to the peculiar mineral character of the districts where they are most frequently adopted), the air which ventilates such mines is seldom required to be split or divided.

The almost entire avoidance of doors, stoppings, and brattices, in this system, might prevent the loss of life to some extent, in the case of an explosion; as the ventilation would right itself at once, and there would be fewer sufferers from after damp. But on the other hand, from the continuity of the air ways, the fire and violence of the blast would probably extend to a greater proportional number of the workmen employed.

SYSTEM IN YORKSHIRE AND DERBYSHIRE.

The coal seams of Yorkshire and Derbyshire are usually worked in a mode which exhibit some features, both of the post and stall, and of the long wall systems; namely, in banks of varying widths, which may be generally stated at from 30 to 100 yards. Pillars of coal are left between the separate banks, to secure the various ways and roads which are required, and to divide the weight on the face of the bank. The pillars are reduced or taken out, after the bank is exhausted.

The seams of these districts which are worked vary from 2 or 3 feet, up to 8 or 9 feet in thickness. One of the most important seams reaches the thickness of 8 feet. The coals of this field exhibit a strongly defined cleavage in one direction only, and at right angles to the plane of the seam. Their fracture is therefore never cubical. This peculiarity, together with the nature of the roof and inclination of the strata, appear to have determined the actual system adopted.

The chief point to be considered in this mode of work, is that which leaves a tract of goaf in each bank, contiguous to, and to the deep of the working face in the whole coal, where the men are usually employed with naked lights. As there is no provision made for carrying off the fire-damp which may be yielded by these goaves, the air is excluded from them as much as possible, for fear of rendering this gas explosive. Notwithstanding this, the fire-damp yielded, after filling the interstices of the goaf, must force itself out into the face of the bank to the rise, there entering the working air current, and if in sufficient quantity, rendering it liable to explode at the lights used by the men.

There is great danger from stagnant or pent-up fire-damp under these conditions, as the quantity passing into the air-currents is liable to much variation, it being sometimes brought out in large quantities when a fall occurs in the barometer, or when the roof over the goaf breaks down. The quantity of inflammable gas yielded by the whole coal is always much more nearly constant, and therefore less liable to foul the air currents of the mine suddenly to an unusual and explosive degree; but stagnant fire-damp in a goaf under the above circumstances is subject to great fluctuations.

When the system of work adopted produces contiguity between the goaves and the workings in the whole coal, and when the currents ventilating or coming in contact with these two sections of the mine cannot be divided, and the fire-damp yielded in the goaf passed off into a separate return, it would appear advisable to employ the Davy lamp instead of naked lights. But the danger existing wherever there is stagnant fire-damp, in contact with the working air currents of a mine, might in general be lessened by a larger ventilation, by splitting the air so as to permit a portion of it to be sealed off wherever it will enter the goaf, in order to sweep out the fire-damp existing near its edges, and then by a well arranged system of air courses passing off the whole of each current into the returns, as soon as it exhibits any traces of this gas.

The obvious advantages of splitting air have been commonly overlooked in this district, and it has generally been carried in one column, from bank to bank, and from goaf to goaf, throughout the mine, and through all the windings of small and intricate air ways.

This modification of the long wall is attended with an economical production, and might probably be introduced with advantage in working some of the inclined seams of Lancashire, and also others in South Wales, the nature of which appears to be adapted to it.

SYSTEM IN STAFFORDSHIRE.

The modes of work practised in Staffordshire are very various, the thickness, cleavage, and other qualities of the coal seams differing greatly, and also the inclination and general condition of the strata.

The greater part of the South Staffordshire field is extremely faulty and contorted. This has been caused by circumstances not frequently found to exist in other coal fields, namely, the intrusion into the coal measures, at a period evidently subsequent to their deposition, of beds of igneous rock, unconformable with the measures generally, and accompanied with repeated outbursts in irregular masses, of very large bodies of the same rock. The coals of this field have been greatly injured by this cause in many places, and especially the bed well known as the Thick coal, which is the principal seam in that part of the district which has suffered most from this action. The firm and regular texture of the coal has frequently been lost, false joints and faces have been produced in it, and occasionally the whole or portions of the seam have been removed by the intrusive rock. The whole of the district has been more or less disturbed by this agency, but the contortion and irregularity of the strata are greatest in the south-western part, where this cause has rendered a well-concerted system of mining operations frequently impracticable. At the same time, from the large mass of coal contained in this seam, and the great facility with which sinkings can every where be made, it is worked even in the smallest and most broken tracts.

The mode in which this seam has been wrought has often been, from these causes, irregular and rude. From the tendency of the goaves which are formed in it to ignite spontaneously, if exposed for a length of time to the action of air, the ventilation of the workings has usually been kept at a very low point. The explosions which have taken place in this seam, have generally been the result of an almost entire want of any current of air to carry away the small quantities of fire-damp which it yields. The difficulty arising from spontaneous ignition, just referred to, has caused neglect, in such cases, to form and connect with the works, air ways of sufficient area, or occasioned the sides of work or openings in which the coal is wrought, to be so situated as to lie dead; that is, beyond and isolated from the general circulation. It has also led to a general absence of the necessary means to maintain the air currents in motion. From the thickness of the seam, and the height of the stalls in the sides of work, or chambers, in which this coal is wrought, fire-damp accumulates near the roof in those cases in which communications with the return air ways have not been opened, to a sufficient height, or to a proper distance in the seam, and it is then liable to be brought down by any fall of coal, on the naked lights which are always used; the Davy lamp not affording the requisite light in these lofty openings.

Great loss of life occurs in working this seam, in consequence of the falls of coal which take place in a sudden and unforeseen manner, arising from its thickness, the height of the workings, and the false joints and faces which frequently run in it.

From the impossibility (owing to the way in which this coal is wrought) of dividing the working places of the men, and paying each of them by the weight of the mineral gotten, as is usual in other localities, and from the difficulty of finding a sufficient number of over-men or agents to superintend the separate, and extremely numerous openings in the collieries of this district, a system of contract work has been generally adopted, under which too great latitude, in the management of the mine, has often been left by the proprietor to the contractor, consistently with its proper direction, and the safety of the men employed. This and other causes have led, in many instances, to a practice of commencing the working of the coal immediately contiguous to the shafts, thereby placing the goaves in situations in which they cannot be effectually isolated from the action of the air, and thus rendering that amount of ventilation dangerous, which might have been safely maintained under a well-arranged system of roads and ways. It has also frequently led to the working of the stalls, in the sides of work, too wide, and without the leaving, temporarily, of a proper number of smaller pillars or eggs in the main openings around the principal and permanent pillars. The coal overhead is thus allowed to break away by its own weight, instead of being liberated with the requisite caution by cutting. The objects of the above practices have been to avoid the preliminary outlay required to effect a complete and well arranged system of wagon and air ways, and for the purpose of saving the necessary expenses of safe working. The effects must be considered, in some degree, the consequence of the system of working through the agency of contractors, usual in the district.

If, in working the thick seam in this coal field, the necessary roads or ways were always driven at proper intervals apart, to an outside, that is, to the boundary of the tract intended to be worked from a particular winning, and the coal was then brought back from that boundary towards the shafts, a much larger ventilation might be safely maintained in the mine. Under this system, the goaves formed could, at any time, and without delay, be isolated from the action of the air; and a much smaller quantity of the seam would be lost in the ribs or barriers of coal, left in order to isolate the exhausted workings, than is the case when the operations are commenced near the shafts. If connected, and sufficient wagon ways or roads were driven, the greater part of the work now expended in air ways or heads might be saved, since by using these necessary roads, for intake and return air courses (a system which would not be objectionable in mines yielding so small an amount of fire-damp as the Thick coal of this district, and in which all the goaves are speedily and entirely secluded from any connection with the air ways of the mine), a much larger ventilation would be obtained, on account of the greater sectional area of these roads, than that of the small headways, of from 6 to 9 square feet, in which the whole of the intake or return air is now usually confined, even in mines in which a large number of men are employed. At the same time, if proper communications were made by ascending headways or spouts, from the termination of the wagon way, which is carried in the lower part of the seam, into the higher part of the stalls or sides of work in which the coal is wrought, all the fire-damp lodging under the roof would be expelled into the returns by the pressure of the intake air; the motion of fluids not being checked, except so far as results from friction, by curvatures in the channels in which they flow, and the specific gravity of gases producing separation only when they are in a state of rest.

A much greater loss of life occurs in working this seam from falls of coal than from any other cause. As long as the system is adhered to, of getting the whole thickness of 30 feet, which this bed contains, by one operation, nothing can be done to prevent these accidents, except by driving the stalls narrow, and leaving numerous temporary pillars or cogs; but it is deserving of serious consideration, whether this coal could not be wrought, with a less loss both of life and of mineral, by adopting a different system of work.

This might be effected by getting this seam in separate divisions by the long wall system, the upper divisions first, and the lower subsequently; leaving a small portion, if necessary, as a roof, between each division of the workings, and always driving the works to an outside in the first instance, and bringing the coal back towards the shafts. The chief object sought has hitherto been to get the greatest quantity of coal of a large size, on account of this selling for a much higher price than the remainder. But as there can be no doubt that the working of the seam in these divisions would enable a larger total production of coal to be obtained from it, it is probable that this increased production would compensate both the mineral proprietor and the colliery owner for the variation in the size of the product. In those places where the seam is irregular and interfered with by rock, it may be questionable how far this mode would answer, as the other affords an opportunity of picking out the best portions and leaving the remainder. There would be less danger of spontaneous ignition by working the seam in this manner, as the slack made would be drawn out cleaner, from it not being liable to be suddenly buried by the falling of the roof before it could be removed. The system of working this coal in separate thicknesses has been in successful operation for many years, in one of the principal collieries in this district.

Fatal accidents are not common in the other coal seams of South Staffordshire, but insufficient ventilation to provide for the health of the men may be found in many cases. Part of these seams are worked by the long wall, part by the pillar and stall method. ° ° ° ° ° °

THE GENERAL PRINCIPLES WHICH OUGHT TO BE OBSERVED IN COLLIERY OPERATIONS.

It appears desirable to endeavor to place, in a clear point of view, the general principles which ought to be observed in colliery operations, more particularly when the seams of coal worked yield inflammable gas:—

It is requisite to determine the general outline of the system which is to be adopted, and the extent and method of the workings proposed, before the operations are commenced. This involves a definite arrangement of all the roads and ways, their number, directions, intermediate distances, sectional areas, and the extent of the districts with which they are to be connected.

These arrangements should be made with reference to the following objects. To the amount of production; to the number of men who will be employed; and to the quantity of air which will be required, both in the aggregate and in each section or panel. To the formation of such a plan as will give a short course and perfect distribution to the air currents, and will especially provide for the shortness of their run in traversing the working sections. To the determination of the extent of workings, or the area of the excavations which will be open and require ventilation at one time; and to the restriction of their extent, to what is necessary to supply the required production.

In those cases in which, from the extent of the workings proposed to be effected, their division or sectional arrangement is necessary, the perfect and effectual isolation of each section or panel, and the ventilation connected with it, should be provided for; and also such future modifications of this system as may become necessary. Barriers of coal of the requisite thickness, to support the permanent air and wagon ways, ought to be left around each section. The sections ought to be surrounded by double or treble parallel drifts. When workings exist, or are proposed, on each side of the main ways (that is, the inclines and levels of the mine), they ought to be flanked by two parallel drifts, for the return air courses; and the lateral openings between the main way and the outer or return ways, should be securely stowed throughout, as the workings advance, to establish a perfect separation between the intake and return currents. The protection of the intake air, and its security, even in the case of an explosion, up to that point where it enters the most distant workings, is the most important element in solving the problem of confining the loss of life from an explosion, to the effects of the fire and concussion only.

The ways and roads should be kept well in advance of the workings, and opened into one another, in a complete manner, in order that the workings and system of ventilation may be under control, and also that the heavy pressure which sometimes exists on the inflammable gas exuding from the coal may be removed, in some degree, by these exploring drifts, before the coal is largely exposed in the workings. A too rapid working of coal, before this pressure has been removed, is dangerous.

The security and accessibility to the men, of the main ways, by which the intake currents enter the works, and of the downcast shaft, having been provided for, the following general rules in the management of the air appear desirable. To allow the air to split itself, using as few doors as possible, and to determine the quantity of air entering each section, by gauging, or regulators at the point where the air passes from the workings into the returns. Few doors, except bearing-up doors, are requisite, under proper arrangements. The leakage of these, if the ventilation is abundant, is of little consequence.

Where whole coal workings, in which naked lights are used, and pillar workings (necessarily carried on with lamps) are in progress in the same section of the mine, in order to prevent communication, it should be subdivided into smaller sections or panels, with continuous pillars of coal, left at convenient intervals, or a barrier of air may be interposed by coursing.

The return air courses should be so arranged that the weight of the air may be thrown against the face of the goaves, and these should be opened at convenient distances into the returns, to allow of the escape of the fire-damp they yield.

The areas and velocities of the different air ways and currents should be carefully estimated and proportioned to each other.

The principles of ventilation, here proposed, are exemplified in the accompanying plan, in which the system of the most important coal fields is subordinated to a general arrangement applicable to all.

The plan adopted in laying down the air ways will permit the introduction of fresh air at any required point of the workings, and the isolation of any part, and especially of the exploring drifts, from the ventilation of the working districts.

Rather more than three fourths of the seam are realized, under this system, as the works progress. A considerable part of the remainder would be obtained in returning.

GENERAL PRECAUTIONS AND REMEDIES TO LESSEN OR REMOVE DANGERS IN MINES.

The Davy lamp, only, should be used in pillar workings, where goaves, containing inflammable gas, are in process of formation. It is desirable to use this lamp in exploring drifts, and wherever the discharge of fire-damp visibly occurs under pressure; as in newly opened seams. Although the use of powder in mines under this condition, would lessen the security to be derived from an exclusive use of the Davy lamp, yet if careful officers only, were employed to fire shots, it would still afford comparative safety. It should also be used exclusively in mines yielding fire-damp, in which the ventilation is dependent on the security of a bratticed shaft.

A well considered system of rules, and general directions for the guidance of the workmen, is highly important to the security of a colliery. These should include regulation for descending; for the examination of the workings previous to their entry by the men, and during the working hours; and also rules for the management of the Davy lamp.

With a perfect system and efficient ventilation, the appearance of inflammable gas in the air of a mine, except in the exploring drifts, may generally be prevented.

In conclusion, it must be stated, as the result of the investigations I have made, that although many of the mines in this country are conducted with all the precautions against accident which experience can suggest, or the expenditure of capital afford, yet that there are numerous others, in which the system and arrangements are defective; and further, that a great part of the grievous loss of life which does occur would be prevented, if due skill and proper means were employed to remove these defects, in existing conditions, which can be clearly recognised.

In addition to the loss of life from accidents of a violent nature, the neglect which too frequently occurs (especially in districts and mines in which little or no inflammable gas is found) to provide a sufficient supply of pure air, is productive of much disease among the mining population. This evil admits of easy remedy, which it will probably receive when the attention of mining proprietors is called to it.

The returns which can be obtained, with respect to the number, nature, and causes of accidents in mines, I have found to be in general so exceedingly vague and defective, that any conclusions based on them would be liable to error. With very few exceptions, no accounts at all are kept at mining establishments on the subject. If accurate registers were to be found at such works, of the accidents of every class which occur, along with that information which might be rendered of their causes, nature, and results, a source of very important knowledge and correct conclusions would be afforded.

If the amount of ventilation in each mine, that is to say, the specific quantity of air in circulation, were measured periodically, and recorded in connection with the number of workmen employed, another valuable source of information, bearing on the actual condition of mines, would be provided.

Although the actual occurrence of explosions may often be traced to the ignorance or carelessness of the subordinate agents, or of the workmen, their primary causes, even in these cases, must be generally assigned to the want of skill and care in the management of the mine, which has produced the conditions that render this carelessness dangerous.

It must be allowed, also, that in many districts, those who have been intrusted with the management of mines, have often been scarcely removed in intelligence or acquirements from the rank of common workmen, their knowledge being frequently so limited, that the improvements made and the principles observed in one district are quite unknown in others.

But the most important means of safety for the mining population in their hazardous employments would be found, if the intelligence of this class generally were elevated by education.

At present, the miner is rarely able to judge of the dangers by which he is surrounded, or, consequently, to defend himself by ceasing to work in those mines in which they unnecessarily exist.

There appears to be no obstacle in the nature of the work itself, or the condition of the younger part of the mining population, to prevent the provisions for education contained in the Factory Act from being applied to this class, by requiring, as a condition of employment, the production of school certificates, to show a certain daily school attendance on the part of all youths employed in mines, until they shall have attained a specified age.

J. KENYON BLACKWELL,
Government Inspector.

ART. II.—NORTHAMPTON DISTRICT. THE LOUDVILLE MINE. By CHARLES S. RICHARDSON, CIVIL AND MINING ENGINEER, NEW-YORK AND LONDON.

THIS valuable mineral property, under the management of Capt. Samuel Pinch, from Cornwall, one of a series belonging to the Consolidated Hampshire Mining Company, is situated in the townships of East and Southampton, Hampshire County, State of Massachusetts, embracing an area of 220 acres of real estate, consisting of wood, arable and pasture lands. A great proportion of it may be said to contain minerals. In my various mining surveys in England, Ireland and Wales, it is seldom I have had the pleasure of being able to lay before the public such a flattering report of a mine as I can of this. Independent of the highly promising mineral indications of the lodes and cross-courses (for the lodes are all metalliferous) the sett possesses local advantages very unusual to be found in the old country. Through its centre runs the northern branch of the Manhan river, a never-failing, small mountain stream, amply sufficient for all the purposes of ore dressing, and, for a considerable time, the motive power necessary for draining of the mine. Above 100 acres consist of wood, among which may be selected some of the finest timber in the States, and in quantities sufficient for the works even if carried out on the most extensive scale. About a mile and a half down the valley, there is now in course of construction a railway, which is to connect with the railways of Boston, New Haven, Bridgeport and New-York, and which will be open for heavy traffic in 1854, thus affording a ready, cheap, and speedy means of transportation for the produce of the mines to the shipping ports, as well as for importing coal, and other materials required for the use of the works. The land is suitable in most places for the cultivation of every kind of agricultural produce common to the country; and lastly, though not least, is the proverbial salubrity of the atmosphere, for no part of the States enjoys a more general state of health than is found among the inhabitants of this part of Massachusetts: here then is every thing desired by a company to carry out a series of successful mining operations.

The stratum of the sett is granite and conglomerate sandstone The granite is of two kinds, the common gray compact, and the quartzose, the former predominating in the elevated portions of the sett, and the latter in the slopes towards the valley. The sedimentary beds of sandstone are nearly horizontal. They are somewhat micacious, and are full of boulders and large pebbles: the presence of mica can be accounted for by the attrition of those boulders upon the granite at the time they were in a state of motion by the ebb and flow of the tide. At bottom the sandstone and sandbeds are finer and more compact, showing they were precipitated by water when in a very slight state of agitation: the depth of these beds I have not had, as yet, any means of correctly ascertaining, but judging from the inclination of the granite on both sides of the valley, I should think near the lode they are not more than about fifty feet below the bed of the river.

THE MAIN LODE.

This immense lode traverses the sett in a direct line for rather more than half a mile, bearing 20° northeast, and underlays about fifteen inches per fathom; it is twelve feet thick, and carries through a leader of lead ore from six inches to two feet thick. In some places the leader is quite solid, but generally the lead is disseminated through the stone. It is composed of regular strata, or veins of quartz, of a most beautiful kind—barytes, blende and decomposed granite, with gossan and friable spar at the surface. The explorations at present on the lode have been in three places. The first on the south side of the sett, near the public highway;—a shaft has here been sunk of eight fathoms deep, at a point where there is a junction with another lode. Its width cannot be very well defined here, as no cross cut has been driven through it. The shaft has been sunk as shown in the figure. On one of the leaders of barytes, where it dips to the eastward about one foot in the fathom, a stope has been continued north about twenty-eight feet; in the bottom of which the orey part is still standing, and apparently holding down rich in silver lead. There must have been a considerable quantity of lead raised from this little opening, as in one place an arch was left that contained a leading vein of nearly solid ore two feet thick. The old miners seem to have carried away about six feet of the lode. This part had lead entirely through it, and if we judge from the old alven pile, it must have been all saving work. In fact, there are many tons of alvens and attle now at the surface that is excellent stamp work, and which will all be returned when the machinery is erected which is now in progress. They have opened a few fathoms northward on the back, and the leader of lead still continues in the barytes, the quartz carries a gossan, and is impregnated throughout, for at least ten feet wide, with stones of yellow oxide and blue carbonate of copper, very beautiful in their appearance. If we were to determine the size of the lode at this spot it would exceed thirty feet in width ; but as I have before said, a junction with another lode here takes place. The next point of exploration on the lode is in the valley by the side of the river. There an adit has been driven into the hill on the course of the lode, 12 fathoms. At this place the real character of the lode may be positively defined ; it is perfectly regular in its bearing and underlay, which is 15 inches to the fathom westerly, carrying regular walls, and spotted with lead throughout. The leading vein is a fine, compact quartz, full of vugs, with alternate veins of decomposed granite, as far as the capels, which also contain ore. If we judge of the mine by the indications here shown, its being immensely productive will not admit of a doubt, for a lode possessing a more promising appearance never could be cut at surface, in this or any other country. The third opening has been on the hill towards the northern extremity of the sett. There a shaft has been sunk some six fathoms. The lode here bears the same character and appearance as in the valley, carrying a spotted leader of ore. In the quartz there is, however, an absence of barytes, and a larger

CROSS SECTION OF THE LODE IN THE OLD SHAFT

proportion of capel. Some shode pits have been put down and openings made on the back further northward, but there appears no material alteration in the metalliferous nature of the lode ; I therefore denominated this, without any fear of contradiction, a champion lode of the first class.

THE WESTERN LODE.

This lode appears to have a bearing 10° northwest, and runs along the confines of the sett on the western side. Nothing more has been done on it than to put down a shode pit on the back, near the junction of the main lode, therefore I cannot venture to say much about it. It carries both copper, lead, barytes and blende.

THE EASTERN GROUND.

Although nothing, as yet has been done on this side of the main lode to discover a parallel one, yet from certain surface indications, I have strong grounds to believe one or more lodes exist. This side of the sett approaches the valley, consequently it is covered by the sandstone formation, through which none of the lodes, as I have seen, make their appearance.

THE GREAT CROSS COURSE.

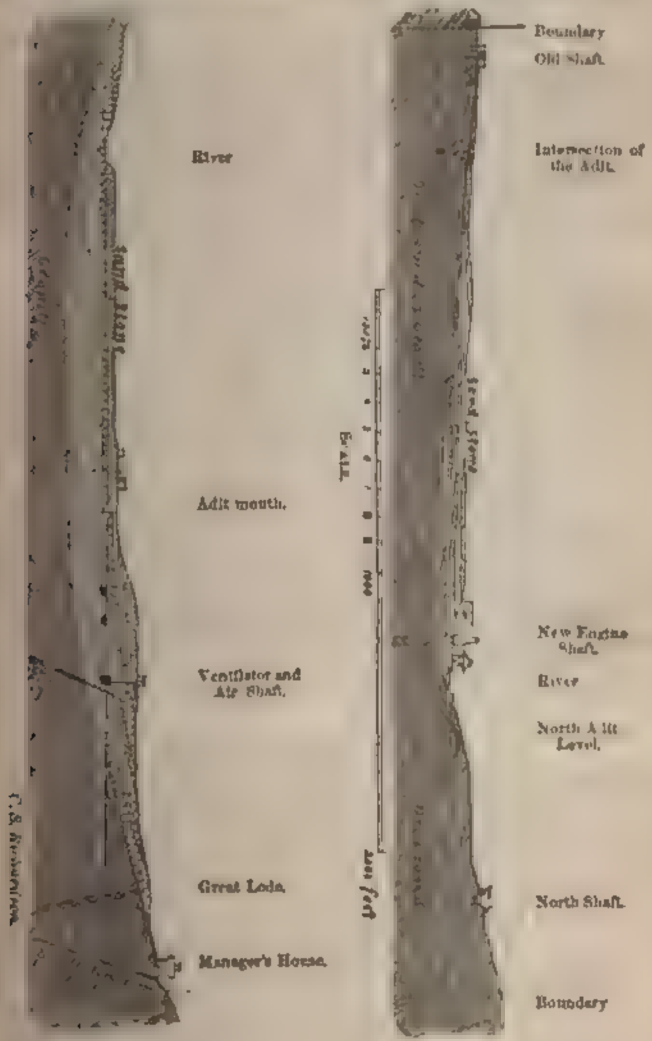
This great dam to the minerals in this mine has been noticed in a former paper, (Vol. I., No. 5), and needs no further explanation. It crosses the eastern part of the sett, and should any lodes be discovered in its vicinity, they may be expected to prove equally productive with those higher up the valley.

THE DEEP ADIT LEVEL.

This level was commenced many years ago, and has been driven in an east and west direction from the river across the sett, to intersect the main lode, which it will take at 23 fathoms from the surface, giving about fifteen fathoms backs. At the resumption of operations by the present company, it was found to run together for many fathoms at the eastern end, and immense labor has been expended in clearing it. It is now secured and newly timbered, and a tram way laid throughout its entire length, which, with the new drivings, is now 183 fathoms. The distance from the river to the hill or mouth of the adit, is an open cutting, and secured part of the way with timber; the drivings are now within twelve fathoms of cutting the lode, an air shaft is sunk 112 fathoms from the mouth of the adit, 15½ fathoms in depth, on which is erected a ventilator that gives good air throughout the end, and enables the miners to work very comfortably. This level has gone through the secondary

EAST AND WEST SECTION ON THE COURSE OF THE ADIT.

NORTH AND SOUTH SECTION ON THE COURSE OF THE LODE.



formation, and entered the primary; the gradations of which are very interesting. A shaft will have to be put down on the course of the lode to communicate with the adit end. There will then be a course of ore to the southward, 94 fathoms in length by an average of 16 fathoms high—or 1500 fathoms of lode ready to stope away, which will make good returns from this part of the mine. The stoping ground northward from the adit will not give any good working backs, as the ground runs off sloping, and dips rapidly into the sandstone formation, where none of the lodes make, they being entirely confined to the granite. Nevertheless, there may be some four or five fathoms of backs, for 70 or 80 fathoms in length workable; and as the lode carries ore quite up to the surface of the granite, it will assist in providing work for the stamps, until deeper excavations are made.

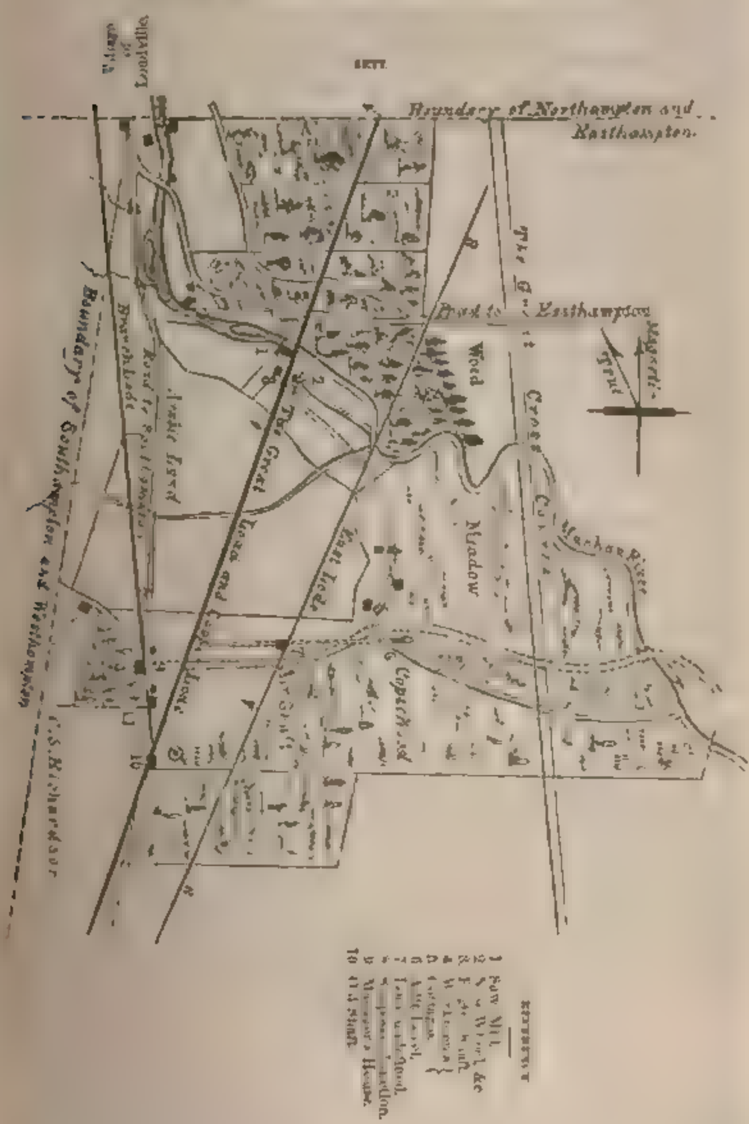
THE NORTHERN ADIT.

This level is driven 12 fathoms to hill from the river, northward on the course of the lode, and from which a fine pile of ore has already been extracted, and is lying at grass ready for the crusher and stamps. This part of the lode is very productive considering the shallowness at which it is opened on. A fine course of ore is found going down in the bottom, from this place to the north boundary; the sett is 175 fathoms, and will give an average of 10 fathoms of good working backs, which, although not rich, will nevertheless return a large quantity of ore, the lode being large, and carrying lead almost throughout. In fact, to the very capels a stone can scarcely be broken without lead being found in it. The stuff from this level will be run direct into the passes of the stamps on an inclined tram way, the wagons being hauled up by the water wheel.

PRESENT MINING OPERATIONS.

These are confined to the erection of a fine dam across the river, the construction of a saw-mill and timber yard, the sinking of a new engine shaft to take the lode at the 30 fathom level; a covered mill lat or canal and lobby—this precaution is taken to prevent the watercourse and wheel from being frozen up in winter—a new 24 feet pumping water wheel, 8 feet breast, with 12 head stamps and all necessary floors and dressing apparatus, a new crusher, griddles, elevator, &c., winding machinery to be actuated by the water wheel in the same mill; whim, capstan and shears, new blacksmith's shop, carpenter's shop, storehouse and counting-house, with all necessary buildings over the large water wheel and floors.

PLAN OF THE LOUDVILLE LEAD AND COPPER MINE.



GENERAL VIEW OF THE PROPERTY.

It consists of 50 acres of fine forest timber, containing oak, maple, birch, chestnut, walnut, red pine and hemlock, sufficient for the requirements of the mine, as long as it may be worked; 30 acres of excellent woodland, containing many timber trees, from 20 to 30 feet cube in a tree of useful timber, and this close upon the works by the river side; 30 acres of copsewood, which is very thriving, and which in 10 years will provide all the underground timber wanted for the mine: 50 acres of arable land, 30 acres of meadow and orchard, and 30 acres of rough land capable of improvement. The buildings consist of the manager's house, stable, barn, chaise house and warehouses; two workmen's cottages, smith's shop, and ore house. At the north shaft there is a smith's shop and changing house, which saves the inconvenience to the workmen of coming down into the valley to have their tools sharpened and repaired. The water privilege here is one of great value to the mine, as it will save steam power for a considerable time. The high road to Southampton passes through the best part of the land, and affords building frontages which should the mines be wrought on a large scale, will be very valuable. I entertain an opinion that this mine will prove one of a very lasting and productive kind. It is at present a lead mine, because little else but lead is found in the lodes, yet I think in depth it will eventually prove to be a copper mine, and now merely carrying lead on the backs. Here is the place to try down an American mine. On a lode of this kind no meagre operations should be attempted, as they will only terminate in disappointment. The mine, to be made productive, will cost a good deal of money, and some degree of patience. For me or any one else to say it will be certain to prove a rich mine, would be absurd; all we can say is, that here is a lode possessing every indication of mineral wealth, and that at a shallow depth—and the only thing which remains to be proved is, whether the mineral produce can be rendered marketable at a price that shall leave a sufficient margin of profit over the cost of production; I am of opinion it will, and amply repay the proprietors; and so promising is it, that I have come to the conclusion that the Loudville Mine becomes more a commercial enterprise than a mining speculation.

[TO BE CONTINUED.]

Art. III.—LODES AND QUARTZ VEINS OF GOLD.* By Alfred Waddington, San Francisco

I promised to enter into some details on the probable chances of success in working gold quartz veins. Nothing more need be said of the directions of the lodes or veins in which gold is found, than that it is obtained in every possible direction, and in a vast variety of positions, and that the extent and dimensions of such lodes or veins, are both uncertain and capricious. I will also observe that there are no *ores* of gold, as often very improperly stated. This metal is never found mineralized in nature, but frequently alloyed with other metals: these are most generally silver, copper, tellurium, and palladium. Specimens of native gold have been found in Transylvania, containing only 30 per cent. of gold, united with 60 of tellurium, and 10 of silver, and which possess a white color. Others obtained in Brazil, from sand and mines 400 or 500 feet deep, are so unlike gold as to possess a black color. These last contain but 9 per cent. of gold, united with other metals, principally tellurium.

Native gold may, however, not only be alloyed with other metals, but it may be inclosed or enveloped in their various ores, the most common of which is iron pyrites. Gold has also been found in malachite (hydrous carbonate of copper), which may explain why gold exists in such quantities in the fine copper of Chili and Japan.

But gold, like tin and other metals, is also occasionally mixed with the rock in considerable quantities. Near St. Anstell, Dartmoor, and the Land's End, in Cornwall, the oxide of tin is in some places so much disseminated through the scoriaceous granite, as to render it worth quarrying for the extraction of the tin; and with respect to gold, it is found at Gougo Soco, in South America, in the Iacotinga formation (ferruginous clay slate), in some parts sufficiently rich to quarry the rock. It is a remarkable circumstance, that small quantities of gold have also been found in the calcareo-silicious stratum, on which the Iacotinga formation reposes. The same dissemination of gold exists at Morro Velteo, where the clay slate, in which the lode is formed, is often found to contain 1 to 1½ ozs. of gold per ton, and in some of the mines of New Grenada, the gold forms, as it were, a component part of the granite masses. A circumstance which

* This is one of four valuable papers on "The Origin of Gold," which were recently published by the author at San Francisco. We regret that the others have not come to hand. This article however, is to some extent independent in itself, and contains some very striking, and probably novel views, to many of our readers.

occurred at the mine of Cocaes, is well worth mentioning. The National Brazilian Company had been driving along the vein for a period of eleven years, at a great loss, and without hardly any result in gold, when, in 1846, a rich gold formation was discovered in the rock, beside the very vein they had been working so hopelessly, and which gradually raised the returns of the company from a mere trifle to £20,000 sterling per month.

I have now briefly explained that gold *in situ* is found in lodes or veins, either alone and slightly alloyed, or more so and in connection with the ores of other metals, under the form of auriferous pyrites: or occasionally disseminated in the rock. All metals that are found in the disseminated state, are always more pure than when they are found in the veins. Those elements which produce joints and fractures, and the formation of veins in the crystalline base, affect the accumulation of the metals in the masses, at the expense of a considerable amount of alloy of mineralizing substances, such as iron pyrites, the arsenical pyrites, &c. Consequently, metals obtained from veins are never so pure as those procured from the decomposition of metalliferous rocks; when dispersed in the latter, they are comparatively unalloyed. It is important to bear this constantly in mind.

A few words now on the chances of success in gold mining. I have observed that the electro-chemical process, which gives rise to the production of gold, appears to have some connection with the atmosphere, or with the more disintegrated state of the rock nearer the atmosphere, and that its action is also greater there, where local circumstances have afforded greater freedom to the different affinities of the more oxidable metals; whereas, on the contrary, it becomes fainter and fainter as we get deeper, or the rock becomes more crystalline, till at last the most careful grinding and washing will scarcely procure a mere tinge of gold. The natural inference is that rich gold quartz veins will only be found near the surface, and that the chances will be greater with auriferous pyrites, which are occasionally found to be worth working at a considerable depth.

Such is the general rule that experience has proved to be correct all over the world, and there is no good reason why it should be otherwise in California. In Siberia, the only small subterranean works that exist in the Ural Mountains, yield a very slight profit, and if the superficial extremities of some of the gold quartz veins have turned out rich (even there where little or no admixture with other ores has existed), they have invariably proved very slightly remunerative, and eventually unproductive, when worked lower down. The gold quartz veins of Siberia are like those of other regions, glittering with gold on the surface, and scarcely producing sufficient to pay cost a few yards in depth, unless there be iron pyrites, vacuities, or any other causes to favor internal aggregation. The only veins worthy of prosecution for gold at any depth, are the pyritous; these often produce large quantities of gold, but of a lower standard as they get deeper, and thus become unproductive.

This may be partly accounted for by the great expense of penetrating lower down, and the difficulty in separating the gold from the sulphates of iron, copper, and sometimes lead, which accompany it; but as a general rule, it has been ascertained that the gold invariably deteriorates in value: *i. e.*, in the percentage of pure gold on the weight of ore the deeper the search is made. The gold mines of Beresof, situated three leagues northeast of Ekaterinbourg, and famous for its chromate of lead, constitutes a large vein composed chiefly of cavernous hydrate of iron (bog ore), which contains five parts of native gold in 100,000. Towards 1786 it gave large returns, but it has become poorer and poorer in proportion to its distance from the surface. At the Guadalupe y Calxo Mine in Mexico, gold quartz veins, opened by British enterprise, though at first productive, gradually declined in value, and became poor as the ore was sought for deeper, and finally became purely argentiferous. The same has been the case with the gold mines south of Santa Fe, and with many others in Chili, Brazil, Spain, and Hungary. In this last country, however, as well as in the Tyrolese, there are cases (chiefly on a small scale) where the auriferous pyrites continue to ramify in veinstones of great depths, and are worked with advantage, though at great trouble and expense. At Zalattina, in Transylvania, a mine called the Maria of Loretto, yields auriferous pyrites, which sometimes contain 28 pounds of gold per cwt. of the ore. Some of the galena (sulphuret of lead), of the same place, contains about 1 oz. of gold, with 30 ozs. of silver in a ton of ore, but the gold is chiefly found in iron pyrites abounding in the decomposed porphyry. Again, gold is raised from mines situated in the north of Piedmont, near Monte Rosa. It is found in a mixture of iron pyrites, blende (sulphuret of zinc), and galena. The annual produce is about 600 pounds troy of gold.

It is pleasing to record the profits derived from such mines, as well as from some other lodes of auriferous pyrites, situated in the Brazil and New Grenada. Gold veins must, however, be carefully selected by those practically acquainted with the subject, in order to be profitable; for out of ten gold quartz veins in this country, I venture to say more than eight are not worth working at the present price of labor. Job was a true and good geologist when he said "There is a vein for the silver," and "The earth hath dust of gold." And for my part, I should at any time prefer a good mine of silver ore, mineralized by sulphur, chlorine, or bromine, to the uncertainties of gold mining. It would be vain to assign any limit to the productive value of silver mines where science has been fully applied to them, as they increase in value as in depth, whereas gold diminishes as we descend to seek it.

I will now conclude these articles with the wish that they may have been in some measure useful to those of your readers who are interested in quartz mining, and deter them from embarking too hastily in mining operations they know nothing about, and which are often puffed up by ignorant or designing men. Nor would I attempt to discourage those legitimate operations which, when well conducted, are bound to succeed. Gold quartz veins, even when unmixed with pyrites, may give, when well selected, very handsome profits for a short period; and, as to auriferous pyrites, the increased knowledge which has been acquired with respect to the character of gold formations, the more judicious and economical management, and the improvements introduced in the modes of extraction, &c., will doubtless render many gold veins more productive than they have hitherto been. I could have added many interesting details on the latest and most improved methods employed in Hungary and elsewhere, for stamping or crushing the ore, and extracting the gold from the schlich: but they would, for the most part, be too complicated and expensive for the present state of things in this country: besides which, my present occupations and the little time I have to spare, would hardly allow me to undertake such a task from memory, all my papers and references having been, unfortunately, burnt in the last fire.

Art. IV.—MOORE'S GOLD MINES. Dahlonega, Georgia. Report of Chas. T. Jackson.

These mines are favorably situated on the margin of Cain's Creek, a never-failing stream of water, with abundant mill power, there being two dams, with at least five feet fall of water over them.

These water privileges are of great importance, since by means of water-moved machinery you will be able to dispense with steam engines, and save the expense of fuel required to drive them, as well as the great cost of transporting such machinery to the place. I learn that granite, such as is used for mill-stones, may be obtained in this vicinity, and hence you will be able to prepare the most weighty materials required for gold mills here, without being obliged to send heavy castings from New-York.

After examining the mining ground, I came to the conclusion that the property is much more valuable than one would have supposed it to be, from the miserable work that has heretofore been done here by the very wasteful operations at present on the ground. Three heads of stamps, with a tail of baise ten feet long and two feet wide, is all the apparatus now at work for separating and collecting the gold ! ! ! More than three fourths of the gold contained in the ore is lost from such a machine. There are no Chilian mills, arastas or other amalgamating mills in this district, and we have not found any machinery adequate to test the value of gold ores, and have been forced to depend upon the trials by pan washing, and to judge from the results of water-sluice operations and subsequent pan washing of the settlings in the sluice grades.

FORM OF THE COUNTRY.

This district is a broken, and hilly country, with serpentine streams meandering among the hills. Your locations consist of sparsely-wooded hills, rising one hundred and fifty feet above the surface of Cain's Creek, which winds about their bases. The soil is bright ocherous, yellow clayey loam, resulting from the disintegration and decomposition of micaceous, talcose, and chlorite slate, originally filled with particles of auriferous iron pyrites. By decomposition the particles of gold have been set free from the pyrites, and may now be separated from the soil by washing operations. The forest trees native on this soil, are chestnut and oak, with a few pines and dwarfish hickory and persimons.

GEOLOGY OF THE DISTRICT.

Like the other well-known gold regions of the Southern States, the auriferous rocks of this district and of your locations, consist of micaceous, talcose and chlorite slates, filled with auriferous pyrites, in veins and scattered particles, and with contemporaneous layers in veins of quartz. The most striking peculiarity in these rocks, is the depth of their disintegration and decomposition, which is not less than eighty feet.

They are so thoroughly decomposed as to resemble a common soil, but the strata remain undisturbed, and stand at their high angle of inclination like that of the unchanged rocks below. The direction of the strata is N. 25° E., S. 25° W., and the dip is from 65 to 70° S.

There are strata of different colors: white, pink, yellow and gray, the two latter being most highly auriferous. Black partings and spots of black oxide of manganese, and thin strata of hematite iron ore, are common in the richest gold rocks. Veins of white and gray quartz, containing bunches and veins of auriferous iron pyrites, are common throughout the rocks of the locations, and cellular quartz containing native sulphur and iron ochre, with particles of gold, result from the decomposition of the pyrites originally contained in the veinstone. Some of the quartz veins cut across the strata diagonally, and are *stock werkes*, or short contemporaneous segregated veins, but they also contain gold, like those parallel with the strata of rock. It will be seen from the above, that the rocks on your localities are of the usual type of gold strata.

YIELD OF GOLD.

This has proved one of the most difficult points to determine, since no proper machinery has ever been employed here, and only the wasteful methods before mentioned, have been followed.

It would be very unjust towards the mines to regard the results obtained in that stamping-mill or water-sluice, as in any way representing the yield of gold that should be obtained from these rocks. So far as we could learn, the late owner of the mill does not know the yield of the ore worked at it, and he can only give the wide limits of from five cents to five dollars per bushel, as results of working different portions at the mill.

The quartz veins have yielded from three to eight dollars per bushel, and some of them but fifteen cents per bushel.

No attempt has yet been made to work the auriferous pyrites in the large way; but a small sample roasted and then pulverized and amalgamated in a mortar, yielded two and a half dollars per bushel. In the sluice works, where a stream of water, raised by a force-pump moved by water power, is led over the surface of the decomposed rocks which are broken up by the shovel for the water to wash, we find much coarse gold detached on the upper grades of the gutter, and fine gold lower down. A pan from each of all the grades, Nos. 1, 2 and 3, was taken and washed in my presence, and from one to three dollars worth of gold was obtained per pan, of less than a gallon of the sediment. The negro men and women earn from one dollar to one dollar and a half per day, in this sluice. It is obvious that all the fine gold must escape in this rude way of washing out gold, by a rapid current of water falling down a flight of steps with considerable velocity

The ground acted upon by this sluice, is only a yard wide, at the most, and the channel but six inches wide. This exposure was enough to satisfy us of the great richness of the hill in gold; and the operation itself is suggestive of a good method of preparing the ore for the Chilian amalgamating mill, namely, by having the earth and decomposed rock well sluiced in tubs largely flowed with water, so as to remove the slime or clay, and to allow the gold to subside to the bottom. The ore thus cleansed, may then be transferred to the Chilian Mill, and by being freed from tenacious clay, would not wash so much of the mercury as it would if it was introduced without the preliminary washing. We shall send to New-York a fair average sample of the gold-bearing rocks and soils of the location, and after they are assayed, we shall be able to form some estimate that may be relied upon as to the yield of the mine.*

DEPOSIT MINES.

In the low lands, and along the margin of Cain's Creek, deposit mines, of great productiveness, have been worked since 1829. Lumps of gold of 90 pennyweights have been found, and much coarse gold has been separated by the rockers. These mines have been worked at the base of the hills on your location.

HILL DEPOSIT MINES.

In the upland, about six feet from the surface of the soil, occurs a bed of gravel and clay, in which a considerable quantity of coarse gold is found. One of these deposits occurs near Mr. Moore's mill, and extends under the house adjacent to Mr. Gray's line, where Mr. Moore has worked an upland deposit on shares, paying one fourth of the produce to the owner of the soil. During the short time he worked that deposit, less than a year, he paid \$1500 to the owner of the soil as his dividend of gold obtained. In the old deposit mines, ten men crushed out 5600 pennyweights of gold in ten months, employing only the common rocker for coarse gold.

CHARLES T. JACKSON, M. D.,
Geologist and Chemist.

Dahlonega, Georgia, November 5th, 1853.

ART. V.—NOTES ON THE GOLD REGIONS OF NORTH AND SOUTH CAROLINA. TAKEN DURING FOUR MONTHS' RESIDENCE, BY STEPHEN P. LEEDS, GEOLOGIST.

THE Gold Region of the Atlantic States extends from the southern interior of Virginia, through the western and central part of North Carolina, the northern and western part of South Carolina, the northern section of Georgia, extending somewhat into Alabama, and being evident in the eastern counties of Tennessee.

* Five different assays have been made since the above was written, with results varying from \$120 to \$143 per ton. The company to whom the mine belongs, is known as the Georgia Gold Company organized under the laws of New-York, of which Dr. James Wynne is President. The capital is divided into 100,000 shares.

That division, the observations on which are noticed in this sketch, occupies but a small portion of this extensive area, being comprised in that section which lies upon the southern part of North Carolina and the northern districts of South Carolina.

The general character of this country is level, there being no mountain elevations or high hills; nothing, in short, but slight elevations, most of them the result of extensive faults in the rock formation, or the erosive action of the surface water. This latter cause has tended, more than any other, to produce those frequent inequalities of surface that are so commonly met with in passing over a few miles of country The traveller can at any point turn from the road and cross the land in a carriage, without any fear of meeting such irregularities of level as would endanger his progress, other than a slight deviation from his course will allow him readily to avoid.

The soil is arenaceous, mixed with a clay formed from the decomposition of the feldspathic rock, which is every where here so abundantly disseminated. It is highly impregnated with a red ferruginous oxyde in many parts, which contrasts strongly with the white sandy soil so prevalent in others.

Many portions of this mixed soil are very productive, and by a careful and judicious management, might be rendered highly so; but under the lax system of agriculture pursued in this portion of the State, their lands are cleared and worked for some three to five years without any attempt at invigoration or restoration, and then deserted for new and more recent clearings.

In this way, thousands of acres of land are now lying unimproved and neglected, fences removed, and whole tracts thrown into common; and the young pine trees waving with seeming desolation over the vacated regions, where luxuriant crops have erst been gathered, woo from the passing breeze a sad and melancholy note, a wailing tone, over the dreariness and loneliness so omnipresent here.

Every where are passed the traces of previous cultivation. The road leads through a young growth of trees, and while travelling its winding and circuitous course, the eye seeks in vain for those patriarchs of the wood, rugged and massive old trees, standing proudly and nobly forth, monuments of years long gone into the dark vista of the past, mementoes of many a passing storm, records of the whirlwind, and autograph tablets of electricity; none of these traces are visible. No gnarled and fractured boughs thrown high in air, like the outstretched arms of despairing Titans; no blasted and barkless trunks rising in bold contrast to the living luxuriance of wild forest vegetation, like defiant Genii guarding the sanctity of the wildwood recess; none of these evidences of an almost pre-Adamite vegetable existence are discoverable; but a juvenility of pine trees, and an infancy of scattered oaks, point out to the understanding the newness and the recent vitality of this young forest group.

Under an improved system of cultivation, these now barren wastes might be rendered productive, and be made to fill the barns and storehouses of the planters to overflowing. Much of the land on the mining properties, is in this condition. A little work, a little care, and the change would appear almost magical.

The bottom lands are very rich, producing an amount of vegetation, when suffered to run on in their luxuriant wildness, that is not only convincing evidence of the strength of the soil, but is also, from the miasmatic influence exerted by its decay, extremely detrimental to the general health.

The climate of this portion of North Carolina, is unsurpassed for salubrity by any portion of the United States.

The time occupied in the investigations of this section, has covered a period extending from the latter part of July, to the earlier part of December. And during the month of August, a month usually considered the most unhealthy and fatal in the year, there did not occur a solitary death in the town of Charlotte, which contains a population of over two thousand souls. It may be strongly questioned if the same can be averred of any other place of its size in the Union.

The weather has been uniform in temperature, the thermometer never rising above 80° F., and in most cases ranging from 65° to 75°.

The nights possess a temperature some 10° below that of the day; and with one or two exceptions, a blanket has been requisite for covering during the whole time. The last three or four days of August, the mornings and nights were sufficiently cool to render a fire very comfortable to sit by, and produced the necessity of causing the body at night to "underlie" a double "stratification" of blankets.

Along the margin of streams, in the neighborhood of mill-ponds, in the vicinity of swamps and low moist grounds, bilious and intermittant fevers have prevailed to a considerable extent; but they have been uniformly mild, and evince a ready subjection to sound medical treatment.

From the number of aged persons to be seen in this region, it may safely institute a comparison with any other section on the score of longevity.

These mining people are peculiarly indolent and devoid of energy, never working until forced by absolute cogency of existing circumstances to exert themselves to meet the direct wants of the time being; and regardless of that frugal and prudent provision for the necessities and requirements of the future, which would stimulate their most strenuous operations to provide an excess over their present exigencies, to hold as a surplus upon which to rely for the disbursements requisite for the time coming. Careless to a fault, prodigal of their scanty resources, with no well arranged or defined system of movements, they work for a brief period, and finding that some few hundred dollars have accumulated in their possession, they yield at once, without hesitation, to the fatal spell that appears so universally to pervade even all classes of society, and abandon themselves to an existence of indolence, which they maintain until driven by actual want to recommence their labors. During this time, the mines, unattended, have fallen out of repair. Never worked for permanency, never worked with the expectation that the construction of the timber should be such as to insure durability and strength, they have, in the most crude and inefficient method that they could by any possibility devise, merely constructed within their shafts a temporary frame work, inadequate for the purposes intended; and as a result which was destined inevitably to ensue, they discover when returning to the scene of their labors, that the pit which they have excavated, has fallen in, and been partially refilled with the loose earth and rubbish. Then wanting gold to meet their requirements of food and raiment, too indolent to clear out and repair their little shafts, they commence, in frequent instances, a new one within a few feet of the actual point of their deserted labors. Some spots in this gold section are so thickly perforated with these holes, that it is not only extremely precarious, but it also requires considerable caution to walk unharmed among them.

They know that they can gather and obtain gold from the very surface downward, and this knowledge produces a tendency to inertion, and its baneful effect is apparent in their improvident neglect of the future.

Uneducated, and possessing no disposition to acquire useful and practical information, they continue to exist in this state of intellectual and actual torpor, which depresses them to a situation a very few degrees above the rank and position of merely animal life.

They know nothing of those leading natural truths which would necessarily evince to them the most expeditious and competent method of investigating these mineral properties, but blindly press forward in their work, only being aware that certain surface indications are generally to be met with in the immediate vicinity of auriferous deposits or veins; and if they succeed in reaching a profitable location, it is one more inducement for them to recede to their condition of inactivity. It is no incentive to apply the practical knowledge they have thus obtained to a similar success; it is no stimulus for further research and exertion.

Such is the condition and character of the native mining people of this district. They can go upon the waste lands and pan gold, and obtain under any circumstances, from seventy-five cents to a dollar and a half per day; and knowing this fact, knowing the supply is ever at hand, they become regardless of all but present want.

On the hill-side, they can often be seen digging; on the open land they are to be found working, and on the margin of the stream or branch, they are to be seen washing the soil they have collected, caring only to obtain enough to liquidate their indebtedness, provide for the present, and establish a brief credit for the future, until necessity shall again compel them to labor.

All their researches have been conducted for the discovery of gold. Other mineral wealth might have been spread in profusion and abundance around them, but it would have remained unregarded.

Their inability to separate the gold from the copper—having neither practical knowledge upon this subject, nor adequate means for accomplishing the object, has caused them invariably to abandon those shafts in which the copper has become too abundant for them to obtain the gold. Many of these locations are, therefore, important as indexes to point out the position of rich veins of this valuable ore.

It is in this manner that many sections of this country have been dug over by the mass or great body of gold seekers; and their very mode of life is a certain evidence of the plentiful and abundant supply of the gold.

The first fact that arises to the observation during the examination of the mining properties of this auriferous region, is the imperfect and undefined method by which the numerous veins have been worked into or explored. Shafts, pits, excavations, ditches, and mere surface scrapings, manifest themselves at each and every point; assuming every variety of form, extent, and depth, that accident, fancy, or ability to work, has called forth. No machinery has been used, no mechanical skill called into requisition to expedite the progress and lessen the toil; but the simple windlass, with an occasional, though rarely to be found horse whim, are the only adjuncts to manual labor that have been called into action.

No rigid and close examination of the formation, course, and dip of the vein, has been taken; no searching out the feasibility of the work to be pushed forward; no estimate of the outlay and expense required; no close calculations as to the probable result of the operations; but with a seeming heedless and reckless course, they have labored, toiled and worked, in many cases, without profit; but in many, very many instances, despite all the disadvantages which must necessarily appertain to so imperfect a manner of working, they have met with astonishing and surprising results.

This fact sets forth conclusively, that Earth's treasures in this region, are bestowed in no scanty, meagre, or parsimonious quantities; but with that lavish profusion, which, to the mind of man, appears unbounded, nature has here scattered broadcast throughout the soil, that golden wealth, to possess which, ever stimulates the man of energy and enterprise to strenuous and active exertion; and which, when obtained, bears evidently at the present day, the ultimate tendency to the amelioration and advancement of the human race.

Some few mining companies were established in this vicinity about eighteen or twenty years since, and under their direction, machinery was placed upon the properties they held. But the sound of the steam engine only broke the universal stillness at points remote and far distant from each other; and ere the utility of this potent power could be incontrovertibly confirmed in its application to gold mining purposes; while yet the companies, in the commencement of their operations, were raising at the same time the virgin gold and the hopes of their members, that financial storm which burst upon the country, and swept with its blighting and paralyzing effect over society, brought their efforts to a close, as sudden and unexpected as it was fatal and ruinous to their expectations.

Some fifteen years have elapsed since those days of literal golden promise, and during that inactive period, these mines, in common with others throughout the land, have been suffered to remain unworked and uncared for until the present time, but are now being examined by that spirit of progression which is evinced by the new companies already in, and still coming to, this rich and extensive field.

If under the incomplete management of former years, large profit was derived, how much more lucrative must be the result, under the more adventitious circumstances of better machinery, more full and complete information, and superior adaptation, of the present time.

To have a correct knowledge and understanding of a mining district—to fully appreciate its prospects, the investigations must not be confined simply and only to the natural and external appearances, and characteristic indications of the surface, and the position, bearing, and attendant qualifications of the veins and strata; but recourse must be had to its past history. The people of the region must also be looked to, and studied, and examined: their habits and customs, and amount of energy and knowledge canvassed; and from their general disposition, as well as from the mountains, hills, plains, rocks, and rivers, bring forth those deductions which will afford a comprehensive and full estimate of all the general, features and the no less important minute points which have a direct tendency to elucidate the true position of the whole. Viewed in this light, the ability is possessed to understand many of the causes that have produced the results which are so evident, and which, were they unknown, would necessarily be attributed to an erroneous principle.

Were this mining people not understood in regard to their habits of indolence, want of information, and inadequate means of working mines, the conclusion would naturally arise, that so much abandoned and deserted work was caused by a deficiency of the metal or ore searched for; but knowing the inhabitants, it can be perceived instantaneously, that it is the profusion and excess, and not the paucity and absence of the ore, that has produced such a like result. The two extremes of cause would terminate in a similar effect; yet how necessary as a basis for future operations, to know from which of the extremes emanated the effect produced.

The rocks of this interesting region, are chiefly trappean belts of country, and ranges of hornstone slate, seemingly forming parallel bands.

The trappean rocks are greenstone, hornblendic granite, feldspathic granite, syenitic granite, and a silicious sub-crystalline rock, closely allied in its external characters to hornstone.

There is in all of these rocks a determination to a crystalline structure, of a rhomboidal form, sometimes strongly, but generally imperfectly developed. This tendency is plainly evident wherever an outcrop of the rock is visible.

The granite rocks are in a high state of disintegration, which may be attributed to one of two causes, and perhaps a modification of both. Either the rock is in an imperfectly developed condition, or the decomposition may be attributed to the chemical influence of the presence of the immense quantities of metallic sulphurets so abundant here, which are constantly undergoing mutations from the sulphuret to the oxyde, which transformation must set free sufficient quantities of sulphurous acid, that absorbing oxygen from the atmosphere and water, becomes sulphuric acid, to react upon the thus rendered soluble portions of the feldsphatic rocks.

From the impregnation of the soil with such quantities of the oxyde of iron—from the universal presence of the decomposed iron pyrites throughout all the quartzose veins, and its appearance in all the crevices, and between all the lamina of all classes of rock, the evidence weighs strongly in favor of this reason for the deterioration of the granitic rocks, and affords an ample field from which to derive sufficient corroding influence to have produced those changes which are manifest hundreds of feet beneath the surface, and which are still in operation over this whole peculiarly attractive region.

As a general fact, the decomposition of the trappean rocks has extended to a greater depth than that of the slate. The greater affinity of the chemical ingredients of the feldspathic formation, which impregnates to so great an extent the former rocks for the sulphuric acid, liberated by the pyritous decomposition, will satisfactorily account for this phenomenon.

At the first glance, and for many after examinations, the variously colored decomposed slates would convey the impression that they were different structures, or modifications of this great class of sedimentary rocks; but upon comparing the result of a long-continued series of observations, made at widely separated points of this extensive auriferous field, and finding in all cases that the variety is confined to the surface, or to a limited distance below it, and that all these modifications result at last at such depths, that the decomposition has ceased to be manifest into the hard, blue-tinted, silicious hornstone slate, the fact becomes too positive and apparent to admit of a doubt, that there is any real variation; but that they are all of one class and composition of rock. The seeming variety arises from some local and limited cause—some greater proportion of iron, alumina, silica, &c., &c., appertaining to some small division of the laminæ. In some instances this has been peculiarly obvious within a space of a few feet, where excavations have shown a vertical section of the decomposed slate, embracing every variety of color, and each merging into the other, and the whole ultimately terminating in the hornstone slate above referred to.

[TO BE CONTINUED.]

Art. VI. THE VALLECILLO SILVER MINING COMPANY, AND THE SILVER MINE OF JESUS MARIA.

Our remarks on this mining property in a previous number (Vol. I., No. 6), related chiefly to the Mexican regulations for holding mining properties, the Mexican system of working silver mines, and the character of the mine of Jesus Maria. We now take up the subject again to present a complete view of the proceedings of the owners, the Vallecillo Mining Company, and the analyses which have been made of the ores. This we are better enabled to do through the aid of a recent statement made by the officers of the company, which shows that their object is a quick, laborious, systematic working of their mine.

The method of organization adopted by the company, is a matter of some interest, as their property is in a foreign country, and that country is Mexico. This statement thus goes on to describe it :—

"That the city of New-York be declared to be the head-quarters of this mining association ; and that the mining ordinances of Mexico, under which this company was organized and has hitherto acted, be continued for the government of the same, together with such rules, regulations and by-laws, as the directors may choose to adopt for their own convenience.

"The amount of the capital stock, and the number and denomination of shares to be issued, received full consideration from the committee.

"By the mining ordinances of Mexico, every mine, great or small, is divided into 24 parts, called *varas*, and these as a basis may be subdivided into any given number of *acciones*, or shares, at the option of the company ; a company may also own and work any number of mines under its organization.

"Considering the present developed condition of the mine of Jesus Maria, with its unproductive, heavy, and expensive works completed, with the hacienda for the speedy reduction of the ores, and extraction of the silver in readiness, estimating the *vara* at fifty thousand dollars each, is a moderate calculation as a basis on which to place the stock. The committee accordingly recommended that the capital of this mine be fixed at $50,000 the vara, making $1,200,000 ; and that the same be divided into 12,000 shares of $100 each. This is, in fact, a low estimate for the stock of a silver mine which, judged by a fair comparison with other mines in the same country, should yield a satisfactory dividend on that amount, and which may, in the course of working, produce in any one year, an amount equal to, or even larger than, the whole capital stock of the mine!

"In order to complete the organization, give to each shareholder the unincumbered evidence of the interest to which he is entitled, and provide for the prosecution of the enterprise on a scale commensurate with the works completed and in progress ; and further, to do justice by not throwing disproportioned burthens on new stockholders, should there be any, the committee recommended that only 864 shares be divided between the present or original shareholders, who have met their instalments, purchased the mine, carried on the works, and borne all the expenses for three years past ; who took all the risk (and it is the only risk in any mine) of opening, restoring, and proving the noble character of the vein, and fine qualities of the ore ; and that the residue of

3,360 shares be reserved and set apart for the benefit of the treasury ; an ample resource for any contingency that may arise, as the mine will be in fruit so soon as the new machinery is in the new shaft, and the water overcome—*vincido—conquered*, as the Mexicans say.

"In my statement of August (page 15), it will be seen that all subterranean works were suspended, except the sinking of the new shaft, which was to be continued till it cut the newly-discovered Esperanza vein at or near the point of junction, and a cross-cut driven from the new shaft at or above the water level ; and, on reaching the vein cut by the old shaft, east and west levels to be driven, especially east, to communicate with those coming from the old shaft, and known as San Miguel and San Pablo. The *last intelligence from the mine, brings the gratifying assurance that these works have been accomplished!* The new shaft, six hundred feet from the old one, has been sunk by Dr. Prevost and his Mexican miners, 240 feet in depth, through rock so solid that not a piece of timber has been needed for bracing, and with the singular good fortune not to meet water until it cut and proved the new Esperanza vein at this point. The cross-cut has also been made to the other vein, and driven on west and east, so that by this time a communication has been made, and a person may pass above the water level from one shaft to the other, a distance of over two hundred yards, and one hundred and fifty feet below the surface. There will be some, and may be considerable ore taken from and above this level ; but its main object is ventilation, preparatory to the deeper workings after the arrival of the machinery. It is also worthy of note, that the new shaft and cross-cut struck the great Esperanza and *Veta Nuevo*, or New Veins, at the very points, to the accuracy of a single foot, previously determined by our surveys of the mine made at the base of the old shaft, 200 yards distant, thus doubly demonstrating the regularity and permanency of the veins.

"In connection with the mine of Jesus Maria, there is another on the same vein, called Dolores, about three miles distant, where three shafts were sunk many years ago by the old Spaniards ; two of them to the depth of 300 feet, and one to the depth of 200 feet. By each, the vein was cut, and found to be full of ore. From the Dolores shaft, 200 feet deep, ore was found so compact and abundant, that according to authentic records still extant, pieces weighing five hundred pounds were broken off ; but owing, says the record, to bad vapor or foul air, these works were not prosecuted, as the Spaniards at that day had no means of relieving it. It is believed, however, in the present state of mining knowledge, this temporary obstacle is a matter of little moment, and may be easily and permanently overcome.

"Should the company deem it proper to commence working the Dolores mine at an early day, the present engine, machinery and pumps at the Maria Mines, may be made to answer for several years: that the two mines could and ought to be worked under the same general direction, the committee had no doubt. No new works, or hacienda, for the reduction of the ores, would be necessary, as one would answer for both mines; and the two mines could be managed and worked under the same principal officers in all the departments, besides many other economical advantages. This union, however, is not indispensable at the present moment, and the proper disposition of it may be left very properly to a later period.

"The committee recommended further, that no *scrip* or stock be issued or transferred to the present shareholders, except for such shares as they may purchase from the reserved fund, in common with other parties, for the vigorous prosecution of the work, and who, like themselves, are willing to look to the mine, and not to any premature inflation of stock for reward; but that these shares or interests be duly credited on the books of the company to the respective account of each individual."

The new machinery required for the mine, which is a Cornish engine and pumps, has been lately constructed at the works of Messrs. Thomas, Carson & West, at Norristown, in Pennsylvania, and is of the following dimensions:—

"150 horse power; cylinder 60 inches in diameter, 10 feet stroke; to be worked with three of West's improved boilers, and has sufficient power to work the necessary pumps to the depth of one thousand feet, and will discharge three hundred gallons of water per minute. The first pump in the shaft will be a 'plunger lift,' of 240 feet.

"This is the largest Cornish pumping engine ever made in this country, and it is finished in a manner worthy to serve as a specimen of American workmanship."

In looking over this statement of the President of the company, our eye falls upon the following remarks, which are very timely, and so full of wisdom and good sense, and so applicable to all mining enterprises, that we insert them in place of any which we might make bearing upon the same point:—

"I am told it is usual to make estimates of the returns that mines will yield, and especially that these are necessary as inducements for the investment of capital. I am also told that disappointment begins to tread very closely on the heels of promise in many of these enterprises, at the present time. Is it strange that it should be so? Have men any more right to expect success in mining, than they have in any other important business, without employing the proper means, guided by the requisite knowledge and experience? Is this the fault of the rich mineral deposits in which our country is known to abound? Or can any deny, that in every country where mining is legitimately followed, it is of more enduring profit than any other pursuit? If a merchant were to fill his store with worthless and unsalable articles, bought without knowledge and without reference to value, would it be strange that he should do a losing business?—and would his failure be any reason why a prudent man should not buy and sell merchandise? In a mining country, like Mexico for instance, where the little knowledge I have on this subject has been acquired during the past three years, and where the first feverish excitement always attending any new leading pursuit has long since subsided and passed away, the first expenditure in proving the character of a vein is always deemed a lottery, with more or less chances of success,—and with them it is the only lottery! Nor do they hesitate, when the character of the vein is known, to expend any required amount, however large, to put it in successful operation, and deem the time short if accomplished in three years! They are then paid for waiting, and have a property that may be transmitted from generation to generation. Nearly all the brilliant fortunes and great landed estates of the Republic are in the hands of descendants of mining families. The English, who are *Bully Miners*, expended two millions of dollars in restoring and putting in order the Bolono Mine, before they got any returns There have been single years since that time, in which the bullion produced was equal to the money first expended. In restoring, clearing out, and repairing the outworks of the great La Luz Mine, after the revolution, $800,000 were expended before any returns. This mine, during the last six years, has produced many millions net profits. The Real Del Monte Mine gives to its proprietors at present nearly two hundred thousand dollars per month. It is indeed a sorry mine here or elsewhere, properly opened and worked, if it do not pay a good dividend on a capital of a million.

"Why, then, is it that there are so many disappointments in the United States? The answer, unfortunately, is to be found in the undeniable fact that, in too many instances, the proper means have not been employed. A location is made, or a tract is purchased, having an out-cropping vein upon it; an excavation is made on the vein, for any thing under a hundred feet is, after all, but an excavation; a few fine specimens of ore are procured, and forthwith a company is formed. One third, one half, or even two thirds of the stock is divided between the owners or getters up; a *whole fortune is given away for selling the scrip*; a ton or two of ore is hurried to the market and sold at auction, as mere samples of what is coming; the stock is thrown on the market, with an abundant supply of "fine prospects, promising lode, beautiful gossan;" all impatience, all hurry; new, ill-adapted, and untried machinery sent out; the stock rises in the market, it is quoted every day at the Board, and men, without much inquiry, knowledge, or experience, buy—because it is so cheap, and expect to pay a ninety days' note from the proceeds, by selling out when it reaches par; and the result is, that time passes along, and, as a matter of course, disappointment follows, and somebody finds a worthless piece of scrip in his portfolio, representing an interest in a mine, which, after all, had it been really properly opened, properly worked, might have yielded very fair returns, if not a brilliant fortune for all concerned.

"Nor is the inventive genius behind the mining spirit of the country. I know not how many quartz-crushing machines and amalgamating apparatus, each the very best, exhausting the whole subject, have been produced. It is a great problem indeed for the gold crop, that they have attempted to solve. It may be already solved, and if so, the result to the mining interests of the country will be what Whitney's gin has been to the cotton crop. If intended for silver mines, and the oxides of the iron from machinery shall not be found objectionable, something less ponderous, less expensive, requiring less motive power, and which may be increased in number as the wants of the mine require, should be aimed at.

"A few experiments on a small scale may be encouraging, but they are not sufficient. What signifies fifty or one hundred tons of quartz put through a machine that must perform weekly a similar task or fall short of what is promised! The amalgamators, too, have sprung, like Minerva from the head of Jupiter, into perfect maturity at a single bound! *In silver ores amalgamation is a chemical rather than a mechanical process, and requires much practical experience:* I do not speak of gold.

"Why, I do not hesitate to say, that take any of our eminent professors, who are really able and learned men, and place them in a Mexican hacienda full of ore, with every appliance around them, and they would not, unaided, succeed in extracting the silver! Give them time and practical experience, and their success may be brilliant. How is it possible, therefore, that in a great mining interest such as has sprung up so suddenly in our own country, without mining schools or previous training, that many failures and losses and disappointments will not happen?

"But all these, and even more, will not suppress, though it may for a time retard, the mining interests of the country. Experience will soon, if it has not already, set these matters right. There are good mines enough in the hands of good men, who have the means and the courage and the patience to work deep and strong. These have met, are meeting, and will meet with their reward. Others, that have started wrong, will have to stop, remodel, or give place to new parties, *i. e.*, where their veins are worth pursuing. Capital must have a better share Originators must be content with less reserved interest or shares, and they will find it more satisfactory and profitable in the end. It does not take a large interest in a good mine to support a family.

"And capitalists, who are not without fault, must have more patience. A company of business men unite for manufacturing purposes,—two, three, or five hundred thousand dollars are invested in steam or water-power buildings and in the erection of machinery, and then fifty or sixty thousand dollars are added for working capital, and after two or three years they are quite content to be in the receipt of ten or twelve per cent. per annum. So in the construction of a railroad, mountains must be levelled and valleys filled up—or a coal mine is opened, and millions spent on roads to get it to market, before the ten or fifteen per cent. can be expected. And so with every other common sense pursuit of life. When capitalists have learned to apply this principle, even on a small scale, to mining matters, they will find which pays best. The experiment has been made elsewhere, and it is in process of being made here."

The statement further proceeds as follows:—

"It is from no want of confidence, then, that I omit stating even what I believe the returns may be, in so many dollars and cents, from the Vallecillo Mine. It is more than a year since the members of the Board and a few others in this city became stockholders; others have been three years, and are not yet impatient. They know how the works have progressed since that time. Within this period of twelve months, also, the mine has been visited by an experienced and competent miner of New-York, who extended his examinations, for the sake of comparison, to many of the great mines of Mexico, now in successful operation. The Board, from personal interviews, know his opinions. He has become a stockholder, on terms precisely such as others have paid, and will direct in person the future operations at the mine, which belong properly to his profession.

"The transportation of the machinery to the mine is provided for by every possible preliminary arrangement, at different points on the way. The first shipment, consisting of all the pitwork, will leave early in January, with a Pitman and Engineer, furnished by the builders. These are the first materials to be used; and so far as the completion of the job is concerned, it is precisely the same as if the whole engine was finished and shipped at the same time, as it will follow in season to take its place, causing no delay in the completion of the work.

"The whole data in my two statements, with a few comments, have now been given. I hope it will, I know it ought to be, satisfactory to the Board. The conditions upon which this Company was formed, that it shall be a faithful working concern, have not and will not be departed from; and knowing, as I now do, that what little remains to be accomplished will be done on the proper scale, I can feel no solicitude about the result. We know that we are in a good mineral district; that one, at least, of the most remarkable yields of silver ever known in Mexico, or recorded in the annals of mineralogy, was from the *Higuana*—only a few leagues from us; that our mine is abundantly proven, to say nothing of what the Spaniards did, from the ores taken out and the silver extracted before cutting the great mother-vein of the mine, the increased water from which drove us from below, made it necessary to procure new machinery, sink a new shaft, and, as compensation, added tenfold value to our property.*

"'Although,' says Dr. Posselt in his report, 'the depth of the mine reaches not to the zone generally regarded in Mexico as the most metalliferous in ore, being only 80 yards deep, there are produced ores of a *richness* and *abundance which give the absolute certainty of great returns for the capital invested*; and promise, by going further down, and reaching the depth experience has proven to be richest in silver, a reward surpassing even the most sanguine expectations. *I have examined the mine below, and come to the conclusion, that it can be made equal in duration and yield to the large and renowned mines of the interior of the Republic.*'

"Supposing it might be interesting to have a strict analysis of the ores, made by a thorough analytical chemist in this city, I placed the four classes of ores, as divided by Dr. Posselt, in the hands of Dr. Charles Enderlin, once the associate and companion of the great Liebig, as yet but little known beyond the *science* of our city; and the result is hereunto annexed.

"From actual observation, Doctors Posselt and Prevost formed the opinion, that the black metal would become 'the main ore of the mine.' It will be seen that, '*from chemical and*

* It is considered by practical miners, resulting from the experience of a century in mining districts, that a great flow of water in cutting a new vein, proves the great strength and character of a mineral lode, and although it often involves an increased power of machinery, is always in these days hailed as the most favorable omen or indication, since the power of the steam engine conquers these obstructions, so fatal to primitive mining operations. It is estimated that the application of the Cornish pump to the mines of England has added over two hundred thousand millions of dollars to her mineral wealth.

geological facts, well known from modern investigations,' Dr. Enderlin comes to the same conclusion. He has made the assay, and given the yield of each class of ore, in ounces of pure silver to the *carga* of 300 pounds of ore, thus following the Mexican method. *Ten ounces to the* CARGA, *when all things are ready, and the supply abundant, gives ample margin for large profits!*

"The mills and reduction works in the hacienda, being equal to pass near two hundred tons of ore per month, I do not deem it necessary to recommend the purchase of any, however promising, of the new machines at present.

"Favored in location, near home because easy of access, cheapness of fuel and labor, a climate remarkable for health, and that knows no interruption to labor the year round, with an entire and unquestionable security for this species of enterprise; I hope the business men who have given it their countenance and support, and taken the management, will find some satisfaction beyond the mere returns, in the consciousness of having given an impulse to an important enterprise, in a new direction, not impossible, from the extent and known richness of the mineral region, to form an era in the production of one of the precious metals, the want of which is so much felt at the present time, as an element in our commercial prosperity. *

Before leaving this subject, we will revert to the immense outlays of capital which were made to work, in former times, some of the mines of Mexico, and the most stupendous operations which

* ANALYSES OF ORES OF THE MINE OF JESUS MARIA.

New-York City, December 8th, 1853.

SIR:—I communicate to you, herewith, the results of the analysis instituted with the four specimens of ores of the "Jesus Maria" mine.

As you know, I had for analysis specimens of three different classes of ores: two specimens of the "Colloradox," one of the black silver ore, and one of a lead ore containing silver. Of the ores belonging to the principal class, embracing the argentiferous iron ores, which contain the silver for the most part mineralized by chlorine and bromine—in the state of chloride and bromide of silver, I have analyzed two specimens, of which one was impregnated with the "blue silver,"—"plata azul," and the other with the "green silver"—"plata verde."

The chloride and bromide of silver, found in cubical or cubo-octohedral crystals, and disseminated in the ferruginous rock, are frequently associated with native silver apparently resulting from the decomposition of the former compounds, as well as the original sulphide of silver, etc.

These kinds of ores being very scarce in the European mines generally, but found in so considerable quantities in Mexico, Peru, Chili, etc., I found to be particularly interesting to me on account of their chemical constitution, as well as in a geological point of view.

As regards the amount of silver contained in these two varieties, which were found to be richly impregnated with the crystallized chloride and bromide of silver, the quantitative analysis gave the following results.

were undertaken, and the great yield of silver often obtained from them. Our best authority upon the early produce of these mines, is Ward; and from his work we gather some statements in relation to them.

The silver mine of Valenciana ranks as one of the most extensive ground mines of the world. It is situated to the north of the town of Guanajuato, upon a part of the Veta Madre. After being slightly worked towards the end of the sixteenth century, it had been neglected as unpromising, until the year 1760, when Mr. Obregon, a young Spaniard of very small fortune, resolved to explore the vein upon one of those points where it was believed to be destitute of mineral wealth. For six entire years he continued to work upon this spot, with a perseverance which nothing but a presentiment that he was to make his fortune there, can account for; and in 1767, having exhausted his own means, as well as the patience of those from whom he had obtained supplies, he entered into partnership with a shopkeeper of Royas, wielding with his own hands the tools of a miner, until the year 1768, when the works having attained the depth of eighty metres, the vein suddenly began to produce enormous masses of rich ore, which continued to increase in value and extent to such

A. Analysis of two Collorados.

1. *Collorados impregnated with Blue Silver.*

Weight of ore	2.00	grammes.
Chloride of silver	0.120	"
Metallic silver	0.090	"
Metallic silver, percentage	4.50	"

Sum of ounces to the cargo, i. e. 300 lbs. of [illegible] avoirdupois) (omitting all fractions) } 325 ounces, or $270

2. *Collorados impregnated with Green Silver.*

Weight of ore	2.80	grammes.
Chloride of silver	0.164	"
Metallic silver	0.133	"
Metallic silver, percentage	5.59	"

Sum of ounces to the cargo, i. e. 300 lbs. of ore, (avoirdupois) } 370 ounces, or $324

I have also analyzed a specimen belonging to the second class of silver ores, called the "black silver ore." This ore, having a grayish black color, and when ground yielding a nearly black powder, is essentially composed of the "sulphide of silver" with metallic silver, accompanied by the sulphides of arsenic, antimony, lead, copper, iron, etc.

This black silver ore, with its varieties that have a similar chemical composition, I do consider to be the mother-ore of the so-called argentiferous iron ores or Collorados. By going deeper underground, you will, in all likelihood, strike at zones where those black ores will predominate; or, it may be exist almost exclusively. At the same time, I have no doubt the ores extracted, will, in richness, by far surpass the present ones.

a degree, that the profits of the proprietors amounted in several successive years to one million and a half of dollars. From 1788 to 1810, the produce averaged $1,383,195, and the profits $527,701.

A number of different "Pertenencias" were united in Valenciana, the works in the interior occupying nearly half an English mile. In order to gain access to the interior, various shafts were sunk, the first of which, called the Tiro Viejo, is said to have cost $396,000. Through this, the first "Bonanza" was raised. The Tiro de Bunyas, and the Boca de San Ramon, were next purchased and incorporated with the mine, and the Hexagon Shaft was afterwards sunk at an expense of $700,000. All these being deemed insufficient, the great Octagon shaft was begun in 1801, and carried on until the commencement of the Revolution, when it had cost nearly one million of dollars, and attained the depth of six hundred and thirty-five Mexican varas. When the mine was subsequently taken up by a company, the interior was filled with water to within one hundred and eighty-five varas of the mouth of the great shaft: there were consequently four hundred and fifty varas to drain, and this not merely in perpendicular depth, but disseminated throughout the whole of the workings, most of which had been so long under water, that the communications were destroyed, the timbering falling to pieces, and many of the lower levels filled up with masses of rock, or tepetate, detached by the action of the water from those above. Had this volume of water proceeded from internal springs, the attempt to carry it off by any power of machinery, would have been hopeless; but up to a late period previous, the mine had been dis-

Such a view I derive from chemical-geological facts, well known from modern investigations.

As to the geological point of view, there can, in my opinion, be no doubt whatever that the native silver, as well as the chloride and bromide of silver—blue and green silver—are the results of a decomposition which the sulphide of silver has undergone by the influence of the atmospheric air and meteoric waters having come in contact with it.

Decompositions and alterations of a similar kind are quite generally found at the higher parts of veins containing other metals, especially of those the ores of which are more or less readily acted upon by atmospheric agents, e. g., those of the sulphides of copper, iron, etc.

I may mention here some phenomena met with in lead veins, since silver and lead have so much in common, and are frequently united in veins, so that it is rare to find silver unaccompanied by lead.

Sulphide of lead is found first to convert into the sulphate of lead by oxydation. But the latter is subsequently converted into the carbonate, phosphate, and chloride of lead by action of soluble carbonates, phosphates, and chlorides of the alkalies, etc., contained in all waters.

Similar if not identical changes, the sulphide of silver has suffered, and has been converted into the chloride, bromide of silver, and finally, by the reduction of the latter compounds, into metallic silver, with the assistance of decaying organic matters.

tinguished for its dryness. The water was first admitted by an injudicious communication with a neighboring mine, and allowed to accumulate during the Revolution, at which time, the machinery was destroyed. The attempt to restore this mine may be regarded as one of the boldest mining speculations ever attempted.

The drainage commenced on the first of February, 1825. Steam engines were not employed, on account of the scarcity of fuel; but eight horse whins, of the largest kind, were erected round the Octagon Shaft, and kept at work day and night, without intermission, for twenty-one months, in which time, they lowered the water 185 varas. As it descended, the levels which became accessible, were repaired, and ores raised whenever veins of any promise appeared: and such was the vigor and activity with which the operations were carried on, that a share in the mine, which, in 1824, would not have sold for twenty thousand dollars, was thought worth one hundred thousand in 1827; and in 1828 there were 351 varas drained.

In this way, also the arseniates, phosphates, and carbonates of copper and lead etc., accompanying the silver compounds in the Colloradoa, must have been produced.

By quantitative analysis the following results were obtained:—

3. B.—Analysis of the Black Silver Ore.

Weight of ore	1.70	grammes.
Chloride of silver	0.270	"
Metallic silver	0.203	"
Metallic silver, percentage	11.94,00	"

Sum of ounces to the cargo, i.e. 200 lbs. of ore (avoirdupois) (omitting all fractions)	600 ounces, or $720

Lastly, I have analyzed a specimen of ore belonging to the third class of ores. This is a lead ore in which the lead was found to exist almost wholly in the form of the "sulphide of lead" associated with "sulphide of silver," probably replacing the former—(argentiferous galena).

The yield of silver I obtained by quantitative analysis, is the following:—

4. C.—Analysis of the Lead Silver Ore.

Weight of ore	2.00	grammes.
Chloride of silver	0.110	"
Metallic silver	0.082	"
Metallic silver, percentage	4.10,00	"

Sum of ounces to the cargo, i.e. 200 lbs. of ore (avoirdupois),	211 ounces, or $258

Since we know from analyses of many specimens of argentiferous galena, that the percentage of silver in it is varying very much from 0.03 up to 20.4% it may be expected that, on coming to the more metalliferous zone, even lead ores will be arrived at showing a great richness in silver.

DR. CHARLES ENDERLIN,
Analytical and Consulting Chemist,
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The famous mine at Veta Grande was one in Zacatecas, upon which a large sum of money was expended by an English company to prosecute the workings, but with such gloomy prospects that orders were sent out to discontinue operations. Before they arrived the appearance of the mine had so changed that they were disobeyed. In April, 1828, the mine had occasioned an expenditure of 657,656 dollars, which bore the more heavily upon the resources of the association as it was unexpected.

The Report on the mine at this period says :—" The Gallega shaft had been sunk by our predecessors, who had driven cross cuts to the lode, and extended levels upon it to a certain distance ; but although they nearly approached the shoot of ore, which we have found so rich, they stopped short of reaching it ; and thus, by one of those chances which occur in mining, it was left for future discovery.

" The shaft was 150 yards in depth ; the lode had been cut at two points between the surface and the bottom of the mine, and some trial had been made in each. The upper level is 75 yards from the surface, and is called Guadalupe ; the one below it is 108 yards from the surface, and is called San Andres. In this level we first met with ore, which soon became rich and abundant, and was afterwards found to be equally so by an extension of the upper level. In the deep level, or that of San Francisco, not much has yet been found, the end not having been driven far enough to the east, to meet what seems to be the run of the ore-ground ; but in a winze, sunk further eastward, under the San Andres level, the ore has been found to hold down as deep as San Francisco.

" The ore ground is now passed through for 30 fathoms in length, and is seen also about 42 fathoms in height : the ends going east, at present continue to be rich, and the ore extends above the Guadalupe level, and will doubtless be found to go deeper than the San Francisco level. The lode is generally nine or ten feet in width, and produces from 150 to 200 cargas of ore per fathom.

" The levels are extending into a large space of virgin ground of the greatest promise, and a shaft is sinking to the east of our present workings, in order to pursue our discoveries with advantage. The water is abstracted by the drainage of the old mines to the east ; but in order to follow the ore below the San Francisco level, some mode of drawing water will become necessary at La Gallega shaft, which will be easily obtained by the erection of one or more Malacates.

" The following Table will exhibit the quantity of ores raised in the last year, distinguishing the mines from which it has been produced, and the periods for which the accounts are rendered :

Statement of Ores raised at Veta Grande, 1828.

	MACIAS.	URISTA.	LA GALLEGA.	Total.	Qtly. Totals.
	Cargas.	Cargas.	Cargas.	Cargas.	
January............	4,715	1,494	....	6,209	
February............	4,788	1,858	489	7,135	
March............	4,914	1,066	814	6,794	
					20,138
1st Quarter......	14,417	4,418	1,303		
April............	3 191	662	553	4,406	
May............	4 847	1,140	535	6 522	
June............	4,119	642	2,883	7 644	
					18 572
2d Quarter......	12 157	2,444	3,971		
July	4,500	801	5 867	11 168	
August............	5 562	793	7 911	14 266	
September.........	3 920	545	7,086	11,551	
					36,985
3d Quarter......	13 982	2,139	20 864		
October...........	5 096	937	9,828	15 861	
November.........	3,992	741	8,499	13 232	
December.........	3,272	528	6,327	10,127	
					39,220
4th Quarter.....	12,360	2,206	24,654		
					114,915
1st Quarter.....	14 417	4 418	1,303		
2d Quarter......	12 157	2 444	3 971		
3d Quarter.....	13,982	2 139	20 864		
4th Quarter....	12,360	2,206	24,654		
	52,916	11,207	50,792	——	114,915

"The whole costs of the mines for the year, exclusive of those relating to the reduction of ores at the Haciendas, amount to 591,219 dollars, which will be found to be equal to a charge of rather more than five dollars on each carga of ore raised."

Of the 115,000 cargas of ore extracted, that part only produced its value in money, which the Haciendas had been able to reduce ; and the extent of the works not having been calculated upon so unexpected an increase in the ores, 30,000 cargas remain in the magazines, which have not yet been turned to account.

85,514 cargas were beneficiated, and yielded 117,581 marcs of silver, or 1,001,098 dollars.

The costs of the Haciendas amount to 301,654 dollars ; the produce, or ley of each carga, averages $11\frac{7}{10}$ dollars ; but the ores improved as the discoveries proceeded, and that in so remarkable a ratio, that, while the average of the first quarter gave only $7\frac{3}{5}$ dollars to the carga, the third quarter averages $13\frac{3}{4}$ dollars per carga, and the fourth $13\frac{1}{4}$.

The profits of the year will appear by the following table :

The cost of the mines as stated	$591,219
Haciendas	301,654
Deduct sundry receipts	27,132
Total cost	865,741
Gross return	1,000,098
Profits in money	$135,357

To this, however, we must add the value of the stock of ore unreduced, but included in the general expenses of the twelvemonth, and amounting, with the ore on hand in January, 1828, to 59,080 cargas. These, if taken at the average* of the later Hacienda operations, would yield 531,720 dollars (assuming twelve dollars to be the produce, and three dollars the cost of reduction for each carga), which, added to the balance of cash profit, would amount to 667,000 dollars, or about £133,000 sterling in the year.

The total expenditure of the Company, both at Zacatecas and Bolanos, up to the end of March 1828, does not exceed £250,000 ; while the ore raised at Veta Grande during the same twelvemonth, is said not to amount to *one fourth* of the mass in sight, that is, actually cut through by the levels, and ready to be converted into silver as soon as the completion of more extensive reduction works shall render its extraction advisable.

"If we assume this estimate to be correct, we shall find that the value of the 345,000 cargas remaining cannot be estimated at less than £450,000 ; while, as the works advance into the unexplored ground to the east, appearances have hitherto been such as to indicate rather the extension, than the termination, of the Bonanza.

"Nothing, therefore," says Ward at that time, "can be more encouraging than the prospects of the negotiation ; and nothing, apparently, less questionable, than its success, although the absence of remittances has occasioned many persons to express doubts upon the subject here, which I suppose that nothing but the actual receipt of a dividend will remove.

"The want of this is, however, sufficiently accounted for ; in the first place, by the unavoidable deficiency in the reduction works, and in the second, by the necessity of applying to Bolanos a part of the surplus produce of Veta Grande, in order to prevent an additional demand from that quarter upon the proprietors at home."

We have made these extensive statements in relation to one

* This average is probably too high, as the richer ores were of course beneficiated first, and the poorer left on hand.

or two of the principal silver mines of Mexico, in connection with our leading subject of the silver mine of Jesus Maria, in order to present a more complete view of the stupendous operations at one time carried on in Mexico, and also to furnish our readers with some particulars of the early workings of these mines, which have not become easily accessible to every person.

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SOCIÉTÉ EN COMMANDITE.

This is the title of a form of copartnership existing under the laws of France, and in accordance with which, many foreign mining companies are organized. It is very similar to our system of silent partnerships with a limited responsibility. In a recent number of the *Westminster Review* is an examination of the English system of copartnerships, which contains an account of the system of *Societe en Commandite* as it is carried out on the continent:—

"The most obvious amendment which seems to be needed is founded on the distinction already adverted to between the dormant and the active partners of a mercantile association. Although rejected by the common law this distinction is respected by almost every other civilized people; among whom it is now well established that those members of a firm who abstain from all interference in the conduct of the partnership business, are liable to its creditors only to the extent to which they have bound themselves. Such is the law of France, Spain, Portugal, Switzerland, Wurtemberg, Russia, Holland, Lombardy, Florence, Sardinia, Naples, Sicily, the Ionian Islands, Hayti, and twenty of the States of the American Union. The French Code, which may be taken as the type of all the others, recognizes three species of commercial societies,—the ordinary trading firm of active partners, or partnership *en nom collectif*, the association partly of acting and partly of dormant partners, called the *Societe en Commandite*, and the *Societe Anonyme*, corresponding to our joint-stock corporations. The first two may be formed at pleasure, the last only by leave of the State. The partners in the first, and the acting partners in the second kind of association are responsible to the whole extent of their means for the engagements of their firm; the dormant partners of the second, like all the shareholders in the third, are not liable for losses beyond the amount which they have contributed, or have undertaken to contribute to the common fund; and after the debts are fully satisfied, the dormant partners become creditors, and prove against the residue of the estate. The protection thus thrown round a dormant partner or *commanditaire*, continues only as long as he strictly preserves his neutral character. To the *gérant*, or acting partner, is committed the exclusive direction of the partnership affairs; and so long as he conducts them in conformity with the articles of partnership and produces the books and annual accounts to his secret associates, he is independent of them. The latter may join in the general deliberations of the society, and may state their views and give their advice—although not their votes—upon any of its transactions; but the moment they advance a step further and do any 'act of management' they pass into the category of acting partners. In throwing off the restrictions, they lose the protection of the law, and become responsible for the debts and engagements of the firm *in solido*, that is, to the whole extent of their means. It should be added, that for the prevention of frauds and other minor inconveniences which arise from secrecy, the French law requires that all partnerships, and among them, therefore, those under consideration, shall be constituted by deed or writing, and that a minute or certificate of the material particulars of the instrument, together with the name of the place or places where the business is to be carried on, shall be registered and placarded in the commercial court of the district, and published in the course of the first fortnight in every January, in the local newspapers. The certificate must contain the names, descriptions, and places of abode of the general partners, the style of the firm, the names of those partners who are to manage the business, the date and duration of the partnership, and—where the firm consists partly of dormant partners, and is consequently a *société en commandite*—not the names, but merely the amount of the funds furnished, or to be furnished by the *commanditaires*. The style of the firm must consist of the names of the general partners with the superaddition of the words, 'and company,' which a single trader is not allowed to assume. The public is thus warned that the ostensible partners are trading with, in part at least, capital not their own; and by means of the registry, the amount secretly intrusted to them can be easily ascertained.

"The system has unquestionably worked well abroad. 'I do not hesitate to state,' writes Mr. Simpson from Amsterdam, 'as the result of twenty-eight years' experience during which time I have acted as a jurisconsult and barrister, that these partnerships have produced great good and little evil, have caused less controversy than other partnerships; in only few cases have been instruments of deception, and the laws have proved sufficiently efficacious to prevent abuse.' The Dutch have dried up lakes, inclosed rivers within their banks, repelled the invasion of the sea with dykes, and reclaimed waste lands, through the agency of these partnerships. In the Rhenish provinces—and by what country is their husbandry excelled?—farming establishments are carried on by companies of the same kind. 'The system of sleeping partners, "*en commandite*," as it is legally termed, exists in Spain,' says Mr Mark, the British consul at Malaga, 'and from practical experience (for upwards of twenty years), I can with safety say it acts well, and is attended with beneficial results.' 'On the Continent,' says Mr H. J. Enthoven, 'it works admirably well; say in France, Belgium, Holland, and Italy.' Mr. Leone Levi mentions that his native town, Ancona, has been lighted with gas by a similar association, and thinks that, although he has known it open to much abuse—he does not say in what respects—the system has done much good in that place, and that its introduction, with complete publicity, would be advantageous to this country. Mr Davis, the secretary of the American legation, says that it has worked well in Massachusetts. At St. Etienne, as already mentioned, half the ribbon manufacturers commenced life as the *gerans*, or acting partners, of *commandite* societies. In France there were in 1846-7-8, according to Mr W. Hawes, [illegible] partnerships, of which 1156 were *en commandite*; but although that gentleman discovers in this disproportion a condemnation of the system by the people among whom it prevails, it cannot but strike others as only demonstrative of what might have been expected *à priori*—viz., that those who embark in commerce are, in general, disposed to take an active part in the conduct of their business,—while the positive number of firms sustained by the capital of dormant partners, cannot but convey the idea of numerous instances of poverty with good conduct rising to competence, and of mechanical genius and inventive faculties utilized for public and private advantage. The best proof perhaps, of the working of the system, is the estimation in which the *commandite* partnerships are held in the market, and on this subject Mr. R. B. Minturn writes from America: 'Such partnerships command as much credit and general confidence as ordinary partnerships, perhaps more. There is certainty in the knowledge the community possess of the resources of such firms.'"

WHEN IS A MINE ABANDONED?

This was a case which came before the Kenmare Quarter Sessions, Ireland, in which the Kenmare Mining Company were Appellants, and the Guardians

of the Kenmare Union, Respondents. The appellants denied their obligation to pay the Poor-rate in consequence of their mine having been abandoned.

Mr McCarthy Downing opened the appellant's case, stating that there were four different objections: the substantial one and which his clients were anxious to have the case decided on, was that the mines were not liable to be rated under the 63d section of the 1st and 2d Vic. chap. 56, the same having been within the meaning of that act *bona fide* abandoned, and not re-opened for seven years since such abandonment. Although the court had twice before decided against the appellants, once upon technical grounds, and secondly on the ground that the mines were not abandoned, he thought that he could then present the case under different circumstances from those on which the court had before decided. It was not in the power of his friend (Mr. McSweeny) who then conducted the case and now assisted him (Mr. Downing), to lay those facts before the court. They were these:—In 1839, Mr. John D. Croker, who was then the owner in fee of the lands of Ardtully, in consideration of a sum of £1000, and a royalty of 1-15th, granted a lease of the minerals on said lands to English capitalists for a term of 61 years. This company continued to work the mines up to the year 1847, from which period to the year 1850 the works ceased altogether and in the latter year Mr. Croker was about to commence proceedings against the lessees for breach of covenants in the lease, when a compromise was effected; the lessees agreed to surrender the lease and hand over the machinery, &c., on the lands, to Mr. Croker, he foregoing his right of action. In some time after, the property was sold in the Incumbered Estates Court, and the minerals were sold in a distinct lot, and were purchased for the sum of £2500 by a person of some notoriety, Mr. Hudson, the railway king, in connection with some others, who granted a lease to parties who were now represented by the appellants and who commenced re-working the mine in the summer of 1851. If he (Mr. D.) proved those facts to the satisfaction of the court, he thought that there could be no question as to the right of the appellants to have the rate made upon those mines quashed.

John Dillon Croker, Esq., proved the lease of 1839, and the surrender in 1850, the sale in the Incumbered Estates Court, and the fact that the mines were not worked since 1847.

Cross-examined by Mr. F. H. Downing.—Had a person in care of it after he got possession, to prevent any harm being done to the machinery, the shafts were filled with water; believes the mine to be valuable; would have no objection to take shares in it, the former company ceased to work the mine in consequence of a large portion of their capital having been misapplied; the mine was not worked from 1847 to 1851.

Mr. John Williams.—Was in the employment of the former company for a year and nine months up to May 1850, when he gave up the possession to Mr. Croker, by the written authority of Mr. Weakfield the secretary.

Capt. Wm. Thomas.—Is superintendent of the mines since June, 1851; none of the present company had any connection with the former: the present company have expended within two years, a sum of £12,000, and have given employment daily to about 280 persons.

Cross-examined.—Believes the mine to be a good one; it has not yet realized any profits, knows that the employment given, has done great service in the east division in which the mines are situate.

The rental under which the lands were sold in the Incumbered Estates Court, was then handed in and the appellant's case was closed.

Mr. F. H. Downing submitted that the case now made, was not sufficient to induce the court to decide otherwise than it had done on two former occasions. He contended that there was no abandonment of the mine within the meaning of the law. It was admitted that there was a person constantly in possession and care of the mines, that the machinery, &c., were never removed and being now in the possession of the present company, showed rather a transfer than an abandonment, and therefore he hoped that the court would dismiss the appeal.

Mr. McCarthy Downing.—If the word "abandon" has any meaning, this mine was abandoned. It was entirely forsaken, and given up as a hopeless enterprise by the former company, not one of whom is now connected with the present. Abandonment means a giving up of something in existence not the withdrawing from a thing no longer in being and the clause in the statute speaks of re-opening the old mine and not the opening of a new mine; but the order for sale and rental and the sale thereunder, are conclusive as to the fact of abandonment. The rental describes the mine to be as late in the possession of the Kenmare Mining Company, and the 51st section of the 12th and 13th Vic. chap. 77, makes every order of the Commissioners final.

Court.—The case as now before the court, is quite different, indeed, from those that had been hitherto before it. I have not the slightest doubt that this mine was abandoned *bona fide* within the meaning of the Act of Parliament. I think the documentary evidence concludes me upon this point; but even if it did not, I have sufficient evidence to satisfy me that it was abandoned. The ceasing to work for so long a period, although it is not conclusive, yet is strong evidence; and when I couple that with the evidence of Mr. Croker and Mr. Williams, I entertain no doubt whatsoever. It is laid down in "Dickenson's Quarter Sessions" that a mine must be worked to be rated and if worked, though a very losing concern, it is liable to be rated. It has been contended that persons had been all through in possession of this mine but that is no evidence of its being worked. I have evidence that the shafts were filled with water and that no works, in fact, could proceed; and during this state of things, the principle in Dickenson's book would apply, that when a mine ceases to work, it is no longer liable to be rated: but viewing the whole of this, the documentary evidence and the sale in the Incumbered Estates Court, there can be no doubt but that this mine was abandoned, and is, therefore, exempted from liability to rates under the 63d section of the Act. I will, therefore subject to the point reserved, quash so far as it assesses a rate upon those mines.

THE RIGHT OF WATER COMPANIES IN CALIFORNIA.

The decision given by the Supreme Court last week, in the case of the Shady Creek Co. v. the Grizzly Co., will be of great interest to the mining community more particularly to that very large portion of the miners who depend upon water for their use, brought to them by artifical means. The ditch or water companies have been in the habit of charging the miner for the use of the water, so much per diem, and considering the water their own, after it had been used once, and if any party wished to use the water at second hand, they were charged for it at a reduced rate. Thus, if on a ravine, a miner used water which had got there by any means, natural or artifical, from a company's ditch, the first was charged a certain rate, the second or third perhaps less, and so on, down the ravine, until the water, which would otherwise be waste water, reaches a river or creek. And also if a miner was using the water for his "Tom," and a friend took the water after running through the machine, to use in working a cradle or common rocker, the company claimed the right of charging for the use of it. The immediate question in the case referred to, was whether a Ditch Company had a right to withdraw water which had been run by the natural level of the country from their premises into another stream or creek, from such stream, to the injury of a company depending upon the stream for water. It was decided that they had not the right, and the principle was also laid down that after water had passed from the possession, that is, from the grounds used and improved by labor of the company, it was no longer theirs, and became the property of whoever might choose to possess it. Another important principle laid down, was, that a farmer whose land the water passes through may have a reasonable use of the same; such, for instance, as to use it for mill purposes, always providing, that the company, if previously in possession, is not injured by such use of it.

THE PROPRIETORSHIP OF MINES IN CALIFORNIA.

The local press of California has discussed with some considerable ability the late decision of the Supreme Court of that State, claiming for the State the proprietorship in all mines within its limits. Here is a specimen of the manner in which the subject is treated:

The Supreme Court (July 25) rendered a decision in the case of Hicks et al. *v.* Bell et al. on an ordinary question of possessory right in a mining claim, so original, and so much at variance with all pre-existing notions of the principle involved, as to be almost startling. The Court went beyond the record to reach the point raised and decided, which is the sovereignty of the mines. The Court decides that the United States has no interest in, claim to, or jurisdiction over the gold and silver mines of California.

The principles of common law upon which this decision is based are precisely the same upon which a contestant of the States' ownership would maintain the absolute sovereignty of the General Government over the mines. That is to say, the Court holds that the rights of the crown, under the common law of England, to all mines of precious metals, vest in this State as the succeeding sovereignty, instead of in the United States. The principle of succession is a common and very well established one; the singularity in this case is in the application of the principle. It has hitherto been a generally received opinion that the succession of sovereignty in this respect was to the Federal Government and not to the individual States. It has been not only the popular understanding, but all the statutes of Congress, as well as (if we mistake not) the action of the Supreme Court of the United States, have recognized the principle. But, according to the opinion of the learned Judges of California, Congress and the Supreme Court of the United States have been laboring under a misapprehension of the extent and nature of the sovereignty of the Federal Union.

The first authority quoted by their Honors is, we think, an unfortunate one, and tends to upset rather than to establish their opinion. They quote Blackstone's ruling that the royal "right to mines has its origin from the king's prerogative of coinage." It is clear that he did not own the mines because such ownership was necessary to the exercise of the "prerogative of coinage;" when the prerogative was withdrawn from the King and vested in another power, the ownership of the mines, being incident to the prerogative, was, according to Blackstone, transferred with it. The jurisdiction of the mines goes with the prerogative of coinage, and not with the sovereignty of the soil in which they are, unless the prerogative and the sovereignty are coincident, as they are in this case. The case cited from Plowden, in which it was ruled that a royal conveyance of lands containing mines did not convey the right which he held in them by virtue of the prerogative of coinage, is also, we think, directly against the opinion of the Court. If the royal ownership had existed by right of sovereignty, the King could have alienated the mines as well as the lands in which they were found. But the jurisdiction of the mines being necessary to the prerogative of coinage, he could not convey them while that prerogative passed from him to his successor, the United States, all the rights and powers incident to it passed with it, and is now vested in the Federal Union as the legal successor of the crown.

Their Honors say "the mines of gold and silver in public lands are as much the property of this State by virtue of her sovereignty, as are similar mines in the lands of private citizens." Very true—but where do their Honors find that "similar mines in the lands of private citizens" *are* the property of this State or any other State? We think not in the New York and Pennsylvania cases cited, because these cases do not appear to touch the principle. They referred to discoveries of mines in the public domain, and the action of the Legislature did not imply, necessarily, sovereignty over the mines in the public or private lands.

We do not assume to pass judgment upon the opinion of the Court, but we cannot avoid thinking the grounds of the decision are untenable. As it must have an important bearing upon the mining interests of the State, it is of the highest consequence that the whole subject should be clearly understood and the principles involved firmly established, before it is made the basis of Legislative action.

EXAMINATION OF THE MINING REGULATONS OF COLUMBIA DISTRICT, TUOLUMNE CO., CALIFORNIA.

The mining laws and regulations lately adopted by the people of the Columbia district, in Tuolumne county, though judicious and practical in most of their provisions, are in others not only injudicious and illegal but dangerous to the peace and welfare of the population within the district, and of the whole State. We are convinced, from the character of the miners of that district, as well as of the mining population generally, that these rules were adopted without the knowledge of any conflict with the constitution and laws, and that when they perceive the conflict they will modify their regulations.

The following article, the only one to which reference need be made at present, is the one most objectionable, and the enforcement of which threatens most serious consequences:

Art. 10. None but Americans, and Europeans who have or shall declare their intentions of becoming citizens, shall hold claims in this district. But foreigners shall have until the first of November next to declare their intentions.

This article of the laws of the miners is in direct contravention of the State constitution and of the statute of March 30, 1853. As the time approaches when the edict is to take effect, preparations are made to enforce it. The following extract of a letter from an intelligent and respectable foreign merchant resident at Columbia, will serve to illustrate somewhat the state of the public mind in that district on the subject:

"The minds of the entire foreign population are unsettled here. The alarm occasioned by a resolution of the miners, in the Columbia *Gazette* of the 22d October, ordering all foreigners who are not naturalized to quit the district before the 1st of November, is general. There are upwards of 1000 individuals whose rights would be struck down by the carrying out of this selfish and tyrannical resolution. The French miners, in particular, will never submit to it. Rather than live as helots in a land for whose liberties their forefathers shed their blood, they will shake the dust off their feet and quit this State forever. I tell you that no reliance can be placed on the authorities of this State, each of whom aims at attaining some selfish end through the people, and who therefore has not the moral courage to risk his would-be popularity by defending the cause of order and of the laws. Believe an old resident of this State, there is mischief brewing, and unless something turns up which I cannot foresee, there will be bloodshed in this district ere long."

The edict ostracising foreigners conflicts with section 17th of the Declaration of Rights, which declaration is the basis and essence of the constitution:

Sec. 17. Foreigners who are or may hereafter become *bona fide residents* of this State, shall enjoy the same rights, in respect to the possession, enjoyment, and inheritance of property, as native-born citizens.

This language is too plain to admit of two constructions. The foreigner who *resides* actually in the State, though he has not declared, and does not design declaring at any future time, his intention of becoming a citizen, has precisely equal protection in the enjoyment of personal rights and possession of property with the native-born or naturalized citizen. He is restricted in the political franchise, and in nothing else; and no act of the State Legislature, or of any other power, can restrict his rights of property or personal freedom, so long as the constitution remains as it is. We have nothing to do at present with the wisdom, or justice, or policy of that clause of the constitution. We must simply take the constitution as it stands, and abide by its declarations, or else array ourselves in open opposition to it and all law. If the constitution is wrong in giving such rights to foreigners, let it be amended, but not violated.

We have the utmost confidence that the people of Columbia district will most cheerfully forego the enforcement of their edict against foreigners when they discover that it is in violation of law. That it is so cannot be for a moment questioned; because the language of the constitution guaranteeing to foreigners the very rights which the edict takes from them, is explicit and cannot be misunderstood. If therefore the edict is enforced, it must be done in open defiance of the primary laws of the State.

The resolution of the miners is also in violation of the statute of March 30, 1853, entitled an Act "To provide for the protection of foreigners, and to define their liabilities and privileges." That Act declares:

Section 1.—That from and after the passage of this Act, no person not being a citizen of the United States (California Indians excepted) shall be allowed to take gold from the mines of this State, *unless he shall have a license therefor*, as hereafter provided.

If the constitution were silent touching the rights of foreigners, the statute guarantees to them the privilege of mining in any part of the State, after procuring a license; but the Columbia edict declares that they shall not work the mines within certain limits, with or without license. It is very true that the act itself is in direct violation of the constitution, because it imposes restrictions on the possession of property by foreigners, which the constitution explicitly declares shall *not be* imposed. But the unconstitutionality of the statute does not warrant a violation of its provisions by the imposition of restrictions greater than those it imposes. It is therefore valid, as against the violators of rights guaranteed to foreigners by its own provisions, as well as by the constitution.

In whatever light it can be viewed it is incontestably clear that the edict conflicts with the constitution and the statute, and that it can only be enforced by violence. We trust the people of the Columbia mining district will not forfeit their character of law-abiding citizens by carrying their resolution into effect, when it is so plainly unlawful.—*Alta California.*

COMMERCIAL ASPECT OF THE MINING INTEREST.

New-York, Dec. 20, 1853.

The transactions in Mining stocks throughout the past month exhibit a considerable increase when compared with the preceding ones; thus showing in the most satisfactory manner, the growing desire on the part of the community to avail themselves of these investments for their surplus funds.

In North Carolina, there has been a good deal doing at better prices. The stock fell as low as 3½, but has advanced to 4¼, and from the character of the buyers, there is a prospect of its advancing still higher. It is stated that the Superintendent writes he is getting out 5 tons of copper per day; if so, and this yield continues, the mine must prove very valuable. Pennsylvania and Lehigh Zinc has declined to $3 per share. A good deal of stock has been pressing upon the market, and the recent loss of a portion of their buildings has, perhaps, assisted this decline. The company are reported to be doing a good and profitable business. Ulster stock has fallen off a good deal, having touched as low a point as 1¼. It has, however, reacted to 1¾, at which price some small lots might be sold. McCullough stands about 8, with scarce any transactions. Gold Hill sells readily at $3. It is expected this company will declare a second dividend the coming January. This stock has very quietly given returns sooner than any other mining company dealt in *in this market*, though the promises from some others has been much larger. One small parcel of the Wickoff Company has also been in the market. Another new gold company, the Buckingham, has also been introduced, which promises handsome returns for investment. Deep River Mining Company, from which much was expected, has declined to a low figure. The company are considerably in debt; if they can arrange to relieve themselves they may do well. Lindsay stock, which mine adjoins the McCullough, has advanced rapidly from about 40 cents to 75 cents per share, and its friends are confident that in time, and by proper working, it will prove equally as good as the McCullough.

Phœnix Gold has receded to a very low figure. The direction in this company are slow, but it is said they are sure, and that in time it will equal in returns all its friends have claimed for it. It appears to us as if there had been great lack of energy in the management of this company.

What has become of Manassas? this is a question often asked by those who from favorable reports, and the promises of the directors, were induced to invest in this mine, at what may be called a high figure. Surely some explanation should be given as to its condition and prospects.

A new company, called the American White Zinc Company, is in course of successful operation at Brooklyn, under Gardner's Patent. The white oxide is made from the spelter, as in France. It is thought the company can make 12 tons regularly per day. They will also grind their white oxide in oil, so that the character of their paint will be guaranteed. They promise to make large dividends.

One small lot of the stock of the Hiwassee Copper Company was sold during the month at 4½. This company have been shipping steadily for some time past, over 100 tons of ore per month, which has met with a market as well in New Haven and Boston as in this city, and from the information we have received that the mine is now prepared to deliver more than double this amount per month, we expect to have to chronicle an advance in any of the stock that may be offered before our next publication.

A lot of the Parker Vein Company's stock, for sale last week, reached the lowest point it has ever yet arrived at; it has, however, rallied since, and now remains firm at 8½ to 9. The Directors published a report in some of the daily papers, accompanied with a letter from the Superintendent, which gives a flattering prospect of what the stockholders in the company may expect in the course of time.

Lead stocks have been generally dull, and not much offering. Some shares of Potosi that were put up, have commanded 5½.

A new company, some particulars of which appear in the latter part of this number, has been formed for the working of some mines in Connecticut, in which cobalt has been discovered. The large demand which exists for this metal, together with the limited supply, there being but one other locality in which it has as yet been discovered, must tend to stimulate enterprise in this quarter.

Fluctuations for November, 1853, in the Mining Stocks during that month at the New-York Stock Exchange Board showing their highest and lowest points, and the date, with the market value at the close of the month, gain or loss for the month and number of Shares of each sold:

Name of Stock.	Shares.	Par	Highest Value	Day Month	Lowest Value	Day Month	Value Dec. [illegible]	[illegible] gain	loss	Shares Sold
Buck Mountain	100,000	5	2	9	1½	8	2	½	—	600
Cumberland Coal	200,000	100	30	22	23½	9	25	—	½	57,936
Dauphin and Susquehanna...	22,000	50	30	7	28	13	28	—	2	192
Do. 7 per cent. Bonds	—	—	45	14	—			—	—	4,000
Gold Hill Mine ...	200,000	5	4	23	3½	12	3½	—	½	7,452
Hiwassee Copper		—	4½	8	[illegible]		—		—	[illegible]
Lindsey	100,000	1½	½	12	½	6	½	½	—	8,200
[illegible] Coal and Copper	200,000	5	8½	8	7½	17	8	—	½	[illegible]
New Creek Coal Company	200,000	1½	3	23	2½	3	2½	—	½	2,195
New Jersey Zinc	96,000	12½	10½	25	9	16	9½	—	1½	[illegible]
North Carolina	100,000	5	5½	21	3½	2	4½	—	½	6,050
Parker Vein Coal	50,000	100	1½	26	5½	16	5½		2	22,471
Pennsylvania Coal	[illegible]	50	[illegible]	24	108	15	109		2½	841
Pennsylvania and Lehigh Zinc	100,000	10	3½	9	2½	10	2½	—	1	10,450
Phenix Mining and Manuf.	20,000	100	16½	28	14	10	14		2½	1,875
Potomac Copper	100,000	10	1½	24	1	16	1	—	½	600
[illegible] Lead	200,000	5	5½	29	5½	13	5½	—	—	1,200
Ulster	100,000	5	1½	23	1½	9	1½	—	½	4,025

BOSTON MINING SHARE MARKET.

BOSTON, DEC. 20, 1853.

The year just closing has done more for the development of the *Mining Interests* of the Lake Superior region, than has ever been accomplished before, and the public have gained much valuable information, in relation to this class of property, which has tended to strengthen their belief in the productiveness of the various mines now being operated. In the early part of the year, the prices of most of the *Mining Shares* were unduly inflated by the action of speculators, without regard to intrinsic value; and as a natural result, many of the stocks now sell at greatly reduced figures from the highest marks then current. The present position of the different companies is much more healthy now, however, as regards their value in the market, and the principal of them have already been developed sufficiently to prove their real value.

In former years we have experienced periodical inflations of "Copper Stocks," and the whole operations were so much of a "bubble" that the public generally failed to have any confidence in the reality of the enterprise. And certainly there was too much ground for these conclusions, for most of the companies in former times, have been represented *on paper* merely, not having taken the first step at *practical mining*, without which there is, of course, no basis for any company to build upon. The Pittsburg and Boston ("Cliff") Mining Company, one of the pioneers, after meeting with almost insurmountable difficulties, finally struggled through, and became a dividend paying mine. The time was, however, when even this company, now so successful, could not get its subscribers to pay in their assessments, and at one time it seemed as though the whole enterprise must be a complete failure. Now, the mines of Lake Superior have been so far developed, that scarcely one can be found who doubts their almost unlimited resources for the production of copper, and many of our most keen-sighted financiers are looking to this point for the opportunity of amassing a fortune out of their investments. Whoever has given due attention to the solid proofs of the internal wealth of the Lake Superior mining interests, cannot fail to have become impressed with their growing importance, which is the more and more *solid* as time and labor opens to view their immense richness. We would not wish any one to place their means in this class of property, without thoroughly satisfying themselves that they are making a safe investment, and therefore would advise all to look minutely into the merits of any enterprise they may wish to engage in. We have unbounded confidence in the mineral wealth of the mining region of Lake Superior, but in thus expressing ourselves, are not to be understood as indorsing all the various companies which have been or may be hereafter organized for mining purposes, neither do we wish to be, in the least, considered as speaking adversely of any of them. Let each investigate for himself, and choose with due discrimination from the facts which may be presented, and to our view the chances for a successful result are highly favorable.

Since our last monthly review, there has been no general reaction for the better in *Mining Stocks*, in consequence of a continued stringency in money matters; but within a week or two signs of greater abundance of money have been more evident, and with a better supply of capital at easier rates, there is every reason for improvement in stocks generally, of which *Mining Shares* will not fail to receive a good proportion.

The stock of the *Copper Falls* has been in quick demand, and as we predicted last month, has advanced from the great depression at that time, to 52½ now, a gain of \$7½ per share. This quick advance may not be maintained, though the present indications are favorable for a still further improvement. Some parties, however, are disposed to "bear" the stock, and after it has risen a few dollars per share higher, they may use their efforts to again break down the price. This company at no very distant day, will become one of the dividend class, though it is probable that an assessment of \$2 to \$3 per share may be called for some time next spring, the policy of the managers being to keep entirely from debt, so that after once commencing the payment of dividends they may be regularly continued.

Pittsburg has further declined under a heavy fire from the "bear" operators, who are generally supposed to be short of the stock; and operated upon by these influences the shares have declined from 149 to about 140, though cash stock is scarce at the latter figure. The certainty of a good dividend in February next, should deter holders from parting with their shares, at the present low prices, produced as they are by speculators interested for a decline, and not in consequence of any unfavorable accounts from the mine as to the real prosperity of the company. *Minnesota* is rather heavy again at about 185; the long delay of the proposed dividend having an adverse influence on the current value of the stock. Very few shares are offered for sale, however, the whole number publicly sold since September 1st, being only *eight*. *North American* has not been sold in this market for some months, the nominal price being about 67. We do not hear any thing particular from this mine, though its prospects are good, and the amount of copper obtained is very large. *Isle Royal* is in good demand with highly favorable accounts from the mine. Large quantities of "silver veinstone" are produced at this mine, and the opinion is strong that the amount of silver will be sufficient to pay well for extracting. This matter is being thoroughly tested at Pittsburg, by Hon. Truman Smith, and should the results be favorable, the value of the *Isle Royal* will be greatly enhanced, as also several other mines with similar formations.

National has declined to 20 and since reacted to 23, at which figure the stock is scarce, and an order for two to three hundred shares, could not be filled at less than 25 if at all, in this market. This mine has been eminently successful, and has been mentioned among those likely to become paying mines within a short time. *Norwich* is well held and few shares come upon the market, the transactions here generally, being much limited. The last accounts from the mine were very encouraging. *N. Western* has been very dull of late, and no sales have taken place since the assessment of $2 per share was paid in Nov. 1st; 15 is offered and 20 asked for the stock, but any forced sale would have to come nearest the first-mentioned figure, while an imperative order to buy could hardly be filled much below 18 to 20. *Forest*, after having run up to 12, under the influence of speculation, has since receded to 8½, and again reacted to 9½, at which point buyers are more plenty.

The following assessments are the only ones called for, that have come to our knowledge, since last month:

COMPANY.	AMOUNT PER SHARE.	WHEN PAYABLE.	WHERE PAYABLE.
Phœnix	One dollar	January 4, 1854	Boston.
Windsor	Fifty cents	January 16, 1854	New York.

Since the announcement of the above assessment, *Phœnix* has been pressed upon the market, and forced sales made as low as 4½. The shares are now in demand, however, at $6½ bid, the low figures bringing in new purchasers. During the speculative buoyancy of last Spring the same stock sold at $19 per share, which was probably much above its real value, but at the present low rates, holders would do well to look into the merits of their property before sacrificing it. *Toltec* has improved since our last, and touched 11¼, but since declined to 10¾ though little stock can be obtained at the latter quotation, $20,000 has lately been paid into the company, which gives them a strong working capital, and the prospects of their mine are of the first class. The stock is one of the most popular operated in here, and is considered cheap at present rates.

Algomah is in better demand, and has advanced to 3½. It is said that this company have struck the "Toltec Vein," which would render the property of great value. *Dana* is improving, and sales are made at about $2 per share, but there is no large amount of stock in the market at that figure. *Fulton* has been very heavy, and declined to 1½, but greater demand has prevailed lately, and 1¾ is now bid. The prospects of this company are said to be very good, but the large number of shares (100,000) operates very much against a permanent improvement in the price of the shares. *Glen* has been forced down to 1¼, but is now firm at about 2, with little stock offered. The prospects of the company are very fair, but it is yet in the early stages of development. *Ripley* is firm at 3¾ to 4, and promises well. *Star* is in good demand at 4½ bid and little stock offered. Thus far the company have realized their most sanguine expectations, and the mine is considered, by good judges, one of the best among the comparatively new companies. *Winthrop* is steady at about 2¾, with a moderate demand for the shares. *Webster* sold at 1½ some days since, but is now in request at about 1¾. The accounts from the location of this mine (Portage Lake) are very satisfactory, and the stock may be considered cheap as $2 has been paid in per share. *Adventure, Bay State, Bohemian, Boston, Manassas, Manitou, Native, Ridge, Shawmut* and *Summit*, are all dull, and in little demand at quotations.

Malone Sandstone ran down to 40 cents per share (for $3 paid in), but has since reacted and now the demand is active, 50 cents bid. At this price the whole property would cost only $20,000, and probably the friends of the enterprise, who sold out at $3, will now come to the rescue, and buy up the floating stock, as they can well afford to. *West Castleton Slate* is heavy at 3 asked, without purchasers above 2½. The company propose making a report in January; but we have been able to ascertain little in relation to their affairs. They promise, however, to make a good show of their condition.

BOSTON MINING SHARE LIST.

Fluctuations for November, 1858, in thirty-one different Mining Stocks, sold at the Boston Stock & Exchange Board, showing their Highest and Lowest Points and the Day, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

Name of Mining Company	Nominal Capital	Shares	Par	Paid in	Highest Price	Day	Lowest Price	Day	Value Nov. 30	Gain	Loss	Shares sold	Value Oct. 31
Adventure, *Copper*,	$2[illegible],000	1[illegible]	25	$11.00	—	—	—		4	0	0	No sale	4
[illegible]	500,000	20,000	25	1.12½	3¼	29	2½	9	2½	¼	—	1100	3¼
Bay State,	500,000	20,000	25	*3.00	—		—	—	1¼	—	¼	No sale	1
Bohemian,	....	10,000	—				—	—	1¼	—	¼	No sale	1
Boston,	500,000	20,000	25	*2.00	—	—	—		2¼		¼	No sale	2¼
Copper Falls,	300,000	10,000	30	19.81	56½	2	46	5	46	—	4	632	51½
Da[illegible],	500,000	20,000	25	1.2[illegible]	2	21	1½	29	1½	¼		700	1½
[illegible]	200,000	16,000	20	15.10	10½	3	10½	9	*9½		1½	258	9
[illegible]	500,000	100,000	5	*2.00	1½	26	1½	9	1½	0	0	6425	1½
[illegible]	500,000	20,000	25	*2.00	2	25	2	25	2	0	0	10	2
Isle Royale,	120,000	12,000	10	6.00	*17	23	15½	2	*17	0	0	191	*17
Malone Sandstone,	160,000	40,000	0	*3.00	½	9	½	30	½	—	¼	1700	¾
Manassas, [illegible]	1,000,000	100,000	10	*2.00	—	—	—	—	1½	0	0	No sale	1
Manitou, *Copper*	500,000	20,000	5	1.25	—	—	—		1¼	0	0	No sale	1
Minnesota,	300,000	3,000	1.00	22.00	—	—			185	5		No sale	185
National,	250,000	10,000	25	2.50	25	11	20	23	23	—	2	45	23
Native,	250,000	10,000	25	3.25			—	—	3	0	0	No sale	3
North American,		[illegible]	—	20.00			—	—	67	0	0	No sale	67
Norwich,	100,000	20,000	5	4.00	*11	19	*10½	26	*11	½	—	90	*11
North Western,		[illegible]	—	12.00	—				*16	—	2	No sale	*16
[illegible]	800,000	10,000	20	5.00	7	3	6½	30	6½	—	½	650	7
Pittsburg (*Cliff*),	....	6,000	—	18.50	151½	7	149	22	147	—	6	91	141
Ridge,		10,000		6.50					4½	0	0	No sale	4½
[illegible]	500,000	40,000	12½	*2.00	4¼	2	3¼	15	3¼	—	¾	4,261	4
Shawmut,	500,000	20,000	25	2.00	—	—	—		1¼	—	¼	No sale	1
[illegible]	500,000	20,000	25	2.50	4½	2	4¼	2	4½	½		20	5
Summit,	500,000	40,000	12½	*5.00	4	—		—	4	0	0	No sale	4½
[illegible]	500,000	20,000	25	4.00	*9½	18	*11	30	*11	½		2700	*10½
W[illegible],	500,000	20,000	25	75	2½	1	2½	9	2½	—	¼	8320	2½
[illegible]	200,000	40,000	5	*2.00	1½	28	1½	29	1½		¼	50	1½
West Castleton, *Slate*	[illegible]	50,000	[illegible]	*[illegible]	3	7	3	7	2½	—	½	125	2½

On the 18th of November, ten shares of the "*New York Mining Company of Lake Superior*" were sold at six dollars per share, [illegible] as the stock [illegible] to be [illegible] at the market at present, we have not placed it in the above table. The series of tables since May 1st have included all [illegible] shares made at the Boston Brokers' Board.

* Assessment Paid. † These are fully paid stock not assessable.

NEW-YORK METAL MARKET.

COPPER.

South American.........per lb.	30c	a	—
U. S. Soft....................	30	a	31
Sheathing......................	32	a	—
Braziers.....................	27½	a	—
Yellow metal..................	26	a	—
Ingot..........................	31	a	
Tubing........................	45	a	—

IRON.

Iron ores, magnetic and hematite..........per ton	$5	a	6
Iron, Bars, American hammered	76	a	85
Do. American refined..........	85	a	90
Do. Swedish best brands........		a	1 8
Do. English common.......	70	a	73
Do. Refined..................	82½	a	85
Do. do. best............		a	90
Do. do. Swedes............	82½	a	85
Do. Norway bars, fork & NIFK brands....................	102½	a	104
Russian..........................	86	a	94
Do. Sheet American ... per lb.	6c	a	—
Do. do. English, No. 1 to 20.	4½	a	—
do. 21 to 24	5½	a	—
do. 25 to 26.	5¾	a	—
Do. Galvanized................	10	a	14½
Do. R. R. rails by contract p. ton	$70	a	75
Do. Pig American red short....	35	a	37
Do. for car wheels..............	40	a	50
Do. White Charcoal for malleable castings...............	45	a	50
Do. Scotch, for cash...........	35	a	—

LEAD.

Galena Pig, as per quantity....	6½c	a	6¾
Spanish.......................	6½	a	6¾
Sheet.........................	7¼	a	—
Pipe..........................	7¾	a	—
Old Scrap.....................	5½	a	—

SPELTER.

Spelter, as per quantity........	6½	a	7¼
Do. in slabs....................	6	a	6
Do. Sheet.......................	9½	a	9½

TIN.

Block Banca....................	32½	a	33½
Do. Straits....................	31	a	32
Do. Spanish....................	24	a	28
Do. Bars.......................	33	a	35

New-York, December 20th, 1853.

LONDON METAL MARKET.

November 25, 1853.

The *London Mining Journal* gives the following quotations, to which we add the duty *ad valorem*, United States Currency, rate of freights, and Foreign Exchange.

ENGLISH IRON.

Duty 30 per cent. ad valorem.

	£	s.	d.	$	cts.
Bar and bolts a..........per ton	£9	0	0	$43	56
*In Wales a....................	8	0	0	38	84
*In Liverpool a.................	8	10	0	41	18
*In Staffordshire a..............	9	10	0	45	98
Sheets, single a..................	11	10	0	55	58
" double a....................	13	0	0	62	62
Hoops a........................	10	15	0	52	3
Nail rod, round a.................	10	0	0	48	40
" square a.....................	9	10	0	45	98
Bars, Wales b....................	8	0	0	34	72
" Staffordshire b.................	8	5	0	39	93
Railway Chairs, Clyde b..........	5	17	6	28	44
Pig, No. 1, Clyde................	4	1	0	20	38
3/5ths No. 1, and 2/5ths No. 3.....	4	1	0	20	38
North Wales c....................	4	10	0	21	78
Scotch Pig No. 1 in London........	4	10	0	19	36
Stirling's Non laminating or Hardened Surface Rails......£9 to	9	9	0	43 56 / 44 05	
Cold blast, No. 1 Foundry......£5 10s. to	6	10	0	26 62 / 31 46	
Charcoal bars....................	14	10	0	70	18
Stirling's Patent Toughened Pigs, Glasgow..........	3	12	6	17	59
Ditto Wales £4..................	4	5	0	20	57

FOREIGN IRON a.

Duty 30 per cent. ad valorem.

	£	s.	d.	$	cts.
Swedish..................per ton	£11	10	0	$55	66
Russian CCND....................	17	0	0	82	28
Indian Charcoal Pigs in London......	6	0	0	29	04

FOREIGN STEEL *a*.

Duty 15 per cent. ad valorem.

		£	s.	d.	$
Swedish keg, nominal	per ton	16	0	0	$77 44
Ditto faggot		—	—	—	— —

SPELTER *c*.

Duty, in pigs, bars, and plates 5, sheets 15 per cent. ad valorem.

		£	s.	d.	$
On the spot in bars	per ton	21 to 22	0	0	101 64 / 106 48
To arrive		21 10 to 22	0	0	104 06 / 106 48

ZINC.

Duty 15 per cent. ad valorem.

		£	s.	d.	$
In sheets *d*	per ton	30	0	0	145 20

ENGLISH COPPER.

Duty: bolt and braziers', 20, pig, bar and old, 5 per cent. ad valorem; Sheathing FREE.

		£	s.	d.	$
Tile 15 to 28 lbs. *a*	per ton	126	0	0	$609 84
Tough cake *a*		126	0	0	609 84
Sheathing for ships 14 by 48, and bolts *a*	per lb.	0	1	8	28¼
Sheet *a*	"	0	1	2	28¼
Bottoms *a*	"	0	1	8	30¼
Old	"	—	—	—	—
Yellow Metal *a*	"	0	1	0	24
Wetterstedt's Pat. Met	per cwt.	2	0	0	968

ENGLISH LEAD *a*.

Duty 20 per cent. ad valorem.

		£	s.	d.	$
Pig	per ton	23	0	0	$111 32
Sheet		24	0	0	116 16

FOREIGN LEAD *a*.

Duty 20 per cent. ad valorem.

		£	s.	d.	$
Spanish in bond	per ton	22	0	0	$106 48

ENGLISH TIN *a*.

Duty 5 per cent. ad valorem.

		£	s.	d.	$
Block	per cwt.	6	2	0	$29 52
Ingots	"				
Bar	"	6	3	0	29 77
Refined	"				

FOREIGN TIN.

Duty 5 per cent. ad valorem.

		£	s.	d.	$
Banca	per cwt.	5	18	0	$28 55
Straits [uncertified]	"	5	16	0	28 06

TIN PLATES.

Duty 15 per cent. ad valorem.

		£	s.	d.	$
IC Charcoal	per box	1	11	0	$7 46
IX Ditto	"	1	17	6	9 08
IC Coke	"	1	6	0	6 29
IX Ditto	"	1	12	6	7 87
Canada Plates *a* ton	"	13	0	0	62 92
Quicksilver *f*	per lb.	0	2	4	57

Terms—*a* 2½ per cent. dis.; *b*, net; *c*, 5 ditto; *d*, 1½ per cent. dis.; *e*, 2 ditto; *f*, 1½ ditto, [illegible] in Liverpool [illegible] per [illegible] less.—* Discount 5 per cent.

* Delivered in Liverpool [illegible] $2 42 per ton less.

EXCHANGE—New-York, Dec. 20, 1853.—Rates are ranging from 9¾ to 9½c. premium in favor of London.

FREIGHTS at Liverpool are about 22*s*. 6*d*. ($5,58) per ton for iron in pigs or bars.

JOURNAL OF GOLD MINING OPERATIONS.

COINAGE OF GREAT BRITAIN.

During six months of 1853, the amount of gold coined was £9,000,000, and of silver, £416,000. In 1850 the value of gold coined was only £[illegible] and of silver £125,000. In 1851, the amount was, of gold, £4,[illegible]; of silver, £[illegible]; and last year, of gold, £4,152,000; of silver £[illegible]. The returns for 1850-51-52 are in each case for the whole year respectively whereas those for 1853 include only six months; but in the six months of 1853, more business was done than in either of the other "complete years" cited.

CALIFORNIA GOLD FIELDS.—QUARTZ MINING.

The prospect for quartz mining operations in California, is briefly but clearly stated in the following language, by one of the most intelligent editors of that State.—

There is an undeveloped source of wealth in California which must one day be made productive, and add immensely to the capital of the State. We allude to the auriferous quartz mines which are to be found along the foot-hills of the Sierra Nevada, from Mariposa to Nevada. It is true, most of them have thus far proved unprofitable to their owners; but this has arisen not from the worthlessness of the mines themselves, but from the great expense, and the miserably inefficient machinery used in working them. There are hundreds of quartz mines in this State that would realize a fortune for their owners in Virginia, Hungary or Russia, where the expense of working them would not eat up all the profits. Even under all the disadvantages of our position, some of the quartz mines of Nevada are yielding handsome returns upon the capital invested. There are two ways of making all of them profitable —obtain cheaper labor or employ improved machinery, whereby the present immense waste of gold from the crushed rock may be saved. It will save as much from the tailings rejected, as any other machine will extract from the original rock. In fact this saving will pay all expenses, and leave the whole amount now extracted as clear profit. There are many quartz mines in the vicinity of Sonora, which only require capital, energy and improved machinery, to become of great value. Heretofore, trifling sums have been expended in opening them, but the money might as well have been thrown away. It will not do to peck at a mine of this character—a small investment will almost certainly be wasted, while a heavy capital may increase itself many fold in the same mine. The Sonora quartz companies seem to have come to the same conclusion. The Trinidad, Hope Fortune, Dodge's and Vulcan's Quartz Mining Companies have consolidated themselves into one company, under the name of the Sonora Consolidated Quartz Mining Company. As these mines are within the limits of the city of Sonora, the owners have applied to the Council for a title to the claim. This granted, they promise to import new machinery and invest a heavy capital in the development of the mines. Give us but the machinery to extract all the gold that we know is in our quartz rocks, and California will be, for centuries after her placers are exhausted, the greatest gold producer in the world.

The Grass Valley *Telegraph* gives the following flattering account of quartz mining operations in that vicinity:—

"The quartz mills are generally doing a handsome business. The Massachusetts Hill Mining Company are realizing a splendid remuneration for their labors; they furnished us with a specimen from their lead which is as rich and beautiful as any thing of the kind we have ever seen. The Helvetia Company inform us that recently in nineteen hours crushing, they have received $1063. The Empire Company still furnish us with highly favorable reports. Out of seventy-four tons of rock, in three days crushing, they have realized the sum of $6,288 25."

PLACER DIGGINGS.

We annex a rapid summary of reports from various Placer Diggings, during a couple of weeks, which, although but items in themselves, yet serve to show that the washings for gold are carried on with great industry at this time, and that the yield continues very rich. A year's operations thus presented in a summary, would show results which are only in part recorded in tables of shipments of gold from San Francisco.

Of the mining operations in Grass Valley, one intelligent writer thus speaks:—

From the best estimate that we can make, there are not over one-sixteenth of the miners at work, that have the convenience of water at the present time. We find by careful inquiry, that the receipts of the banking offices are about $25,000 in the aggregate, weekly, in this town. The amount of earth that will be taken out and worked this season within three miles of this place, will not, I think, fall far short in its yield of two millions of dollars. There is enough upon the ground even now to fully warrant that amount. On the extensive flat fronting the town there are about one hundred and fifty men at work and it is necessary to employ three heavy steam engines to free the works of water; but with this heavy outlay for drainage, a highly remunerative business is carried on. I am informed from reliable sources, that even with the disadvantages that the miners of this section now labor under, a much greater amount of gold has been purchased this year than the year preceding. It would appear from this fact, that the mines are not yet quite exhausted, but are still highly productive, and not from a greater aggregate number of persons.

The French who arrived across the plains with Col. Cipram, announce that they found gold in abundance in Carson Valley. According to their statements, the miners who have penetrated to that point, are receiving an ample reward. Upon the west slope of the Sierra Nevada, at an elevation of more than 3,500 feet above the level of the sea, parties of French were found, who were making from $7 to $8 per day.

Many of the claims on the Tuolumne are proving exceeding rich. The Big Rock, Paine's, Kanaka, Extension and Willow Bar claims, near Jacksonville, have been flumed and pumped dry, and the hands are now on the ledge where they find the pay dirt. On the 18th October, $450 was taken from one pan of dirt in Extension claim, and as high as 100 ounces were taken out in one day from Paine's Bar.

A beautiful specimen of quartz gold was recently taken out of Mount Pleasant Flat, near Placerville. It weighs forty two ounces in gold.

The miners at Calf Bar, near the junction of the North and middle Forks of the American River, are making good wages. One company working in the bed of the river is taking out $25 per day to the man.

On Scott River, Trinity, there are bank, bar and river diggings—the miners generally doing well, but the country has been but little prospected. One company of five have taken out between $15,000 and $20,000. There have been but three flumes built on the river this season, all of which have given ample satisfaction to the parties interested; so much so that they are willing to stay and winter here for the purpose of finishing working their claims, it having been rather late, on account of high water, before they could get into operation this season. Thus far the river claims have, at a rough calculation, averaged $20 per day.

At Crescent City there is new excitement about the "beach diggings," from the mouth of Rogue River to Port Oxford. Big strikes are reported from $25 to $100 per day all out of the black sand. Quicksilver is of course in great demand.

New diggings have just been discovered about a mile and a half from St. Louis, Sierra county, by a gentleman from San Francisco, who went up there about six weeks ago. They are extensive, are hill diggings, and yield fifteen cents to the pan. There is quite an excitement in regard to them and a great number of claims are already taken up. But there is plenty of room yet. They are called "Longville," after the discoverer, Mr Long. There will be a new town there this winter to add to the list of towns, all within a space of four miles viz.: St. Louis, Pine Grove, Cedar Grove, Longville, Chandlerville and Gibsonville.

The miners on the San Joaquin River are doing well. There is no one making less than $5 per diem and some lucky ones as high as $179.

The claims of Messrs. Akins, Locke, Lockhart, Squire Donaldson, and a dozen others, are paying from $16 to $30 per day to the man, with a prospect of its continuing for two years to come, as they have from 7 to 10 feet of wash dirt.

Recently while the workmen were engaged excavating in the hill side for dirt to fill in the dam belonging to the San Joaquin Water and Mining Company they struck a stratum of gravel yielding from 50 cents to $2 to the pan—the appearance of the gravel showing that at some future day it had been washed by the waters of the San Joaquin. Every thing indicates that in many places the river has been forced from its original channel by land slides, and wherever these slides have been tried they have been found rich with the precious ore. Wages are good and laborers in demand at $75 per month and found.

The miners who own claims at Murderer's Bar, on the middle fork of the American, are doing exceedingly well. The river is turned at that point, and there are several deep shafts sunk two of which are now thirty feet each below the river's bed, and are still being sunk deeper. The dirt taken from these has paid about an average of fifty cents to the pan, and, as they sink, is getting richer. There are two steam engines employed in hauling up the dirt in cars on a rail track from the river bed to the bank, where it is washed. The claims are worked night and day the water being pumped out by means of wheels turned by the water in the flume.

At Park's Bar on the Yuba, claims are paying as much and in some instances more than formerly. In one day the sum of $10,000 was taken from the Union Claim on Feather River, near Bidwell's Bar. New and productive diggings have been discovered near Sears' Diggings, by a green hand from San Francisco. At Lake Valley, near the eastern line of the State, new diggings have been discovered.

The *Sacramento Union* has reliable information of unusually rich diggings which have been struck within the last week, on Kansas Flat, near Fiddletown, El Dorado Co. The gold is coarse and found about twenty feet below the surface in a kind of cement which seems to be filled with it. The rich lead was struck by Capt. Stowers, who has taken out pans of the cement which paid a hundred dollars. Previous to this discovery the Flat had been worked at different points and a bed of cement struck which paid about a dollar to the pan and which was several feet higher in the ground than the rich lead discovered by Capt. Stowers.

Some months since a party of Frenchmen struck, in prospecting, this rich lead at the base of the hill. They have tunnelled for some distance, and have dug themselves rooms in which they keep their stores. This company have taken out pans of the cement which paid as high as five hundred dollars, and the lead seems inexhaustible. The Flat contains some fifty or more acres, and a shaft has never been sunk on it which did not pay. The top dirt will pay well for sluicing, which they expect to be able to do the coming winter, by means of a ditch to bring water from the river. At present, the dirt is panned out or run through the cradle.

There is another flat north of the town called Brown's, which pays nearly as well. One claim was mentioned, owned by two brothers, which pays them at the rate of $100 a day. The cement here pays about an ounce to the pan.

Another large flat, called Loafer's Flat, from the fact that any one about town who happens to get strapped can take a pan and go out to the flat, and in a short time make enough to take another start. It affords good pay dirt, and immense quantities of it.

Even in the streets of Fiddletown a lead was struck which has been profitably worked all summer.

OPERATIONS OF WATER COMPANIES.

The companies working in creeks are generally doing well, having just sufficient water for washing flowing by them, while the springs beneath, having less form and volume than at any other seasons, allow the bed to be drained with more facility. Where the claims are deep and springs abundant, force pumps and wheels worked by mule power are used, which must be kept at work night and day to render effective assistance.

The Tuolumne County Water Company is the only one whose canal still affords a supply—and its stream is so diminished that the benefits are necessarily confined to a few companies. In the mean time many of our mining population are preparing for winter, by prospecting their claims, throwing up dirt, fitting their cabins, and laying in a winter's supply of provisions. At various points, now dry, the earth "prospects first rate," promising an abundant yield of gold when the rains fall and enable the owners to wash it out. The immense amount of labor performed each succeeding year does not appear to have any sensible effect in diminishing the immense area of auriferous ground. The deposits fill not—while the energy and industry of the laborers are silently doing their work, discovering fresh resources and more fully developing the old.

Every portion of our country is now intersected by canals, which, after the rains, will supply the needed element each succeeding season.

The two great canals—one from the Stanislaus and one from the Tuolumne—run almost parallel from north to south, at least a distance of 15 miles through mining ground. Then there are numerous smaller ditches, whose supply is taken from creeks to numerous small districts. The influence of all these is felt in a greater or less degree. Should the works of the Tuolumne Hydraulic Company be completed before next spring there will scarcely be a camp in all the country left unsupplied with water. Industry will be assisted and stimulated thereby, and the general prosperity increased.

Instances of individual success are not uncommon even at this season, many such coming under our own observation. The claims on Sonora, Sullivan's and Woods' Creeks are being worked to advantage. The miners on the Tuolumne have turned the river, and have begun to work the bed. Much labor and money have been bestowed on these operations, and a good return is expected, if the continuance of the dry season gives time enough to explore the crevices. The miners of Don Pedro's Bar are doing remarkably well. There are 25 water wheels in operation, and one flume 1,700 feet in length, within the distance of one mile.

The San Joaquin Water and Mining Company are about to turn the water into their race. They employ about seventy-five men. The bed of the river which they turn has been prospected sufficiently to prove that they will receive a large reward for their money and labor expended. A Joint Stock Company has been formed, consisting of twenty practical miners, for the purpose of tunnelling a ridge above Millerton and draining the highest part of the river for the distance of ten miles. The ridge is a mile and a quarter through, and the estimated expense of doing the work is $500,000.

Mining Water Companies have rapidly increased in all quarters; millions of dollars have been invested in these works, and the water is conveyed through the mines in every direction. A convention of the companies has been recently held, and memorials are now in circulation praying Congress for certain privileges not at present enjoyed.

Most of these companies commenced operations in the summer of 1852, after two comparatively dry winters, and when large amounts of dirt had been thrown up to be washed. Many of the canals were undertaken hastily and managed badly, and the consequence is that they have been unprofitable stock. The convention and the attempt to obtain legislation favorable to the canalling system, have awakened some opposition among the unassociated miners, who have to pay the companies for the use of the water, and often look upon them as oppressive monopolies.

On some of the rivers mining is quite prosperous. A large number of extensive enterprises, such as canals and tunnels have been projected, and some of them will be commenced during the winter; and it is a matter of certainty that large tracts of auriferous land, heretofore unworked for the want of water, will be furnished with the element during the next summer by means of canals.

AUSTRALIAN GOLD FIELDS.

The aspect of political affairs in Australia is a matter of some interest. The colonists themselves are far from unanimous in relation to their political system; and the license regulations are regarded by the mining population with no friendly spirit. Thus a late arrival from England brings this statement:—

There has just been received in England the draft scheme of a constitution for New South Wales, drawn up by a select committee of the Legislative Council of the colony, and whether that particular plan be adopted or not—whether the attempt at the concoction of a constitutional form of government, similar in many respects to the political machine by which society is set in motion in this country be found successful or not—the step must be regarded as an important one.

According to the Australian journals, there is a considerable opposition to the adoption of the new Constitution, and a meeting was attended at Sydney by four thousand persons, at which it was voted to ask the Council to give the people more time to consult upon the matter.

At the latest date it appears that the Government and the gold diggers were at issue as to the amount of the license fee—the Government demanding thirty shillings, and the diggers demanding a reduction to ten shillings. The Governor was opposed to the reduction, on the ground that so far in 1853 the expenses of the gold fields in 1853 had exceeded the revenue about £100,000.

The Melbourne *Argus* of August 24, says:—

We regret to say that already this has been the case. An express from our correspondent at McIvor yesterday brought us word that there had been a collision between the diggers and the authorities at the new diggings on the Goulburn; and although in this particular instance no bloodshed has occurred, the result is one which must shock every man who knows the value of a peaceful and orderly condition of society.

It appears that some irritation had been exhibited at these newly discovered diggings, in consequence of the license fee having been demanded so late in the month. Many of the diggers had only just reached them before the 20th, and as the licenses for September would be issued on the 24th, they thought it hard that they should be forced to pay the August license fee for so small a number of days.

THE DIGGINGS.

The news from the gold diggings does not show any great increase of the yield. Large numbers have gone to the various diggings.

The following letter from a citizen of one of the Eastern States, tells some facts which convey a distinct idea of life at the mines:—

I have talked with several old miners, who have tried all the diggings, and who told me they had sunk some ten, some fifteen, and some twenty holes, varying in depth from 10 to 40 feet, and not seen a particle of gold; it lies in patches and the uncertainty of striking that particular spot is very great. The mining population which is now estimated at 280,000, is a roving one; they are continually moving from place to place hoping to find better and richer diggings. There are thousands of men in the diggings not paying their expenses. A friend of mine who has just left Bendigo, told me that men offered to work for him for four shillings a day.

Meetings are being held all through the diggings, for the purpose of getting the licenses reduced from 30s. a month to 10s. the mines not being near so remunerative as formerly. They say they cannot, and will not pay it. The general opinion is that they will gain their ends; if not, there will certainly be trouble.

The miner's life is a very hard one. I will give you a description of one day's work. The first thing in the morning is to go into the mountains and chop wood for the day, which we carry on our backs to the tent, then cook breakfast, which consists of oatmeal stirabout or a piece of meat toasted before the fire on a stick (perhaps he cannot spare time to more than warm it through), a piece of damper and some coffee. The damper is flour and water, mixed and baked in the ashes; it is not quite as light as your baker's bread. Then to the hole perhaps half a mile from the tent; bail out five or six feet of water, which has leaked in during the night from some old holes, and commence sinking, one standing on the top to haul up the dirt. At one o'clock to dinner, more damper, and half-cooked mutton, or beef; back to work, anxious to get the hole down before night. Perhaps we are fortunate enough to reach the bottom; it turns out a shiser (that is, a blank); commence another, it gets dark, home to supper; we have left off work to go to chopping wood; build a fire and make some flapjacks; these are simply flour and water, with a little salt, mixed, and fried in a frying-pan; that, with a dish of tea, is our supper; we then lie down for the night. This is a sample of every day's work; some of the sinking is very hard; Cornish miners who are here say they had no idea the work was so laborious. They say two years of such labor will break down the strongest constitution. Hundreds are leaving the mines every day for Melbourne, who have spent all their money, and not been fortunate enough to make any thing.

Here are some particulars respecting the nature of the diggings at Mount McIvor, in the colony of Victoria: —

Since my last communication, the diggings at McIvor have slightly improved in so far that ground hitherto neglected, or but badly prospected, has within the last week had a more thorough trial, by sinking through in cases no less than three, four, and even five bottoms of clay, and coming down to the hard rock—at a depth say, from 30 to 50 feet. In consequence of this deep sinking on the rising eminences and gullies between, running along the creek south from the Melbourne Private Escort Office, a heavy rush has taken place, and a considerable amount of gold has been secured by those who have reached the hard rock bottom. So many false bottoms of clay above referred to have puzzled until lately, the diggers at McIvor altogether. One would think the first clay was the true bottom; another would imagine the second clay was the real thing; another digger the next clay, and so on. Gold certainly is found, more or less, lying on these clay bottoms, and the best and surest way at McIvor to sink a hole is first down to the hard rock; that reached, then drive under as far as you can; when that is completed, then fill up the hole to the lowest clay bottom; drive on that again, and so on up to the highest clay bottom in the pit. Another thing I may mention is, that at McIvor the washing-stuff has quite a yellow red kind of color, and not that bluey white color, as at Forest Creek and other diggings. This has deceived many old diggers; so much so, that in one instance two men realized a heavy weight of gold in nuggets on the Commissioner's Flat, but not knowing the nature of the soil, threw away their washing stuff. The two men afterwards separated; one went to Bendigo, but the other remained at McIvor, and, becoming better acquainted with the soil, went back to his holes, and in the first week washed out from what they had thrown away 10 oz. Very recently, a 52 oz. nugget was again picked out in a pit behind the 'Commissioners'.' I have seen a fine crystallized piece of gold weighing 11 oz., taken out by a lad among the rocks adjoining the Golden Hill—in the possession of Dr Waugh. A considerable rush has also taken place during the week to the Bald Hill, about two miles and a half north of the Private Escort Company's place, where I am given to understand the diggers are realizing most handsomely.

Among other improvements going on at McIvor and which show what the authorities think as to the stability of the McIvor diggings, contracts have been issued and taken up by the Messrs. Crowley (late of Adelaide) for the erection of splendid stone barracks and offices for the "powers that be" in amount somewhere about 5000*l.* The foundation for the same is now being laid down by the contractors, and will be completed in a few months.

In compiling the results of gold mining operations, it cannot be out of place to notice the incidental effects produced upon the country where they are carried on. Thus the progress of Victoria becomes a matter of interest.

Little more than half a century has elapsed since the strait which forms its southern boundary was discovered. Port Philip was not discovered till 1802; the overland route from Sidney was first traversed in 1824. The first attempt at settlement (for the brief visit paid to the port by Collins with a convict party in 1803 cannot be so designated) was made in 1834 from Van Dieman's Land. The actual settlement began some years later. Yet two towns (or cities) on the shores of Port Philip already number 100,000 inhabitants between them, and the tonnage of ships annually entered inwards and outwards at Port Philip already exceeds that of the Clyde. This has been accomplished not only without state or government assistance, but in opposition to the strenuous and prolonged efforts of government to prevent any settlement in these regions, and the temporary subjection of Victoria to the legislature of a neighboring colony—a still more rebellious thraldom than that to a mother country. And the prosperity of Victoria is certain to advance with increasing rapidity. All the gold regions hitherto discovered in Australia are situated on the western declivity of the high land that extends from the Australian Alps to the north of Moreton's Bay. This high land is of a very impracticable character and shuts out to a great extent the beautiful harbor of Port Jackson from easy access to those rich regions, while they are easily accessible from the equally excellent harbor of Port Philip. Victoria too, was originally designated Australia Felix, by Major Mitchell, who first surveyed it, on account of its superior fertility and better climate, as compared with the west of Australia. Port Philip, not Port Jackson, seems destined to be the seat of the future metropolis of Australia.

GOLD MINES NEAR CHARLOTTE, NORTH CAROLINA.

Some valuable mines in the vicinity of Charlotte, North Carolina, within the limits of that rich gold region, are thus described by a journal of that neighborhood, the *Charlotte Democrat*:—

The rich Gold and Copper mining region by which we are surrounded is, as we are happy to learn, not only awakening the attention of capitalists to its true worth and value, but is also likely soon to call forth their actual energies and exertions. That productive belt of slate formation lying about twenty miles southerly from this town has long been known as being one of the most valuable gold deposits of the age; and the work and mining operations that have been conducted upon it have by their immense yield already made many of its most favored points as familiar to the ear of mining men as household words. Taking the entire range of this belt, from the well-known Gold Hill Mine, on the northeast, to the equally reputable Dorn Mine, on the southwest, we doubt if our country can produce a similar tract that can compare favorably with it in point of true mineral wealth. South of us, about 22 or 24 miles in Union county, within the limits of our State, are situated the Washington, the Lawson, and the Howie Mines. The first named of this valuable group has yielded over $100,000 worth of gold; and such was the extreme richness and value of the two latter mines, that the vein, which was traversed by the line separating the two properties, was worked with the most scrupulous care and exactitude under the guidance of a plumb line, giving to the proprietor of the Howie the ore from one side, and to the owners of the Lawson that from the other side of the line. It is questionable if any slates have ever been raised from a gold-bearing belt, that can approximate in value those from this immediate locality. The gold is thickly scattered over the surface of the laminæ of the rock when they are cleft asunder, in particles plainly visible to the naked eye, and imbedded through all parts of the slate to an extent of value seemingly incredible, but really verified by actual returns. The Lawson Mine has produced about $100,000, and the Howie Mine has returned the comfortable sum of $150,000. We are highly pleased to learn that these three mines have recently been purchased by an association of capitalists, combined with gentlemen of high standing and repute of this place and that they are now vigorously preparing to work them to their full capacity; powerful and well adapted engines are already partly on the ground, and it will be but a few weeks before two engines of one hundred horse power each will be wielding their mighty strength to bring about a full development of the resources of these mines. This company is to bear the appellation of the Union Gold Mining Company. If, under the crude and imperfect method of working these mines which has heretofore been pursued, they have been made to afford such valuable returns, how much more ample and favorable must necessarily be the case when the improved course of operations shall have been placed in full and successful progress.

In relation to Virginia gold mines *The Richmond Dispatch*, of Nov. 29th, says:

We saw yesterday two specimens of gold from the State Hill and Walnut Grove Gold Mines. They were apparently of the very finest quality, amounting to about $5000. They were in the hands of Mr. Seidles, the agent of the companies, who was taking them North for coinage.

GEORGIA GOLD MINES.

We hear it currently reported that the gold mine belonging to Mrs. Franklin, situated in the county of Cherokee, was sold a few days since to a company, for one hundred thousand dollars. This is a round sum to be sure, but we don't know that it was any thing extravagant. The mine to which we refer is truly valuable, but it does not in our opinion excel in richness and value many mines situated in our own county; indeed the one now being operated upon by Mr Robert Moore, of this place, we deem superior. In connection with the inexhaustible rich veins of rich ore with which the numerous hills are interspersed, it is accompanied with deposits which yield more than a sufficiency of the precious stuff to pay every expense in procuring and carrying the ore to the mill, situated on a stream close by. Union county is not far behind, if any, in her mineral wealth. We learn from a reliable source, that the Gum Log Mines, situated a short distance from Blairsville, are making an average yield of 7 dwts. to the bushel of ore, from an operation of sweep and stamp, or wooden mortars. This mine is of but recent discovery and as yet has only been opened to the depth of some 15 feet.—*Dahlonega Signal.*

GOLD DISCOVERIES IN TURKEY.

The fame of the Pactolus would seem to be endangered by some recent discoveries. Engineers have been lately going to and fro among the vales and hills of the classic regions, looking into the sands, pounding rocks, climbing peaks, and exploring mines. Their first purpose has been a survey of the country for a contemplated railway; but they have kept their eyes open to every sign of physical wealth in the soil; and their diligence is said to have been rewarded by the discovery of gold, silver, mercury, lead, copper, antimony, arsenic, and iron, as well as salt, sulphur, alum, coal and saltpetre. The river Arda, flowing from the ridges of the Rhodope Mountains towards Adrianople, is said to more than rival the ancient Pactolus. The greatest mines are reported to have been found in Thessaly, on the slopes of Mount Pelion and Mount Ossa; but these are of lead and silver, rather than of gold. Should these reports prove true, they will render all the more fierce and interesting the contention now raging for the possession of the noble country in which the mines are said to be situated.—*London Athenæum.*

McCULLOCH GOLD MINE.

A report of Mr. Bonner, an intelligent miner, contains the following particulars relative to the McCulloch Gold Mine:

The vein consists of a dark brown clayey material, approaching in appearance to very coarse sand, with occasional lumps sufficiently solid to lift without breaking. This material contains the gold. I found on trial that an exact cubic foot of the gold ore, as I shall call the material described above, weighed ninety-seven pounds, and a bushel ninety-three. Taking these weights as a basis, I estimate the quantity of ore in the piles on the surface at about 6,000 tons carrying gold, and 1,000 carrying copper—all of which is the produce of the present levels only.

From this trial of its weight, and from the fact that the constituents of the vein in both levels are precisely the same, some idea may be formed of the large quantity of ore in the vein between the two levels, and what may be expected above and below them.

The treatment of the gold ore is very simple. It is ground to a fine powder in two Chilian mills, worked by water power. During the process of grinding, quicksilver is introduced into the troughs, which amalgamates with the gold. The mills are cleaned up every twenty-four hours, leaving a deposit of amalgam of gold and quicksilver.

The two mills, which are weak in power and insufficiently supplied with water, crush together eighty bushels of ore in twenty-four hours, weighing 7,440 pounds, from which quantity a ball of amalgam is obtained averaging 800 dwts., though as much as 1,000 have been obtained. The quicksilver is then expelled in a retort, with a small loss in quantity, and the gold remaining amounts to forty to forty-two per cent. of the original weight of the ball.

On the day before I left the mine, I saw one of the mills cleaned up (the other being stopped for want of water), when a ball of amalgam was taken out, weighing 812 dwts., being the produce of fifty-seven bushels of ore in twenty-four hours.

A steam engine of 100 horse power has just been erected for the purpose of driving ten Chilian mills, and twenty-five heads of stamps, which are now in the course of erection in the same building. These additional works will crush about 100 bushels of gold ore in twenty-four hours, producing, at the present rate of yield, 6,000 dwts. of amalgam, containing forty per cent., or 2,400 dwts. of gold, which, at ninety-five cents per dwt., will amount to $2,328 in twenty-four hours.

A shaft is now being sunk to strike the vein at twenty-five fathoms, and another at fifty fathoms. If the vein maintains its present character at these depths, the mine will, I believe, be unparalleled in the United States.

DANIELL'S PATENT STEEL SHOD STAMP-HEADS.

The following invention described by the *London Mining Journal*, although useful for stamping all ores, and introduced for the purpose of stamping tin ores, will be found particularly serviceable to quartz miners in California. Stamp-heads there require frequent renewal and the difficulties of transportation for heavy articles are often quite embarrassing:

We are glad to announce the complete success of this very important invention, especially with reference to the Cornish tin, hitherto seriously deteriorated and rendered unfit for various purposes in the arts, from the presence of iron, derived from the abrasion of the cast-iron stamp-heads now in use, and hence the constant and well founded complaints on the part of the manufacturers having to use that metal, of the bad color of the Cornish tin. This will be entirely obviated by the introduction of Daniell and Co.'s patent heads; for whilst the principal part of them always remain intact, the steel shoe may be renewed at pleasure, and it has been found by recent trials for two months, at Tincroft Mine, in Cornwall, upon the hardest stones which that or any other mine in this country produces, that whilst the common cast-iron stamp-heads had lost 2 cwts. in weight, and upwards of a foot in length, the wear of the cast-steel shoes was barely appreciable, and now that it has been ascertained that the most highly tempered steel may be used with impunity, they may be rendered comparatively everlasting for all moderately hard tinstuff or other ores. Cast-iron being of equal density with the oxide of tin it will be seen that in the experiment referred to, from the wear and tear of the common stamp-head 2 cwts. of cast-iron per head became inseparably mixed with the tin ore in two months, and sold as such, to the great detriment of the tin trade and manufacturers in general; for as in the present case where the trial referred to was made, 60 heads were constantly at work the surprising quantity of 6 tons of cast-iron will have been smelted with the ore every two months. The first object of the patentees has been to remedy or prevent the evil and their patent and the introduction of cast-steel for blasting purposes now getting into general use, will fully effect it; but there are other obvious advantages connected with this invention of vast importance to the miner. The tin ore for the most part is only found as an oxide and the accidental admixture of iron being prevented, there can be no reason why it should not always fetch the price of fine tin. In point of economy the steel shoes have an extraordinary advantage over the iron heads now in use—the shoe only, as before observed, requiring renewal, the other part of the head being simply a makeweight, and a receiver, or socket for the shoe, will not be exposed to wear or accident. By the application of the steel shoe, the effective power of the engine will be greatly increased; for besides that the very frequent necessity for the stoppage of the machinery, in order to shift the tongues and introduce new heads will be almost entirely avoided, it will always present a flat surface to the ore operated upon. We need scarcely remark that the cast-iron head soon becomes rounded and misshapen, so that it is often necessary to throw them out at the end of a month's work; added to which it has been usual with a view to economize to continue to work the cast-iron heads till a very considerable part is worn away, to the manifold sacrifice of the power of the engine. This defect will also be obviated by the introduction of the steel shoe.

To the gold mines of Brazil and other places where the cost of freight and carriage is an object, from the great durability and portability of the shoe, and the fact that it is only that which will ever want renewal, this invention must be of the first importance.

ON THE RECOVERY OF GOLD AND SILVER FROM THE FLUIDS EMPLOYED FOR ELECTRO-PLATING AND GILDING.

We are indebted to the *Scientific American*, a Journal whose pages are always enriched with valuable and scientific information, chiefly on mechanical subjects, for the subjoined translation from the "Centralblatt," a German scientific magazine, for a method of recovering gold and silver from the fluids employed in electro-plating and gilding as it is described by Professor Balley:

The cyanide of gold, dissolved in an excess of cyanide of potassium, resists most means of separation; even sulphuretted hydrogen produces no precipitate in it. The complete separation of the gold cannot be effected in the humid way; and this has given rise to the propositions of Bottcher, Hessenberg, Elsner and others, to evaporate the fluid, mix the dry residue with an equal quantity of litharge, fuse the mixture at a strong red heat, and dissolve the lead from the fused mass by hot dilute nitric acid; by this means the gold is left as a loose sponge. A more recent proposition is that of Wimmer, by which the mass left by evaporating the fluid to dryness on the water bath is mixed with one and a half times its weight of nitrate of potash and thrown in small portions into a red-hot Hessian crucible. The explosions must be waited for, and the process continued until the entire mass runs smoothly. The first process has nothing against it, except the necessity of a strong fire and the employment of nitric acid; the second on the contrary is very unpleasant and unsafe in its performance. It is sufficiently well known that there is no substance with which nitrate of potash detonates so violently when heated, as with cyanide of potassium. If the portions of the mixture employed be only a little too large, very violent explosions are produced, which cannot take place without loss.

The following process may be adopted in small operations with a platinum crucible over a spirit-lamp. The dried mass of salts is mixed with an equal quantity of powdered muriate of ammonia and gently heated. The ammoniacal salts decompose the cyanides of the metals forming cyanide of ammonium, which is decomposed and volatilized, whilst the acid of the ammoniacal salt or the halogen combined with the ammonium unites with the metal which had been combined with cyanogen. In the present case muriate of ammonia forms chloride of potassium, chloride of iron (when ferro-cyanide of potassium has been employed), and chloride of gold. The latter is readily decomposed, with formation of metallic gold, the other at least partially, with separation of peroxide of iron, in fine crystalline scales. Undecomposed chloride of iron, as well as chloride of potassium, may be extracted with water after complete decomposition, for which a slight red heat is sufficient; the gold forms a coherent spongy mass; the iron fine light scales, which are readily separable by mechanical means. If any gold remain in the form of dust with the peroxide of iron, it may be dissolved out with nitro-muriatic acid (the calcined oxide of iron long resisting the action of the acid) and the gold thrown down by protosulphate of iron. In most cases this mode of separation will be unnecessary. The author has convinced himself by the employment of measured volumes of the same solution of gold, evaporation, heating with muriate of ammonia and so forth, that even the quantity of gold in such solutions may be determined with sufficient exactness.

The same process may be adopted with plating fluids; chloride of silver is obtained together with oxide of iron (from the ferrocyanide of potassium); the chloride is readily dissolved by ammonia; metallic silver, of which however but little or none is formed, is extracted by nitric acid. It is unnecessary to say that the residue is operated upon in the usual manner to obtain the silver; nevertheless, as the decomposition of the plating fluids may be effected in the humid way by means of sulphuretted hydrogen, this process may not be so frequently adopted for silver.

Lastly, it may be useful to inform those persons who occupy themselves with electro-plastic processes, that the employment of chloride of ammonium or a salt of ammonia in this manner, furnishes a ready means of testing the composition of such fluids as are used in the formation of a galvanic coating. For solutions of copper the author employs sulphate of ammonia, because when muriate of ammonia is employed, chloride of copper is formed, which is partially volatilized with the undecomposed sal-ammoniac, producing a loss of copper.

JOURNAL OF COPPER MINING OPERATIONS.

LAKE SUPERIOR COPPER MINES.

Pewabic Mining Co.—In a report by the officers of this company, are the following details relative to the location and prospects of this company:

The location of this company is situated in Houghton county, State of Michigan, on Portage Lake, about twelve miles from its entrance into Keewenaw Bay, and comprises a tract of about three hundred and seventy-five acres of land, being the west half of Section No. 25, in Township No. 55, North of Range 34, West.

This tract has a water front of half a mile on the Lake, and can be approached from Lake Superior by vessels drawing six and one half feet of water. There are about forty acres of nearly level and excellent farming land bordering on the lake, after passing which there is an abrupt rise of from 200 to 300 feet within the distance of half a mile; after that the surface becomes quite level.

The entire surface of the tract is covered with a rich alluvial soil, varying from a few inches to several feet in depth, and is also heavily timbered with maple, bass-wood, birch, hemlock, cedar, spruce and balsam trees.

Few locations on the mineral range promise the same advantages as this for mining, being situated immediately on the banks of the lake, having an elevation of three hundred feet, and occupying, as it does, a central position east and west on the trap range, the character of the rock is good, and such as accompanies most of the productive mines of the country, and from a thorough examination the greenstone does not exist here.

Numerous ancient pits have been found on this tract, corresponding in their lineal direction with the course and bearing of the veins on the south side of Portage Lake, as determined by actual survey made during the past winter.

The vein has been considerably explored on the south side of the lake, where it has been found large, well defined, and well filled with lump and stamp copper; the veinstone is composed of quartz, spar, epidote, and a red ferruginous rock mixed with copper. The vein has also been opened at several points on this tract, and has been found to correspond in character and material as well as in general course—the continuation of which gives the company the vein for about one and a half miles.

For the carrying on of mining operations, this tract possesses great advantages, being situated immediately upon navigable water, where every thing necessary can be shipped directly to and from the mine, and in every respect the tract is well provided with all the requisites to make a valuable mine.

Letters from the agent, Mr. C. C. Douglass, give a very favorable account of the prospects of the mine:

The prospect of the Shaft, on what we consider the Montezuma vein, is decidedly good, and improving as the Shaft is being sunk. Such is also the case with the small vein to the east of the Montezuma vein."

From a letter dated Nov. 17th.

"We have found another vein further northwest than either of the others. We had frequently met with floating chunks of veinstone and copper from this vein, and supposed it not far off. It has a fine surface appearance, and may, when fully opened, be one of the most promising veins found on the location. Two of the other veins are looking well and improving."

Continental Mining Co.—We learn from the *Lake Superior Journal*, that this is the title of a new organization on a large and valuable tract of mineral land:

It is situated between Eagle Harbor and Copper Harbor, in Secs. 9 and 10, Township 58 north, of Range 29 west. The ground has been explored during the present season, and several promising veins discovered in the wide belt of amygdaloid, north of the greenstone ridge. The principal vein, on which the company are commencing work, has been traced over from the south side of the range in Section 16, and it increases in width as it runs north. At the point where the company commenced work the vein is three and a half feet wide at the surface, well defined and regular, and it is looked upon as a good show for the foundation of a mine.

S. W. Hill, Superintendent of the Copper Falls and other mines, has the general superintendence of this concern, and from his well known ability and energy in this business, another valuable mine may be expected to be added to the list in proper time.

Empire Mining Co.—By the same source we are informed of the organization of this company, which has commenced operations on the north half of Section 11 and adjoining lands:

They have a vein virtually proved up at the outset. This vein, we believe, was discovered by S. W. Hill on the lands of the Iron City Mining Company last winter; and it was traced from the south side of the range over north into the lands now owned by the Empire Mining Company. The Iron City Company spent several thousand dollars in opening up the vein, by sinking small shafts at short distances from one another along northwardly from their old mine, and found the lode heavier and richer in copper the further they worked north out of the greenstone and into the less crystalline trap.

They took out of the last shaft which was sunk some 80 feet, a fine lot of stamp work, and several masses of copper of several pounds weight each. At this stage of the work, which was too much like proving up their neighbor's ground, mining was suspended on the north side of the range. Not far from this shaft the Empire Co. have commenced, or are about commencing work. They have opened up the vein in several places, and find it every where from three to four feet in width, rich in copper. At one place the explorers took out from the surface of the vein, several pieces of native copper, weighing some six pounds each, and a mass was left exposed, which could not be taken out without blasting. The indications are apparently highly favorable for a rich vein and a promising mine.

In the adjoining township east, in Section ten, valuable discoveries have recently been made under the superintendence of W. H. Stevens, Esq. Fine pieces of copper have been taken from a large vein, and a good show is presented for the foundation of a promising mine. A company will soon be organized to to work this vein.

Copper Falls Mine.—The Company have shipped since 15th August last about eighty tons, and have several fine masses in progress of being cut up for shipment, and they will undoubtedly send to market several tons more before close of navigation. The Hill Vein continues to improve rapidly, as does the older vein at the east.

North American Mine comes forward in its development with a steady and sure progress, every foot of new ground opened, showing an improvement of the vein. The copper is there, but more work has had to be expended in opening this mine than in opening some others. Now that they have their machinery erected, and their mine systematically opened, the copper will be forthcoming hereafter at no slow rate. They have shipped this season twenty-six tons, and the vein continues to improve in every respect.

North West Mine.—From this mine the Company has shipped about 138 tons of copper during the summer. The Company's new vein is said to look very promising for the amount of work done on it. Both veins will be worked hereafter, and further explorations will be made on this valuable location another year.

Isle Royal and Portage Mines.—The miners first commenced work on the Isle Royal on the 18th August, 1852, and on the Portage Company, Nov. 3d of the same year—thus placing them on a par or even ahead of most of the new companies started in the country. These companies are now employing 60 to 80 men each and will increase their mining forces during the winter to about 100 men each. The mines are looking well, and prove to be equal to the expectations of their projectors.

The Dodge Company.—This company has opened the same vein as the Isle Royal, nearly one mile south of the Isle Royal Mine, where they find the vein quite as rich in copper, and as well defined as at any point where it has been opened. There are now four companies at work on this vein, all of which have good prospects of meeting with success.

The Ripley, Pewabic, Montezuma, and Quincy Mines are raising copper, and feel highly encouraged with their prospects.

From the Ontonagon.—The mining interest is more prosperous as a general thing than usual. Many new companies are starting under favorable circumstances, the old ones increasing in the production of copper. The developments at the Minnesota Mine are remarkable, even for that mine—they have recently thrown down, which is now being cut for shipment, over 250 tons of mass copper. Two of these masses will weigh over 100 tons each, and one of 50 tons or over. One of these masses is of the extraordinary thickness of five feet. The Rockland Mine, a new work adjoining the Minnesota, is also producing considerable masses from sinking, showing a good lode of mass and barrel copper. The projected opening of this mine, if accomplished as expected, will give large results the next year.

On the west side of the river the Norwich Mine is producing the most copper, and from the ground now being opened, their shipments must be largely increased the next season.

East of the Flint Steel the Fulton is doing the largest work, and promises well for copper the next year. In the vicinity of the mines mentioned are a number of works more or less advanced, which from their general promise, give much life and encouragement to the copper range for forty miles in extent.

ONE YEAR AT LAKE SUPERIOR.

At the opening of navigation last spring, there were only three companies, all of which only employed about 60 men; now there are ten companies at work, giving employment to over 300 men.

RICHES OF THE LAKE SUPERIOR REGION.

Mr. Heman B. Ely, who is acquainted with the iron and copper districts on the south of the Lake, estimates the annual product of iron and copper from the mines, as of sufficient importance to become a weighty consideration in favor of the construction of a railroad thither:—

It may be stated safely, that the iron mines here, so soon as facilities are opened for full access to them will export annually 2,000,000 of tons of iron ore. This is now worth, delivered at Marquette Bay for shipment, eight dollars per ton which is sixteen millions of dollars. Carried to market, and manufactured, yielding readily as it does sixty per cent of malleable iron, it is worth at the lowest prices, sixty millions of dollars. The product of the copper mines is steadily and rapidly increasing. Probably, within five years, it will come up to 25,000 tons per annum, which is worth ten millions of dollars. It is assumed, however, that one half of this iron and copper will be carried away by water. There will be yet left 1,000,000 of tons of iron ore, and 12,500 tons of copper products, which, in their raw state, are worth thirteen millions of dollars, and in market manufactured, thirty-five millions of dollars, to be carried off annually by railroad, on the various avenues which will be offered, and the cost of transportation by railroad, whatever it may be, these products will always bear, and be able to sustain.

THE ANCIENT MINERS.

As far as at present known, the most striking remains of the ancient miners are on the Ontonagon River, extending 15 or 20 miles along the trap range each way from whence it crosses the course of that stream.

They are also very apparent in the vicinity of Portage Lake. On Point Kewena they may be seen extending from the Forsyth location (now Fulton), eastward along the range about 20 miles; and across the Lake on Isle Royal, are abundant evidence of mining operations of the same era. All of the ancient works yet explored, show that they have been *abandoned* more than 500 years, and not only before the French first heard the Indians speak of copper, but before Columbus landed on the continent.

NORTH CAROLINA COPPER MINE.

The report of the superintendent of the North Carolina Mine, Mr. D. B. Wilder, presents very full particulars of the condition of the mine and the progress of operations. We extract such portions as are of general interest:

On my arrival at the mine in August, I made personal examinations, with a view to determine our future operations, not only as regarded driving things ahead, but at the same time exercising a thorough system of economy in financial matters, consistent, however, with the proper working of the mine, for many things that should have been done had been set aside, and others of minor consideration substituted. The number of Cornish miners who were receiving high wages was altogether disproportionate to the number of men employed, and more particularly so as the mine was under process of "opening," and consequently not sufficient ground opened to admit of their being advantageously employed.

Also, but little or no provision had been made for the erection of the machinery, which latter, I regret to say, has made its appearance a little at a time, during an interval of many weeks, whenever it suited the convenience of those having the job for its transportation to the mine. It is true, a few brick were on hand for a portion of the engine boilers, &c., but not, however, in sufficient quantity to complete the above work, and as a matter of course, has been a severe drawback to the proper working of the mine, owing to the want of the engine and pumps, for instead of doing the work that we should have done towards proving the ground fully, and developing its resources, by sinking the shaft and opening new stoping ground, by a succession of levels or cross-cuts from the shaft to the lode, we have been driven to the alternative of confining our operations to certain levels, where the water was with difficulty kept down by means of the whym, and where we could be out of its reach. Still, under these embarrassing circumstances, the extraction of 1000 barrels of ore, weighing from 840 to 1020 lbs. net, of a high percentage, besides a sufficient quantity now lying on the surface capable of making over 300 barrels more, speaks volumes in favor of the mine, when we take into consideration that at four (4) different points of the lode, the mine *never has appeared better than it now does.*

In a large mass of dead matter extracted formerly, I notice some very fine gossan taken at a depth of fifty feet, which I consider one essential condition towards the future success of the miner in his search after copper.

The lode from the commencement of operations for copper ore, and at a depth of sixty feet, has been very flat, nearly horizontal, but carrying perfect walls; from this depth the underlay has changed very materially for the better, and in traversing the side of the shaft, one portion of the lode carries three separate and distinct veins, converging slightly, below which point they dip 45 deg. or six feet per fathom, and in one deepest level, take in some thirteen feet of mineral ground, changing again its underlay to three feet per fathom. On the south side of the shaft, we have the lode four feet wide, capable of yielding *eight tons to the fathom;* at another point of the lode, in another level, three feet wide, yielding seven tons per fathom; in our lowest level, one hundred feet deep, thirteen feet of ground, carrying ore suitable for the crushers, and in the stope north of the small shaft, a good dradgey lode, five feet wide, carrying No. 1, as well as ore for the crushers.

This, therefore, is the actual position and appearance of the mine as regards our prospects for the future extraction of ore, and which cannot be equalled by any mine in the State.

The pumps, of which we have a drawing lift seven inch, and a plunger eight inch, are in their respective places, and properly secured. Sheds for the comfort of the workmen have also been erected, and we are now preparing four more hutches, which, when ready, will greatly facilitate our efforts towards the daily increase of ore for shipment to New-York. The wages of the men, in many cases, have been reduced, and many of the high-priced men discharged, for whom others were substituted, competent to fill the stations, at one hundred per cent. less.

Owing to the non-arrival of our machinery as soon as was expected, we have necessarily been retarded in our operations, particularly in regard to shipping more ore, much to my regret; and although this detention has also prevented us from proving our ground to a greater depth, still no time has been lost,—for in the extension of our ten and sixteen fathom levels, ore of a superior quality in abundance has been met with, at points hitherto enumerated, and now ready for extraction. The whym shaft has been sunk seventy-five feet vertically, and twenty-five on the underlay, and owing to the quantity of water at this last point, it was deemed inexpedient to attempt descending further, with the machinery hitherto used by horse power, but defer this work until such time as the engine and pumps were in operation. From the above shaft levels have been extended on the course of the vein, as also for the circulation of air and proper ventilation of the mine, at such points as were deemed essential for the health of the workmen employed, and now connected with the shaft A near by. N. 31° W. a distance of one hundred and seventy-one feet from the whym shaft, the engine shaft was commenced, for the purpose of cutting the lode at a certain depth, assuming the underlay to be regular. This shaft is now down fifty feet, and has been sunk thus far through a hard granite rock; this, with the water, makes it a slow and expensive operation, and I think for the present had better be deferred, for the following reasons, viz., after sinking the whym shaft, we shall be driving towards the engine shaft, far below its present depth, and unless the country (through which the E. shaft will necessarily pass) be a close, compact rock, or a cross flookan intervenes, we shall, as a matter of course, take up *all* the water with our pumps, and thus be able to have dry working, which will expedite the sinking of the engine shaft. South, 34½° west, a distance of two hundred and eighty-two feet from the whym shaft, another shaft was sunk eighty feet, known as the "Blacksmith shaft," from which a cross-cut was driven to the lode. The lode here is three feet wide, composed of quartz, carbonate of iron, and yellow copper, yielding about one and a half tons to the fathom. As a level has been driven eighty-four feet from the whym shaft towards this shaft, the same will be continued, in order to unite with the shaft, and thus serve as an outlet for the water to the pumps, as well as giving good air.

The force employed at present on the mine, is seventy-five men and boys, consisting of underground and surface men, of which a statement is forwarded semi-monthly, giving occupation and price per month.

The moment our crushers and hutches are in operation, which will be by the middle of the present month, we shall then be able to turn out daily from five to seven tons of No. 1 ore, or about two hundred tons per month, and increase that amount by working more hutches.

As my remarks are intended to show the actual position of the mine now, without trespassing in the limits of the future, I will conclude by saying that many gentlemen, accompanied by intelligent miners, at different periods, have visited the mine, and solicited the privilege of examining for themselves, which privilege has in every *such* instance been readily and cheerfully granted, and who, after such examination, have of their own free will, unsolicited, said "that the mine far exceeds the flattering representations that had been made respecting it." For my own part, I am fully satisfied that the Company have a good mine, and one that now surpasses the best ore mines in the United States.

COPPER IN WISCONSIN.

Some facts relative to copper lodes in Wisconsin are stated by a correspondent of the *New-York Tribune*, who likewise furnishes some particulars respecting the aspect of the country :—

About two miles north-east of Mineral Point, Iowa Co., Wisconsin, several lodes of copper were discovered several years ago, and some millions of pounds of ore raised. The ore is principally the yellow sulphuret or *copper pyrites;* it was smelted at the diggings, and the average yield was about thirty per cent. of metal. The physiognomy of this district is formed of ridges, divided by bare valleys, through which flow small water-courses—numerous small points, or arms branch off from the ridges and terminate in escarpements or low broken terraces along the line of the water-courses. The copper veins traversed east and west vertical crevices in the lower beds of the upper magnesian limestone. The limestone bed is interlaid with nodules of flint, and is slightly metamorphic, somewhat analogous to the *kelvin* of metamorphic limestone of the Cornwall mines. Yet, the copper producing influence has evidently been widely different here from that of the old country. There, igneous rocks are protruded through the limestone beds, and the copper bearing rocks are formed in vertical or highly inclined bands at the junction of the granitic and stratified rocks ; whereas, in this copper district no igneous rocks have reached the surface. The magnesian limestone is underlaid by a bed of sandstone from three to four hundred feet thick. The elevating forces or anticlinal axis of this district are traversed by the water-courses. The rocks dip each way from the water courses to the centre of the ridges—consequently each ridge forms a separate basin of limestone. The valleys are denuded down to the sandstone within a distance of half a mile from where the copper veins have been worked. The limestone beds in the centre of the ridges at the diggings are about one hundred and fifty feet thick. The copper veins that were discovered and worked, made their principal deposits about seventy-five feet deep. The ore formed in an opening in the fissures is somewhat similar to the lead deposits in the lead region. The veins in the crevices discovered appear to be mostly exhausted. These veins are evidently the outcrop of a copper bearing basin having a considerable area on the north, where these spurs or outlying beds of limestone connect with a dividing ridge. The sandstone sinks in this direction, and the limestone beds increase in thickness.

Should the copper-producing influence be found to have been active north-west and north from the "diggings," we may suppose the veins will be much richer and traverse the rocks more or less below the water level. These beds of limestone give evidence of being traversed by east and west vertical fissures, which are ran parallel from fifty to two hundred yards apart; and the copper veins will evidently be richest along the central axes of the ridges. These "diggings" have been idle for the last six years. There is no market here for copper ore, and consequently no prospecting. The lands are owned partly by individuals living in the district, and by non-residents. To operate successfully for copper in this district, it would be necessary to buy the lands or lease them at a low rate, and open the grounds by prospecting for new veins. A number of prospects are now struck which when proved up will evidently make good lodes. The cause of these "diggings" being stopped was bad luck in smelting the ore, and expense of transporation of the metal to market. A railroad is now under contract from Mineral Point to the Illinois State line, to be completed in twelve months. When this facility is opened for the transportation of coal for smelting, or ore to market to be smelted in the East, we must suppose this copper field will offer inducements worthy attention.

NEUVITAS COPPER MINE.

This mine is located in the jurisdiction of Neuvitas, in the Island of Cuba. The veins run about north 60 degrees east, and south, 60 west, underlaying to the south at an angle of about 20 degrees.

There were three shafts sunk on the mine previous to recent operations, in each of which the vein has been cut, and an aggregate of about fifty tons of ore taken out.

Another shaft was subsequently sunk, which also cut the vein.

These four shafts have all been sunk nearly in a line parallel with the vein, as it appears on the surface, the deepest of which is not sixty feet. The ore taken out is a yellow sulphuret, thickly coated with black, and is very uniform in its class and quality. It was sold in England, and the *average* yield was 26¼ per cent. There has never been on the mine any apparatus for dressing or cleaning the ore.

NEW HAVEN COPPER WORKS.

Near Fort Hale on the east side of New Haven harbor, extensive smelting works have recently been erected by the Humphreysville Copper Co., at a cost of about $30,000, and are rendered quite conspicuous by the heavy clouds of smoke that are constantly passing off from their lofty chimneys. They are doing an extensive business, though not yet fully in operation. Nine furnaces are now in use, smelting three tons of copper per day, and this quantity will soon be doubled, when fourteen furnaces will be in operation, and $1,000,000 worth of copper be smelted annually. Considerable quantities of copper are brought there from Bristol, Ct., though the bulk of it comes from Chili, South America. Five tons of ore generally yield one of the pure metal. The copper is run into ingots, and is principally bought up by brass founders.

IMPROVED REVOLVING MANDREL FOR LINING CYLINDERS WITH METAL.

Patented by George Potts, *Cincinnati, O.*

"The object of my invention is, the production or manufacture of a pump, or other cylinder having a lining or interior casing of sheet copper, and the peculiar feature of novelty exists in devices for the application of said casing in such a manner as to give to the interior of the barrel a smooth, dense, and truly cylindrical surface, superseding the necessity of, and superior in its result to the fine boring and grinding now requisite."

Claim.—"What I claim is, the revolving mandrel furnished with one or more rollers, whose distance from the axis of the mandrel can be increased or diminished by means of a nut, sleeve, and conical head as described, or any equivalent device for the purpose herein explained, of lining with one metal the interior of a cylinder formed of another metal."

COPPER MINES IN BOLIVIA, S. A.

Copper occurs in various parts of the country, both in the metallic state and as an ore. In the province of Lipez, particularly, the ores are very rich, and the metal is easily extracted. At Corocoro, in the northern part of Bolivia, the metal occurs in small metallic particles diffused through a friable gray rock. This rock is ground, the earthy portion washed out, and the remainder which is sold as *barrilla*, yields 60 per cent. of bar copper. The owners of several of the copper mines are said to accumulate fortunes more rapidly than any other men in the country. The Indians, however, are the chief workers of the mines, selling the ore or barrilla which they procure to the merchants.

COPPER AND CHOLERA.

An article some time since appeared in one of the Paris papers, in the course of which it was stated that a French physician, named Burq, had discovered a preventive of cholera. *Galignani's Messenger* contains a communication from the pen of Dr. B. himself, in which he endeavors to show that of 200,000 workmen engaged in copper mines, and in the various manufactories of copper, from the works in which it is rolled into sheets to the shops of coppersmiths, nearly all escaped; and in most cases all escaped from attacks of cholera, although the disease was raging in their immediate neighborhood with fatal violence. Dr. Burq naturally attributes the immunity to the action, electric or otherwise, of the copper; and infers that if other persons would surround themselves in the rooms which they occupy with a sufficient surface of copper, say fifteen or twenty feet of sheet copper, or wear metallic belts of squares or round pieces of flat copper and steel, with card-board between them to prevent immediate contact, they also would be secure against this terrible malady. The joint agency of steel he considers to be very useful, but the chief and essential metal is copper. Galignani adds:—

The theory may be erroneous, but it appears to have reason on its side, and if faith be placed in it, the wearers of those belts would at least have that conviction of security, the want of which depresses the mind, and acts powerfully toward a predisposition to cholera. There is, however, something more than imagination in this matter. The powerful action of copper in cases of cramp, when applied to the part affected, has been frequently proved, and it may be presumed that if the metal were applied more extensively, some electric or other action hostile to cholera would be elicited. In our first notice of the theory of Dr. Burq, we stated that in England, during the cholera of 1832, electric belts of copper and zinc had been used, and that we were not aware that this had been done successfully. We have no proof, however, to the contrary, and if there were, it might be urged that the excessive action caused by these belts might produce as much perturbation in the system as the absence of any precaution. Dr. Burq appears, like many other scientific persons, disposed to attribute the cholera to a diminution or modification of the electricity of the atmosphere as compared with normal periods. M. Andraud, who made several experiments on the air during the cholera of 1832 and 1849, found that at Belleville and some other places where the cholera was raging fatally, there was much less electricity in the air than in other parts of Paris which the disease had spared. The real cause of cholera, however, is still a mystery.

although the presumption that it is connected more or less with electricity is a reasonable one. Dr. Burq, as we have already stated, considers that copper may be used curatively as well as preventively. When the disease has declared itself, he recommends the use of copper in the form of salt of copper, or any other preparation of that metal, in doses which a physician would not regard as dangerous.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

SILVER MINES IN BOLIVIA.

The silver mines of Bolivia hold out more than ordinary inducements to enterprising miners. The following brief statement presents a summary of interesting particulars relating to them:—

The silver mines should perhaps be regarded as constituting the essential wealth of Upper Bolivia. The extraction of this metal requires more capital and more skill than that of tin or copper, and is therefore never entirely in the hands of Indians. Previous to the long distraction of the country during its contest with Spain, there were probably worked ten thousand valuable silver mines, but as the Spanish difficulties turned the public attention in another direction, made labor more difficult to obtain, and drove a large amount of capital from the country, the mines were gradually deserted, and at the present time it is estimated that but one hundred and fifty are wrought. At least two-thirds of the abandoned mines have not become exhausted or diminished in richness. The inducements for the re-opening of these mines by enterprising capitalists are manifest. They contain ores of silver of good quality, which can be procured at a moderate cost. In some of the mines steam pumps must be used to keep them free from water; in others, tunnels are to be cut; but this outlay *is not in the way of experiment*, for the kind of ore, the breadth of the vein, and the depth to be reached, are all known beforehand. The titles to the mines, too, are perfectly safe. If a mine is neglected more than a year by its owner, it reverts to the government, and the government will reconvey it to any one who will carry on the work. This is for the purpose of encouraging foreigners, with skill and capital, to re-open the works.

THE SILVER OF THE LAKE SUPERIOR MINERAL REGION.

The question recently raised in relation to the existence of an ore of silver in the veinstone of the copper mines of Lake Superior is interesting in more points than one. The fact of the existence of an ore of silver may doubtless be regarded as decided in the negative. The statements in former numbers of this Magazine—(Vol. I., Nos. 5 and 6)—show the results to which we have arrived in our investigation of the question. Many of the copper companies have also caused analyses of the veinstone to be made and in all instances, so far as we have learned, the results have been the same as our own. No ore has been found, but the existence of native silver has long been known. To what extent it exists has not been extensively determined. In the veinstone of many of the copper mines, such for instance, as the Minnesota, it averages about six dollars to the ton. In this case the amount is too small to make its extraction an object of consideration. The percentage in other mines is larger, and in the Michipicotan particularly, it is so large as to obtain for it the denomination of a silver mine. From many of the copper mines very considerable amounts of silver have, at different times, been obtained by the owners, notwithstanding all which the miners may have withheld. Here are certainly sufficient facts to encourage an extensive investigation, if not also to warrant an enterprise which shall have for its object the extraction of the silver. An establishment for this purpose would have favorable auspices before it. There are silver lead mines in various locations yielding a respectable percentage of silver, and there is no place for its extraction in this part of the country, outside of the small assay offices of chemists. The letter of Senator Smith heretofore alluded to in these pages, contains some remarks which have weight as bearing upon this point:—

I am informed by Gen. Villamil, the very able minister from Ecuador, it is considered in South America that an ore which will yield from 4 to 6 ounces, will pay all expenses, including of course, the mining expenses. It should be borne in mind that I brought forward these ores (adhering as they did to the copper) without the slightest suspicion that they were argentiferous, and therefore it cannot be said that they are selected specimens. But I must believe that these results will prove greatly above any average that can be obtained by practical operations. That the ores are likely to add much to the value of our mines, I strongly believe. The mining expenses are all incurred in taking out the copper. Hence whatever may be obtained in the form of silver, will be an addition to our resources.

The question may be asked, What is the amount of these ores? Are they likely to become a matter of national importance?

I am not prepared to answer these inquiries. My belief is the quantity will prove to be very considerable and perhaps large in some of the mines, and large in the aggregate. I shall take measures to have this subject investigated, so far as it can be done at this late season of the year, and I may make a further communication thereon.

SILVER MINE IN NORTH CAROLINA.

The *Raleigh Star* understands a silver mine has been recently discovered in Stanley county, which is believed to be immensely rich. The vein is said to be three and a half feet wide, and has thousands of sheets and lumps of silver all through it. It is estimated that the ore is worth from $1 50 to $3 per every eight pounds. The mine has been purchased by a company, which will proceed very soon to develope its wealth. The *Star* adds:—

If the confident expectations of the proprietors in regard to the richness of this mine be realized, it will be the first discovery of a purely silver mine in the United States, and must prove a source of great wealth to the company.

SILVER MINES OF ARRIZONA.

The silver mines of Arrizona, about which Raousset de Boulbon had a difficulty with the Mexican authorities some time ago, have turned out to be of unparalleled richness. News had been received at Guaymas a short time previous to his departure, announcing that immense deposits of silver ore had been discovered at Arrizona, yielding a dollar's worth of pure silver to 3 lb. of ore. The news produced great excitement among the inhabitants, and upwards of 1,000 men had left Guaymas and Hermosilla for the mines.—*London News.*

THEORY OF SMELTING LEAD ORE.

The reduction of lead ores is extremely simple. In all instances of smelting, a considerable loss of metal is experienced, which has been the cause of a close examination of the process, and we may assert, that no metallurgical operation is more thoroughly and scientifically known than the reducing of lead. This metal is in most instances the bearer of silver, the bulk of which is obtained from lead ores. In order to investigate the cause of the loss in lead metal, and also a suspected loss of precious metal, much labor and ingenuity has been bestowed on this subject.

In the smelting of crude galena in a reverberatory furnace, the sulphuret is, at the commencement of the operation, deprived of a part of its sulphur by heat; metal is formed, and as oxygen finds access to the ore, oxide of lead, and consequently sulphate of lead is also formed. The proportion of these substances depends of course on the degree of care bestowed upon the process. When after two hours the roasting of the ore is so far completed as to admit of its reduction, the heat is raised so high as to form a pasty mass. Oxide of lead and sulphuret of lead now mix completely and form metal, sulphuret, and sulphate, from which mixture the metal parts by force of gravitation. In mixing carbon with the slag, the sulphate is reduced to sulphuret, which is again deprived of its sulphur by heat. Thus, by alternate oxidation and reduction of the ore, a certain amount of metal is abstracted. The removal of lead from the slag, causes it to be more refractory at the end of the operation than it was at first, because the sulphuret or the oxide of lead, which was the cause of its fusibility, is chiefly removed. When the slags are so pasty as to enclose grains of metal which have not the power of separating by gravity or cohesion, they cannot yield any metal although the whole of it may be revived. In order to obtain all the metal from the slag, it ought to be at least as fluid as the metal itself at the same degree of heat. Such a slag is not easily obtained without oxide of lead, or sulphurets of other metals. Salts of any kind, such as fluorides, chlorides, and sulphates, form the best auxiliaries in this operation; and if present only in a small quantity, they are of service. Lead, bismuth, antimony, and in fact all the fusible metals will readily separate from other matter than metals, in virtue of their gravity and cohesion; but it is a necessary condition of their separation that the matter with which these metals are combined should be fluid. The metal cannot separate from a dry slag; an agglutination of its particles is necessary before it can subside.

A fluid cinder is necessary not only for the agglutination of the metallic particles, but also for their production. When a dry or pulverulent mixture is mixed with carbon, oxygen may be abstracted from it by the carbon, but as the newly-formed particle of metal is exposed to the influence of oxygen—which it will absorb from the products of combustion if it cannot obtain it in another form—it will oxidize as quickly as it is reduced. If metallic oxides or sulphurets and slags, are fluid, the addition of carbon to the mixture will deprive the oxidized metal of oxygen; and if the metal as well as the slags continue to be fluid, the latter will protect the first against oxygen. The fluidity of the slags will also admit of the subsidence and gathering of the metallic particles.

In smelting galena in a reverberatory, we deprive the slags gradually of the means of fluidity by abstracting that metal from them which has been the cause of their fusibility. This abstraction can be carried only to a certain point. When the slags cease to be fusible at the heat by which the metal melts, they must cease to furnish metal any further, however much may be contained in them. We perceive, therefore, very readily, that the quantity of metal retained by the slag depends entirely on its fusibility, and not on its composition. Lead, like the precious metals, separates easily from all other matter, and thus far the composition of the slags has little effect on its quality. If in operating on galena fluxes can be introduced which continue the fluidity of the slags at a moderate heat, all the lead, even the last particle of it, may be obtained.

The fluidity of slags depends as well on heat as on their composition; we may continue the fluidity of a slag by increasing the heat; this, however applicable with some metals, is not the fact with lead. When the heat on metals is raised beyond a certain degree they evaporate. In any smelting operation, therefore, it should not exceed that degree. Metallic lead, and especially oxide of lead, sulphuret and salts of lead, are very volatile, and a strong heat on them must be avoided. It must be, therefore, the practice to smelt lead by as low a heat as possible, and in order to accomplish this, a mixture of ore must be prepared which affords a fusible slag without lead.

Lead combines very readily with other substances under certain conditions, and in most instances in definite proportions. Iron will combine with sulphur in all proportions, but not so lead. There are various combinations of lead and sulphur which, when exposed to heat, form the combination which we recognize in galena. If less sulphur is present, metal and sulphuret are formed. This accounts for the revival of pure lead from galena that is partially roasted. In the composition of reverberatory and blast furnace slags, we find the means of detecting the true conditions under which lead is smelted most profitably.

A slag which had been deprived of its metal by a long-continued operation in the reverberatory—16 hours' work—contained still 15 per cent. of oxide of lead, 5·5 oxide of iron, 11·5 barytas, and 5 sulphuret of lead; also 17 silex. This shows that the last particles of sulphur will adhere to lead when all other substances are oxidized. A reverberatory slag entirely free from sulphur, contained sulphate of barytas 51, sulphate of lime 10·5, fluoric acid 1·5, protoxide of iron 3, and oxide of lead 14. A slag obtained from impure galena, that is, an ore from which heavy spar could not be separated, was composed of 30 sulphate of lead, 24 sulphate of barytas, 5·6 gypsum, 8·5 fluoric acid, 14·7 carbonate of lime, 2 sulphuret of lead, 5·6 protoxide of iron, 8 oxide of zinc. A very fluid slag which flowed off with the metal contained sulphate of lead 3, sulphate of barytas 30, sulphate of lime 50, fluoric acid 13·5, lime 8·8, oxide of iron 2, oxide of zinc 2. This contains the least lead and a large quantity of alkaline earths; all the alkaline earths are combined with some acid, which renders the compound fluid.

The last-mentioned slag is produced from crude galena which has been merely freed by hand from impurities, and for these reasons we invite attention to it. It shows a very rational operation and one most suitable for our country. The ore is charged in the furnace in the common manner, and reduced so far as it will furnish metal. When the slag becomes too stiff for yielding metal, some finely pulverized fluate of lime is thrown in and mixed with the mass. This renders the barytas and gypsum fusible, and the reduction of galena may take place. So long as the fluidity of the slag is continued, lead is formed. To render this operation profitable fluate of lime should be used in a considerable quantity; but as this cannot be obtained always, we propose the substitution of chlorine for fluorine, which possesses in as high a degree as the latter the quality of fluxing sulphates. In this instance, gypsum and common salt may be pulverized together when damp. These form a very fluid slag with barytas, lime, iron and other metals.

The following reverberatory slag shows that lead can be removed almost entirely from the ore by oxidizing the mixture completely. A slag from zinc ore contained 64·5 protoxide of iron, 2·4 oxide of lead, 1 oxide of zinc, 2·5 alumina, and 29·5 silex. The iron and silex here form the slag. It must be observed that in precipitating all the lead from a slag by means of iron the metal will contain much iron and be otherwise impure. When an ore contains much zinc there is hardly any other profitable way of smelting it than to flux by means of iron either with iron ore or pyrites; all or most of the zinc remains then in the slag.

The slags of blast furnaces differ somewhat from those of the reverberatory in containing more silex and in most cases, less lead. A slag which was formed at a moderate heat and considered as exhausted of lead contained 34·4 oxide of iron, 0·6 oxide of lead, 7 lime, 0 sulphuret of iron, a little manganese and oxide of zinc, and 54·8 silex. A slag from an argentiferous galena contained protoxide of iron, 45·4; magnesia, 11·2; sulphuret of iron, 2; alumina, 3·9; and silex, 36·3. The following proportions show that a large quantity of lime is of no advantage: protoxide of iron, 25; lime, 24; zinc, 10·6; oxide of lead, 3; alumina, 7; silex, 28·5. The following is a profitable slag: protoxide of iron, 34·8; oxide of zinc, 6·8; oxide of copper, 2·4; manganese, ·7; lime, 6·6; magnesia, ·6; oxide of lead, 2; sulphuret of iron, 12; alumina, 5·4.

When ores are exposed to a low heat, they hardly enter into any combination with silex, and of these the oxides only. Sulphurets, sulphates, chlorides, fluorides, and, in fact, all other metallic compounds, do not combine with silex; it is only after all other matter is evaporated that the oxides unite with that acid. We may smelt lead to perfection without forming any silicate, but this requires the presence of a large quantity of chlorine, fluorine, or some other permanent acid. In roasting the ores before smelting we are deprived of the advantages resulting from the fusibility of the sulphurets and acids, and are compelled to form silicates, because those substances which form a fluid slag in the low heat of a reverberatory, evaporate in the heat of a blast furnace and are lost. When it is in our power to form a fusible slag either by means of fluates or chlorides and sulphates, it is more profitable to smelt in a reverberatory than in a blast furnace, and precipitate the lead to within a few per cent in the first and only operation. In this instance the ore needs no crushing and expensive washing; a removal of the coarsest pieces of quartz and of the loam is the only labor necessary to be performed on it. The presence of quartz will not influence the result, because when other acids are present it does not enter into combination. If no materials are at hand to form a fusible slag, either by natural or artificial means, then it is necessary to roast the ore and smelt in the blast furnace. In this instance, the ores must be roasted, because the sulphurets are very volatile and will not resist the heat of that furnace. The most profitable flux is the protoxide of iron. Lime or magnesia and other alkaline earths do not form sufficiently fluid slags to be used profitably.

When circumstances render it necessary to smelt in blast furnaces, the operation ought to be conducted in such a manner as to obtain all the lead at one smelting. This appears sometimes to be difficult, but it is not so where cheap iron ore can be obtained in sufficient quantity. When a slag or ore is to be exposed to smelting in a blast furnace, it ought to be thoroughly oxidized; because if any sulphur is left in it, even in the form of sulphate, lead and zinc are the first to evaporate. Lime does not remove sulphur, but combines with it, like all other alkalies. Iron, because it absorbs sulphur and as easily parts with it, is the most suitable substance to mix with the sulphureous ore for the purpose of oxidation; it forms a fluid slag at quite a low heat with silex, and is thus far the best flux in the blast furnace. Manganese serves equally as well as iron, and may be substituted for it; but no other metallic oxide can be substituted for these two.

When sulphurets of lead are roasted in the air, they are never entirely liberated from sulphur; the most carefully roasted lead ore contains sulphur. Galena roasted with extreme care in a heap, contained oxide of lead, 18; sulphate of lead, 56; sulphuret of lead, 10. The same galena, roasted during 7 hours in a reverberatory, formed metallic lead, and the roasted ore powder consisted of oxide of lead, 30; sulphuret of lead, 46; metallic lead, 17; iron oxide and silex, 7. When other metals are present besides lead, such as iron, zinc, and others, they are oxidized before all the sulphur is removed. A persevering roasting of 10 or 12 hours, in a reverberatory furnace, will remove much of the sulphur, but from 8 to 10 per cent. of sulphate of lead remains in all instances. The presence of a large quantity of silex, say 25 per cent. of the ore, is the best means for the removal of sulphur. From such ore the last trace of sulphur may be removed in the reverberatory, or in roasting it in the open air. It would not make any difference by what means sulphur is removed in roasting, and silex might serve quite as well as iron, if it could be removed advantageously before bringing the ore or slag into the blast-furnace.—*Overman.*

COALS AND COLLIERIES.

THE ANTHRACITE COAL TRADE FOR 1858.

	TONS.
Amount sent by Railroad to close of week ending Dec. 8th. ..	1,[illegible] 00
Do. Schuylkill Canal, Dec. 8th........	[illegible] 177 18
	[illegible] 18
Same time last year	[illegible] 05
Increase........	11,128 18

The following is the quantity of Coal transported over the different railroads in Schuylkill county during the season:—

	TOTAL.
Mine Hill and S. H. R. R........	1,[illegible] 11
[illegible] do........	[illegible] 14
[illegible] do........	14[illegible]
[illegible] do........	4[illegible] 04
[illegible] Pt Carbon	[illegible] 04
[illegible] R. R........	[illegible] 16
Union Canal do........	70,894 16
Swatara do........	[illegible] 760 08

LEHIGH COAL TRADE FOR 1858, TO DECEMBER 8.

	TOTAL.
[illegible] Mines	382[illegible] 06
[illegible] Mines........	[illegible] 74 19
[illegible] Co.	[illegible] 13
[illegible] Leaf	[illegible] 11
[illegible] Mountain Coal	12[illegible] 7
[illegible]	[illegible] 16
[illegible] Coal Co........	1[illegible] 01
[illegible]	[illegible] 14 [illegible]
Sugar Loaf........	4[illegible] 11
[illegible] Mountain Coal Co........	[illegible] 19
Wilkesbarre Coal Co........	[illegible] 04
	1[illegible] 24
last year........	1,10[illegible]
Decrease this year........	[illegible] 850 11

DELAWARE AND HUDSON COAL TRADE. SHIPMENTS TO DEC. 8, 1858.

	WEEK.	TOTAL.	DEC.	IN.
Delaware and Hudson Co.	[illegible]	47[illegible]	17,992	
Pennsylvania Coal Co........	11,4[illegible]	50[illegible] 845		80,324

The increase according to the above, is 62,532 tons. The actual increase to December 4th, is about 52 000 tons. The Pennsylvania Coal Company has increased about 70 500 tons, and the Delaware and Hudson Company is 17,992 tons behind last year's shipments to date. Showing an increase of only 13,533 tons for the year from the three principal regions.

The estimated increase required for the year, it was supposed in the spring, would be in the neighborhood of 400 000 tons. This was considered a moderate estimate, but the high prices which have prevailed for the last three months, both in freight and coal, has checked the consumption very materially, and dealers purchase with extreme caution. At present (December 10) the demand for coal is very moderate, and the business of the railroad has decreased from 15 or 16 to 9 trains a day; and by the canal but little is done. A large portion of the operators are curtailing their business for winter, and a number will cease mining entirely after this week, and commence preparing their collieries for next year's mining.

CUMBERLAND COAL TRADE FOR 1853.

Shipments over Mt. Savage Co.'s Railroad for the year beginning January 1st, 1853, to December 3d.	226,001
Do. over Cumberland Coal and Iron Co.'s Railroad for same time	[illegible]
Do. from George Creek and Westernport Regions, from Jan. 1st to December 3d	62,816 14
Total from Cumberland Region for the year.	611,102 14

RESULTS OF THE YEAR 1853.

The year closed November 30th, of the Reading Railroad, and the quantity of coal forwarded during that time amounts to 1,582,211 tons, against 1,659,911 17 tons for the previous year, showing a falling off by railroad for 1853 of [illegible] tons. From the Schuylkill region the quantity forwarded to Nov. 30th, was 2,915 tons more than the previous year. With respect to the business and the prospects of the railroad and canal the *Miners' Journal*, located in the heart of the region, makes this statement:

Although the coal tonnage has been less, the rate of transportation ruled higher throughout the whole year, and the receipts from the coal tonnage, as well as the miscellaneous traffic and passenger travel, have been considerably increased.

The coal tonnage on the canal will be increased from 70 to 80,000 tons this year, at increased rates of toll. The miscellaneous business of the canal has also been considerably increased over former years. Both corporations have done a prosperous business the present year, which will add greatly to their strength in maintaining a strong competition after next year, with other lines of railroads now progressing from New York direct not only to the Wilkesbarre and Lehigh regions but to tap the Schuylkill region, at Tamaqua and at Auburn. Of the first mentioned route a survey has been made, and the project pronounced practicable. The distance from Tamaqua to connect with the Lehigh Valley Railroad above Lehighton is about miles. On the latter route a survey is now being made, and it is reported that this road will in all probability be made via Allentown and Hamburg, to connect with the Dauphin and Susquehanna Railroad at Auburn, which latter road is now completed, and in operation from that point as far as Pinegrove, Schuylkill county.

The shipments from Richmond up to Nov. 26th, 1853, it will be observed, have decreased 158,320 tons. From Bristol we learn the shipments have also largely decreased, which shows that the markets east of New-York must be comparatively bare of Anthracite Coal.

THE PRESENT STATE OF THE ANTHRACITE MARKET.

In the same quarter, we meet with some remarks respecting the cause of the present state of the market, which although they are incidentally made, show the views entertained by the operators at the mines:

It is very natural that consumers should be anxious to obtain fuel cheap—and they ought to have it as cheap as circumstances will permit. But those who produce the article, and those who traffic in it, have interests to protect also, which are equally important. The present critical state of the coal trade was not brought about by the operators here or the dealers abroad—it was a combination of circumstances over which they held no control, prominent among which were the high prices of transportation. It is true that the prices of coal advanced, but not in proportion to the other expenses attending the trade. Freight charges from Philadelphia to Boston ran up to $[illegible] and even $3 10 per ton—in former seasons the rates were from $1 75 to $2 00. A corresponding increase took place in the prices of freight to all the other markets from Richmond. Dealers abroad were forced either to cease receiving supplies or pay these rates. If they had refused to pay these high freights, the markets could not have been supplied, and the prices must necessarily have advanced even beyond the present rates. Much of this coal is sold on credit and has not yet been paid for—and therefore would it not be folly and madness for our operators to force coal into the market, at greatly reduced rates—ruin their customers, destroy themselves, cripple the business, and prevent a full supply hereafter, and thus produce a similar state of affairs next year.

Our policy was to induce dealers to take a full supply of coal—and in order to induce them to do so, we advised our operators to give them assurances that they would not force coal into the market at low rates after they had sold all they could to dealers, as some did last year. Dealers were holding back under such an apprehension. It was necessary that this apprehension should be removed, otherwise the trade would be checked.

ABUSES OF THE COAL TRADE IN NEW-YORK.

A correspondent of the same journal, writing from New-York, notices at some length points which he regards as abuses in the city coal trade, and suggests as a remedy the establishment of a Coal Exchange. The substance of these views is contained in the subjoined:—

One of the chief evils to be remedied is a want of union and harmony among the dealers themselves; that they should act more in unison with one another, thereby promoting their own best interests, and at the same time protecting the public from the depredations of that numerous class in the trade, known as *cheap dealers*, is the grand desideratum, as a first step toward the regeneration of the business.

Under existing circumstances, there is a want of stability in fixing and maintaining a selling price, since each coal merchant fears to allow a customer to leave his office knowing well that his next neighbor would gladly secure him at a sacrifice of one half or quarter of a dollar per ton, on the old and trite maxim that "half a loaf is better than no bread." If this was merely a fancy sketch it would do well to smile, but unfortunately it is a well-authenticated fact of daily, I may even say hourly, occurrence.

Now, if there was a true and proper understanding between one another, this would not be so. If A knew well that the customer, whom he refused to sell a cent less than an established price, and that, mind you, not a fancy, extravagant one, but a bare paying profit, would go to B, C or D, and meet the same state of affairs, he would allow him without hesitation to leave his office and try his fortune elsewhere. For it is a well known fact, that any man's customers will patronize him if they can do no better elsewhere, and a natural consequence of this rule in human nature, that the coal merchant would retain all his regular patrons at a fair, living, paying price. The public also would settle down into a more quiet state, and instead of running through the town, pricing and shopping, screwing one man down a half or a quarter, and then making a handle of such an offer to beat down the merchant with whom he has always dealt, and to whom probably he intended all along to give his order—instead of regarding the trade as so many highwaymen, each striving to get his hand the deepest into the unfortunate consumer's pocket—the public would, I say, give their orders without hesitation, relying upon the in-

tegrity of the trade, and the whole standard of the business be elevated to that level which its importance and the character of the men who compose its better part—that part with which we now have to deal—commands.

Thus much for this one evil—we see its effects, and the good that would flow from its eradication. But how shall it be remedied? That is the question!

We have long thought that one of the most beneficial projects for the trade that could now be put forward, is the establishment of a "Coal Exchange." The business has grown to be one of tremendous weight and extent, surpassed by few if any, in the magnitude of its transactions and the amounts of money that it involves.

CONSUMPTION OF COAL.

Several tables relating to the consumption of Anthracite have been prepared by Mr J. W. Alexander, and attached to a report laid before the Baltimore City Council, which contain one or two points of interest in addition to what may be found in No. 1., Vol. 1., of the *Mining Magazine*:—

The *annual average increase* of the coal trade of the Schuylkill region from 18[illegible]5, at which time the trade was nearly equal to that now existing on the Baltimore and Ohio Railroad, was 137,000 tons; of the Lehigh region, since 1845, [illegible] tons; of the Lackawanna region, since 1846, [illegible]; and from other regions of Pennsylvania and New York, since 1847, 14,000 tons.

The average annual increase of the entire anthracite coal trade from Pennsylvania and New York since 18[illegible]2, at which time its amount was nearly the same as now exists on the Baltimore and Ohio Railroad, was 2[illegible]2,000 tons.

The anthracite trade may be regarded as being carried almost wholly by the four following works, whose actual distribution and estimated capacity, without further enlargement, may be stated as follows:—

	Quantity Carried.	Est'd Capacity.
	TONS.	TONS.
Reading Railroad	2,[illegible]	4,[illegible]
Lehigh Navigation	1,[illegible]	1,[illegible]
Delaware and Hudson Canal	[illegible]	1,[illegible]
Schuylkill Navigation	[illegible]	1,[illegible]
Total	5,[illegible]	7,[illegible]

The actual outlay in these works has been $45,000,000, or at the rate of $9,000,000 for every million of tons annual carriage capacity. The increased demand for coal is generally rated by those conversant with the subject, at 15 per cent. per annum. At that rate the market would be, for the

YEAR.	TONS.
[illegible]	[illegible],7[illegible],000
[illegible]	[illegible]
1855	7,[illegible],000

—when the utmost capacity of the existing channels will be exhausted.

In view of all this, the report states that the Baltimore and Ohio Railroad may confidently rely on an increased coal trade of 250,000 tons per annum—and their trade would stand as follows in

YEAR.	TONS.
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	1,[illegible],000

—which last amount would, according to the anthracite experience, warrant an expenditure of capital for such capacity specially of $[illegible],000.

The occasion of the report before alluded to, was an application for an indorsement by the Council, of the Baltimore and Ohio Railroad bonds, of five millions of dollars.

Bearing upon this same point of the capacity of the Baltimore and Ohio Road, is the annexed remarks of the *Cumberland Journal*:—

In view of the acknowledged impossibility of increasing the amount of coal sent over the Baltimore and Ohio Railroad much beyond its present limits it behooves the companies engaged in the trade to open the next season on the canal with a large addition to the present number of boats. The superior cheapness of canal transportation, since the increase of freights on the railroad, is a consideration which causes the latter work to start up into new and fresh importance as an avenue to market. There is no reason to fear that the present rates of toll will be raised, and as no time is to be lost, we hope to witness great activity in boat building during the coming winter.

PREPARATIONS FOR SENDING PENNSYLVANIA COAL TO MARKET.

Coal is the great staple of Pennsylvania. Her present annual product is little more than one-seventh that of Great Britain. Mining for coal is yet almost in its infancy there, if compared with Europe. Yet it is gratifying to know that the enterprise of the country is aware of the field open before it. The preparations for sending coal to market from the Northern and Central regions of Pennsylvania are going forward on a grand scale. A correspondent thus describes the routes opening from the Northern Region:

First: A line of railroad is now being constructed from a point near the Delaware Water Gap to Scranton, in the very centre of the great Lackawanna and Wyoming Coal Fields of Pennsylvania. From Scranton to Great Bend, on the Erie Railroad, the northern division of this road is already finished, and about six hundred tons of coal per day are now regularly sent over it, destined for Buffalo, Chicago, and intermediate points lying on the lakes, canals, and railroads of northern and western New-York.

Second: The south-eastern division of the road, lying between Scranton and the Water Gap, is all under contract, to be completed in one year from the first of December 1854. Near three thousand men are now engaged in its construction; the iron is all purchased; the money ready; and it will be somewhat remarkable if the whistle of the locomotive is not heard on the top of "Pocono" before January, 1855.

Third: From Scranton to the great Baltimore coal vein, near Wilkesbarre, is some fourteen miles. A railroad is chartered and surveyed from Scranton to this point, with no grade more than fifteen feet to the mile, which will run the entire distance through and over the most extensive coal beds in the world, giving the owners an opportunity at all seasons of the year to send their "black diamonds" to the Atlantic seaboard.

Fourth: From a point near the Water-Gap the Delaware, Lackawanna and Western Railroad connects with the New Jersey Central Railroad. A contract has been made with this latter company by which they are bound to lay down a wide gauge track for the accommodation of the Delaware, Lackawanna and Western road, and which also requires the New Jersey Central road to construct a double track from the point of junction.

Fifth: By way of the New Jersey Central and Delaware, Lackawanna and Western Railroad to Great Bend, some twenty-five miles in distance is saved between New-York and Lakes Erie and Ontario over any line of railroad yet constructed or surveyed.

Sixth: The manner in which the Delaware, Lackawanna and Western Railroad is being constructed from Scranton east, will give it a capacity for freight, not inferior to the Reading Railroad and by the lateral roads, up and down the Lackawanna and Wyoming valleys every coal field in both valleys can be reached within twenty-three miles from Scranton, while probably seven eighths of the entire quantity of coal is found within fifteen miles distance.

The Middle Region as it is called, extends from Buck Mountain on the Lehigh to the Mahanoy, ten miles from the Susquehanna—in length about fifty miles. We condense the following particulars respecting operations in this region. The coal is said to be of an excellent quality:

The Middle Region has remained for some years it may be said, almost wholly undeveloped owing to a want of facilities for reaching market. This difficulty is being rapidly overcome by the construction of railroads leading to the principal markets of the country and the formation of improvement companies within the region itself. There are already some nine or ten of these improvement companies, besides individual operations, all of which are actively engaged in putting their lands in condition for the mining of a large quantity.

First in order of these companies is—

The Philadelphia and Sunbury Railroad Company.—The lands of this company embrace [illegible]000 acres, running from east to west six miles, lengthwise with the mountains and coal measures. At least one third of the coal of this estate is above water level. On this property a double coal breaker is erected, 10[illegible] feet long [illegible] feet wide and 7[illegible] feet high which will contain eight breaking rollers propelled by a fifty horse power steam engine. One hundred and fifty houses for miners, with six rooms each, are also under construction. The railroad of this company, which extends from Sunbury, on the Susquehanna, to Mount Carmel, a distance of twenty-seven miles, runs through this property. By this railway and through its projected connections, they will be enabled to reach the markets of New-York, Baltimore, Philadelphia, and the lakes of the great Northwest.

The Locust Mountain Coal and Iron Company possess an estate of [illegible] acres of coal land. There are seven veins, which are given in six different localities by the [illegible] extending through the whole property a distance of upwards of five miles in length. The company is now constructing three coal breakers, one steam saw mill, and one hundred miners' houses. The facilities for reaching market will be first, to New-York City, over the Coal Run Railroad, ten miles in length, which connects with the New-York and Catawissa road; to Philadelphia over the Mitchell Extension which intersects the Reading road; to Baltimore, over the Philadelphia and Sunbury road intersecting the Susquehanna road at Sunbury; and to the lakes by the Sunbury and Erie route. All the companies and individual operations, with two or three exceptions, of the region will have like access to the same facilities for transportation.

The Coal Run Improvement Company's Lands consist of 3[illegible] acres, adjoining the Locust Mountain Company, extending east and west with a basin of coal nearly one mile in width, and a tract of [illegible] acres adjoining the Philadelphia and Sunbury and Lake Fiddler properties. The company is preparing three collieries, with breakers of the largest size, and fifty miners' houses. The Coal Run Railroad ten miles long, under construction is the property of this company. It connects with the New-York and Catawissa Railroad at one end, and with the Philadelphia and Sunbury at the other. New-York, through it, is placed within 1[illegible]0 miles of the Middle Region.

The Green Ridge Improvement Company,—whose lands are also of the Hazleton and Beaver Meadow Range, is situated in the middle of the [illegible] Basin, and consequently embraces all the veins of that basin. The coal consists of both the white and red ash varieties. The veins have a run of about three miles. In this estate there are 2500 acres all of which is coal land. The company is building a railway to connect with the Philadelphia and Sunbury road.

It will be seven miles in length. There is also in course of construction two large collieries, two coal breakers, and one hundred miners' houses, with extensive facilities for the shipment of coal.

The Carbon Run Improvement Company's lands consisting of 2000 acres, lies a short distance west of the Shamokin Gap, near the town of Shamokin, 1800 acres of which are underlaid with prime anthracite. Some twelve veins have been proven on this property, and are found to aggregate in thickness seventy-five feet of coal. According to the estimate made of the Philadelphia and Sunbury Company's land, this extent of coal would produce 148,272,000 tons. The veins have a run of three miles in length. The Carbon Run Railroad, being built by this company will be, when finished, about three miles and a half in length running through the property, from east to west, and connecting with the Philadelphia and Sunbury road at Shamokin. This lateral road will not only transport the coal of the company, but will command the trade of other lands in the vicinity, thus producing for the stockholders more than ordinary revenue. The improvements are two collieries, one coal breaker of the largest class, with eighty miners' houses and other facilities calculated to make it a heavy operation. The veins are of the purest quality of white and red ash coals.

The Big Mountain Improvement Company own 6000 acres of land. Upon this land are already two collieries and workmen are active in preparing two coal breakers, a steam-saw mill, about one hundred miners' houses, as well as a lateral railroad one and a quarter miles long to intersect the Philadelphia and Sunbury road at the town of Shamokin. These lands embrace four individual tracts adjoining each other. Though now in one body, each of them may be opened by separate lateral railways leading to the Philadelphia and Sunbury road; four collieries can thus be established. This property is near the town of Shamokin, where the Shamokin creek cuts the Big Mountain at right angles, through which the railroad runs from Philadelphia to Sunbury.

The Susquehanna Coal and Coal Mountain Company, though comparatively small, is among the valuable estates of the Middle Region. It consists of upwards of one thousand acres of land, all of which is underlaid with coal. This company's land lies about five miles east of Shamokin, and has a continuous range of about two miles. The Mount Carmel branch of the Philadelphia and Sunbury Railroad passes through the whole extent of the estate, thus doing away with the usual necessity of constructing laterals to tap the main road. The company is now making arrangements for sending to market a large supply of coal.

The Mahanoy and Shamokin Improvement Company and the Zerbe's Run and Shamokin Improvement Company, are both located in and embrace the entire width of the western end of the Shamokin Basin, extending from the Little Mahanoy Creek on the north to that of the main Mahanoy on the south, and westward from the water gap of Zerbe's Run to near the junction of the Big and Mahanoy Mountains, at the termination of the coal basin.

The first named company owns 2000 acres of land, 1200 of which are underlaid with coal, while the latter is in possession of 1,700 acres of coal land, and 3000 acres timber land. The only outlet for both companies is on the Susquehanna, ten or twelve miles below Sunbury, by way of the Treverton Railway, hastening to completion, which at that point connects with the Baltimore and Susquehanna road and the Pennsylvania Canal.

In addition to these chartered companies there are individual ownerships under firms worthy of mention. Among them are Messrs. Helfenstein & Boyd, who have five hundred acres of land. They are known as the Old Lake Fiddler Mines, and have been very moderately worked for two years. At present a heavy coal breaker and a number of miners' houses are being erected.

Messrs. Hegins, Dewart, and others, have 500 acres, one and a half mile run and two veins eight feet thick each, and one six feet thick. The collieries have been worked heretofore, but to no great extent.

Messrs. Longnecker, Baumgardner and Helfenstein have also a track of 1800 acres, which embraces all the veins of the basin, with a run of one mile. A colliery has here been in operation also for a short time.

This array of preparatory workable force in the Middle Region will give a tolerable idea of what may hereafter be expected from that coal basin. The production has not thus far in any one year exceeded [illegible] tons. The improvements above, if taxed to their full capacity, will be able to swell this figure to millions.

THE COAL TRADE OF PITTSBURG.

A late number of the Pittsburg Post says: Our coal merchants have had the most successful run of coal this year, that has ever been known. The fleet was, we are informed, the largest ever started on one rise. Few boats out of the whole fleet were lost, and the prices for which the coal sold at Cincinnati and Louisville were better than usual. Some was sold as high as eighteen and twenty cents, and we have heard of no sales below ten cents.

This successful run of coal makes a very material item in the prosperity of our community. And we rejoice that the coal men for one season have had good luck generally. The trade is becoming every year a more important branch of the business of the country; but it is not every year more profitable than the former year. It is subject to so many casualties that the fortunate of one year may be almost ruined by the disasters of the next. Coal barges and tow boats are becoming more generally used in the transportation of coal and is undoubtedly the more safe and economical way, though requiring a larger investment of capital. Millions of dollars worth of coal have been sunk in the Ohio and Mississippi rivers, within a few years past, and some mode of avoiding these frequent losses is necessary to the entire success of the trade. The tow-boat plan will secure the end.

A NEW COAL BREAKER.

In a late number of the *Mining Register*, published at Pottsville, Pennsylvania, in the Schuylkill coal region, we meet with a description of a new Coal Breaker:—

We have had an opportunity to examine a breaker, erected by D. P. Brown & Co., at their new works near the Mine Hill Gap. Their works are erected on the Primrose Vein—a vein 12 feet in thickness, having a slope 115 yards in length, and below a tunnel 150 yards in length, connecting with the Orchard Vein, which is 7 feet in thickness. The lifting is performed by an engine of 30 horse power, but worked up to a much higher effect. This engine, however, does nothing but raise the coal, the pumping being performed by another engine. They have still another engine of [illegible] horse power at the breaker, used for taking the coal up an inclined plane of 50 yards in length, and for driving the machinery for breaking. But it is in regard to the new arrangement of screens that we propose to speak more particularly. In the schute that carries the coal to the breakers there is a space of open iron work over which the coal must slide before reaching the first pair of breakers. In sliding over this not only the dirt is allowed to fall through, but all pieces of coal that are already sufficiently small drop down before reaching the rollers, and are thus saved from the loss that would be effected by passing them through. This mass is carried along in a schute so arranged that the coal, after being separated from the dirt, enters the first revolving screen by passing under the first pair of rollers, and mixes with the coal that has passed between the breaker. Here the whole mass is subjected to a more perfect sifting, and all the pieces that are of proper shape and dimensions are dropped out, and those that are not sufficiently small are passed between the second rollers, to be subjected to more breaking. This second pair of rollers revolve much closer together than the former, and from the speed with which they move (80 revolutions per minute) and from the comparatively small quantity of coal that reaches them, each piece passes through separately; consequently there is no crushing. By this arrangement of rollers and screens, a portion of the coal being small enough, as it comes from the mines, does not pass through either pair of breakers; another portion being small enough after leaving the first breaker, does not pass through the second; and on this judicious separation of the coal there is effected, we are informed, a saving of 5 per cent. at least. In most, if not all the breakers in use before in this country, we are told, the entire mass of coal, whether the pieces were large or small, were put through both sets of rollers, and the consequence was that much of that which was small as it came from the mines, or after leaving the first set of rollers, was unfit for use after leaving the second set.

THE COAL MEASURES OF THE SOUTH JOGGINS, NOVA SCOTIA.

Read before the London Geological Society, by J. W. Dawson.

The South Joggins, in Cumberland Basin, Nova Scotia, has a coast line of above seven miles in length, presenting a series of oblique strata cropping out one after the other, the vertical thickness of which is 14,000 feet. These extend from the marine limestones of the lower carboniferous series to the top of the coal formation; and in the greater part the beds are exposed in a vertical cliff from 30 to 80 feet high, and in the reefs which at low tide are dry to the distance of 200 yards from its base. In the cliff and on the beach, more than 70 seams of coal with their underclays and their roof shales can be distinctly seen; and erect trees and plants occur in these beds, at about as many distinct levels. The section described in this paper refers to a vertical thickness of 2800 feet of beds in the central part of the coal formation, which has been examined with especial reference to the conditions of accumulation of coal, the nature and mode of preservation of erect trees, evidences of contemporary land animals and other points of interest or novelty. After describing in detail the lithological character of this extensive series of deposits, which he divides into 24 groups, Mr. Dawson gives an historical sketch of the sequence of events indicated by the structural phenomena and the contents of the several strata. It appears, then, that the lowest observed forest, indicated by the presence of trunks and roots of the *Sigillaria* underwent slow and intermittent subsidence until it was quite inundated by waters, in which *Modiolae* and *Cyprides* existed in great numbers. This changed again to a terrestrial surface, with brakes of *Calamites* and a forest, succeeded by a gradual subsidence and inundation by water swarming with *Modiolae, Cyprides*, and ganoid fish. These conditions continued to alternate more or less quietly. Sometimes, however, so rapidly were the swampy forests submerged, that some trees remained erect during the deposition of the silt and sand brought in by inundations. Some drifted trunks of trees and parts of plants were also brought into this area from neighboring forest land, subjected to inundation. In one of the groups into which the author has arranged the strata, he finds as many as nine soil surfaces—the last of which was slowly inundated, its trees coated with the little coiled shell of the marine *Spirorbis* and covered up ultimately by mud and silt (now shale beds) containing innumerable shells of the minute *Cyprides*. Intermissions of long continued submergence and of long sustained swamp and forest conditions, have occurred at various stages in the formation of these alternating deposits. One of the groups is thus described. Group 11 commences with a layer of soil lying immediately over the truncated tops of the trees projecting through the last deposit. On this soil was formed a deep swamp now represented by 5 feet of coal and bituminous shale in alternate bands. Large quantities of clayey mud and sand buried this swamp, but not in such a manner as to preclude the contemporaneous growth of many trees—some of which were entombed erect by the deposits forming around them. In the sandstones and shales thus formed, no less than six erect trees were observed at different levels—the lowest being rooted in the shale that now forms the roof of the coal seam; 15 feet of the trunk of one of these trees still remains; two other stumps are respectively 5 and 6 feet in height; these are accompanied by erect stalks of *Calamites*. The soil which was subsequently formed over these beds, supports one of the thickest coal seams in the whole section; and this marks a long and undisturbed accumulation of vegetable matter. The coal was then covered by clay, which became soil for a forest of *Sigillariæ*, as indicated by its being penetrated, like many other such "underclays," in all directions by the *Stigmaria* roots; this was then submerged for a sufficient time to allow of the formation of a thin bed containing *Cypris* and *Spirorbis*. Above this we find a series of beds indicating swamp conditions, alternating with aqueous drift and deposition; and finally, again giving place for a long period to a quiet estuary or lagoon inhabited by *Modiolæ* and ganoid fish, and receiving but little mechanical sediment. We have here three distinct conditions of the surface. First, terrestrial surfaces more or less permanent; secondly, undisturbed marine or brackish water conditions; thirdly, intervening between these, the deposition (probably with considerable rapidity) of sands and muddy sediment. There are, also, we may observe, five distinct forest soils without any remains of the trees excepting the roots; and we find throughout the section that the forest soils are much more frequently preserved than the forests they bore. Among the many objects of palæontological interest referred to by Mr Dawson as occurring in these piled-up coal forests, are particularly erect coniferous trees of the Araucarian type, the various erect stumps of *Sigillariæ* with their stigmarian roots *in situ*, the upright *Calamites* with leaves and rootlets, the reptilian foot tracks, ripple marks and rain marks on some of the beds, and especially the reptilian bones and the land shell found in one of the upright tree stumps, and already described in a letter read by Sir C. Lyell before the Society, January the 5th 1853. In conclusion, it is evident that the series of events indicated by this remarkable section belong to a succession of oscillations between terrestrial and aquatic circumstances, without any material permanent change in the nature of the surface, or in its organized inhabitants, but accompanied by a long-continued general subsidence; and it is probable that during a great part of the period, the locality of this section was *near the margin* of the alluvial tract in question, where the local results of the successive changes of level would be more sensibly felt, and more easily recorded, than near the open sea or further inland.

On the Albion Coal Measures, Nova Scotia. By H. Poole, Esq., and J. W. Dawson, Esq.—In illustration of the physical phenomena of the coal deposits at Albion, Mr Poole has supplied the plans and details of the trial works at these mines; and Mr Dawson has furnished a geological sketch of the district and a map of an ideal restoration of the surface at the time of the coal formation. The coal of the Albion Mines is somewhat peculiar in its structure and chemical composition. It is more highly laminated, more bituminous, and much more free from sulphuret of iron than coals from other parts of Nova Scotia. Mr Dawson is of opinion that the Albion coal was formed in a depressed space separated by a bar of shingle from the more exposed flats without, on which the swamps and forests, with their alternations of marine conditions, existed, that gave origin to the Picton coal seams. This would account for the great thickness of the Albion coal and carbonaceous shales, and the absence of sandstone, and the peculiar texture and qualities of the coal, as well as the association with it of fish and *Cyprides*, since modern analogies show that such an inclosed space might be alternately a swamp and lagoon, without marked change in the nature of mechanical deposits.

CORNISH ENGINES.

It is said that a good Cornish steam engine, by the consumption of one and a half pounds of coal, will perform as much labor as an able-bodied man, working eight hours; five tons of coal therefore, would evolve as much power as that of a man at work eight hours every day for twenty years. This is certainly a great triumph for science and mechanism, rendering five tons of coal equal in effective force to that obtained on an average, from a man during his whole lifetime.

We know not the authority for the above statement, but append to it the following, from the *London News*:—

We are informed that the 25-horse portable steam engine, which has been built by Medwin and Hall of Blackfriars road, for the Old Trewether Consolidated Mining Company, was tested at their factory, and answered extremely well. This description of engine is destined to effect a considerable improvement in mining affairs, and will compete with the performances of the Cornish engines, and to all new undertakings cannot fail to be advantageous. This engine will be forwarded to the mine in the course of next week, and will be at work in about a month, when the operations in the old antimony lode will be resumed.

SCHMITT'S IMPROVEMENTS IN CLEANSING AND SEPARATING ORES AND COAL.

The processes hitherto employed for separating ores and coal have been found unsuccessful, on account of the employment of water as an agent in such processes, whereby a degree of adhesion between the matters under treatment is produced which counteracts the effect of the differences of specific gravity in the ores and size and weight in the coal. Mr. Schmitt proceeds on an entirely different principle, and abandons altogether the use of water. His invention consists in first drying and sifting the ores or coal to be treated, and then separating the particles of the same according to their specific gravity, or size and weight by means of a blast of air transmitted from a blowing machine, through a blast pipe in communication with suitably arranged passages opening into vessels or chambers for the reception and classification of the substances to be acted on by the blast, the substances falling into such vessels or receptacles according to their specific gravity or size and weight.—*London Mechanic's Magazine.*

CONVERSION OF CHARCOAL INTO DIAMOND.

The savans of France have acquired something of a reputation on the continent for chemical and metallurgical discoveries too nice and refined to be of much practical value. Annexed is an illustration of a reported discovery, which viewed in its most favorable aspect promises nothing of genuine usefulness. It is the reported conversion of charcoal into diamond.

M. Despretz, a French savan, has communicated to the Academy of Sciences, an account of some experiments on the nature of the diamond. He has obtained amorphous graphite from the melting of the diamond, although he has not been able to restore this product to its original form. He shows that in order to obtain crystalized charcoal neither fusion nor sudden volatilization must be employed; not fusion, for like the diamond, pure charcoal melted gives only amorphous graphite, and not sudden volatilization, for in that case, nothing is obtained but a black powder without any crystalline appearance.

It is known that many crystallized bodies are obtained by means of the powerful fire of the galvanic pile; and perhaps, under the same conditions charcoal might be changed into diamond. But there is a difficulty to be overcome at the outset, namely, the want of crucibles less fusible than charcoal. Pending the removal of this difficulty, M. Despretz has experimented in another direction, attempting the gradual volatilization of charcoal, by means of the galvanic battery. He has thus obtained, not indeed the diamond, but crystallized carbon in black octahedrons, in colorless and transparent octahedrons, and in colorless and transparent plates, possessing the hardness of diamond dust, and disappearing on combustion without a perceptible residuum.

These specimens of crystallized carbon have been examined by M. Gaudin, in reference to their action on precious stones, and especially on rubies. After numerous trials he had found nothing equal to very fine diamond dust used with oil for polishing rock crystal and rubies, but precisely the same results were experienced by employing the microscopic crystals furnished by M. Despretz. After working with them for a few minutes, rubies presented a perfectly smooth and brilliant surface, just as was the case with the use of diamond dust. It is, accordingly, regarded as a fixed fact by M. Gaudin that genuine diamonds can thus be produced, although at present only in a microscopic state.

COAL IN INDIANA.

There are in Indiana 7,700 square miles of coal beds. In Great Britain a single square mile of coal area produces annually about 2,570 tons of coal. Her whole coal area exceeds Indiana's but 4,100 square miles, yet her annual production is [illegible] tons. The coal beds of Indiana worked with an energy comparing with hers, are capable of approximating her production within 11,000,000 tons, yielding yearly [illegible] tons of the mineral, exceeding the present annual product of the whole United States some [illegible] of tons, and approaching very nearly one-half of the total product of the world. For the mines of the Union yield but about 5,000,000, and the mines of the world but about 50,000,000 of tons annually.

IOWA COAL FIELD.

This zone of limestone has an average width of twenty-five miles; it circumscribes, with a short interval, the great coal field which occupies the whole of south-western Iowa, extending north to latitude 42° 30', and separates it from the Illinois coal field by a calcareous belt, varying in width from twenty-five to fifty miles.

Of this coal field (in Iowa alone, not including its extension south into Missouri) the dimensions are as follows: Its average width from east to west is less than *two hundred miles*; its greatest length from north to south, about *one hundred and forty miles*; its contents about 25,000 square miles. It extends, measured in a direct line, nearly two hundred miles in a north-westerly direction, up the valley of the Des Moines.

After crossing the Iowa boundary line into Missouri, the boundary line of this coal field bears nearly south through Clark, Lewis, and Marion counties, to near the junction of the three forks of Salt River; thence through the western part of Ralls county, towards the head waters of Rivière au Cuivre, in the eastern part of Audrain county, and north-western corner of Montgomery county; thence it sweeps in a southwesterly curve through Callaway county, towards the Missouri River, which it crosses near its confluence with the Osage, leaving a belt of country some twenty miles wide between this coal region and the outcrops at Charbonnière and the coal pits worked on Rivière des Peres, in St. Louis county; these are in fact outliers of the Illinois coal field. From the Missouri River the boundary bears with a westerly curve up the valley of the Osage, north of that river, which it crosses, but for a very limited distance, only at three points—in Camden county, near the mouth of Niangua; in St. Clair county, near the mouth of Sac River; and in Bates county, near the confluence with the main river of the Little Osage. Thence the line bears with a northerly curve, towards the western confines of Fayette, recrossing the Missouri at Wellington, thence up the valley of that river, keeping from ten to twenty-five miles from the river, to the State line.

The coal measures of Iowa are shallow, much more so than those of the *Illinois coal field*. They seem attenuated as towards the margin of an ancient carboniferous sea; not averaging more than fifty fathoms in thickness. Of these the productive coal measures are less than a hundred feet thick. The thickest vein of coal detected in Iowa does not exceed from four to five feet, while in Missouri, some reach the thickness of twenty feet and upwards.

Lignite was found on the Mankato River and its branches, which approached the cannel coal in its character. Although search was made no regular bed of lignite was found. All the fragments we gathered, when put together, only weighed about ten pounds.—*D. D. Owen.*

IRON AND ZINC.

PENNSYLVANIA AND LEHIGH ZINC CO.

The Report of the Directors on the Mines, Manufactures, and condition of this Company, contains a detailed statement of its affairs, much of which relating to their method of manufacturing, its expense, etc., is of general interest.

The Pennsylvania and Lehigh Zinc Company was organized during the spring of 185[illegible], with the view of mining zinc ores in the State of Pennsylvania, and of manufacturing these ores into zinc paint, under a charter granted by the State of Maryland to the National Mining Company.

The capital stock of the Company is 100,000 shares, at a par value of $10 each. Of this stock, 25,000 shares were set aside for the construction of the works.

THE MINES.

The mines of the Company are under the immediate superintendence of Capt. John M. H. Keenan, a graduate from the Royal College of Engineers, Sappers and Miners, at Woolwich, England, and has worked in many of the mines of England and on the continent of Europe, as well as in this country. His operations at the company's mines have shown that he is thoroughly competent in his profession, and well versed in mining and underground engineering. The construction of shafts and levels will be made with a view to the economical and permanent working of the mine upon the most approved plan and well-tested scientific methods. He is now engaged in sinking the main engine shaft ([illegible] feet by 12), from which he will construct an underground tram road in the levels, upon which the ore will be conveyed from the farthest extremity of the mine to the shaft to be elevated, taking down his "pillars" as he works toward the shaft, so that none of the ore will be lost in the working of the mine. Cars drawn by mules, which are to be stabled underground, will be used in taking the ore from the extremity of the levels to the shaft. Several other shafts have already been sunk. An adequate force is now employed at the mine.

Mr. Keenan has also constructed a cheap arrangement for raising ore and liberating water from the mine, which consists of a two-horse whim, so contrived that the horses reverse in the circle, and raise water and ore at the same time. A pump-lever is geared to the whim, working a pump that will lift large [illegible] gallons of water per minute. This contrivance, it is believed, will save the company a large outlay required for a steam engine to do the same work.

MODE OF MANUFACTURE.

The process of manufacture invented by Mr. Wetherill is new and eminently successful, as is well attested by the daily product of the manufactory. He has taken up the invention of Le Claire, of converting the distilled or sublimated fumes of zinc into a pigment, and has completed it as far as it seems possible for human ingenuity to do. Le Claire first converted the fumes of the burning ore into metal and again burned the metal in fire-clay tubes, and caught the oxide: thus requiring two processes. By Mr. Wetherill's invention the ore is *converted directly into an oxide of extraordinary purity.* This is mainly due to the ingenious contrivances, which were invented and perfected by him. These contrivances oxidize every particle of ore and completely separate it from particles of coal, deleterious gases, and impurities of every nature without injuring its qualities as a pigment. The French Government rewarded Le Claire with the cross of the Legion of Honor: and Mr. Wetherill, by his inventions, has proved himself scarcely less worthy of reward. Mr Wetherill gives his personal superintendence over the manufactory; and the affairs at the works will be continued with the same systematic regularity and productive energy that has characterized them from their commencement to the present period.

QUALITIES OF ZINC PAINT.

On this paint the Report proceeds thus —

Hitherto, in the southern parts of the United States, it has been found almost impossible to make white lead paint adhere for any length of time on the outside of buildings, it soon rapidly changes its nature, and is washed off by rains. At the North, where the majority of the dwellings, churches, and public buildings built of wood are painted with white-lead, a second coat of paint has been required every year or two; while on the inside of dwellings and other buildings painted with white lead the color of the paint, at first a bluish or yellowish white (inferior to zinc), has changed to a dirty yellow, within a period of a few months, from the combination of the sulphuretted hydrogen gases which prevail in such places with the lead, forming a sulphuret of lead, which is dark *yellow*.

The superiority of zinc white as made by this Company, consists in its being a perfect oxide. It cannot take up, either from the atmosphere, or from the oil with which it is ground, any more oxygen. White lead, which is a carbonate, having affinity for oxygen, destroys the life of the oil by subtracting its oxygen, and when exposed to the weather, takes up oxygen from the atmosphere until it becomes dry white-lead, and is easily rubbed off or washed away. It is impossible to limit the durability of zinc paint. The oil remains for years, giving to the paint an enamelled surface not acted upon by the atmosphere, or water. Houses painted fifteen years ago have still a good coat on weather-boards, and boats painted with zinc white show that it is as durable in water. It is much lighter and more in bulk than lead, and consequently goes twice as far in painting.

Painters who use lead paint are all more or less disabled and made sick by lead diseases caused by inhaling into their lungs small particles of lead, which act as a *cumulative poison* (according to "Tanquerelle, on Lead Diseases)" while zinc paint is entirely innocuous and healthy.

For these reasons, and many others, the French Government *have forbidden by law* the further manufacture of lead into a pigment; and the corporation of the city of New York, after referring the subject to a committee who made a full and careful investigation and report thereon, recommended unanimously the use of zinc paint upon all the public buildings of the city.

ZINC MINES IN EUROPE.

The only two large strata of calamine known in the world are, the one in Belgium, the other in Silesia. That of the former has been worked since 1837 by the Société de la Vieille Montagne, which company by substituting the combined and compact force of an anonymous society for the isolated and weak endeavors of private individuals, has risen to an extraordinary prosperity and development. The government of Prussia, with a view, no doubt, to realize in

Silesia what has been so successfully accomplished in Belgium, has given its sanction to the formation of an anonymous society for the working of the mines and foundries of Silesia. This society is to be established with a capital of five million thalers (£750,000), and important privileges have been given to it. The Counts Henckel, the heirs of Von Winkler, and the principal large proprietors and directors of the Silesian mines have united with banking houses of Breslau and Hamburg, and with the directors of the Société de la Vieille Montagne, in order to accomplish the organization and to appoint the directors of this new society. If we are correctly informed, this society will, from the commencement of their operations, command the sale of more than 20,000 *tons of spelter, which amounts to more than two thirds of the whole production of Silesia.* Of this quantity, about 7000 or 8000 tons will be produced by the mines and foundries that have been placed at the disposal of the society, and which are now in full activity. Their richness and extent are fully proved and they are susceptible of an immense development. By the part which the Vieille Montagne has taken in the formation of the new society, and by the influence which it will continue to exercise in its direction, another advantage is secured to the same, and all the markets will thus be open to it. Taking into consideration that the Société de la Vieille Montagne when starting produced only 3000 to 4000 tons of zinc, that this figure has since been raised to 18,000 tons; that the consumption which is however still in its infancy has doubled during the last few years, there remains no doubt that the most favorable prospects are open to the Silesian company which as before remarked, has to dispose of more than 20,000.—*Journal des Debats.*

THE VALUE OF IRON.

To show how cheaply iron is obtained, and how the mechanical skill and labor expended upon it totally overshadow the price, a number of the *British Quarterly Review* gives the following curious and instructive calculation:—

Bar iron worth £1 sterling, is worth when worked into horseshoes	£2 10
Table knives	36 00
Needles	71 00
Penknife blades	657 00
Polished buttons and buckles	897 00
Balance springs of watches	50,000 00
Cast iron worth £1 sterling, is worth when converted into ordinary machinery	4 00
Larger ornamental work	45 00
Buckles, Berlin work	660 00
Neck chains	1,386 00
Shirt buttons	5,896 00

Thirty-one pounds of iron have been made into wire upwards of one hundred and eleven miles in length, and so fine was the fabric that a part was converted, in lieu of horsehair, into a barrister's wig. The process followed to effect this extraordinary tenuity consists of heating the iron and passing it through rollers of eight inches diameter going at the rate of four hundred revolutions per minute, down to No. 4 on the gauge. It is afterwards drawn cold down to No. 38 on the same gauge, and so on till it obtains the above length in miles.

MANUFACTURE OF RAILROAD IRON.

The Dodge Co. Iron Company just organized with a capital of half a million of dollars in Dodge county, Wisconsin, are about going largely into the manufacture of railroad iron, so that Wisconsin will no longer need to go abroad for her rails. They have contracted for the erection of twenty blast furnaces and one large rolling mill, to be devoted exclusively to railroad iron. The *Beloit Journal* states that they have already contracted to furnish to the Milwaukee and La Crosse Railroad fifty tons of iron per day on and after the 1st of March next, until the track is laid to Portage city.

Safe Harbor Iron Works.—These works are in successful operation, making over three hundred tons of railroad iron per week, and running about one hundred tons of pig-iron per day.

Mount Savage Iron Co.—The rolling-mill at Mount Savage is in full operation, and turns out a large amount of railroad iron daily. The rails are of a very superior character, and the company have no difficulty in obtaining contracts to supply all they can manufacture.

AN IRON VILLAGE.

Ironton, on the Ohio River, the capital of Lawrence county, Ohio, was begun four years ago, by a company of associated capitalists. It has now 2500 inhabitants, with four churches built or being built, a railroad extending 15 miles into the iron region, and soon to be pushed through to the Hillsborough and Parkersburg road, 44 miles, bringing it into connection with Philadelphia and Baltimore. It is now bringing into Ironton the product of ten blast furnaces, estimated at 20,000 tons per annum, and will soon reach five more such. Ironton has a manufactory of railroad iron, with two more in progress—one of them capable of turning out fifty tons per day, beside two large foundries, a machine-shop, &c., &c. Coal is delivered at these works for $1 per ton.

IRON MANUFACTURES IN DETROIT.

Manufactures of castings and machinery are now active in Detroit, and need only the impetus which a moderate and judicious investment of capital would afford, to make this city especially noted for the extent and perfection of its productions in iron. The railroad communication which will soon be had with the iron regions of Lake Superior, together with the canal around the Sault Ste. Marie, which may be *completed* for the passage of vessels by the close of 1854, will give Detroit an *access* to the material not surpassed, perhaps, by any city in the United States, with the exception of Pittsburg. The best iron and copper ores in the world will then be brought to its wharves, to be converted on the spot into all the forms of machinery and useful manufactures to which such facilities would give rise in eastern towns. The demand for lake boat engines, engines and mills in the mining and lumber districts, and in the great agricultural section of Michigan, for locomotives and cars, for which the Michigan Central, the Great Western of Canada, the Oakland and Ottawa, the Military Tract and other roads would give Detroit machinists the *preference*; for rails, chairs, spikes, rods, bar and plate iron,—would give a market for the productions of iron in Detroit, for which no probable investments of capital need give fears of an over *supply*. New-York capital is now carrying these ores to Sharon in Pennsylvania; Cleveland and Chicago are taking active steps in giving them direction to their ports, while Detroit stops from want of capital to start large works for converting these ores, relies upon New-York, Philadelphia and Sharon for their supplies of bar, plate and pig iron. Much of the pig-iron used is Scotch, and is imported *via* Quebec.—*Railroad Journal.*

CAST-IRON RAILS FOR RAILROADS.

Why cannot cast-iron rails be used for railroads? is a question which has been examined at considerable length by Mr. R. W. Hughes, the able and accomplished editor of the *Richmond* (Va.) *Examiner.* We are not able to go over the whole ground in the present number of this Magazine, but will notice the important considerations in favor of cast-iron rails, with the intention of returning to the subject again. After speaking of the importance of the subject, Mr. H. proceeds:—

If this be so in reference to roads now in course of construction, the difficulty will but be increased with the growing demand for other roads. These facts, together with the present high price of railroad iron, constantly press the question upon the intelligent mind—"Why cannot cast iron rails be used on railways?"

The fact is daily before our eyes, that cast iron is made to bear the heaviest burdens that can be imposed. It forms a part of almost all machinery, and is subjected to enormous strains. With it we construct houses and build bridges. It is given the preference over wrought iron for railroad car wheels, which when running at sixty miles an hour make about nine hundred revolutions per minute—the cast iron wheels thumping the road with the momentum due to that velocity. All these things are constantly presenting the important inquiry, whether cast iron rails may not be safely used on roads? It is known to be vastly cheaper than rolled iron, and can be made at a profit for one-third the price of rolled iron. It requires no very great expenditure to prepare the works requisite for its manufacture, but may be run into bars directly from the ore which abounds along many of the projected railway lines of Virginia.

Supposing its substitution practicable, no limit can be set to the industry and enterprise that may call it into being. It invites population into our mountain lands, now waste and barren, yet teeming with iron. It would pour their value to our State, and increase the fund for taxation of the State. It prompts railroads by enabling them to be built by persons along their lines, whose labor alone could convert their iron lands and ores into active capital. By doing these things, it would so far cheapen railroad transportation as to make these works far greater beneficiaries to the public than they now can be.

Indeed no single result could be contemplated which would tend so much to develope the resources of Virginia and stimulate her enterprise as the adoption of cast iron rails on her projected railways. It would advance internal improvements in the State at least twenty years, and afford a cheaper and, it is believed, more durable structure than we now have.

But the advantages which must result from the successful application of cast iron rails to railway tracks are far too numerous to be detailed. They suggest themselves to every reflecting and intelligent citizen. The question is, Can cast iron be advantageously used on railways?

Whether all iron ores will be suitable for the purpose we shall not undertake to decide, but that we have large bodies of iron ore which directly from the furnace would make more durable rails than many we now import, we have not the smallest doubt. The Lynchburg and Tennessee Railroad runs through the county of Wythe, and within five or six miles of a body of iron ore equal, if not superior, as it has often been competently pronounced, to any in the world. It is better than the Swedish—it is better than the Pennsylvania deposits. It is unlimited in quantity, and may be gathered from the surface of the earth. Wood, coal, stone and mountain streams for driving machinery are at hand; and withal, the iron is of so tough a texture, that castings, such as pots and ovens made for the neighborhood, have frequently been tried by being pitched some ten or fifteen feet, several times, into a pile of stones, by the foundryman himself, under which severe test very few instances have been known of their being broken. Yet a railroad is to run for miles along this great iron deposit, the rails of which are imported from England!

Descend one of those English mines, where for ages the work of excavation has been going on; go down a thousand feet or more; traverse these caverns for miles under the earth, until you are told the ocean is rolling above your head, and at the farthest extremities of these infernal caverns you will find men plying the pick axe and extracting iron ore. You will find railway tracks throughout one of these abodes of Pluto and Vulcan, leading to the shaft. Here a car is filled with ore. Inquire the destination of this car. The answer—calculated quite to astonish a citizen of Wythe—would be this: It is to be sent several miles to the shaft; then to be raised up a thousand feet to the surface of the earth; then hauled to the foundry to be made into pig metal; then to the rolling mill to be converted into bars; then to the sea-coast to be shipped to the other continent. After crossing the Atlantic Ocean, some three thousand miles, it is to go up James and Appomattox rivers; to be discharged at Port Walthal; to be hauled by railroad to Richmond, and thence by wagons from the depot to the canal; thence along the canal to Lynchburg, and thence by railroad and wagons to Wythe county, Virginia, to be distributed along the Lynchburg and Tennessee Railroad, which runs over great iron deposits of that county, where iron lies upon the surface of a much superior quality, and has to be removed out of its way in excavating for its track!

This case is similar to hundreds of others—and the practical remedy for this state of things is the adoption of cast iron rails. Public opinion at first obstinately pronounced that cast iron wheels could never be used—that they would break under the velocity required of them. Economy rendered it absolutely necessary to try them, and they have been found not only cheaper, but, in fact, to wear longer than wrought iron wheels.

Strange as it may seem, all the early writers concur in stating that cast iron rails were used before the wrought, and that the latter was introduced chiefly on the ground that they were cheaper than cast iron rails—cheaper for the reason, as then contended, that wrought iron rails being not so likely to break, might be made much thinner and lighter than cast iron, and would be more economical in that way. Since it has been found necessary to increase the thickness and weight of the rail for the purpose of firmness and steadiness in the superstructure, it has never occurred to the engineer to return to cast iron rails.

Experience has shown that wrought iron rails wear out rapidly, and this although they are now made heavier than it was supposed would be requisite even for cast iron.

From an essay on this subject, by Ellwood Morris, Chief Engineer, Philadelphia, published in the Journal of the Franklin Institute in the year 1841, we extract the following observations on this subject:

"We are informed in Wood's treatise upon railroads that in the early part of the seventeenth century, railroads were first used in England, and they were then formed of wood; the wooden rails were used for about one hundred years, when in 1767 cast iron rails were first introduced, and thereafter continued for a period of near fifty years, to be used instead of any other materials; but in the year 1815 malleable iron rails were devised, and after Mr. Birkenshaw in 1820 had obtained his patent for an improvement in the form of such rails, and applied the rolling mill to their manufacture, they were very extensively adopted, and subsequent to that period of time have been almost exclusively used. The chief reasons which seem to have induced engineers, both here and abroad, so much to prefer malleable before cast iron rails, as to exclude the latter from use, appear to have been originally a belief that

"1. Malleable iron rails were cheaper than those of cast iron.

"2. Malleable iron rails being made in longer lengths caused fewer joints.

"3. Malleable iron rails were less liable to fracture from concussion.

"4. Malleable iron rails were thought to be somewhat more durable."

The writer then takes up these reasons *seriatim*, and shows how little they are worth when tested by experience.

That the first and principal reason for the introduction of malleable iron rails, their greater cheapness, has no foundation in truth—is apparent to every body at all conversant with the iron business; and yet all the early writers on this subject concur in stating this as the chief reason for their introduction at the time.

Secondly. That cast iron rails may now be made from sixteen to twenty feet in length, about as long as the rolled we are accustomed to see.

Thirdly. While malleable iron rails, of equal weight, may be less liable to fracture from percussion than cast iron rails, yet there is no such imposing direct force on the rails in working a road suitably constructed, as would be likely to produce this. He compares the relative strength of the two metals, and makes the cast iron rails proportionably heavier. He denies that the liability to fracture, at high velocities, is greater than when going slow, but shows the greater the velocity the less will be the vertical pressure, and says upon the same principle it is that a musket ball shot parallel along a horizontal plane so as barely to touch it tangentially will not press upon the plane at all within the limits of its level or point blank range.

Whether these views agree or not with those commonly entertained concerning fast trains on railways, they are nevertheless legitimate deductions from the established doctrine of forces, and serve to account for the small effect produced by the ordinary inequalities of a railroad, as shown in the results displayed by the following direct experiments touching this matter, which were made by Professor Barlow, and recorded in his work on the "Strength of Materials," English edition, 1837. These experiments are conclusive to establish beyond question the fact, that the vertical stress imposed on a railway by the transit of locomotive engines of velocities ranging from twenty-two to thirty-two miles an hour, is but little, if any, in excess of that produced by a quiescent load of the same weight!

More experiments by Professor Barlow were made with an ingenious and accurate instrument, to determine the deflection of rails under trains running at high speed, and as the deflection of the materials under a strain is as the resistant weight, the vertical pressure upon the rails is by this means accurately indicated.

Again he says, after quoting largely from Professer Barlow's experiments: "These experiments having demonstrated, as they distinctly do, that the vertical stress of trains at speed surpasses so little the effect of quiescent loads of the same weight, that it is only necessary to proportion the rails of railroads to resist quiescent and not concussive forces, to change the whole face of the question between cast and wrought iron rails—they strike away all the objections heretofore urged against the brittleness of cast iron, for it does not admit of doubt, that a beam of that material, of suitable proportions, is quite as competent to carry a quiescent load, as one of malleable iron." Again: "A cast iron rail will yield sufficiently to impart a return to its proper level the moment it is relieved of the weight of a train—for it is well known that its elasticity and power of restoration after deflection, is within certain limits so perfect, that owing to its regularity in that respect, it was even proposed by Tredgold to use beams of cast iron as weighing machines, measuring the weights imposed by the deflections produced."

From the various experiments made, he deduces that the proportion between wrought and cast iron rails should be as 1 : 1 3-10—and says these calculations refer to rails supported at intervals only, but if the plan of continuous bearings should be adopted on railways, the propriety of which has been strongly urged by English engineers, as a perfect remedy for acknowledged defects—all objections against cast iron rails must wholly vanish.

LAKE SUPERIOR IRON REGION.

This region, which is so immensely rich in iron ore, is undergoing vast improvements. The progress of enterprise on the part of the Iron Companies, is told in glowing language by the *Lake Superior Journal*:—

The various improvements which are going forward in the Iron Region, and now beginning to develope the enormous wealth of the Upper Peninsula, have been pushed steadily forward the past season. Much has been accomplished, notwithstanding the high price of labor and the cost of the transportation of supplies, the principal difficulties which those engaged in the various new enterprises have had to contend with here. By this time next year, our canal, however, will be completed, and these obstacles will be removed.

THE MARQUETTE FORGE.

The Marquette Forge has been for the most of the time in blast, and a considerable quantity of their choicest iron turned out. Its bright fires, as the town is approached at night from the lake, are seen at a great distance; getting nearer, the confused roar of steam engines, mingled with the sound of forge hammers is heard. If curiosity tempts you to visit the establishment at this hour, you will see the swarthy sons of Vulcan, handling like playthings the immense glowing masses of iron, and you depart with the conviction that the bloomers there are not like those "below," either in sex or costume.

OLD JACKSON FORGE.

A considerable quantity of iron has also been made in the Old Jackson Forge, under the direction of of Mr. Watson Eaton. This establishment is nine miles inland.

FORGE ON MAD RIVER.

A new Forge is being erected on Mad River, above Graveraet's Mill, by Messrs. Butler & McConnell. The work upon it is already considerably advanced. They are making preparations for an extensive supply of coal, and their works will be in operation early in the spring. We understand also that a new Forge is to be built upon the water power at the mouth of Carp River. The location of this will be convenient on account of its proximity to the lake. An establishment is also to be erected and put into operation as early as practicable by Messrs. Trowbridge, Graveraet & Co. But whether near the lake, or at the Iron Mountain, is not yet decided.

THE CLEVELAND COMPANY.

The work upon the railroad, seventeen miles in length, which the Lake Superior Iron Company, under the direction of Mr Heman B. Ely, are building from the mountain to the lake, is steadily advancing. This company are the owners of the most extensive and valuable iron lands in the whole region. A plank road has also been projected by the Scatsen Iron Company from their mines, the Jackson, to the lake, and the grubbing and clearing of some portion of the upper part of the route is already done.

Extensive preparations are being made by the Cleveland Company for hauling ore from the mountains to the lake the coming winter. This new commands on the dock at Marquette from seven dollars and a half to eight dollars per ton. A few hundred tons, all that could be procured in consequence of the want of roads, have been shipped to Cleveland and other points the past season and converted into iron, and some impression may be formed of the vast amount of business which will be done, and the large amount of tonnage required, when it is understood that these mines can furnish nearly all the ore which can be carried away, be it five hundred thousand or a million of tons per annum. And all will be carried away which can be delivered on Marquette Bay for the purpose of being manufactured into iron.

BOONTON IRON WORKS.

These works are located in Morris county, New Jersey, and belong to the New Jersey Iron Company, which employs some four hundred hands. A correspondent writing to the *New-York Tribune*, states some facts respecting the manner in which the establishment is conducted which are of interest:—

The Boonton Iron Works were built in 18[illegible] on a plot of ground which, from all accounts, was about as rough as the hand of industry ever undertook to make smooth. It is said the original cost of the works was something more than a quarter of a million of dollars, but this expenditure must have been doubled to bring them to their present condition. It was a very bad investment from some causes, and I am told that for years it did little more than sustain itself, with little or no remuneration to the stockholders.

After several changes more than a year ago, the whole establishment, rolling mills, rail and spike mills, blast furnace, &c., &c., were sold under the sheriff's hammer, and Fuller & Lord of New York were the purchasers at probably not more than one half, if one quarter of their original cost. Past experience has added to their value, and the same master has no doubt taught some useful lessons to the present managers.

They are doing a great business at these works at the present time. The blast furnace, under the efficient management of Mr. George [illegible], is turning out some one hundred tons of pig iron each week, having just been repaired after a run of some thirty months of uninterrupted success. This part of the enterprise has thus far been so remunerative, that I have heard it hinted as probable that another similar stack will be built. In one respect the situation is very fine, since the stream of cinder as it issues from the furnace is conducted to the gorge of the river, by which means in time a dam will be formed, adding greatly to the water power of the site, by giving them a new and quite large reservoir, a thing much needed when the water is low. The upper part of the canal is on a level with the top of the furnace, which makes the transporting of coal and ore boats very easy and convenient. The materials thus thrown down the bank, are there prepared and measured, and then hoisted upon platforms, which are caused to ascend and descend by water.

At 4½ o'clock in the morning, I accompanied Mr. Mulligan to the mills, and he described to me with great minuteness the arrangements of the establishment. In this department I understand he employs the hands, and graduates every thing by the actual work done, as weighed on the scales. The company furnishes him the raw materials and power, and keeps the works in repair, and he converts the pig iron into wrought iron in shapes ready for the rail and spike factory, receiving a stipulated sum per ton. One man contracts for delivering the coal at the different furnaces, and is paid by the ton. The puddlers, "squeezers," "nobblers," and rollers, are paid by the ton. Head contractor, puddlers, rollers, weighers, carriers—all are thus graduated, and thus become mutual parties in the concern, [illegible] to turn off as much work as the time and materials will allow. The rolling mill does nothing but prepare iron rods for railroad spikes.

The puddlers and head rollers make large wages, in some cases as large as five dollars a day, and cases are not unfrequent in which men have stood at the furnace and rolls a day and night, making two full day's work within twenty-four hours.

During that morning visit I saw the furnace opened, and the red liquid torrent rushing down the clay canal, which conducted it into the sand and [illegible], known among the workmen as "the sow." The rough bars thus made receive the name of "pigs." A short distance from the furnace an obstruction is placed in the little canal which carries the metal so as to bring its surface a little higher than the level of an adjoining side canal, so that the iron being heavier flows on and breaks beneath it over the dam, while the melted cinder being lighter, rises to the top and is easily turned off into the side canal which conducts it without expense to the river's edge.

The entire product of the puddling furnaces and rolling mills, goes to the rail and spike factories. These are only driven in the day time.

EXPERIMENTS ON THE EFFECT OF REMELTING ON THE STRENGTH OF IRON.

Mr. Fairbairn presented a report of experiments undertaken at the request of the Association, "On the Mechanical Properties of Metals as derived from

repeated Meltings, exhibiting the maximum point of Strength and the Causes of Deterioration." In making the experiments, one ton of Eglinton hot blast iron was operated on. The proportions of flux and coke at each remelting were accurately measured, so as to be alike in each. The iron was run into bars 1 inch square, and the tests were made on lengths of about 4 feet, supported at each end, and the weight applied in the centre gradually, until the bar broke. One bar was reserved at each trial, and the rest of the iron was remelted. This succession of meltings and trials was repeated seventeen times, when the quantity of iron was so much reduced, that it was not considered desirable to continue the experiments. The results obtained prove that cast iron increases in strength up to the twelfth melting, and that it then rapidly deteriorates. The commencing breaking weight was 403 lbs., and this went on increasing until at the twelfth melting the breaking weight was 725 lbs. At the thirteenth it was 67[illegible] lbs.; at the fifteenth, [illegible]1 lbs.; at the sixteenth, 363 lbs.; and at the seventeenth melting the bar broke with 3[illegible] lbs. After the fourteenth melting, the mottledness of the metal, when fractured, appeared to have undergone a decided change. There was a bright band, like silver, on the edge of the bar, whilst the middle retained the ordinary crystalline fracture; and in the succeeding meltings the metal was bright all over, resembling the fracture of cast steel. Mr. Fairbairn exhibited specimens of the iron broken at each successive melting, and he said it was his intention to have them analyzed, to ascertain the chemical change that had been effected by the repeated processes.—*London Civil Engineer.*

FOR AN IMPROVEMENT IN THE MANUFACTURE OF SHEET IRON.—*Patented by* HENRY MCCARTY, *Pittsburg, Penn.*

"The object of my invention is to impart to sheet iron in its manufacture the beautiful mottled appearance presented by imported Russia sheet iron. The invention consists in the use of planished or hammer-dressed rollers, between which the sheets of iron are passed, after having been prepared according to the process described in my patent of June 29, 1852. These rollers are arranged similar to those of a common rolling mill, and reduce the iron but slightly; their surfaces, which present the appearance seen in the drawings, giving the sheet passed through them the glossy mottled appearance desired."

Claim.—"I do not claim the use of rollers generally; but what I do claim is, imparting to the surface of sheet iron the peculiar mottled appearance of Russia sheet iron, by passing the sheet between a pair of planished or hammer-dressed rollers, in the manner substantially as herein fully set forth."

IMPROVEMENTS IN THE TREATMENT AND MANUFACTURE OF IRON AND STEEL. *By* THOS. W. DODDS, *Rotherham, Eng.*

Claims.—1. A general arrangement of machinery.

2. The conversion of iron into steel, wholly or partially, by the use of a carbonaceous fuel, or a mixture of soda ash, soda, potash, pearlash, or other alkaline matter, and carbonate or bicarbonate of lime and charcoal.

3. The mode of converting iron wholly or partially into steel, by the use of a compound of soda-ash, lime, and charcoal, or any mixture of alkaline matter with carbonate or bicarbonate of lime and charcoal.

4. The mode of treating iron or partially or wholly converted metal, by plunging it when red hot or thereabouts into a wet or dry bath; that is, either into water, water impregnated with carbonaceous matter, liquid ammonia, or ammoniacal liquor, a solution of potash, or hydrate of potash, or into a mass of dry carbonaceous material, as highly carbonized sand, charcoal and soda-ash, or other carbonaceous matter."

5. "The mode of arranging and working the furnaces of conversion, wherein the retorts or converting chambers may be charged and discharged whilst they are in working condition, without being permitted to cool."

6. The mode of adjusting the anvil level of steam hammers by means of a hydrostatic cylinder or chamber.

7. The mode of working hammer or tilt-levers, so as to strike in both directions by the use of a rotary crank-shaft connected therewith.

8. "The use of an atmospheric buffer for increasing the rapidity of the hammer strokes."

9. "The use of cork or other partially elastic material at the points of metallic connection of hammer details" for the purposes described.—*London Mechanics' Magazine.*

IMPROVEMENTS IN ANNEALING OR SOFTENING METALLIC WIRES AND SHEETS OF METAL; ALSO IN REDUCING, COMPRESSING, OR DRAWING METALLIC WIRES; ALSO IN THE MANUFACTURE OF METAL ROLLS.—*Patent dated Jan.* 11, 1855

The patentee describes and claims—

1. The annealing or softening of metallic wires and sheets of metal by immersing them in a heated bath of melted lead, or other fused metal, either in direct contact or inclosed within a casing or chamber from which the air is excluded.

2. The reducing, compressing, or drawing of metal wires (when such wires are circular in their cross section) by the use of four cylindrical cast metal steel rolls, arranged either two vertically and two horizontally in close proximity, or with their peripheries grooved, and these grooves meeting at a common centre, so as to form a circular aperture through which the metal is drawn or forced.

3. The manufacture of metal rollers for rolling iron, composed of a wrought iron, malleable cast iron or cast steel shaft or mandrel, with an outer casing of metal cast on or around the said mandrel or shaft.—*Mechanics' Magazine.*

IMPROVEMENTS IN ORNAMENTING METALLIC SURFACES, AND IN MACHINERY AND APPARATUS TO BE EMPLOYED THEREIN.—*Patented by* THOS. FEARN, *Birmingham.*

These improvements are applicable chiefly to the ornamentation of tubes, pipes and rods of metal, but can also be adapted for operating on strips or flat surfaces. In all cases the ornament is produced by rolling pressure. The patentee's machinery consists of a cylindrical box or drum, having an aperture through the centre, inside of which is fixed a plate or disc of metal, which has also an aperture corresponding with that on the outer casing and on one side any desired number of grooves radiating from the centre to the circumference. Into these grooves are fitted short bearing-blocks, on which are hung small wheels revolving on pins bearing in the sides of the blocks, and on the peripheries of these wheels patterns are cut in relief, or engraved according to the design required to be produced on the tube or rod. The bearing blocks with the wheels hung on them are laid in the grooves of the disc and the cover of the casing screwed on. If it is a tube that is to be operated on, a rod of steel, tapered at one end, is inserted into the tube, and acts as a mandrel. One end of the tube is then also tapered and placed in the central aperture and the converging rollers are driven tight against it by means of screws by which the depth of the impression is regulated. The tube is then drawn through at a common draw-bench, when the rollers rotate, and impress on the surface of the tube the design engraved on their peripheries. When the tube has been thus ornamented it is again drawn through a common draw-plate, to smooth its surface and sharpen the impression on it. This mode of operating gives the ornament in straight lines parallel to the axis of the tube; but when the patterns are required to run spirally, the bearing blocks in which the figured wheels are mounted are formed in such manner that the wheels rotate in a slanting direction. In this case the casing of the whole set of wheels also rotates round its axis, and to allow of this it is to be attached to a disc capable of revolving in a collar which embraces it. Solid rods are ornamented in a similar manner, and the formed wheels may be suspended from axes below a plane surface when flat strips of metal are to be operated on.

The claim is for the general arrangement and application of the various parts set forth, constituting apparatus or machinery for the purpose of rolling or pressing ornamental figures on the surface of metal tubes, rods, or strips.—*London Mechanics' Magazine.*

QUARRIES AND CLAYS.

NATIONAL OIL STONE COMPANY.

The works of this Company are located on the Carp River, in the iron region of Lake Superior. Among the slates which occur there, is one extremely hard and of a fine grained siliceous quality, found to be admirably adapted for sharpening steel. This Company has been steadily engaged in cutting up and polishing hone stones for market. They have become distributed over the Union, and though the amount of business which the company has done is limited, it has been sufficient to establish the name and reputation of the article. It is stated to be their intention to enlarge and extend their works next season.

ROSE COLORED MARBLE.

Within four miles of Marquette are the extensive marble quarries of Messrs. Burt & Ely. The marble is veined, and of all shades, but generally of a rich rose color, unlike any other found in the United States. It admits of the highest polish, and is pronounced, by workers in marble, equal to the best Egyptian. Solid masses of almost any required dimensions can readily be obtained. We understand that the owners have disposed of a portion of their interest to a company about to go into the business with a large capital.—*Lake Superior Journal.*

THE OHIO RIVER LAND AND MARBLE COMPANY.

The report of the agent of this Company, Mr. H. G. Smith, to the President and Trustees contains very full details of the extent of the property of the Company, and of the nature of their operations. The property of the Company consists of [illegible] acres heavily timbered lands on the Ohio River. The Big Sandy Railroad runs through it twenty miles from Vanceburg to opposite Portsmouth, Ohio. The Company are cutting lumber and cord wood and making lime for market. We make the annexed extracts from the report, respecting the quarrying operations of the Company :—

Upon opening the quarry of marble and lithographic stone, I find the whole upper part of the hill to be covered by large and small detached pieces of superior limestone. The upper strata (below the rubble immediately out cropping) is two and a half feet thick, which quarries easily and can be got out in large blocks. That the lithograph strata could be reached at a small cost, and the upper portion be made to contribute to strip and open quarry, I determined to build one of the improved perpetual burning lime kilns, which is estimated to burn from [illegible] to [illegible] barrels of lime per day. We have also constructed two kilns of common pattern, which will burn about [illegible] barrels per week. It is a superior lime and will bring the highest price in market. The principal lime now consumed at Cincinnati and Portsmouth is brought up the river from Louisville, and taken as far up as Pomeroy, Ohio, and brings $1 to $1 50 per barrel.

I have made the following estimate for lime:

Cost of burning	per bbl.	$0 15
Barrels		25
Cost of transportation		10
Total cost		$0 50
Average sale		1 00

Leaving a profit of 50 cents per barrel. Estimating to burn 80 barrels per day, at a profit of 50 cents, yields $40 per day to the Company, and is putting the quarry in condition that the lithographic stone can be quarried at trifling cost. The strata is from 12 to 15 inches thick as far as observed. You have had some fine specimens of lithography already done, now in the office of the Company. As I understand it is only within eight or ten years that they have obtained their best stone at the quarry at Solenhofen, Bavaria. I can see no reason from samples we have, why we may not find as good when the quarry is opened as deep and extensively as theirs. A large and apparently inexhaustible quantity of Mineral Paint has been discovered on your tract near the Ohio River, which experiments have proved to be superior to any yet used, the analysis of which is annexed hereto by Dr. Chilton, and the experiments and opinion of Mr. Phillips of Brooklyn, who has used it. A few barrels are now on the way to be prepared in resin and oil for water proof experiments.

I am fully confident that the Paint, situated on navigable water, will warrant the Company in an outlay of capital sufficient to erect mills for grinding and barreling it, as the amount required in a new country, settling as rapidly as that west, make a vast traffic and yield a large profit.

In regard to iron ore and sites for blast furnaces, I am informed by the old residents and those acquainted with the tract, that there are two sites upon the upper portion, and opposite to Portsmouth, where there is an abundance of ore, limestone, and wood for coal; and I am also informed that the best bed that has been heretofore worked by furnaces in reach of this tract, called the New-Hampshire Furnace, is upon the Company's land. The present price of iron in that vicinity has increased the value of such locations to a great extent and they are much sought after by capitalists. I would advise the Company to extend the manufacture of lime by erecting three more kilns, which will cost each about $1,000, which will enable them to make 250 to 300 barrels per day, and pay a large income, and also employ from 50 to 100 men to cut cord wood for market at home and abroad. The part immediately opposite to Portsmouth cannot fail to pay a large profit, as it is the only tract well timbered in the vicinity.

The property of the Company consists of 16,800 acres of land in Lewis and Greenup counties, Kentucky.

For the information of such readers as may not be familiar with the value and scarcity of the lithographic stone, we add a few particulars respecting it:

The art of lithography was discovered in 1796, by M. Aloys Senefelder of Munich, Bavaria, who applied it to the transfer of music; but it was not until some years after that the art of lithography, properly, was developed. It did not make much progress, however, until in 1814, Mr. Andre d'Offenbach attempted its introduction into France. The government however refused any encouragement to it on the ground of its insignificance. Finally the Count Lasteyrie took hold of the matter with zeal and enthusiasm. He devoted his time and fortune, first learning the art as an apprentice and then pushing improvements he succeeded to the most happy results. On his establishing himself in Paris, the most distinguished artists offered him their services, and the original designs of Vernet, D'Eseboy, De Bonnington, &c., were sold at very low rates. The autograph letters of Henry IV., with a portrait of that monarch on stone by Girard, attracted the attention of the government, and it henceforth encouraged the art. Since 1818 the Minister of the Interior has issued many patents for lithographic printing; also many premiums have been offered for the discovery of the stone in France by the society for the encouragement of the national industry. In 1817 they offered 600 francs for the discovery in France of a suitable stone. In 1831 they awarded it to M. Lefebvre Chatillon. But in 1835, finding that the question was not settled, they offered 3000 francs reward. This, in 1837, was awarded to M. Dupont, who had obtained at Chateauroux 7,820 pieces of stone, that sold at 30 per cent. below the Munich stones. In 1841 it became necessary to offer a reward of 1500 francs for a new quarry. These French stones, however, like those of Bath, England, can be used only for the transfer of writing, or some coarse work. The stones of Solenhofen remain up to this time the only resource of the artist. There are in Paris 200 establishments, employing 3,000 workmen, and their lithographs are valued at 7,000,000 francs annually. The value of the stone used in 1817 was 4,480 kilogrammes, or 14,200 pounds. In 1824 it had risen to 74,886 kilogrammes, or 176,749 pounds, and in the last few years, to 250,000 kilogrammes, at one franc per kilogramme, or 550,000 pounds at 10 cents per pound, making a value of $55,000.

The true lithographic stone is a compact limestone, and the processes of the art founded upon the adhesion to this stone of a fatty ink, with which the picture is formed. 2. Upon the power of the ink thus applied to hold the oily printers' ink spread over it for working. 3. Upon the interposition of a film of water to prevent the adhesion of the ink to the stone. These conditions are said to be more fully fulfilled by the Kentucky stone than by even the German.

HARDENING AND COLORING ARTIFICIAL STONE AND CEMENT.—*B. Barrett, of Ipswich, England, patentee.*

The inventor introduces the liquid indurating substance into an exhausted chamber containing the stone to be indurated, the liquid substance being previously heated to a temperature of about 50° or 60° Fahr. When the stone requires to be colored, the color is laid on with a brush and allowed to dry, before the indurating process is commenced. The mixture employed by the inventor for indurating stone is composed of 56 parts, by weight, of sulphur, dissolved by the aid of steam or dry heat, and 44 parts of diluted vinegar, or acetic acid, containing 17 parts of acid to 8 of water.

In preparing indurating mixtures to be applied to the exteriors and interiors of buildings, whether the surface be of brick, stone, cement, or plaster, he employs:

Mixture 1.—14 parts by weight of shellac, 14 parts of seed lac, 1 part of coarse turpentine, and 14 parts of pyroligneous spirit.

Mixture 2.—Gutta percha dissolved in coal tar, naphtha, or other suitable solvent in the proportion of 3 parts by weight, of gutta percha, and 8 parts of the solvent.

Mixture 3.—One bushel of limestone or chalk, 12 gallons of water, 12 lbs. of alum, half a gallon of beer grounds, and half a gallon of gall, well mixed together.

These solutions, when heated, are to be laid on with a brush until the surface will absorb no more.—*Scientific American.*

IMPROVED STONE DRILL.

W. C. Wright, of Boston, Mass., has applied for a patent on a machine for drilling rocks, which consists in an arrangement by means of which two sets of gripers are made to operate alternately, the one set griping and carrying the drill upward, while the other is sliding downward upon the drill bar, preparatory to the succeeding movement. This arrangement allows the drill to strike two blows during every revolution of the driving shaft and saves the time lost in raising the bar when only one set of gripers is employed. It also consists in certain means of giving to each pair of the gripers a movement upon the axis of the bar, whereby the latter is turned the desired distance between its successive strokes.

IMPROVEMENTS IN THE METHOD OF RAISING WATER AND OTHER MATERIALS FROM MINES.—*Patented by G. R. Lucas, Sheffield.*

According to Mr. Lucas' arrangement, a tank or vessel is introduced under the chair or cradle used for carrying up the materials. In the bottom of this tank is a valve with a rod, having at its upper part a cross-bar, so that when this cross-bar drops upon the rests at the top of the shaft, it lifts the valve and allows the water to escape. Near the upper part of the shaft is a receiver or trough, which, when the tank has been raised beyond it, is caused to descend under the tank, and receive the water to conduct it away to the drain; when the chair is again lifted from the rests ready to descend the shaft, the receiver falls back into the end of the drain. A reservoir is formed at the bottom of the shaft in which the water is collected from the workings of the mine, the tank descends into the reservoir, and is filled with water to be raised at the same time that the mineral is loaded upon the chair.

IMPROVEMENTS IN GRINDING-STONE AND WHETSTONES.—*Patented by J. Haskett, London.*

According to this invention, 25 parts of brown natural gum-lac or stick-lac, are to be melted by means of a suitable degree of heat, the liquefaction being aided by the addition of a little linseed-oil, being adulterated with litharge if thought desirable; then 100 parts of siliceous sand, of the requisite degree of fineness are to be added, and the whole mixed carefully together. More or less of the gum-lack or stick lack may be used, according to the degree of hardness desired. By means of moulds, stones suitable for grinding fine cutlery, scythes, tools &c., may be formed.

Claim.—The above-described method of manufacturing grindstones and whetstones.

SOUTH CAROLINA GRANITE.

We have at our office two very handsome samples of Carolina granite—one quarried at Newberry, the other at Columbia, the latter being employed in the construction of the new State Capitol. In texture and color they will bear a favorable comparison with any granite that has been quarried in the United States, and if proper facilities for transportation were provided, they would supersede entirely our present dependence on the Northern quarries for this important building material.—*Charleston Mercury.*

MISCELLANIES.

NEW CHATHAM COBALT AND NICKEL MINE.

This mine, which is located in Connecticut, is worked by a company organized under the laws of New-York. Capital $500 000. No. of shares 100,000.

The principal and most successful establishment in this country, so far as we are informed, for the refining of cobalt and nickel ores, is that of Messrs. W. Coffin & Co., of Philadelphia, whose reputation as refiners of these ores is known abroad. We have before us a report of several analyses of the ores worked by this company, which was made by C. F. A. Simonin, one of the firm of W. Coffin & Co. The same firm offers the company two hundred dollars per ton of ore washed to eighteen per cent. of cobalt and nickel.

SIR:—At the request of Doctor Francfort, I visited the cobalt mine of the "Chatham Cobalt Mining Company," and took therefrom a sufficient number of specimens of ore to illustrate, as far as analysis concerns, the character of the lode the company is at present working, as also to throw as much light as possible on the prospects of your present operations.

These specimens were taken by me from the lode designated as "Robert's Lode," and were four in number, viz:—

A—a specimen of the general run of the lode, crushed and washed in my presence [illegible].
B—a specimen of [illegible] washed ore.
C—a specimen of [illegible] washed ore.
D—a specimen of the general run of the lode.

I regret that not having sufficient time allowed me, I have been compelled to confine myself to merely testing your ores *for cobalt and nickel*, which I hope will answer your present purposes. The results of my tests are as follows:—

A—18·2, per cent of oxide of cobalt and nickel.				
B—[illegible],	"	"	"	"
C—1[illegible],	"	"	"	"
D—[illegible]2,	"	"	"	"

The relative proportions of oxide of cobalt and nickel in these different results, are

Oxide of nickel	95·6
Oxide of cobalt	4·4

These proportions may, however, change very much in the different levels of your lode; in fact, I have tested at a former time a specimen of ore sent to our firm by Mr. W. L. Hubbard, which gave me nearly twenty-five per cent. of oxide of cobalt and nickel, containing the nickel in much smaller proportions. This large amount of nickel may seem to lessen the intrinsic value of your ores; this however is but seemingly the case, taking into consideration the large quantity of ore which you are enabled to bring into the market, and the but limited consumption of cobalt, whilst the applicability of nickel to many different purposes in the arts, will enlarge its consumption and consequently retain its value.

In alluding to the prospects of your mining operations, I can but express myself most favorably; although a yield of 2·2 per cent. may appear but very inconsiderable, it is nevertheless abundantly sufficient to pay for its extraction. In making this assertion, I take into consideration the great advantages and facilities your mine offers. You have a large, fully defined lode, with the ore well disseminated, very easy and consequently cheap mining, the great advantage of concentrating your ores by merely mechanical means to a high percentage, the prospects of an almost unlimited supply of ore, and from the fact that your mining operations so far being but surface operations, we may infer from analogy that your lode will increase in richness and size as you extend your operations to a greater depth.

C. F. A. SIMONIN.

EXPERIMENTS WITH CAPTAIN NORTON'S BLASTING CARTRIDGES.

The Master-General of the Ordnance having given instructions to the officers of the Royal Engineers, Captains Haldan and Synge, to examine and report on the efficiency of Captain Norton's percussion cartridge for blasting, operations were lately commenced in the quarries on Spike Island, with the most satisfactory results. Captain Norton has received letters from England, Wales and America for the use of his cartridges, has consented to grant licenses for a royalty to those applying. A description of the cartridge has already appeared in print, but as the course of practice has suggested new matter, we give the last addenda.

In boring horizontally, or with an inclination downwards, clay may be met with in the narrow fork between the limbs of the block; but boring through this, sound timber is again entered in the opposite limb. After the whole is bored with the auger, its entrance should be widened for one third the way with a rimer; this admits of the iron rammer being placed in its proper position, when the blow from the fallen block above will impel it perfectly air tight on the head of the cartridge. By causing the wooden block, suspended by a rope or supported on an inclined plane, to strike the iron rammer in a slight degree obliquely, a section of the root of a tree, or of a rock, can be separated in the direction required in like manner, and more efficiently than by the powerful leverage of a long crowbar, because the severing power of the explosion and leverage of the iron rammer act simultaneously. In blasting rocks, either above or below water, a cylindrical plug of deal, or other wood, about three inches long, and the same diameter as the bore, may be used, the plug having on its lower end a broad headed iron nail, *cone formed*; this will be driven into the plug by the force of the blow above, and the explosion of the cartridge below, thus forming a perfect condensed tamping; the tamping and cartridge may be all in one, thus making one action or motion instead of two. The cartridge may have but one percussion cap, and that at its lower end, which need not be put on till it is to be used. They can be packed for carriage with perfect safety, and may be made waterproof by a coating of Japan varnish, such as is used in varnishing iron and other metal.

Three different modifications of this cartridge were tested in the quarries on Spike Island, each of which succeeded perfectly.

In blasting, in the ordinary way, with a clay, pounded brick, or sand tamping, if a miss-fire occurs, it is necessary to remove the tamping, in order to insert a fresh fuze or priming; but with the percussion cartridge, if a misfire takes place, it is only necessary to drop a short cartridge upon the one that missed fire, and the ignition of the upper cartridge will also fire that below it. The percussion appliance fitted into the wooden head, or tamping, of the cartridge, and charged with the composition that lucifer matches are primed with, is the same as that for the rifle percussion shell. The head of the cartridge is, in fact, a wooden percussion shell, striking, or being struck, "point foremost." The percussion head, or wooden tamping, may be charged by dropping a few heads of Bell's lucifers into the hollow chamber, then pouring over them about a drachm of gunpowder; the wooden plug, fitting air-tight, is then inserted, projecting about an inch; the blow on the plug ignites the charge, bursts the tamping, and fires the cartridge, something on the principle of the brass tube and piston for igniting the German amadou, or tinder. In order to prevent the block from falling off the head of the iron rammer, a deep hoop of sheet iron is secured to its lower end, so that it falls on the iron rammer like an extinguisher or inverted basket.

Another modification of the cartridge, by which it is fired in the centre, is thus: half the charge of powder is poured into the hole bored in the root of a tree or a rock, a small pill box, about the size of a hazel-nut, and containing half a dozen lucifer heads of Bell's matches, together with a little fine gunpowder and pounded glass, is dropped on the gunpowder, the remainder of the powder of the required charge is then *poured in*, and the blow of the iron or wooden rammer crushes the pellet and fires the charge. On one occasion the experiments were carried on without using a triangle for suspending the wooden block, and in place of it the iron rammer had the block fixed on its head; a steel pin passed through the iron rammer and supported it in the bore of the rock, a rope was attached to the pin, and when the men retired to a safe distance the man who held the rope drew out the pin, when the rammer falling on the head of the cartridge fired it; this is a more simple way of causing the rammer to fire the cartridge than that of the triangle.—*London Mechanics' Magazine.*

QUICKSILVER IN CALIFORNIA.

The annual production of mercury at the mines of Almaden (Spain), Idria (Frioul) Hungary, Transylvania, Peru, etc. is valued at from thirty to forty thousand quintals (cwt.) China and Japan also produce a large quantity of mercury but I believe do not export the article. Notwithstanding this large production, the supply is by no means equal to the demand, and many gold and silver mines have ceased to be worked on account of the scarcity and high price of that metal. The mystery which yet envelopes the operations at the mine of New Almaden has prevented me from obtaining accurate returns, but we can to some extent supply the want from our own observations, and enable your readers to appreciate the value of these mines in California. The richest minerals of Europe are those of Almaden and Idria; the first contain 10 per cent. of metal, the latter 8 per cent. The other minerals are less rich. I have analyzed several samples of cinnabar, taken from different spots in New Almaden, and they have yielded from 29 to 72 per cent. The general average was about 50 per cent.; that is to say, the cinnabar is from 10 to 11 times richer than that of Europe. I have analyzed the refuse which came from the furnaces at New Almaden, and have found 8 and 10 per cent. of mercury. Thus have they thrown aside a mineral as rich as that of Idria and Almaden. That loss of 8 to 10 per cent. combined with an equal loss by evaporation, on account of defective apparatus, is a most deplorable waste of the riches of the earth. There are at New Almaden 10 furnaces for roasting, more or less imperfect in construction, and which, nevertheless, furnish, if in constant operation, from thirty to thirty-five thousands pounds of mercury weekly. To obtain that amount of metal, one hundred thousand pounds of cinnabar are consumed and from eighteen to twenty thousand pounds of mercury lost from bad management. The following calculation will serve to show at what weekly expense these mines could be worked, under a proper system of management:

Fuel	$100
Laborers' wages	1,500
Wear and tear of machinery	200
Expense of package, etc.	500
Interest on capital	1,500
	$3,800

The above outlay would produce 50,000 lbs. of mercury. This would be working with a very limited capital, and it would be easy to double the product by increasing the capital from eighty to one hundred thousand dollars. I need not say that these calculations are not founded upon any results obtained at New Almaden; I neither know the receipts nor expenses of working those mines. I only wish to render apparent to all, the importance to which that branch of metallurgic industry can be raised.

But to return to New Almaden, the only important work which exists there is a "drift," or inclined plane, which conveys the mineral to the works. Do they find collections of pure mercury in those mines? We do not know, but *think it ought* to exist in considerable quantities, and that it would be discovered by well-directed researches. The depots of cinnabar appear very extensive in the neighborhood of the mines now worked, and we may safely predict that hereafter new and extensive works of a similar character will be established there.—*Courier des Etats Unis.* D. D'HEIRY.

A MINERS' HOSPITAL is to be established at Pottsville for the benefit of the coal region. F. W. Hughes, Attorney General of the State, and a well-known citizen of that place, has offered to contribute $5000 towards a fund of $20,000 for the purpose, conditional that the whole amount shall be subscribed within the next two months by responsible parties. To aid in the work, a public meeting was held at Pottsville, at which a committee was appointed to solicit subscriptions.—*Register.*

MASTODON BONES FOUND.

In four places in the vicinity of Tinsmans Mound, Grant Co., Wis., miners in prospecting for veins of lead ore, have dug up portions of the skeletons of animals of the Mastodon species. These bones in one place were found in an east and west crevice thirty feet deep, imbedded in the clay which forms the matrix for the veins of lead ore. This clay is a yellow unctuous deposit, filled with sand, flint, and small pebbles of trap and other igneous rocks. Within the last ten years, as many as ten or twelve skeletons of these huge extinct animals have been discovered in various parts of the lead region, and almost invariably in the fissures in the limestones imbedded in the clay which fills the crevices and forms the matrix for the veins of lead ore. The fact of the general distribution of these animals over this district, must leave the impression that perhaps hundreds of similar skeletons are yet buried in the deep clay beds of the mining region, and the question may come—What light do these fossils throw on the time of the repletion of the lead veins? The bones being found in the clayey matrix of the veins, and the ores associated in the clay with them, proves beyond a doubt that the Mastodon species became extinct before the lead ore was deposited in these crevices. The mountain, or lead bearing limestone is a marine rock, formed in the bed of an ocean; then acted on by elevating and abrading forces and formed in ridges and valleys. The crevices in the bed of the Mastodons, were evidently fissures in the rock, and these animals were destroyed by falling in these chasms, which after filled with clay and drift, and the ores have since formed in this clay. And there are more reasons than we might at first imagine to sustain the belief of the recent formation of lead veins. We find all developments of our planet to correspond to the wants of animal organizations—and as ores were evidently designed to supply the wants of the highest class of organizations—we may suppose their origin to have been somewhat contemporaneous with that of man.

PETRIFIED HUMAN BONES IN CALIFORNIA.

The collection of highly interesting skulls and bones, partly petrified, found in a deep cave in Calaveras county, were exhibited in San Francisco recently. They are among the most singular bones ever found. It is a well known fact to geologists that the fossil remains of nearly all species of animals except man, have been found, and the fact is considered as strong evidence that the human race was not created until long after the existence of the lower orders of animals. The solid stone where we generally look for an osseous structure, appears very singular. A heavy coat of sulphate of lime completely covers the inside and outside of some of the skulls,—eight layers of stone are plainly discernible. These layers required a very long time for their formation—a century for each, as some estimate. In some places the stone is more than an inch thick. It is probable that the cave, which was about a hundred feet deep, was used by a former race, now departed, as a sepulchre, and the stone has preserved the relics, which, exposed on the surface of the earth, would long since have entirely disappeared.

GEOLOGICAL RISE OF LAND.

A San Francisco paper states that observations made by Baron de Terloo, a Belgian naturalist now residing in that city, have proved beyond a doubt that an important change is gradually taking place in the level of the ground in that vicinity. During the last twenty months the surface of the earth at the Mission Dolores has been elevated eighteen inches—and this without being accompanied by any perceptible subterranean disturbance.

This phenomenon of the gradual rise or fall of the surface of the earth, is not a new or startling fact. It is well known that remarkable changes of this kind are constantly going on in various portions of the world. In some parts of the Straits of Magellan the earth, within comparatively a modern date, has been raised in this manner more than ten feet. The islands of Chiloe and Madre de Dios have been raised sixteen feet; Talcahuano seventeen feet; and Cobija five feet in two years. But perhaps one of the most wonderful cases of the gradual rise or sinking of the earth on record, is found in the geological history of Sweden. In the northern part of Sweden the land has, probably, for thousands of years, been gradually rising above the level of the sea. Barnacles and oyster shells have been discovered adhering to the rocks, hundreds of feet above the surface of the Baltic, and beds of shells are found at a distance inland of sixty or seventy miles from the coast. These facts all have a tendency to prove the gradual elevation of the country, and modern experiments confirm their testimony by showing that the coasts are regularly rising from the water at the rate of about four feet in a century. They may in ages past have risen more rapidly than at the present time.

But this is in the extreme northern part of Sweden. Descending to the southward the ratio of elevation becomes gradually less, until at Stockholm, the upward movement diminishes to a few inches. South of Stockholm this movement ceases and gives place to a downward motion; and the character and positions of the various formations, and numerous other evidences, afford the naturalist abundant proof of the regular and continual sinking of that portion of the kingdom. This fact is especially perceptible in the cities on the sea coast, where many of the streets, which were once raised considerably above the water level, are now overflowed by every swelling of the sea. In the town of Malmo, some excavations which were made a few years since, discovered an ancient street more than eight feet below the present high-water level of the Baltic.

RECENT PUBLICATIONS.

The Electro-Magnetic Telegraph: with an Historical account of its rise, progress, and present condition. Also practical suggestions in regard to insulation and protection from the effects of lightning, together with an Appendix containing several important Telegraphic decisions and Laws. By Lawrence Turnbull, M. D. 2d Edition. Illustrated with numerous engravings. 8vo. pp. 264. Philadelphia: A. Hart.

We have no American treatise upon the electric telegraph so complete as this work. It embraces both the science and the practical operation of this ingenious method of communication, and contains likewise, a sketch of all the results produced by its experimental working. In a word, it is the latest work upon the subject, and the author has taken care to make it one of the best. It is published in a very substantial and attractive style, and embellished with well executed cuts of the instruments in this country and England.

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Mines, Mining Operations, Metallurgy, &c. &c.

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ART. I.—REPORT ON THE GRAN PROBRE SILVER MINE IN VENEZUELA,—ITS SITUATION, RICHNESS, AND THE FACILITIES FOR WORKING IT, WITH ANALYSES OF THE ORES.—By CHARLES KESSLER, MINING ENGINEER.

HAVING been the Directing Engineer of the operations at the Gran Probre mine for nine months, the results of my observations may be thus stated:—

This mining property consists of three united lots (pertenencias), each of which measures one thousand two hundred varas (yards less 8 per cent.). It is situated in the canton Carupano, in the province of Cumana, two leagues (six miles) to the south-west of the seaport of Carupano, in the coast chain of mountains of Venezuela, in longitude 63° 2′ W. of Greenwich, and 10° 36′ North latitude. It is at an elevation of two thousand feet above the level of the sea, and in a group of mountains; bounded south-westerly by the Rivilla river, northerly by the valley of Carupano, easterly by the Stone Ravine (quebrada), through which passes the principal road from the interior to the coast at Carupano, south-westerly by the river Seco. On the south the group of mountains is connected by a spur with a more interior chain.

From the middle of the first-mentioned group, and in an east and west direction, lies the hill particularly called Gran Probre. On the northerly part of this hill are the veins of the mine which run north and south. Here the principal operations on the mine have been carried on. These consist of several shafts and an adit, running at a depth of ninety-three feet beneath the vertex of the hill. At the distance of 218 feet from the entrance a vein of lead was struck, which proved not to be of sufficient richness to induce the construction of works to mine it.*

* The silver galena of this vein was some time after sent to England to be there assayed: the result of it, which is annexed to the above article, proves that the working of that vein will be productive, by the newly discovered process for desilvering lead.

A side gallery was opened, and at the distance of one hundred and thirteen feet from the entrance of the adit, the chief or principal vein was struck, after nine months of *exploitation*, carried on by a single miner, who was constantly embarrassed by a want of adequate tools and instruments for the work. As soon as the nature of this rake vein was known a mine of immense richness was undoubtedly proved.

The vein penetrates through aluminous and talcose slate of transition formation. The minerals are carbonates, sulphurets and molybdate of lead, oxides of iron and manganese, &c., containing even five per cent. of silver in one hundred pounds of ore.

Assays were made in October, 1852, of very small parcels of several classes of ores taken out of this vein without particular selection, and produced the following results:—

No. 1. Black mineral (sulfuro de Plata fragil), gave 1 oz. silver in 100 pounds of ore.

No. 2. Black mineral gave 26.3 per cent. of lead; and 100 pounds of this lead, 3 pounds 8 oz. of silver.

No. 3. Black mineral gave 6 per cent. lead; and 100 pounds of ore, 4 pounds 11½ oz. silver.

No. 4. Lead mineral gave 38.53 per cent. lead; and 100 pounds of lead, 2.5 oz. of silver.

No. 5. Galena gave 64.8 per cent. lead; and 100 pounds of ore, 3.52 oz. of silver.

No. 6. Red mineral gave 6.2 per cent. lead; and 100 pounds of this lead, 26.8 oz. of silver.

No. 7. Carbonate of lead gave 2 per cent. lead; and 100 pounds of this lead, 8 oz. of silver.

No. 8. Lead minerals gave 17.5 per cent. in lead; and 100 pounds of this lead, 7.4 oz. of silver.

Portions of the silver obtained in each of these assays, when dissolved in nitric acid, left a precipitate of gold.

These very satisfactory results were obtained by assays made in the dry way, and through the medium of cupellation with imperfect apparatus and re-agents of an inferior quality, and doubtless fall short of the exact quantities of metals contained in the ore. It should be stated that all the ores assayed were taken out of the mine at a very inconsiderable depth and nearly at the edge of the chief vein.

From the observations made on the explored parts of the vein, it is evident that as the depth increases the minerals improve in quality and become of greater value. This is especially the case as the gallery advances further from the lead vein first struck and which proved poor in silver.

The analytical examination of the ores found combined with iron and with lead, very satisfactorily demonstrates their chemical constitution to be such as to afford great facilities for the extraction of the silver and gold they contain.

The value of the vein does not only depend upon the superiority and richness of the ore, but upon its abundance and proper distribution in the gangue. The considerable quantities of rich minerals equally distributed throughout all parts of the vein, present the prospect that the expense of working it, and the separation and transport of the minerals, will be much less than it would under more unfavorable circumstances. So far as it has been explored, the vein is not of equal thickness, in consequence of the greater or less firmness of the ground (terreno) in which it is found. Taking this into consideration, it may be stated to be on an average four or five feet in thickness. This convenient thickness, and its inclination of 78° east, will allow the works for the extraction of the ore to be very simple and cheap; especially as the firmness and solidity of the argillaceous slate ground (terreno) does not oppose a strong resistance to the miner, nor require much timbering.

The configuration and height of the ground (terreno) is well adapted to extending the works to a considerable depth, without the necessity of constructing galleries below water level; consequently there will be no occasion for pumps to drain the mine, or expensive hoisting machinery to raise the ores to the surface, as in other cases.

Besides the two veins aforementioned, there are others upon the same property (pertinencias), the value of which is not yet known, as they have not been explored. Assays, however, of minerals taken from the surface of them have proved very satisfactory.

In respect to the facilities for carrying on an enterprise of this importance, there is on the property timber suitable for mason work, construction of machinery, coal, &c., all of the best quality, and in great abundance; also stones for building purposes. There is also a spring of sweet water in sufficient quantity for all the necessaries of life, although not abundant enough for washing the ore. This can be done in the Rivilla river, which is distant only three miles. A wheel road can be constructed at an insignificant expense to the "land right," which the owners of Gran Probre have upon the river.

The location of the Gran Probre mine, six miles from the port of Carupano, and three miles from the Rivilla river, (to each of which points good roads are opened, parts of which are already suitable for transportation on wheels, and the remainder may be finished at a trifling cost,) renders it very advantageous for the prosecution of mining operations.

The natural advantages of the place are very favorable to mining enterprise. Houses can be easily constructed suitable for all seasons of the year; the temperature is fresh, highly healthful, and like an everlasting spring. The inhabitants are not exposed to any of those inconveniences which the European suffers on account of his climate.

These statements are sufficient to prove the richness of the Gran Probre mine, and that the mining operations carried on for working it, would be substantial and quite profitable to the proprietors.

CARACCAS, *May*, 1853.

ASSAY OFFICE, 79 HATTON GARDEN,
London, Feb. 7, 1852.

The box of minerals sent by Messrs. Isaac and Samuel have been carefully selected into fine parcels, and duplicate and triplicate samples inclosed in separate parcels.

Each of the samples may vary a little in other assays, as the minerals vary in richness, but will be found to correspond in character, and as near as can be in richness, without destroying the specimens by pounding.

The assays tried by us we find to be as follows:—

No. 1, chiefly sulphuret of lead, produces soft lead equal to 73¾ per cent., and pure silver equal to 28 ozs., in a ton of 20 cwt.

No. 2, sulphuret of lead, with carbonate, produces soft lead equal to 67 per cent., and pure silver equal to 12 ozs., in a ton of 20 cwt.

No. 3, sulphuret and carbonate of lead, produces soft lead equal to 80¼ per cent., and pure silver equal to 28 ozs., in a ton of 28 cwt.

Nos. 4 and 5 are chiefly earths, with slight trace of lead and very slight trace of silver, but not worth notice. The three first samples contain a slight trace of gold, but not to any value or notice. If the ores on the three first samples were properly selected and dressed, they would pay well for shipment to England, the value being ascertained by calculating the lead produce according to the market price of the day, and silver at 5s. 2d. per oz., and reducing from the ascertained value about £5 per ton for smelting charges.

JOHNSON AND MATHEY.

ART. II.—THE COBALT AND NICKEL MINES IN CHATHAM, CONN.

REPORT OF C. S. RICHARDSON, CIVIL AND MINING ENGINEER.

SIR:—Your valuable mineral property is situated about six miles from Middletown, Conn. The sett is one of considerable extent and amply sufficient to make a large mine. It is in a locality highly congenial for minerals, and more particularly for copper, being immediately on the junction of the granite and slate formation. The strata appear to be regular, although somewhat flat: this, I am certain, will change in depth, as it is found to do in most sloping grounds near the primary mountain slopes. It is in situations like this that the Cornish miner looks for good mines; a reference to the maps of Cornwall will show that most of our rich copper mines, particularly in the neighborhood of Camborne and Redruth, are similarly located.

THE MAIN LODE, OR CHAMPION LODE.

This is a truly beautiful lode; and is the champion lode of which all the others yet discovered are the feeders, which in depth will fall into it. Its underlay is towards the granite, which is very favorable, about four feet to the fathom or at an angle of 50° with the horizon, but which will get more vertical in depth. It is nearly five feet wide, carrying a leading vein of quartz with arsenical ore going down. On this lode a shaft has been sunk eight fathoms deep, as I understand; the water being in it, I could not examine the bottom, but Captain Roberts, the agent of the mine, informed me that there is a good course of ore now opened, and the specimens shown me confirm the truth of his statement. I examined the deads from the shaft, and find that ore is finely disseminated through the lode. I am certain a lode like this cannot fail to make a large quantity of ore when it is intersected by the droppers and other parallel small veins. The ore is at present an arsenical iron, with its usually associated minerals, mundic, nickel, and cobalt. I should advise the erection of a small steam-engine to prove the lode down 20 or 30 fathoms. This can be done at a small expense. The engine need not to be placed at the shaft, but may be erected on the site chosen for the stamps and dressing floors. The pumps should be actuated by means of flat rods, as the distance will not be very great. When the lode has been driven on some 20 fathoms each way, the proper place for the working engine shafts may be determined. Then a perpendicular shaft should be put and a proper pumping engine erected. The bearing of the lodes varies but little with each other. They appear to run with the granite range, which is nearly N. E. and S. W. Shode pits have been put down in many places on the backs and have proved them to have a regular bearing, besides carrying strings of ore up to the very surface.

There are three other lodes on the property, which I will describe as,

No. 1.—A south lode.
No. 2.—*The middle, or Roberts lode.*
No. 3.—The North Branch.

NO. 1.—THE SOUTH LODE, CALLED BARRATT VEIN.

This lode or branch is a flat underlayer, its underlay being seven feet in the fathom, bearing 72° N E. A level has been driven on it for a few fathoms. It will continue its inclination until it falls in with the lode No. 2. It has a greater dip than the strata, which are mica slate of a very shaly decomposed character, quite congenial for making ore. At the present shallow depth it is about sixteen inches thick, and composed out of a mica flucan with traces of cobalt ore; between this and Roberts lode is a dropper or vein of opaque quartz, eight inches thick, dipping also towards No. 2. This will, in my opinion, if it holds down, strongly influence the No. 2 lode, and probably heave it away faster towards the Champion Lode, but there is no positive reliance to be placed in it, as strings of quartz of this character are frequently found in the slate formation in the form of floors or beds, and thus die out.

NO. 2.—MIDDLE, OR ROBERTS LODE.

[This is the lode upon which the Company carry on at present their chief operations.]

This is a very pretty lode situated twenty-one fathoms north of No. 1. It averages two feet in thickness, dips five feet to the fathom. Its bearing is 70° N. E. Its veinstone is gneiss with a great deal of black mica and red garnet; its ore, the true nickel and cobalt ore. A level is being driven on its course easterly, which is now extended to 31½ fathoms. In the back of this level some ground is now being sloped away, which is good stamp work. The lode is spotted with ore throughout; in fact, the whole is saving work, and if it was in the old country would set at a fair tribute. I am somewhat surprised tribute pitches are not set in a lode like this, particularly as the ground is so fair. The specimens taken, as hereinafter described, were a fair sample of the end, back, and bottom of the lode. The results of the yield of saleable ore gained from them, are sufficiently satisfactory for any reasonable person to expect from a lode not six fathoms from grass. In fact, I was greatly astonished when I made a van of its contents.

NO. 3, OR NORTH BRANCH.

This lode is seven fathoms distant from No. 2, and is a flat underlayer, being seven feet to the fathom. It is entirely composed of mica flucan. The country around it is in a very decomposed state. The lode appears to be one foot thick, but in consequence of its unsettled state, very little can be said of its properties. A level has been driven on it five and a half fathoms. There appears very little alteration of its properties in the end. I did not perceive any mineral in it. If this branch does not materially alter in depth, it is very likely to form a slide. Large deposits of mineral take place, and the lodes are enriched by slides, but still they are troublesome. There not being any plan of the sett, I have been unable to lay out the exact position of the lodes on paper, but the following section will give an approximate idea of their relative positions. I should advise you to have the property properly surveyed, and a working plan made of the intended works. By doing this, you will see what is required, and then an estimate can be made of the cost of erecting machinery, etc., etc.

As you are already satisfied that the lodes are productive, you should this winter prepare for the erection of a high-pressure engine of about 14-inch cylinder, which, working at 40-pound steam, will give you 20-horse power. It should have a long stroke, and made to work expansively to save fuel. To this engine, on the north side, will be connected the flat rods of the trial shafts, in which must be dropped a lift of 8 pumps and balance bob for a five-feet stroke; this, going 12 strokes per minute, will draw 120 gallons of water, which, I think, will keep the shafts in fork, until down to the intersection of the lodes No. 2 and No. 3, at which point a much larger quantity of water may be expected. Attached also by the same side of the engine, must be a winding apparatus for drawing the stuff from the shaft. I should recommend one similar to that erected by Mr. Sheldon at the Bristol mines, which is both simple and efficient, and not expensive. The process of dressing the ore must be by stamps, as the ore is finely disseminated like gold through the stone, and requires to be brought down very low to effect a perfect separation. I should recommend the floors to be set out much similar to tin floors, but with long drags from the covers and slime pits one below the other. This is necessary, as the waste is very light, having in it so much finely laminated mica. You can dispense entirely with buddles, racks, and frames, by adopting a set of "Bradford's Vanning Machines." This beautiful invention effects a perfect separation of the ore, and renders it marketable in one operation. I should say nearly cent. per cent. is saved in time and labor, besides the advantages of having the ore dressed much cleaner and better than can be done in the old way. To the south side of the engine, to commence with, 12 heads of stamps must be erected; others can be attached as the operations on the mine enlarge. The stuff from the shaft and several shallow levels will be run on tram ways, direct into the passes of the stamps. For the sake of saving labor and facilitating the conversion of timber for the various uses on the mine, a good circular saw-mill should be put up in the carpenter's shop. The cost is trifling, compared with its use. If you adopt the new vanning machines, I must advise you to have "compound stamps and agitators." These stamps have three different speeds. They reduce the stuff to an impalpable powder, and render it fit to go direct to the agitators, from them to the machines, from whence the ore is ready for market.

This mine must be worked in nearly every respect similar to a tin mine. The ores should also be calcined, to free them from sulphur and arsenic, which would bring the produce much higher, and a better standard would be thereby obtained.

For your guidance in estimating the value of a lode, the following formula may be relied on. It is estimated rather under what it brings out in practice, as allowance is made for waste.

A cubic fathom of lode = 216 cubic feet.
A cubic fathom weighs = 32,000 lbs.
A cubic fathom will make at grass = 2,000 gallons of work.
10 gallons of work = 1 sack.
100 sacks of work weigh = 16,000 lbs.
200 sacks of work make = 1 cubic fathom.
1 cubic fathom weighs = 16 tons (American*).

The mode of estimating the value, then, will be, as so many pounds of clean ore to the 100 sacks of work or lode stuff. I have taken a sampling from the main lode, and the No. 2, or Roberts lode. The produce in marketable ore of the latter, I herewith send you. For this, I will assume a value of thirty pounds, or $145 per ton.† Samples taken from the stope, the end and the bottom of No. 2, or middle lode (Roberts lode), give an average throughout of 2267 lbs. per 100 sacks, which at $145 is worth $386 per cubic fathom, or $128 per fathom of lode as it stands taken at two feet thick. In addition to the above samplings, I took stones from the leader of the main lode, and also some from the adit end, which may be called best work, and gave them to Captain Pinch, of the Northampton mines, Mass. He made a most careful van, of which the four packages I herewith send you are the results.

VAN OF SAMPLE FROM ROBERTS LODE (NO. 2, OR MIDDLE LODE).

Cobalt and nickel ore,	28.57
Waste,	42.86
Slimes,	28.57
	100.00

Of course the produce of even best work cannot be expected to make, when dressed by machinery or the ordinary process of buddling, anything like this sample; nevertheless, *there is not the least doubt but that the lodes are very rich and productive.* It does not come within the province of a mine report to say what will be the profits derivable from the working of the mine: that depends entirely on the manner in which the mining operations are conducted: but if due economy and prudence are exercised in the management, I have not the least doubt but the mine will be *highly* remunerative.

* A slight difference is made from the Cornish computation, to reduce it to decimal calculation. The English ton is 2240 pounds, the American being 2000 pounds.

† This is the ore for which Mr. Coffin offers two hundred dollars per ton.

Art. III.—THE GEOLOGY OF THE UPPER MISSISSIPPI LEAD REGION. By J. V. Phillips.

INTRODUCTION.

About eight years ago, while mining in the northern part of the lead region, I noticed that the sandstone, which divides the upper from the lower beds of magnesian limestone, dipped each way from a small spring branch, which forms one of the head waters of the Pecatonica river. This at first struck me as being somewhat singular; and my curiosity was further excited by finding the same principle applied to all the water-courses in that vicinity. In this way commenced my study of the geology of the lead region, which was pursued by observation for five years before I had an opportunity to procure any written works on this science.

The dip of rock each way from a line of water-course shows that an elevating force has acted along that line; an axis is formed. This water-course traversing a valley of denudation shows that an abrading force has worn down this channel in the rock. There we have in miniature a history of all the forces which have formed the ridges, valleys, mounds and walls of the table lands of the lead region. An elevating force, probably produced by igneous action, deep-seated in the earth, uplifts the limestones and sandstones, and the abrading and eroding forces of air and water wear down the cracks into valleys along the lines where these stratified beds are bent over the lines of axes. The discovery that all the elevating and abrading forces are connected,—or that there is, so to speak, but one elevating and one abrading force,—and that these two agents have acted in concert, or simultaneously, along the same lines and with corresponding degrees of power, reduces the geology of the lead region to great simplicity, and may be said to be the key which unlocks the vast mineral wealth of that district.

FIXED LAWS TO THE DYNAMICS OR GEOLOGICAL FORCES OF THE LEAD REGION.

1st. The water-courses follow and correspond to the lines of elevating forces or anticlinal axes. That is, the Mississippi and other rivers of the lead region all run on anticlinal ridges. The rocks dip each way from all the rivers, creeks, spring-branches, and ravines of the lead region.—See section No. 2.

2d. The amount of dip of the rocks is governed by the distance between the lines of axes. The nearer these lines of the same magnitude the greater is the dip, and *vice versa*. That is, when two rivers run parallel a half a mile apart, the basin of rock between them will be deeper than between two spring-branches the same distance apart.—See Section No. 2.

3d. The elevating and abrading forces have acted simultaneously along the same lines and with corresponding degrees of power. That is, where there has been the greatest amount of elevating force, along the same line has acted a corresponding denuding force. The lead-bearing rocks have, as it were, been held between these two antagonistic agents, and by their concert of action have been formed the valleys, ridges, mounds, and walls of table lands of the lead region.—See Section No. 2.

ROCKS.

The cliff or *mountain limestone* includes all the limestones forming table lands, mounds, or beds traversed by the lead veins. Mr. Owen in his survey of the lead region subdivided this cliff rock into three beds. 1st. The *upper* or *shell beds*. 2d. The *middle* or *coralline beds*. 3d. The *lower lead-bearing beds*. The lower strata I have subdivided into four beds, which will be designated by numbers 1, 2. 3 and 4. These rocks are called by miners the *upper magnesian limestone*. They include all the productive rocks yet proved, and rest on the sandstone of the Wisconsin river.—See Sections Nos. 3 and 4.

No. 1.

This is the upper stratum or *cap rock*—is a fine-grained magnesian limestone—in layers about one foot thick—divides by lines of stratification and vertical joints—contains marine fossils—several large *orthocera*—one near the Sinsinawa mound, and two eight feet in length have been discovered at "Catfish diggings" in this rock. Seams of this rock, pictured with vegetable forms by the black oxide of manganese, called by miners, *cap rock, calico rock, shingle rock*, etc., cap the ridges of the Dubuque valley, the high grounds around the mounds, and cover the largest area in the central and southern portion of the lead region. The east and west caves west of Dubuque, the vertical *openings* at Potosi, the caves around the Sinsinawa and Blue mounds, the vertical east and west veins worked at Platteville, Hazelgreen, and various other mining locations in the lead region, have been found filled in crevices more or less capped over with this rider for the *lead-bearing beds*. This rock forms a fine building stone—quarries have been opened in it on the bluffs at Dubuque, in the vicinity of Galena, and at various places in Grant, Lafayette, and Jo Davies counties. Where this rock is over twenty-five feet thick, it generally carries the veins of ore below the water level.—See Section No. 4.

No. 2.

This is yellowish pockety limestone—contains marine fossils, many of them distinct from the *cap*—stratified in layers from two to four feet thick—is traversed by vertical east and west crevices, which are generally about one hundred yards apart:

crevices form *openings* at the junction of the two beds of rock. These openings terminate both above and below in funnel-shaped chimneys in the two beds of rock. The lower chimneys of these openings are generally filled with a yellow unctuous clay, which forms the matrix of the lead veins. This bed of limestone, which is about one hundred feet thick, gives evidence of being the great *lead-bearing* rock of the upper Mississippi. It would be safe to say that not less than half a million dollars have been uselessly expended in sinking in this bed of rock below the range of the east and west lead veins; almost all the unsuccessful operations in search of ores have been in this bed of rock, where it was partly removed by denuding action, and the veins did not attain any depth in the crevices. It is called by miners, *sand rock, crevice rock*, etc.—See Section No. 4.

No. 3.

This is a gray limestone—splintery fracture, and is filled with nodular-formed layers of flint or chert, generally about one foot apart—the flint beds lying parallel with the lines of stratification of the limestone. The veins of lead ore in it are horizontal. The outcrop of this rock covers a considerable area in the northern and eastern portion of the lead field. In it is that class of diggings known to miners as the *flint openings*. When this rock has not been abraded it is about one hundred feet thick—is called by miners *flint strata, flat opening strata*, etc.—See Section No. 4.

No. 4.

This is the lower stratum of the *lower lead-bearing* beds of Professor Owen's survey, or of the bed of rock more generally known to miners as the *upper magnesian limestone*. It is a blue limestone, alternating with beds of fossiliferous limestone, and blue and brown encrinital marble—contains a large per cent. of fossil remains, embracing many species, from the smallest *animalcules* to *orthocerata* from six to eight feet in length, and where not abraded, this belt is about one hundred feet thick. It has produced considerable quantities of lead ore associated with the carbonate and sulphuret of zinc.—See Section No. 4.

SHALE BEDS.

In basins on the surface of the cap rock, are found beds of blue and yellow shale; about one-sixth of the lead field is covered with these shale deposits, the greatest areas being around the Platte, Blue, Sinsinawa, Sherrill's, Scale's, and other mounds of the lead region. At Gratiot's Grove, and on the dividing ridges which connect these mounds and the Sinsinawa with the Platte mounds, are found larger deposits of this shale. The upper portion of the shales is yellow and unctuous, grows indurated, and changes to a dark blue color where the deposits are of any depth. Mining shafts in the Dubuque valley and around the Sinsinawa mounds, have been sunk thirty feet through this deposit. This shale is impervious to water, and all the mines, in wet seasons, in this formation, are more or less inundated with surface water.—See Section No. 2.

CLAY BEDS.

Overlying the shales, and where these deposits do not exist, are found covering the rocks beds of clay varying from a few inches to a depth of from thirty to forty feet. These clay beds possess peculiarities of interest to the miner which would fill a volume. Every shade of color, brown, black, blue, green, and red, are found intermingled through the different layers. In vertical or horizontal sections, the shadings resemble every variety of pattern the mind can imagine, and a singular fact is, that the most delicate markings, or minutest change in the color or elements of the clay deposits holds a fixed position to the mounds, water-courses, lines of axes, ridges, and other great outlines in the physiognomy of the lead region.

PHYSIOGNOMY OF THE LEAD REGION.

Imagine a natural amphitheatre or circular valley of elevation seventy miles wide;—the Platte mounds in the centre; the Sinsinawa, Sherrill's, Scale's, Blue, and other mounds, surrounding these as satellites;—a circular wall of table land three hundred feet high, as boundaries of this valley on the west, south, and east; an outcropping zone of sandstone and outlying mounds on the north; the groundwork of the picture formed of ridges which radiate from the mounds; water-courses radiating in spring branches from the mounds and other smaller centres, and forming rivulets clear as crystal flowing through denuded valleys. Add to this a soil covering about two-thirds of the district, black and rich as the deposits of the Nile; wide prairies skirted with timber, and traversed by ridges which, in the distance, resemble the swells of an ocean; here and there villages connected by scattering farm-houses; the yellow and red ochres and clays excavated by the miner forming bright dots on the scenery; and some faint outline may be formed of the physiognomy of the great lead fields of the North-West.

LEAD VEINS CLASSED.

FIRST CLASS.

East and west vertical veins of galena crystallized in cubes, filled in well-defined vertical fissures in openings at the junction of rocks Nos. 1 and 2.

SECOND CLASS.

North and south vertical sheets filled in crevices in rock No. 2—edges of the crystal form—these veins always truncated.

THIRD CLASS.

Horizontal veins of chunk and sheet ore filled in openings at the junction of rocks Nos. 2 and 3. Solid angles of crystals from this class of veins are always more or less truncated.

FOURTH CLASS.

Horizontal sheets of lead are associated with carbonate and sulphuret of zinc. This class of veins, yielding ores in chunk and sheet forms, traverses rock No. 4. The chunk ore generally makes in openings, and the sheet is generally inclosed between solid sills of this limestone. All the discoveries of ores yet made will find a place in one of these four series of veins. The number of the rock is always an index of the kinds of ore it will produce.

ANTICLINAL LINES OF AXES.

These lines of axes are all connected, and follow and correspond to the rivers, creeks, and spring branches which flow out from the various centres of the lead region.

SYNCLINAL LINES OF AXES.

These lines are all connected, and follow the centre of the ridges which radiate from the mounds and other smaller centres of the lead region.

MOUNDS.

The mounds of the lead region are outliers of the corralline beds of cliff limestone; are centres disturbed by neither the elevating nor abrading forces; centres where anticlinal lines of axes flatten out, and from which synclinal lines of axes radiate.

ORIGIN OF THE LEAD-BEARING ROCKS.

In most mining districts, igneous action has protruded granite axes through beds of slates and limestones, and at the junction of these two rocks are the repositories of ores. In the Lake Superior copper region axes of trap are protruded through sandstones, and the interfusion of these two rocks has formed the amygdaloid or true copper-bearing rock. The metaliferous rocks are usually formed in bands nearly vertical, and follow the anticlinal lines of trap and granite rocks. The veins have a limited surface area, and run to a great depth. In the western lead region the lines of axes of igneous rocks are all subterranean. The overlying beds of limestone and sandstone are probably about two thousand feet thick. These rocks, by the action of elevating and abrading forces, are formed in basins in which the lead ores are deposited. Could we lift off the limestones and sandstones of this district we should find miniature plutonic mountains below the lines of rivers and their branches, forming the lines of disturbing forces and anticlinal axes which divide the lead-bearing beds.

FIXED LAWS WHICH APPLY TO THE VEINS OF LEAD ORES.

1st. The anticlinal lines carry the outcrop of the veins and the synclinal lines the central wealth of the beds.

2d. East and west veins of ore are found only where rocks Nos. 1, 2, 3, and 4 are all in place.

3d. North and south sheets are found only where rocks Nos. 2, 3 and 4 are in place.

4th. Horizontal sheets of chunk ore are found only when rocks 3 and 4 are in place.

5th. Horizontal sheets of lead ore, associated with the carbonate and sulphuret of zinc, are found only in rock No. 4.

FAULTS.

The faults which traverse the lead-bearing beds are all found at the flattening out of lines of elevating forces, and the upthrows or slips in the strata vary from six inches to fifty feet. In every ravine, valley, and along the water-courses, strata are found to be more or less unconformable.

EAST AND WEST CREVICES.

These crevices cut the central portion of the beds of limestones in parallel lines, generally about one hundred yards apart, and are entirely distinct from the lines of elevating forces or anticlinal axes.

NORTH AND SOUTH CREVICES.

These crevices cut through rock No. 2 in patches, and are frequently found in parallel lines a few yards apart.

QUARTERING CREVICES.

Are found in rocks Nos. 2 and 3 generally in nests or patches, at intervals of from ten to fifty feet.

AGES OF THE LEAD-BEARING ROCKS.

FIRST AGE.

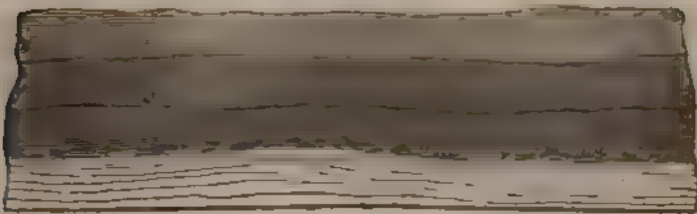
Rocks formed by causes now in action—the sandstones of detritus worn down from granite and other igneous rocks in the upper portion of the Mississippi valley—the limestones built up by crustacean families in the bed of ancient seas.—See Section No. 2.

SECOND AGE.

The district of country which now forms the lead region was in this age a horizontal plain in the bottom of an ancient ocean; no valley, ridge, mound, nor wall of table land, had yet come into existence.—See Section No. 1.

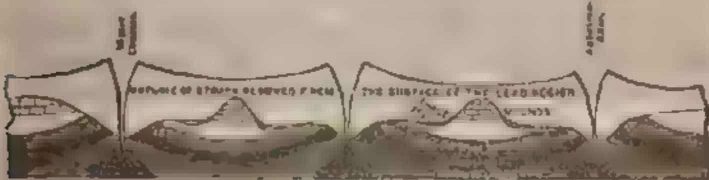
No. 1.

Position of Lead-bearing Rocks when first deposited.

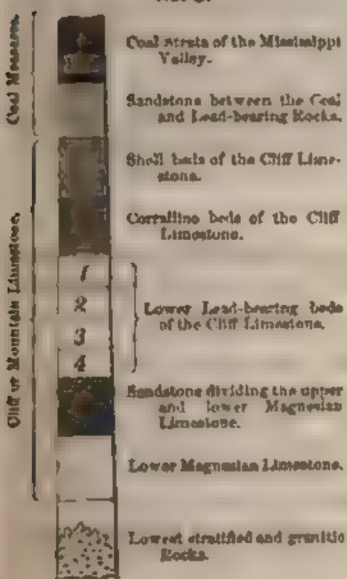


No. 2.

Position of Lead-bearing Rocks after being acted on by elevating and abrading forces.

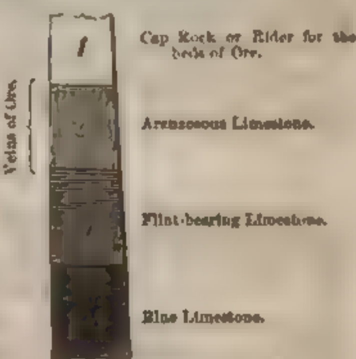


No. 3.



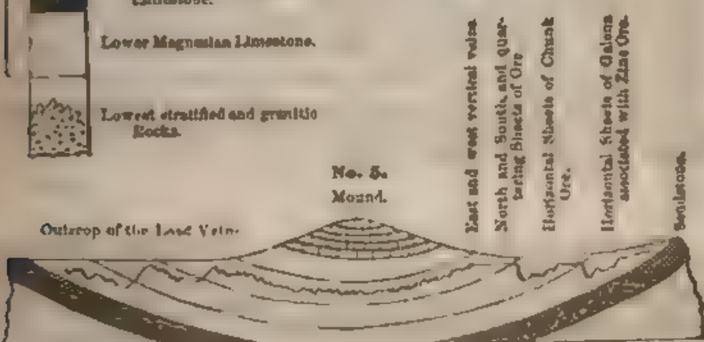
No. 4.

Lower Lead-bearing beds of Owen's Survey subdivided.



No. 5.

Mound.



THIRD AGE.

The elevating and abrading forces commence to uplift the stratified beds—the abrading forces to wear down the rocks along the lines where the strata are bent over the axes—the lines of forces traverse the strata longitudinally and flatten out around centres—these centres resist the denuding action from the fact of their not being disturbed. The mounds and ridges of the lead region now mark the centres.—See Section No. 2.

FOURTH AGE.

The east and west vertical crevices at the junction of rocks Nos. 1 and 2, are by voltaic or other agencies formed in openings—the shale beds are deposited—the openings in the fissures are by aqueous action filled with clay, sand and pebbles—basins in the centre of the ridges are gradually filled with clays—mastodons are entombed in this era in the deep clay around the mounds.

FIFTH AGE.

The outlines of ridges are finished—spring branches commence to radiate from the surface of the beds of shale, and break out by the artesian force from the various basins of rock—the lead-producing action deposits ores in the clayey matrix of the openings and caves, and in the clays on the surface of the rock. The deposits of ores found in rocks Nos. 3 and 4 give evidence of being first produced; the lead-producing action probably being active, while the limestones were partially submerged in the waters of the ocean.

SPRINGS.

All the springs in the lead region break out by the artesian force and radiate from centres. The east and west veins in the large basins of rock are found in a matrix of variegated unctuous clay. In the small basins of rock the ores are found in a red ferruginous ochrey matrix. North and south sheets in some places have a matrix of red clay, and in other districts are inclosed between solid wall rocks of limestone. The horizontal chunk sheets of ore which traverse rock No. 3 have a matrix of flint, ochre and limestone. The horizontal sheets of galena, associated with the carbonate and sulphuret of zinc, which traverse rock No. 4, are generally found in low flat openings between the strata of the limestones, and are associated with a brown ferruginous ochrey matrix.

HEAT.

The heat which has permeated the lead-bearing rocks, and on which depends the color of the matrix of the veins, has radiated from the anticlinal lines and decreased in inverse proportion towards the synclinal lines.

VOLTAIC PILES.

The elevating and abrading forces have formed the lead-bearing rocks in natural voltaic piles. The principle applies—first, to the whole lead basin—second, to the beds of rock around the mounds—and third, to single ridges or the smallest basins of rock.

CRYSTALLIZING LAWS.

These laws have acted around centres, the principal of which are marked by the mounds.

DIP OF ROCKS.

The rocks dip to the centre of all the ridges and mounds of the lead region.

OUTCROP OF ROCKS.

The outcrop of sandstone which underlies the upper magnesian limestone, forms a border along all the principal water-courses, which flow out from the centre of the lead basin. The outcrop of blue limestone forms a border which is inclosed by the sandstone, and reaches up towards the heads of the rivers. The outcrop of the flint strata, or rock No. 3, forms a border inclosed by the blue limestone and follows some of the spring branches up to their fountains. The outcrop of the arenaceous limestone, or rock No. 2, forms a border inclosed by No. 3. The outcrop of the cap, or rock No. 1, forms a still more central border, and incloses all the beds of blue and yellow shales. In these outcropping borders, around the edges of the lead basins have been worked the four classes of lead veins.—See Section No. 5.

FIXED PRINCIPLE.

The shale beds fill the surface of all the large basins of limestones, and, being impervious to water, form a natural roof or water shale for the beds of lead veins. The veins increasing in richness towards the centre of the lead basins, and the water-courses radiating from the roof of shale, make a *fixed principle* in the geology of the lead basins, that all the centres of metalliferous wealth are at points most remote from the water-courses. This principle applies to the whole lead region—to the districts around the individual mounds or to the smallest ridges or basins of rock.

REMARKS IN CONCLUSION.

The lead region is divided into twelve principal beds or basins; these are marked centrally by the mounds. Surrounding and connected with these, are other smaller centres, amounting to several hundred in number. The mining in this lead field

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vein now worked runs through a corner of this lot. For the mining rights the proprietor has been paid five hundred dollars, and is entitled to a small interest of two per cent. only in the ores that may be found upon it.

4th. The mining rights, with use of the surface, &c., below the Farm Line, including the "old mine," and extending five hundred yards on each side of the vein.

MACHINERY AND BUILDINGS.

On taking charge of the mine, on the second week in February, I found it without buildings, except an office, and with no machinery but a windlass. My first care was to provide those things required for working the mine on as extended scale as practicable. A mining pump of large size had been ordered some weeks previously of manufacturers in Pennsylvania. The want of it completely interrupted the sinking of the main shaft, and opening of the mine in depth. Though repeatedly applied for, it was not until some time in April that it was received. In the mean time, a good whim was built for working the pump by horse power; and on its arrival, it was immediately set in operation. With the exception of the breaking of the windbore, which was soon replaced by one of superior quality of iron, made by Messrs. Lang, Cook & Co., of Hudson, the pump has proved all that was desired, and will always continue to do the work of the mine to the depth one lift of pumps ever work. With this exception, also, no accident nor imperfection in any of the smelting or mining machinery has caused the loss of one day in the operations of the mine.

Two Scotch hearth furnaces had been sent to the mine, but they required a building, a steam-engine and blowing apparatus to put them in operation. I procured a suitable engine in Boston. The blowing apparatus, of the most thorough construction, was ordered of a machinist in the county. Though its preparation was pushed forward to the extent of the capacity of the works, considerable time was required for its completion. The engine and smelting house was built in the mean time, and the furnaces and engine set. On the 24th of May, the blowers then being ready, the furnaces were started, and during this and the succeeding month, 618 pigs of lead, weighing 70 lbs. each, were run out. An amount of lead equivalent to forty-four pigs more, was left to fill the hearths of the two furnaces. Two lead smelters from St. Lawrence County, accustomed to the Scotch hearth furnace, were engaged, and one of them is still in charge of this branch of the work. The smelting-house was laid out of sufficient size (60 × 30 feet) for the engine and furnaces, and also for crushing rolls, whenever it may be important to add these. Besides the blowers, the engine now runs a circular saw, which cuts all the wood required for the furnaces.

Next in importance to the smelting works, a large building was required for dressing the ores, as they came from the mine. This was soon put up, eighty feet long and forty feet wide, and connected with the furnace on one side and the mine on the other by railroad tracks. Water was conveyed to it by long launders, extending to a permanent water-course up the side of the mountain. As the production of the mine increased, it was found necessary to add a considerable wing to this building, which is devoted to the dressing of the copper ores. The arrangements for room and apparatus are sufficient to prepare all the lead ores the furnaces can smelt, as well as the copper ores, which are extracted from the mine at the same time. In the convenience and completeness of these arrangements, combined with great economy of plan and construction, no works for the preparation of ores for the furnace, and their conversion into metal, can probably be found superior at any other establishment.

The blacksmiths' and carpenters' shops are large and commodious, and well stocked with all the tools and apparatus required for an extensive mining establishment. The dock built by the Company upon the canal, with the storehouse upon it, affords great convenience for receiving the anthracite for the engine and shops, and may also be used for the shipment of pig lead and copper ores. It has been intended to extend the railroad track from the furnace down to this point.

An office and powder-house complete the list of buildings, and are all that will probably be required until the erection of a pumping engine for the mine. By reference to the accompanying report of the treasurer, it will be seen that the outlay for machinery and buildings has been remarkably small, considering the mine is so well provided with them, and all within the past year.

MINES.

The character of the vein now worked has been described in former reports. It is one of a series of nearly vertical veins, which cut obliquely across the range of the mountain. The dip of the vein is seen in the section across the main shaft. (Fig. 2.) As the work of opening progresses, it is found to follow the course of an extensive fissure, which is partially filled with loose fragments of sandstone, bunches of quartz crystals, and lumps of lead and copper ores, all bedded in a sticky and tough yellow clay. Where the fissure closes up, the vein marks its range, either by courses of rich galena and pyritous copper, or by a mere crack, entirely deficient of vein stones or ores, but leading on across the stratification from one "floor" of ore to another. These "floors" of ore ranging up and down with the strata of rock, which dip towards the valley at an angle of about 48°

with the horizon, are of various lengths along the drift, and have no regularity in the height to which they rise between the strata, nor in their width. In the longitudinal section, (Fig. 1,) it is seen how far they have been followed upwards, and how far each course extends in length—the dotted portions representing those parts which have been found productive in ores. The courses are followed no further upwards than they are found to pay the expenses of extraction. But, though a few feet above the drift, the wall rocks shut in close upon the vein, there is no evidence that they do not open out at higher elevations, and that the vein may be found productive there also. The width of the floors is sometimes not less than five feet of pure galena. This rich ore frequently occurs entirely unmixed with other substances, and immediately on being broken up is ready for the furnace. A portion of it is associated with the pyritous copper, from which it is separated by jigging. The proportion of blende continues very small. The course of ore recently cut at the bottom of the shaft, furnishes large cubical crystals of galena, with brilliant mirror like faces, equal in purity to any found at the western lead mines, or any other mines.

The rock formation containing the vein, and to which its productiveness may possibly be limited, is the hard sandstone called the Shawangunk grit. It dips under the valley, and no doubt extends further downwards than any mining operations can ever reach. It is a peculiar feature to find rich veins in this kind of rock. In no other locality in this country, and in very few in England, have the sandstones of this group proved, as here, true mineral repositories. It is in the limestones belonging to the same series, that the veins are usually found productive. Professor Mather, in the State Geological Report, expresses the opinion, that the slates within the mountain, as well as the limestones without, are in general more metalliferous than the grit rocks. To determine the position of the limestone, if possible, that it may be reached by a shaft sunk in the valley on the course of the vein, as well as to ascertain approximately the thickness of the sandstone, seemed to be objects of sufficient importance to take the advice of one of the State geologists, who have had most experience in tracing out and locating these formations. I therefore invited Professor James Hall to make an examination, and consulted with him for these and other objects connected with the working of the mine. Among the results of this examination are—a confirmed reliance upon the sandstone as the chief repository of the vein—the assigning to this a greater thickness than five hundred feet, the maximum estimate of Professor Mather—increased confidence in a larger yield as the vein is followed downwards in the sandstone—distrust in the expediency of prosecuting the shaft commenced in the valley, until the other workings have followed courses of ore

occasionally interrupted, when it is required to remove the ores as fast as they are exposed to view. These causes have kept back the opening of the mine from the limits the drift and shaft would otherwise have reached. An idea of the difficulty of this work may be had, from the fact that contracts cannot be let to miners for less than $130 per lineal fathom, the miners finding every thing. The estimated cost of carrying in a level in the same rock by other parties, at a point a few miles from Ellenville, is $25 per foot. The extreme length of the drift is now 200 feet, and the depth of the shaft is 100 feet from the top of the curb. The latter has gone down in close rock nearly the whole way, and for a great part of it by the side of the great fissure. Had this happened to extend a little further towards the valley, the cost of the shaft would have been very much lessened. Near the bottom, it reaches one of the principal courses of ore, which is the first one from the level of the drift that has been met with crossing the line of the shaft. The discovery of this is a matter of no small importance, and if the fissure is found to pass under the shaft, and outwards from the mountain, a point can be selected, after going a little deeper, for extending a drift in this direction with the least expense. With one going also in the other direction, on the same level, room is at least afforded for sufficient number of miners to open the mine three times as fast as could be done, when operations were necessarily limited to one level. Rapid progress, therefore, may soon be expected in this most important work of opening the mine and proving it in new directions. From the past production, which, from the amount of ground opened, I believe I may safely say exceeds in value that of any other mine of the same age in the country, there is reason to look for a largely increased yield of ores. There is no single feature that tends to inspire a doubt of the permanence of the vein, or that it will continue to produce largely of rich lead and copper ores.

The number of miners employed continually varies, according to the room there may be in the mines for their work. Six miners are employed, in three shifts of eight hours each, in extending the drift, and the same number in sinking the main shaft. But the larger proportion of them are engaged in breaking down ore at different points in the mines, and in cleaning out the loose rocks, mud, and ore, which fill the fissure. Though in some parts of the country common miners have been paid the last season as high as fifty dollars per month, no increase of their wages has here been found necessary beyond the rate of thirty-five dollars.

At the old mine, little has been done beyond laying out and commencing to sink a shaft at the foot of the mountain. The indications here are very favorable for another rich vein. Fine lumps of galena have been met with at the surface, as well as copper ores, while the vein, which is distinctly to be seen, presents a more "kindly" appearance than did the new vein in its outcrop. So soon as money can be appropriated to this purpose, it should be deemed a matter of importance to prosecute the opening of this mine. To put up a horse whim and blacksmith shop, and supply all the materials and labor to effectually prove the vein, not less than three thousand dollars will be needed. With this expenditure, there is a fair prospect of this proving as valuable as the new mine.

A third vein has been recently discovered, crossing the property of the Company in a precisely similar situation to the vein now worked, carrying lead ore, and presenting similar surface indications. It is distant only about twenty rods from it. The agent, who has been directed to open this vein, writes in favorable terms of the prospects of its making another mine.

SMELTING OPERATIONS.

The two lead furnaces have been run, either separately or together, with hardly any interruption, from the time they were started on the 24th of May. From the mixture, though exceedingly small, of copper ore and blende with some portions of the ore, the smelting is attended with more labor than with the western ores, which are more free from this association. This, however, does not seem to lessen the per centage of metal extracted, but it has the effect of requiring more hands to run the furnace. Before commencing to smelt, great distrust was expressed by some, whether the economical form of furnace chosen would effect the reduction of the ores; and by some it was most emphatically condemned. Being for this reason unwilling to try it with inefficient blowers, I was at the more pains to secure such as I knew I could rely upon for pressure as well as volume. At the expense of some time I obtained these, which have proved far superior to what are ordinarily applied to this purpose; and by their use the furnaces have run as satisfactorily as can reasonably be expected with these ores. As will appear below, the cost of smelting is not materially higher than it is in Wisconsin, allowing for the great difference in wages obtaining at the Ulster furnaces and in Wisconsin; and it certainly falls very far below the cost of smelting in reverberatory furnaces, if the cost of the first lot smelted more than a year ago for the Ulster Company in Pennsylvania be any criterion.

In consequence of the greater labor of working these ores, above referred to, the shift of two men work only eight hours, instead of twelve. Six are therefore required to run one furnace twenty-four hours, instead of only four men. The wages of these are, for the head smelter, $2 per day; his assistant, $1.25. The other four are paid, two of them, $1.50 each, the others, 1.25 each. The engine is run twenty-four hours by one man, at $35 per month, and one boy, at $15.86. Another man tends the saw, splits wood, and helps at other work about the furnace, for $22.75 per month. The engine consumes a ton of coal a week, costing $4, besides a small quantity of wood. The consumption of fuel for one furnace is about three cords of pine wood per week, costing $2.25 per cord. About a cord of slabs are used every day for warming the wash-house, at a cost of $1.50. Some difficulty has been met with in procuring suitable wood for the furnaces. They require the best of white pine, well seasoned; any change in the quality of this is immediately attended with a falling off of the production. In commencing a new operation of this kind, with untried ores, some loss of time must of necessity be incurred in meeting and remedying unforeseen difficulties of this nature. No step, however, has been taken that required to be retraced, and no machinery purchased for the furnace or the mine has proved in any respect unsuited to the purpose required. The following statements taken from the furnace book present the details of the smelting:

ORE DELIVERED TO THE FURNACE.		PIGS OF LEAD MADE. *Weight 70 lbs. each.*	
May,	20,885 lbs.	May and June,	662.
June,	78,465 "		
July,	113,206 "	July,	1,017.
Aug.,	140,000 "	Aug.,	1,328.
Sept.,	140,000 "	Sept.,	1,414.
Oct.,	91,515 "	Oct.,	795.
Nov.,	86,000 "	Nov.,	828.
Dec. to 21,	46,000 "	Dec. to 21,	452.

Besides this, there is an amount of rich slag on hand, estimated at 60 tons, and containing, by analysis of average samples by A. A. Hayes, M. D., 47 per cent. of lead. It would be fair to estimate that 40 per cent. will be saved by its reduction in the slag furnace just built for this purpose, thus adding 48,000 lbs. of lead to the above production, and bringing the yield of the ores to about 70 per cent., which is as high per centage as it is customary to obtain at the Wisconsin furnaces.

The rate of production is shown in the following extract from the workings during a part of the month of August, commencing on the 8th. I am not aware that the furnaces were doing better or worse than the average on these days. They happened to be selected, because they were just previous to the time of my noting them down, and since then there has been no change of consequence:—

August	8th,	four shifts of 8 hours each,	60
"	9th,	" " "	40
"	10th,	" " "	48
"	11th,	" " "	36
"	12th,	" " "	44
"	13th,	" " "	32

August	15th, two shifts of 8 hours each				20	
"	16th, four	"	"	"	54	
"	17th,	"	"	"	48	
"	18th,	"	"	"	64	
"	19th,	"	"	"	66	
"	20th,	"	"	"	28	working slag.

At this rate the number of pounds produced per shift is 856, and the monthly production of one furnace is 66,768 lbs.

The monthly running expenses of one furnace are, as above:—

26 days,	1 head smelter	a.	$2 00,	$52 00
	3 assistants	a.	1 25,	97 50
	2 "	a.	1 50,	78 00
	1 "			22 75
	Fuel, say			30 00
				$280 25

RUNNING EXPENSES OF ENGINE.

26 days,	1 man	a.	$35 00	
	1 boy	a.	15 86	
	Fuel, say		20 00	$70 86
	Total			$351 11

The cost per 2,000 lbs., including power, is then	$10 51
Cost " without power	7 71
Cost " " in Wisconsin	5 30
Cost at Romie, same time, and without charge of extra assistant or power	3 47

Although from the greater amounts and higher rate of wages paid, the cost of smelting is somewhat greater than it is in Wisconsin, on the other hand, this difference is much more than counterbalanced by the favorable position of the works upon the canal, by which all expenses of transportation are included in the sum of $1.56 per ton for freights and tolls to New York. The whole summed up amounts to this, that when ore is worth in Wisconsin $60 per ton, it is worth at Ellenville $75.

The quality of the lead is superior to the Spanish, and but little inferior to the western lead. It has uniformly sold at a better price than the former, though in consequence of not making quite so pure white lead, its value is a little below the latter. Unlike the western lead, it contains some silver. By my own assays I have found as high as twelve ounces of this metal to the ton of lead. One third of this amount pays for separation in England. Were there other mines in this country producing any quantity of silver-lead, whose products might reach New York, it would be an object to put up furnaces near the city for separating the metals; but the quantity produced by one mine, unless of extraordinary richness, would not justify this. Until there are such works in operation, the silver cannot be saved. Some lots of lead, which I did not assay, from the appearance of the ores I judge contained even more silver than those which I took of the ordinary run of the furnaces. Attention should frequently be directed to this matter, and the lead be occasionally cupelled, for the vein may become so productive in this metal as to make its separation more of an object than it is now.

COPPER MINES.

Pyritous copper, of very good quality, continues to be found to considerable amount, and but little mixed with the lead ores. As with these also, the stony matters accompanying the ore are easily removed, by breaking with bucking hammers and jigging. It has not yet been found necessary to go to the expense of crushing rolls; but as the mine is extended these may be required. The smelting-house was planned for their accommodation when wanted.

The purity of the copper ores considerably exceeds the average of this variety of ore. One lot of fifty tons produced 24.3 per cent. of copper.

These ores, too, contain some silver—the proportion, according to the analysis made by Prof. Eaton, of the last lot, reaching seven ounces to the ton. This association of the silver with the copper ores also renders it still more important to watch for any increase of this metal.

In both lead and copper ores, the prospect of continued production is as good now as at any period since the opening of the mine.

There were, on the 21st Dec., at the furnace, 450 pigs of lead and six or eight tons of rich copper ore. According to the letters of the superintendent, the number of pigs on the 29th, were 556, and the amount on hand was increasing at the rate of 40 pigs per day. Capt. Rickard also reported there would be 30 tons of copper ore on hand that month.

In now transferring this property to others, who will be able to give their attention more exclusively to it than I have been able to do, it is with much gratification I can do so, with the conviction that it is greatly enhanced in value during the last year, and with a reasonable hope that this improvement will continue to go on under a more active administration. My own visits to the mine, in consequence of attention to other matters, have been but eleven during the last eleven months. From the fact, however, of the agent at the mine, Capt. R. H. Rickard, being a man of experience and good judgment, and of my very frequent correspondence with him, a more exclusive attention to its affairs did not seem to me important.

Very respectfully,

JAMES T. HODGE, *President.*

NEW YORK, *Jan.* 3, 1854.

POSTSCRIPT.

The last letter from Capt. Rickard, dated January 4, contains the following information:—

"I have never seen the vein in the stopes, in the bottom of the drift, so rich as at present; it will average four feet in thickness solid galena for more than twenty feet in length. We have got out from this place at least twenty tons of lead during the last two days. The vein in the bottom of the shaft holds out well, but our progress in sinking the shaft is rather slow, in consequence of the great width of the cavern. The vein, in the end of the drift, still carries very favorable indications, but not sufficient lead to pay for working. I am in hopes we shall soon have a more favorable change in this place. The cost of driving drift, at present, is $100 per fathom; the rock is softer than it has been, etc., etc."

FINANCIAL CONDITION OF THE COMPANY'S AFFAIRS, AS PRESENTED BY THE TREASURER'S BOOKS, ON THE 2D OF JANUARY, 1854.

CASH RECEIPTS.

From subscribers to capital stock	$500,000 00
From cash assets of the Ulster Mining Company	12,644 17
From sales of pig lead and copper ore	29,915 18
	$542,559 35

DISBURSEMENTS.

Paid to J. Elnathan Smith, for real estate and other assets of the Ulster Mining Company	$500,000 00
Real estate account	8,111 87
Office expenses, including travelling expenses, salaries, &c.	3,363 79
Furniture	886 28
Machinery	2,613 16
Freight	420 28
Buildings	3,140 62
Surveying and mapping	110 85
Miners, landers, trammers, and strikers	8,156 19
Blacksmiths	1,166 58
Carpenters	1,171 06
Laborers	780 74
Engineers, smelters, and masons	2,274 65
Ore washers	2,202 61
Teamsters and whim drivers	806 32
Laborers and whim boys	302 41
Commission for the sale of lead	612 94
Superintendent	1,000 00
Tools, horses, harnesses, wagons, carts, lumber, chains, rope, wire, sieves, powder, safety fuse, candles, coal and wood for smelting, etc., etc., etc.	5,438 08
R. H. Rickard, an advance on account of mining expenses	530 00
Cash on deposit in Mechanics Bank	5,476 69
	$542,559 35

Besides the cash in bank, the Company have on hand at the mine, ready for sale, according to the statement of the Superintendent:—

Pig lead, worth	$3,375 00
Copper ore, worth	2,500 00
They also hold 650 shares of their own stock—to-day quoted as worth	1,300 00
	$7,175 00
Add cash in bank	5,476 69
Assets immediately available	$12,651 69

Art. V.—THE PROSPECTS OF THE LAKE SUPERIOR MINING REGION.—By William H. Stevens.

Having been engaged, during the past seven years, in the exploration of the metalliferous region upon the southern shore of Lake Superior, I have neglected no means in my power to ascertain the probable value of the veins of native copper. Especially has it been my object to acquire such a knowledge of the geological formations and their influence on the productiveness of the veins, as would tend to aid in the early and vigorous development of the mineral wealth of this region, and hasten forward the time when we should no longer be dependent on foreign nations for our supplies of this indispensable metal. At the request of many of my friends, I am induced to give some account of the progress of discovery in that region, of the striking changes which have taken place in public sentiment at various times in regard to it, of the present prospect and general value of the mining interest, and of the future developments which the experience of the past gives us good reason to believe may be expected.

It is to the capitalist that we have to look for the necessary means of developing our mineral resources, since associated capital has been found necessary in all countries for enterprises of this nature. The expensiveness of machinery and the amount of labor, scientifically directed, required in working a mine, are so great that a heavy capital must be invested in the undertaking. To open a mine thoroughly, and to place it in such a condition that its successful progress may be uninterrupted, and its yield an increasing one, is a work of time and money. Nowhere is it so foolish to do things by halves. The work must be systematically laid out, care taken to secure the greatest possible amount of natural drainage, shafts sunk and levels driven, and the necessary machinery erected for freeing the mine from water and raising the ore, before the work of taking down the valuable portion of the vein can be hardly said to be commenced. Hence it is necessary that a considerable amount of capital should be invested before a return can be looked for, and it is far from being good economy to proceed on so limited a plan as to expect that a mine will pay its expenses while it is being opened.

The great question with every vein ought to be, Is there a reasonable prospect of its making a paying mine? If this question can be answered affirmatively, then such arrangements should be made as will insure the work being done with efficiency and thoroughness. To answer this question, however, is, in many mineral regions, no easy matter; hence we see, not unfrequently, large sums of money expended in proving veins which are found to be valueless. This is the case in the oldest mining regions, in those where work has been carried on on the most extensive scale for hundreds of years; how much more then should it be expected that such undertakings would not always prove profitable in a region just opened to the world, and one in which the phenomena of the veins and the nature of the metallic contents are so different from what has been met with in any other country?

The history of the attempts at copper-mining on Lake Superior, compared with the present state of these enterprises, shows that a wonderful progress has been made in our knowledge of the country, and demonstrates also that there is hardly a mining region in any part of the world where there is so much real simplicity in the phenomena of the veins, and where the metalliferous lodes can be so easily proved, and at so little expense.

The first regular attempts at mining, at least within the present century, were made in 1844, by the Boston and Pittsburg Mining Company, the pioneers of the Lake Superior region. Their attention was directed to the well known "green rock" of the *voyageurs* at Copper Harbor. This was a vein of calc-spar, colored by silicate and oxide of copper, which occurs in the conglomerate, and which, cropping out on the lake shore, was formerly a conspicuous object. Soon after, the same vein was traced across the harbor, by the side of Fort Wilkins, and here it was found to be at the surface rich in oxide of copper—a mineral which had never before been found occurring in any considerable quantity, or otherwise than as an impure product of the decomposition of other ores. This discovery created a great excitement, and already in 1843 and 1844 numerous applications had been made for permits to locate on the mineral lands of Keweenaw Point and Isle Royale.

In 1845, also, the "Lake Superior Company" commenced operations on Eagle River, near the north boundary of the main range of trap, and the discoveries of native copper and silver made at that point contributed powerfully to swell the excitement which was leading so many to turn their attention to the Lake Superior region. In 1845, the rush to the copper region became general; the whole of the trap range, and a very large extent of country covered by sandstone and conglomerate, and on much of which nothing could be found but swamps and morass, was covered by permits which were issued by hundreds from the War Department. Work was commenced, houses erected, and explorations carried on. Veins containing native copper were found, and bowlders of the pure metal were not unfrequently picked up on the lake shore or in the interior. In general, however, during 1845, the attention of the public was mostly directed to speculation, and in 1846 the fever reached its climax. Numerous companies were formed in the principal cities, locations were taken possession of at random, and reports made by incompetent persons, some of whom called themselves geologists, were spread all over the country. Stock-gambling became the rage, and the result was, as might easily have been foreseen, to destroy all confidence in mining operations, and especially in those of Lake Superior. Up to this time very little was known about the position of the really metalliferous belts of rock. Most of the explorations had been directed towards the veins in the sandstone, conglomerate, greenstone, and porphyry. These rocks are situated upon the coast of the lake, or constitute the highest mountains of the country, so that it was natural that the veins should be first discovered at the points where they were most exposed to view, and worked there, since nothing was known of the really productive belts of rock, or that one formation was likely to be more favorable to the development of the vein than another. Some even went so far as to suppose that all the copper was indiscriminately scattered through the rock; and it was asserted that it was not necessary that the veins should have any walls, because they were of the same age as the rock containing them. When these gross errors came to be exposed, and when it was found that the veins which had been opened were unproductive, the natural consequences took place; the innumerable fictitious companies went to pieces, and the country was almost deserted, while many a ruined stockholder cursed his credulity, and the quackery by which he had been deceived.

Luckily, however, for the Lake Superior region and for the Boston and Pittsburg Company, who, though they had expended $40,000 on worthless veins, yet prosecuted their explorations with skill and vigor, a discovery was made by them which established where the great metalliferous range of Keweenaw Point was situated. This was in the winter of 1845-6, and it is hardly an exaggeration to say, that had it not been for this discovery, the country would have been almost entirely deserted in 1847.

The first valuable discovery was made by the miners while removing some rubbish near the base of the greenstone bluffs, which rise to the height of over 300 feet. Here they struck upon the amygdaloid, and in it discovered a mass of copper of about one ton in weight, and in driving in the level others were exposed. As the work progressed numerous other masses of much greater weight have been brought to light, and that which formerly excited so much wonder has now become a matter of everyday occurrence. The largest mass thus far exposed weighed about 80 tons. The mine has been opened to a considerable extent, the shafts being over 400 feet in depth, while the lower levels are extended more than 1200 feet in length on the vein. The entire product of the mine thus far has been about 8000 tons of pure copper, and there is every reason to believe that there will be a constant increase in the annual yield of the mine, since it may be said to be, comparatively speaking, but just opened, and to have just commenced paying dividends.

From the last Report of the Directors, issued Jan. 15, 1858, we learn that the aggregate expenditures up to the end of the year 1852, were $755,763.12, including cost of real estate and furnace at Pittsburg. The receipts from the sale of copper and silver, and the estimated value of metal and ore on hand and at the mine ready for shipment, amount to $1,079,611.15. By July, 1853, $352,880 will have been paid in dividends to the stockholders from the produce of the mine up to the close of 1852, besides leaving a surplus fund of over $70,000 on hand. The estimated earnings of the year 1852 are $103,892.10.

The gangue or vein-stone of the Cliff vein, and of others of promise in this region, consist of calcareous spar, quartz, prehnite, chlorite, and laumonite. The vein will average about 18 inches in width. The course is N. 30° W., S. 30° E. It is situated in the great amygdaloid belt, which forms the principal metalliferous range on Keweenaw Point, and which lies directly south of the main range of greenstone bluffs, and is separated from it through nearly the whole length of the Point by a thin belt of conglomerate. Since the discovery of this vein, explorations have been directed upon this range, and where veins have been found in it of sufficient width, they have in many instances been opened and worked with encouraging results.

The belt of amygdaloidal rock, which lies immediately north of the conglomerate band just referred to, and in which are situated, among others, the Phœnix, Copper Falls, and Native Copper Mines, had been hitherto but little worked. The energy and perseverance of the Copper Falls Company have, however, now demonstrated the existence of highly valuable deposits in this range, as is shown by recent developments at the mines under Mr. Hill's superintendence. In sinking shafts Nos. 4 and 5 of the Hill mine, large masses of copper have been struck, by the side of one of which they have sunk 40 feet without reaching its termination. From the bottom of shaft No. 4 they are drifting along the side of an immense mass, the size of which cannot yet be ascertained. According to Mr. B. R. Livermore, to whose energetic and well directed explorations is due the discovery of the principal vein of the Summit Location, the appearances at the Native Copper Mine are highly favorable, as the vein is very rich in copper.

The discovery of the Minnesota vein, in the winter of 1847–8, was the first great impulse given to the development of the veins of the Ontonagon region. This was the first vein wrought in that section of the mining district, and its richness in copper was so great as to turn the attention of all in that direction. This Company has paid in $22 per share on 3000 shares, and is now producing copper at the rate of about 50 tons per month. They have now over 600 tons of copper on hand, ready for shipment at the opening of navigation, and are expecting to pay a dividend of from $30 to $40 per share during the present year.

I anticipate that, in due time, the most sanguine expectations of stockholders in the really valuable veins will be fully realized, for I hardly believe that the real value of the country has been overrated, and, indeed, I believe that at this time there are few who fully appreciate its importance.

The great error of some of our scientific men was in attempting to designate the points for successful mining, before making themselves acquainted with the real geological character and structure of the country. It is now admitted, by all who have examined the copper region, that there is no mineral district where the geological features are so strongly marked, and where a practical man can designate a valuable vein with so much certainty from surface appearances, as in that of Lake Superior.

Art. VI.—THE BLOW-PIPE, AND ITS USE IN CHEMICAL ANALYSIS.—No. 3.*

I. THE QUALITATIVE BLOW-PIPE ANALYSIS.

This analysis consists of the performance of certain operations, with a close observation of those appearances taking place from which the presence or absence of certain matters may be known. These operations are most properly executed in the following order. 1st. In the glass receiver (a short glass tube on one end having been fused together). 2d. In the (on both ends) open glass tube. 3d. In charcoal. 4th. In the forceps with platinum points. 5th. In the borax pearl. 6th. In

* Continued from Vol I., No. 5, of Mining Magazine.

the pearl of salt of phosphorus (microcosmic salt). 7th. With soda. After the performance of these tests there are usually yet to be made—8th. Some trials for the purpose of proving specially certain substances, the presence or absence of which could not be determined with entire certainty by the preceding tests.

1. TEST IN THE GLASS RECEIVER.

The receiver, previously cleaned and perfectly dried, into which has been placed a small quantity of the substance under examination, is to be heated at its lower end, at first moderately, which can best be done over a common alcohol lamp, then gradually increasing by means of the blow-pipe until the glass begins to become soft. Meanwhile it is necessary to observe:—

a. Whether anything *sublimes* or *volatilizes*, as, for instance, water, mercury, sulphur, selenium, tellurium, or arsenic. The first-mentioned three of these substances are easily perceived by their known nature. If a moist sublimation is received, one must not neglect to try the same for its acid or alkaline reaction by putting a strip of litmus paper into it. The presence of organic matter produces a fluid with an odor like that of a burning substance. A small amount of *sublimated mercury* often cannot be perceived but with the aid of a magnifying glass, the use of which at all these trials ought not generally to be neglected. *Selenium* sublimes with a red color; if there is much present, so that it sublimes in a thick layer, the red color in the lower part of the receiving glass will change into steel-gray. *Tellurium* produces a gray, *arsenic* a black sublimate; the latter, when there is a considerable quantity of arsenic, appears in part with a metallic lustre. If these reactions do not appear, we still cannot conclude that there is a total absence of these substances; sulphur, selenium, tellurium, and arsenic, especially, can be in combinations from which they are either not at all expelled, or at least not in their metallic state, by such heating. It ought also to be considered, that two or more of these substances might be contained together in a combination, and therefore expelled and sublimed one with the other, whereby their detection is rendered more or less difficult. This is very often the case with sulphur and arsenic. They give sometimes a sublimate, the lower part of which (nearest to the heated test) consists of bright metallic arsenic, but further up, in successive layers, it appears black, brown, red and yellow. These colors originate from *sulphuret of arsenic*, which volatilizes earlier than the metallic arsenic. *Oxygen* and *ammonia*, if they by heating escape from a substance, can also be recognized; the former by putting a small quantity into the glass receiver, the latter by introducing a moist piece of reddened litmus paper. Usually, however, the ammonia does not escape in a free state, but in connection with an acid, in which case a white sublimate of a *salt of ammonia* is received. By mixing the substance in question with lime or soda and then heating it in the glass receiver, the ammonia becomes free and capable of being detected. There are also some other substances, particularly *fluor*, *chlorine*, *bromine*, *iodine*, and *nitric acid*, which can be demonstrated by the test in the glass receiver. Since, however, in most cases, this is not done by heating the substances in question by themselves, but by means of the simultaneous use of certain re-agents, the particulars thereof will be given under the eighth paragraph, "On making some tests for specially detecting certain substances."

b. Whether a heated substance becomes altered in one way or another; for instance, *changes* its *color* (and perhaps recovers it at cooling), *alters* its *form* or its *state of aggregation*, *shows* an *ignition*, *phosphoresces*, *decrepitates*, etc. To specially discuss all such cases would lead to an unnecessary length, and render indispensable the close chemical knowledge and experience which must necessarily assist every blow-pipe experimenter.

The test in the glass receiver gives in many instances, as is apparent from the preceding, uncertain results, and often only hints of the presence of matters which can be detected with full certainty only by the further prosecution of the examination. These remarks, however, are of importance, and facilitate the subsequent investigation.

2. TEST IN THE OPEN GLASS TUBE.

The body under examination, being pulverized, is to be put into the tube about half an inch, and the tube on that part where the powder is, gradually heated. The tube is meanwhile to be kept somewhat inclined, so that the hot draft passes over the powder and escapes upwards through the upper (longer) part of the tube. In this manner there is a waste (an oxidating heating) produced, whereby several substances become volatilized and perceivable. The *sulphur* goes off as sulphurous acid, and is as such very easily recognized by the known pungent smell. *Selenium* is scarcely oxidized at all, but sublimates with a color from red to steel-gray (see part 1) above the heated part of the glass tube. The very characteristic smell of the escaping vapors of selenium—similar to rotten radish—offers at the same time an easy and sure means of detection. *Arsenic* volatilizes as arsenious acid, *antimony* as oxide, and *tellurium* as tellurious acid, all three of which adhere as white sublimates. That of the arsenious acid is very distinctly crystalline, whilst the other two appear in a powdered form. Arsenious acid and oxide of antimony can be expelled, by heating, from the place where they have sublimated. With the tellurious acid this is only seemingly the case; it melts in small clear drops, which often can be detected by the naked eye—more certainly, however, by the magnifying glass.

The roasting must be performed slowly, at a gradually increased temperature and with a good draft—effectuated by holding the tube in an inclined position—otherwise unoxidized volatile matters could sublimate and easily mingle with the roasted substance. If there be a perfect off-roasting aimed at, the substance, after being some minutes treated in the tube, must be poured into an agate mortar, ground, and again roasted. This alternate roasting and grinding is to be repeated, until no more volatile substances escape.

ART. VII.—THE VENTILATION OF MINES.—BY J. KENYON BLACKWELL, GOVERNMENT INSPECTOR.*

IT must be admitted that mining operations are often conducted without due consideration of future requirements, and without laying down at their commencement such a general system as will provide for them. The consequence in such cases is, either a liability to violent and extensive explosions, or a state of ventilation in which the vitiated and loaded air circulating, if it does not produce violent accidents, is highly injurious to the health of the miners.

THE OBJECTS TO BE PROPOSED IN THE VENTILATION OF MINES.

There are three principal objects which ought to be proposed in the ventilation of mines; namely, the introduction of a sufficient quantity of air; its proper distribution; and the security of the arrangements to maintain this distribution and circulation. In the first place, the quantity of air to be introduced should be not merely that which is necessary barely to neutralize and carry off the explosive and noxious gases which are yielded under ordinary circumstances in the mine; but also to supply a sufficient volume to provide for the unusual emissions of them, which sometimes occur, and to dilute these to such an extent as to avoid danger; and at all times to afford a healthy atmosphere for the breathing of the workmen. In the second place, due regard must be given to the proper distribution of the air introduced, so that every part of the excavations of the mine may have its requisite circulation, and none be left stagnant for the accumulation of gas; to the conducting of that which is introduced, without waste, and without its coming in contact with

* The remarks upon "The Ventilation of Mines" complete the Report presented by Mr. Blackwell to both Houses of the English Parliament. We have inserted it at the present time in order to comply with the wishes of many readers to have the entire Report in the pages of the Mining Magazine. The subject of ventilation of mines has not yet reached that importance here which it is destined to possess at a future day. It is, however, of interest at all times.—ED.

the dangerous and noxious gases, to those parts where the men are engaged; and to the providing for its separate return or escape, or that of any portion of it, carrying off with it these gases, as soon as it shall have become anywhere perceptibly loaded with them, without again entering the working districts or coming in contact with the workmen or their lights. In the third place, the security and stability of the air ways, their freedom from leakage, and strength to resist the shock of an explosion, and also the regular and equable action of the motive power employed to produce the circulation, require attention.

In determining the requisite measures to effect these objects, it is necessary to consider the following subjects. The nature of the seam to be worked; its thickness and inclination; the character of the accompanying strata; the extent of the workings which are to be effected, and that of the surface of coal which will be exposed at one time in the excavations; the state of these workings at different and future periods; and the number of workmen who will be employed.

The number of workmen to be employed is one of the most important elements in determining the quantities of air which ought to be introduced into a mine. The data which I have collected on this subject would induce me to assign an amount varying from 250 cubic feet per minute, in coal seams which are not fiery, up to 500 cubic feet per minute in fiery seams, as requisite for each person employed.

Attention cannot be too strongly called to the importance of measuring and recording, at stated times, the quantities of air passing through the different parts of mines; and that, not only in the ingoing and outcoming passages contiguous to the shafts, but also in those distant parts where the majority of the men are employed. It will be found that the volumes measured near the shafts often give erroneous results, if employed to estimate the state of ventilation in the more distant districts, on account of the leakage which occurs in the passage allowing a large portion of the air to return before it reaches the face of the workings. The investigation of numerous cases clearly shows that the greater part of explosions occur in collieries in which the defective supply of air, especially in the working districts, would become immediately evident, if submitted to measurement. The practice of ascertaining the exact quantities of air circulating in mines, especially if brought into comparison with the number of men employed, would also direct attention to the injury to health produced in numerous cases by insufficient ventilation.

THE MOTIVE POWER APPLICABLE TO COLUMNS OF AIR CIRCULATING IN MINES.

The following subjects require to be considered in the next place; namely, the motive power applicable to ventilation in mines: the velocities of air currents, particularly as connected with the loss of effect from friction; the relation of velocity and friction to the area, form, and length of air passages; and the separate volumes into which the total amount of ventilation should be divided.

THE VENTILATING FURNACE.

The effective power of furnace ventilation (which from its general use, where large quantities of air are needed, may be taken as the standard of reference) depends on the height and sectional area of the ascending and descending columns. In deep shafts the diminution of temperature, in the upper part of the ascending column, is considerable, and reduces the ratio of effect due to the height. In shallow shafts the want of height in the column is not found inconvenient, as the loss of effect, from this cause, may be compensated by giving a larger sectional area to the shafts; whilst at the same time, the length or run of the air currents is generally so much shorter, in shallow mines, and the quantities of air required are also so much less, that the apparent objections to its use under such conditions are not regarded.

The furnace fulfils the most important requisites in motive power, by its efficiency, its uniform action, and the easy control of which it admits. The steam jet is inferior to it in some of these respects, but it is free from objections to which the furnace is open. The liability to derangement in all machines appears to preclude their use in ventilation, in other than exceptional cases. In mines of large extent it would be difficult, perhaps impossible, to withdraw the workmen, in case of breakage, before danger ensued. The comparative effect, from a given consumption of fuel, between the furnace and the most approved machines, is not favorable to the latter.

The objections to the furnace are, the possibility of its exploding foul returns from the mine, either when this state is permanent, or produced by a sudden emission of fire-damp, or caused by the derangement in the general system which follows an explosion; and also the inconvenience and damage produced by an elevated temperature in shafts applied to winding. The first objection, relating to the danger from permanently foul returns, has been met by feeding the furnace by a split from the intake air, or by returning for this purpose a part of the air which has only had a short run and contains little inflammable gas, while that part of the return air which is explosive is passed by a dumb drift into the upcast shaft; or, otherwise, by such an increased ventilation in the mine as shall sufficiently dilute all the returns from every district, and permit the whole to be passed over the furnace. The latter of these plans is in general preferable, not only from the improvement in the state of the ventilation which it necessitates, but also from its allowing the whole of the returns to be rarified, and thus enabling a larger effect to be obtained from the increased temperature. The second objection arises from the possibility of large emissions of fire-damp suddenly rendering the return air currents explosive. In fiery seams, which are newly opened, especially when the goaves begin to be formed, it may be advisable to employ the steam jet, the waterfall, or some other motive power than the furnace. The last objection may always be obviated by an additional shaft applied to ventilation alone.

In examining the effective power of the furnace, and comparing the results obtained in different instances from given temperatures, the drag, or comparative friction, in air courses of varying sizes, forms, and lengths, must be taken into account. A comparatively high temperature, in the upcast shaft, is necessary to obtain the largest economic effect, since the amount of difference between that of the upcast and downcast is, up to a certain point, expended in counteracting the resistance from friction consequent on setting the air in motion. After this point has been passed, all additional increase in the temperature would be utilized, or produce a corresponding effect, provided the area of the air passages were proportionally enlarged, as the temperature ascends, so as to maintain a constant or uniform velocity in the air currents. But if this rate of velocity be an ascending one, from the area of the air passages being constant, the resistance from this cause increases so rapidly, that a rise of temperature in the upcast column gradually loses the effect which would be otherwise due to it. It will thus be seen that by modifying the form and area of these passages, a lower temperature in the upcast shaft connected with them may become more effective than a higher one, under different circumstances; or, in other words, a small effect, with a high temperature, may be the consequence of friction; a large effect with low temperature may be the result of the removal of this cause of retardation.

THE STEAM JET.

The data which have been hitherto obtained for the comparison of the effect of the steam jet with the furnace, have not been of a nature to admit of exact conclusions. The application of it has been made, in almost every case, in combination with the heating and rarifying power exerted on the upcast column, by the boiler furnaces required to produce the steam. In the only instance in which I have been able to compare the two forces independently, and under equal circumstances, the consumption of fuel to produce a given effect (from the data furnished me) was greater by 25 per cent. with the steam jet than with the furnace. The pressure of steam in the boiler, in this case, was 50 lbs. to the square inch. The boiler was set on the surface. The steam was conducted down the shaft, and used in the furnace tunnel, being distributed in small jets over its area. From 40,000 to 50,000 cubic feet of air, per minute, were moved in these trials.

In this instance, however, the temperature in the upcast shaft, when the furnace was employed alone, averaged only about 80 degrees. Therefore a small part only of the effect due to the fuel consumed would be utilized. The comparative duty obtained from the consumption of fuel, in a case in which an average temperature of 140, 160, or 180 degrees could be maintained in the upcast, by the use of the furnace, would be much less favorable to the jet.

The temperature in upcast shafts, which are used for winding, cannot be raised much above an average of 80 or perhaps 90 degrees, without injury to the winding apparatus, and prejudicial effects on those who have to descend and ascend in them. When larger quantities of air are required in mines, connected with such shafts, and the limit to which the temperature can be safely raised in them has been reached, the employment of the steam jet (which may be used in the furnace tunnel, in conjunction with existing furnaces) will probably be found advantageous. The inconveniences, arising from the condensation of a large quantity of steam in winding shafts, would be greatly obviated by using it in combination with a column of heated air, whilst the volume of air obtained would probably be considerably increased. Very contradictory results are stated, however, to have been obtained in different cases in which this combination has been tried. In those cases, however, in which it has not been found effective, this may have occurred from want of enlargement and modification of the air passages, to correspond with the additional power applied.

From those examples of the use of the jet which I have examined, it appears that the best situation for its application is at, or near the bottom of the shaft with which it is connected. Its results were found less advantageous when used at the surface. This and other facts appear to lead to the conclusion, that a large part of its effect is due to the transmission of heat, by its agency, to the upcast column, and not to its impulsive force.

In a great number of mines, no artificial power is used to produce ventilation, particularly in those which are not deep, and are of small extent. When the shafts are numerous, and, with the roads and ways, are large in their area, compared with the extent of workings they have to ventilate, the effect produced by the elevated temperature of the mine may be quite sufficient. The chief difficulty found under these circumstances is the variable effect, from the changes in the external temperature at different seasons, but this may be compensated by applying artificial rarification to the upcast column, at those times when the heat of the atmosphere approaches that of the air in the mine.

VELOCITIES OF AIR CURRENTS.

In considering the velocities of columns of air, in the shafts and air ways of mines, the question to be first proposed is, what are found in practice to be the rates attainable, without an excessive loss of power by friction. So many variable elements, namely, the sectional area, form, and length of the air ways, in connection with the rates of velocity in the air currents, being concerned in determining the actual loss from this cause, an exact expression of the rule which governs it cannot probably be given. It is evident, however, that resistance from friction increases much more rapidly than in the simple ratio of the velocity, and follows at the same time the inverse ratio of the sectional area, and the direct ratio of the length of the air ways which the currents have to traverse. The form of the air passages, in so far as their course approaches a straight line, or contains numerous curvatures, produces a great effect, especially with high velocities. The conclusion in practice should therefore be in favor of adopting a low rate in the interior of the mine, whatever may be the speed of the currents in the shafts, since from the shortness and directness of the latter channels, the rate in them is mainly to be determined by the degree of temperature which can be admitted in the upcast. The highest velocities which I have found in practice to be obtained in upcast shafts, which are also used for winding, are from 8 to 10 feet per second. This amount will depend not only on the temperature, but also on the area left free from the obstruction of winding apparatus. Shafts in which two bands work in opposite directions, and in which the action on the column of air, by one cage, is compensated by that of the other, admit a much higher velocity than when the whole area is nearly filled by a cage, or platform, moving in one direction. The increased temperature (sometimes averaging 140, 160, or 180 degrees) which can be given to the air, and the absence of resistance from the winding apparatus in those shafts which are used for the upcast current exclusively, permit a velocity of 20 or even 30 feet per second to be attained. In the interior of the mine, high velocities are inconvenient, and the loss from friction great, in consequence of the length of the air currents. In the main wagon and air ways, in which the whole of the ingoing or outcoming columns from different districts are united, it would be advantageous to give sufficient sectional area to keep the velocity below 10 feet per second, and a lower rate even than this would be preferable. In particular cases, however, I have found the velocity in a single district of the mine contiguous to a shaft may reach 20 feet per second. But even in large air ways, a velocity of more than 5 feet per second is productive of much loss by friction, as becomes immediately evident from the results of splitting a column of air travelling at that rate. A velocity of from 3 to 4 feet per second may be stated as the full speed desirable in the general branch ways and workings of a mine, except in such situations as those in which a large yield of inflammable gas is taking place from the whole coal.

RELATIVE AREA OF SHAFTS, AND OTHER AIR WAYS.

The relation between the sectional area of the upcast shaft and the aggregate sectional area of the air ways of the mine, is important, in those cases in which as large a ventilation as possible is required to be maintained. The following is proposed as a suitable rule; namely, that since, when this shaft is used for winding with double bands and open cages, a rate of velocity of from 8 to 10 feet per second may be obtained in it (which is equal to fully double the average rate that should be calculated on, in the air ways of the mine), that, therefore, in this case, the aggregate sectional area of the latter should be double that of the shaft. If this shaft be not used for winding, but for the upcast column only, the velocity maintained in it may be from four to six times greater than that which should be found in the mine, and therefore, in these cases, equivalent proportions should be observed.

VOLUMES OF AIR CURRENTS.

The thickness of the seams of coal, and their yield of inflammable gas, must be considered, in order to determine the volumes of the different currents into which, in extensive mines, it is most fitting to divide the total quantity of air introduced. In seams about 6 feet thick, from 10,000 to 15,000 cubic feet per minute, according to the extent of the workings, will be found convenient volumes for a single current. But as a speed of from 5 to 7½ feet per second is requisite to pass these quantities through a sectional area of 35 square feet, and such velocities would be inconvenient in a current thrown on the working faces of the boards or stalls, it will generally be necessary to divide columns of this amount into two or three parallel currents, passing by that number of headways or air courses nearest to the face of the workings. It will be convenient to reduce these amounts according to the diminution in the thickness of the seam. In those which are thin, 5,000 cubic feet per minute will be found in practice to be a suitable quantity; since, from the small area of air ways in such seams, much subdivision is necessary to obtain a large circulation. There ought always to be a superabundant supply of air at the face of the workings, so that any required quantity may be immediately directed by brattice to the places where the men are engaged.

AREA, FORM, AND LENGTH OF AIR WAYS.

It is important that air ways should be rendered as direct and short as possible. By a proper system of arrangement and division, the longest which can be required need not greatly exceed a length of 3 miles, in a mine extending over an area of 1,000 acres, nor in one of 2,000 that of 5 miles. Under the mode in which the air ways in it are arranged, the longest in any part of the mine could not exceed 2 miles. The average length would be much less. The length of the currents which traverse the working districts, or that section of each column between the intake and return air courses, is proportionally shortened. In the Newcastle district, before the system of splitting the air was fully introduced, the distance which the air travelled in one column in some mines reached the enormous length of 50 miles. At the present time, in other districts in which this system of splitting has not been adopted, the length of the air ways is even more disproportional to the extent of the workings. In such cases, the sectional area of the single column, in which the whole of the ventilation of the mine is forced through all the windings of intricate air ways, frequently only bears the proportion to the sectional area of shafts, of from one-fourth to one-tenth of a correct relation.

CAUSES OF EXPLOSIONS IN MINES, AND MEANS TO BE ADOPTED FOR THEIR PREVENTION.

The immediate sources of explosions in mines may be divided into four classes. First, the permanent yield or inflammable gas from the whole coal, as exposed in the roads and workings, which is in general of a constant amount. Secondly, a sudden and large discharge from the whole coal, or from the roof or floor of the seam. This is unusual, and seldom occurs, except in newly opened fiery seams. It may take place from the whole coal, as exposed in the workings, if it has not been previously drained by exploring and intersecting drifts; from the roof or floor of the seam in the goaves, especially when these are first formed; from the coal, or roof or floor in the drifts, on approaching or striking faults, or the soft coal contiguous to faults, or when the pressure of inflammable gas, existing in the seam, or in thin seams in the floor or roof, produces sudden rupture and liberation. Thirdly, stagnant fire-damp in the goaves of the mine, either on account of there being no channels for its outflow, or of the ventilation not being properly directed, or not sufficiently strong to carry the product of these goaves, on approaching their edges, into the return air courses of the mine, without their mingling with the working air. Fourthly, isolated roads or workings in which fire-damp is liable to accumulate, if secluded from the general circulation of the mine.

The first source of danger specified above may be guarded against by an increased ventilation. But in opening and working tracts of coal, from which there is a great discharge of fire-damp, the too rapid progress of the works is dangerous. This gas appears to exist in a state of condensation in coal seams, when first opened, and time is often necessary to allow it to relieve itself in some degree from the pressure which occasions its violent escape. For this reason, it is desirable that the main roads and ways of the mine, with cross intersections, should be kept considerably in advance of the workings, in order to allow this natural drainage to take place, as far as possible, before the coal is worked, and a large surface exposed.

The cause of danger referred to in the second place, is that which arises from sudden discharges. These are always possible when fire-damp is escaping under pressure, and ought to lead to much caution, when this is evidently the case, in seams of coal newly opened, and in exploring drifts. Increased ventilation may lessen the danger, but cannot remove it. The indications of a state of pressure on inflammable gas escaping from coal are immediately evident to the experienced eye, and their existence will point out the propriety of an adherence to the use of the Davy lamp in all such cases, as the only effectual safeguard. The exploring drifts, when there is a heavy discharge of fire-damp at their face, ought to be isolated in their ventilation from the other working districts of the mine, and may be preceded or accompanied by borings. A more extensive employment of the Davy, in conjunction with improved ventilation, will be found to be the only means by which the occurrence of accidents from fire-damp can be diminished in number.

With reference to the third source of danger above alluded to, namely, the accumulation of fire-damp in goaves which have been shut up, or along the edges only of which a current of air can be directed, and the liability of this inflammable gas to acquire pressure, or to fluctuate from various causes. These circumstances have long shown the propriety (which is acknowledged in the regulations of all well conducted collieries) of carrying on the workings, which are in contact with these goaves, with the Davy lamp, and not with naked lights. But in addition to this precaution, it is desirable to restrict as much as possible the size of the goaves by subdivision, and to provide return air courses, into which the fire-damp they yield may escape by its expansion, or its specific gravity, either alone, or by mixing with the ventilating current which has swept along the goaf, and which, after this contact, ought not to be used again in any other part of the mine, in which naked lights are employed. The provision of these return air courses, if the goaves are made to communicate with them by the necessary openings, in conjunction with that ventilation which may be directed along their edges, ought to prevent any appearance of inflammable gas in the air of mines, except at the face of exploring drifts. Dangerous goaves are those in which fire-damp is permitted to exist in a stagnant condition, or under that pressure which will be gradually communicated to it, when they are left without any channels for its escape, as it is yielded, or as it reaches their edges. In cases of an accumulation of stagnant fire-damp, the fluctuations to which it is liable are to be feared, even when there is no pressure upon it, as heavy falls, or the state of the atmosphere, may bring it suddenly in large quantities into the air currents. Wherever it can accumulate in goaves, to the extent of acquiring pressure, and such goaves are driven into, a sudden rush of gas is the consequence. A powerful ventilation sometimes becomes dangerous, when directed along the face of such goaves, as the mode in which the air current impinges on them, may be such as to have a tendency to draw a portion, but not the whole of the accumulated gas, out of them, and it may, from its fluctuation at different times, be carried to the upcast furnace in unusual quantities, and produce an explosion.

The fourth and last source of danger spoken of, in which, from inadvertence or misarrangement, a portion of the workings liable to the accumulation of fire-damp is secluded from the general circulation of the mine, admits of such easy removal, that it is only necessary to allude to it.

The examination of the various circumstances, to the occurrence of which explosions can be traced, has shown that discharges of inflammable gas occasionally take place in mines which cannot be provided for by ventilation only; but, in such cases, the condition of the seam, and the amount of pressure under which the exudation of fire-damp occurs, will afford a degree of warning, to the experienced eye, and suggest the propriety of obtaining the additional security afforded by the use of the Davy lamp. Attention has also been drawn to the fact, that in pillar workings, or wherever goaves are in process of formation which yield fire-damp, and are in contact with the working air, the necessity is already recognized, in well-regulated collieries, of adhering to the exclusive use of the Davy lamp, in those districts of the mine in which these circumstances exist.

These facts certainly appear to direct our consideration to the practical security, which long experience has proved to result, from the careful use of this lamp, even under conditions of the greatest danger; and to the inquiry, whether its more general adoption, as the light employed in coal mines, would not be practicable, and prevent many explosions.

In connection with this inquiry, it is desirable that two points should be kept in view. In the first place, the use of the Davy lamp must not be allowed to supersede good and complete ventilation. In the second, unless this lamp is used with care, and under strict regulations, it becomes a source of danger from the mistaken confidence it produces. A mixed system of lamps and naked lights in the same district of a mine, or the allowing of workmen to open their lamps at their own discretion, is extremely hazardous.

With reference to the quantity of light afforded by the Davy lamp, I consider it to be sufficient for all but the thickest coal seams. Many collieries, both in the Newcastle and Lancashire coal-fields, are worked exclusively with this light, both in the whole coal and in the pillar workings. The whole of the pillar workings in the Newcastle district are now carried on exclusively with lamps. The only real difficulty to its general employment seems to be, the occasional necessity for the use of powder in working coal. In those collieries in which the coals worked yield fire-damp, and the use of powder can be dispensed with, the Davy lamp ought to be adopted.

With regard to the practical security which this lamp affords, the result of several years' experience, in many extensive collieries in which it is exclusively used, does not present one case of accident from explosion: and its daily use, ever since its invention, by the wastemen, (who visit, with it, the most explosive atmospheres,) has never been attended by an accident.

In some districts, sufficient attention is not paid to the size of the cylinder of wire gauze which surrounds the lamp, nor to the proper fineness of the meshes of the gauze. When the diameter of the cylinder exceeds 1⅝ inch, or a gauge below 28 to the inch in fineness is used, the lamp becomes comparatively unsafe.

Art. VIII.—THE LAW OF MINES AND REAL ESTATE.*

The pursuit of mining has heretofore attracted so little attention in the United States, that mining properties can hardly be said to possess any rights distinct from property in general, neither have the general principles which affect real property received any modification consequent upon their application to the pecu-

* A Compilation of Spanish and Mexican Law in relation to mines and titles to real estate, in force in California, Texas, and New Mexico, and in the territories acquired under the Louisiana and Florida treaties, when annexed to the United States. Vol. I., containing a translation of the mining ordinances of New Spain, Gamboa's mining ordinances, the laws relating to mines of gold, silver, and quicksilver contained in the "Novisima Recapilacion;" also, the laws and decrees of Mexico on the subject of mines, colonization, and the right of foreigners to hold real estate; together with a digest of the common law on the subject of mines and mining. By John A. Rockwell. 8vo, pp. 663. New York. John S. Voorhies.

liar nature of mineral deposits. The owner of the soil is in most cases the owner of the mines within it, and mining operations are carried on under the general principles relating to "contracts," and to "master and servant." In some instances, the owner of the soil sells out to purchasers for a stipulated sum, the whole of the mines, and conveys away all claim upon his part to them, and sometimes the owner of the soil and the mines leases them at a certain per cent. of the yield. Nevertheless, the general principles of law have undergone no modification in their application particularly to mining interests. In other words, the law of mines has not become a distinct subject in the United States.

It cannot be expected that this subject will fail to receive decisive action much longer, in the State of California, which is so deeply interested in mineral property, and contains such a numerous population so devoted to its development. There, the proprietorship, even of the mines, is an unsettled question, and no further progress has been made than to establish regulations for obtaining a revenue from foreign miners, and defining the conditions upon which companies may be formed.

If we turn to other nations, a great contrast is presented. Spain, whose citizens and subjects have been working mines for centuries, has a code of mining ordinances which may command the admiration of mankind. The commentaries upon this code by Spanish jurists would be honorable to a Blackstone, or a Kent. In England, mining operations have been carried on for a long period, and the principles of the common law, so far as they affect this class of property and pursuit, have been somewhat extensively investigated. And in so far as the common law has been re-enacted in the several states of this country, there is in force a class of principles and decisions directly bearing upon the rights to mineral property. This does not conflict with our preceding remarks. Although the common law bearing upon mineral property may be in power in many states, no questions, as we are aware, have arisen to test its application, nor have any cases occurred in which mining and other property was necessary to be observed.

We have entered upon these remarks, as worthy of notice in connection with the volume the title to which is placed at the beginning of this article. Its object, in a single word, is to aid in the investigation and decision of questions affecting the titles to lands, and in relation to mines in every part of the United States which was once Spanish territory. In order to accomplish this object, the author and compiler has found it necessary to present the entire Spanish and Mexican legislation from an early period, and without interruption. The first volume comprising this vast enterprise, is the one before us, which is confined principally to the laws in relation to mines of the precious metals, It contains a translation entire of "The royal ordinances for the direction, regulation and government of the miners of New Spain," which is now known as the *ordinanzes* of Mexico, and which are in force, with a few modifications adapting them to a republican form of government, throughout a large portion of South America. In addition to this very rare and valuable translation, the volume contains the valuable commentary of Gamboa, so far as it is a commentary upon the law. This is a treatise on all the laws by which Spain and her several colonies were governed in their mining affairs, up to 1783, and which is regarded as important in relation to all the ordinances not set aside by the royal ordinances of 1783. It is the best work published on the subject of mining laws of Spain and her colonies, and, with the preceding, forms the entire Spanish and Mexican law in force relative to mines and mining operations. Following these translations, the compiler has added a digest of some branches of the English common law on the subjects of mines and minerals, such as "On the transfer of mines," "On the statute of frauds, transfer by deed, will, operation of law, transfer of shares," "On leases and licenses," "On partnerships in mines," "On remedies relating to mines and minerals." Individuals who may be interested in mines in Mexico, will here find the decrees of that Republic in relation to colonization, and in relation to the holding of land and mines by foreigners.

Although a leading object with the compiler of this volume was to throw all the light possible upon the rights to real estate under Spanish law, we are quite gratified that he has also explained the entire mining law of that kingdom and her numerous colonies upon this continent, and that he has presented us in an American dress so much that is extremely valuable. The observant miner can not look over these pages, devoted exclusively, as they profess to be, to the law of mining property, without detecting many useful hints and remarks bearing more or less directly upon some step in mining operations, or without deriving a general impression of the methods of working these immense mineral deposits, which in former centuries have yielded such vast treasures to mankind.

JOURNAL OF MINING LAWS AND REGULATIONS.

THE COMMON LAW ON THE ALIENATION OF MINING PROPERTY.

The following statement of the construction of four sections of the Statute of Frauds as applicable to mines and minerals, seems to be all that is necessary on a branch of the law so familiar.

1 The first section, then, requires the creation of any lease, estate, or interest in mines to be in writing, and to be signed by the parties creating it, or their agents thereunto lawfully authorized by writing.

It must particularly be observed, that the authority of an agent to *create* any lease or interest must be in *writing* from the principal. The authority may, of course, be either general or special, under a general power of attorney, or for a special purpose. In practice, however, a general deputation of authority is not usually resorted to. It would confer too great authority upon agents to invest them with the power of creating any interest whatever in the mines which may lawfully pass from the grantor, and upon any terms they may think proper. Special powers are, of course, not liable to the same objection, and are adopted in cases when, as in other transactions, the signature of the grantor cannot be conveniently obtained at the proper time and place.

2. The exception contained in the second section cannot be said to have any practical reference to mines; for though the duration of interest might be made to correspond with the requisitions of the exception, it can never happen that lessees would agree to give two-third parts of the full improved value of the thing demised. The profits of mines in general are too valuable ever to admit of any reservation to that amount. The usual render with respect to all minerals is of very much less amount; and after great expenditure of capital, time, and labor, a rent of two-thirds of the profit of a mine in its most prosperous condition would form a most disproportionate deduction from the returns of an adventure which, in almost all cases, is uncertain in its results. Even in the demise of quarries and open workings, the labor of getting and disposing of the stone or mineral must always be too great to justify so large an amount of rent.

3. It has been already observed, that the operation of the third section extends to all cases within the meaning of both the first and second. All leases and other interests, therefore, in mines and minerals, whether originally created by writing, or subsisting by parol under the second section, must be assigned and surrendered in writing, by the party himself, or by an agent lawfully authorized by him in writing, as in the first section.

But the assignment or surrender need not be by deed. A note or any writing to that effect so signed by the party or his agent will be sufficient, but it must be stamped.

4. The fourth section, so far as relates to our present purpose, is confined to any contract or sale of lands, or any interest in or concerning them. For it is quite clear that the words in the remaining part of the section "or upon any agreement not to be performed within a year," does not extend to an agreement concerning lands. And it is equally clear that this section contemplates in its operation not only the origin of a contract, but also all transfers of subsisting interests.

But this section differs materially from the preceding ones in not requiring the authority of an agent to be in writing. It follows, therefore, that though no agent can pass a legal interest under the first and third sections, unless their authority, however lawful, be evidenced by writing, yet, under the fourth section, they may, if otherwise lawfully authorized, bind their principal by creating or transferring in writing an equitable interest *in fieri* without being authorized by writing.

THE COMMON LAW ON MINING LICENSES.

A license to work mines is very distinguishable from a lease of mines. The former is an incorporated hereditament, a mere right, which in some instances may be revocable, in others, not exclusive of the similar rights of others, and, in all cases, only confers a right of property in the minerals when they have been severed from the freehold, and taken into the possession of the party. A lease, on the other hand, is a distinct conveyance of an actual interest in the thing demised, the right to which attaches even before the substance is extracted or taken.

A license or liberty to work mines is very useful in mining countries. When an adventure is entered upon, a regular lease is not always obtained, till the prospects of the enterprise promise such results as may require a more particular arrangement; and the mine is, in these cases, often worked under a license. It becomes, therefore, very important to ascertain whether such a license be within the Statute of Frauds.

It is submitted, that licenses of this description are directly within the meaning of the statute, and that this opinion rests upon reasons very different from those applicable to some of the cases which have been decided upon the subject of licenses generally.

It has certainly been held that a mere license is, in some instances, not within the first, and by implication, the fourth sections of the statute.

A parol agreement was entered into for liberty to stack coals on part of a close for seven years, and, during this term, the person to whom it was granted should have the sole use of that part of the close upon which he was to have the liberty of stacking coals. Lee, C. J., and Dennison, J., were of opinion, that the agreement was good, and relied upon the authority of Webb and Paternoster, where it was held, that a grant of a license to stack hay upon land, did not amount to a lease of the land. They maintained that the agreement in the present case was only for an easement, and not for an interest in the land—that it did not amount to a lease, and consequently it was not within the Statute of Frauds. Forster, J., said, that the agreement did not amount to a lease, but he inclined to think that the words in the statute, any "uncertain interest in land," extended to the agreement; upon which the other judges observed, that these words related only to interests uncertain as to the time of their duration. It was ultimately decided that the agreement was good for the seven years.

Now, with respect to the case of Webb and Paternoster relied upon in the above case, it is sufficient to observe that the decision there was come to upon another point, and that that case arose before the Statute of Frauds.

RIGHTS TO MINING PROPERTY IN VENEZUELA.

Under the constitution and laws of Venezuela strangers enjoy the same civil rights with the native citizens. They can hold property, sell or bequeath it, without any other charges than those imposed by law upon the citizens of the country. Liberty of conscience prevails and all religions are tolerated. Strangers are not enrolled in the militia service, nor is their property subject to any other than the ordinary and common contributions. No taxes are paid on property, and foreigners are more highly respected than natives.

It is an object with the government to encourage immigration, and the laws are framed with that object in view.

There are in Venezuela very fertile high and low lands, uncultivated, and which the law gives to immigrants, on condition that they are put under cultivation in four years. There are many fine tracts in the high lands where the temperature is fresh and mild, and the weather like unchanging spring. A portion of the year rains prevail, which is considered as the winter.

The regulations respecting mining properties are comprised in the following extracts from the "Laws of Venezuela":—

The Senate and Chamber of Representatives of the Republic of Venezuela, in Congress assembled, having seen the proceedings in favor of Andres Monagas, to the effect that the property of a coal mine he discovered in Curamichate, Province of Coro, should be declared as his property, and taking into consideration that neither the Government nor the Constitutional Congress itself had bear in mind that the *Ordenanza de Mines* of New Spain was in force in the Republic, do resolve:—

That in conformity with the Decree of 24th of October, 18[illegible], the Ordenanza to serve as a Rule to the Government, in all that relates to mines, is that of New Spain, of [illegible] of May, 1783, on the terms as in the aforesaid decree is expressed.

Given at Caraccas, 27th April, 1832. 3d and 22d.—The President of the Senate, Francisco Mo[illegible]. The President of the Chamber of Representatives, Dr. José Manuel de los Rios. The Secretary of the Senate, Pedro J. Estaquera. The Secretary of the Chamber of Representatives, Rafael Acevedo.

Caraccas, 29th April, 1832.—Let it be executed. Diego Bautista Urbaneja. For His Excellency the Vice President of the Republic in charge of the Executive, the Secretary of State in the Department of Finances—Santos Michelena.

The Senate and House of Representatives, &c.

In consideration that mining industry is yet in its infancy in Venezuela, and that the product of the only establishment in operation (the copper mine at Aroa) is not sufficiently encouraging to the proprietors themselves to go on in the working of it, and to others for entering into new enterprises, do decree:

The products of all mines of metals and mineral coal are free from all duties, national and municipal, for the space of eight years.

This exemption of all duties, national and municipal, does not extend to the port charges to be paid by the vessels loading the minerals, nor to that of ferries, which are to be paid for the cars and mules to pass the roads, or for the boats to pass the rivers, in case such duties are paid on the transportation of any other produce of the country.

Given at Caraccas, 5th May, 1840. 11th and 30th.—The President of the Senate, Francisco Aranda. The President of the Chamber of Representatives, Juan N. Chaves.—The Secretary of the Senate, José A. Freire.—The Secretary of the Chamber of Representatives, Rafael Acevedo.

Caraccas, May 11th, 1840.—Let it be executed. José Antonio Páez. For His Excellency, the Minister in the Financial Department—Guillermo Smith.

COMMERCIAL ASPECT OF THE MINING INTEREST.

New York, *Jan.* 20, 1854.

In our article for this month we have to record more transactions than have taken place at any period since the existence of the New York Mining Board. A new and decidedly favorable feature has been the activity in a number of the Lake Superior stocks, which, though upon the lists of the Board and regularly called, were scarcely ever dealt in. Transfer agencies have been established in this city during the past month for many of these companies, which will facilitate operations in them, and, by giving them some currency, lead the public to inquire into their condition and future prospects. In another part of our journal, under the head of Copper Mining Operations, will be found one or two interesting articles in relation to some of these mines; they have been prepared by parties who are well acquainted with the whole matter, and in whose statements the most implicit reliance can be placed.

Several new companies have been brought out, some of them with very flattering prospects. We would say to those who are about forming new companies to work mines, and who have not yet organized, that if they prefer drawing their profits from the produce of their mines, and not from the operations of the stock market, it would be well for them to place their capital stock at a much lower figure than that generally adopted. Two or three hundred thousand dollars is quite as much as is in most cases needed for a company to go to work with vigorously, and the practice of setting out with millions of capital acts most unfavorably for the mining interest. It delays the prospects of fair dividends to have the nominal capital so large that few mines, however rich, can pay a fair interest on it, and thus lessens the desire to invest; and the temptation to extravagant outlay arising from too large a capital has, in many cases, led companies into difficulties they have never yet been able to surmount. The Lake Superior companies do not exceed $500,000 of capital. The Minnesota, which has paid lately a dividend of 30 per cent., has but $300,000. It is quite clear that if this company had to distribute the amount at their disposal amongst a company of a million dollars, the percentage to each shareholder would be much below its present highly satisfactory rate. We feel that we have but to call attention to the matter to induce its being taken into consideration.

As we intimated in our last, North Carolina has risen considerably. The highest point it touched during the past was 5¾, but it has fallen back to 5, at which point it is heavy. Nothing further than already published has been received from the mine. Pennsylvania and Lehigh Zinc has fallen to 2¾, and from the quantity of stock pressing on the market, we should not be surprised to see a lower point touched. The Company are reported to be doing a good business, and the decline in the stock is the more strange on that account. There was great animation in Ulster about the middle of the month in anticipation of a change in the direction. This change has taken place, and the stock fallen back again to the point from which it started. It is said the mine was never in a better condition, nor the smelting works attached to it doing better than at present. The new direction is a strong one, but it remains to be seen whether they will be able to manage the valuable property intrusted to their care with the same discretion and economy as those who have just retired from office. In McCullough there has been scarcely a transaction; the stock still stands about 3, and a large order to buy or sell would materially affect the price; much cannot be bought at 3, and we do not think much could be sold at that figure for cash. The fluctuations in Gold Hill have been large. The price, in anticipation of a large amount of stock which it was feared might be thrown upon the market to meet the liabilities of the Company, maturing early this month, amounting to $100,000, fell rapidly to 2¼; but the liabilities having been arranged by the payment of $25,000 in cash, and an extension of two years for the balance, the price rose as rapidly to 3¼, at which figure it is now current. As expected, a dividend of 2 per cent. has been declared payable on the first of this month (Feb.), and it is the intention of the Company to make a like dividend every 60 days; Should they be able to do this, it appears to us the stock is selling at an exceedingly low figure. If bought at present price, and paying a dividend of 2 per cent. every two months, it would give a return of 20 per cent. upon the investment.

In Wickoff Gold there has been one transaction at a great depreciation in price. Buckingham Gold finds no buyers at the Board. Deep River continues in about the same situation as at our last issue; there can be no improvement in the stock of this Company until successful measures are taken to relieve them of their debt. Lindsay continues firm at last quotations, say 75 cents per share. We know of large transactions which have been made in private at a shade under this figure. A person largely interested in Phœnix Gold has recently returned from a visit to the mine, and expresses himself not only pleased at the systematic manner in which work has been done there, but astonished at the richness of the property. With only one Chilian mill they are more than paying expenses. When four mills and six head of stamps are erected, measures for which are now in course of execution, it is expected the mine will yield a splendid return to the stockholders. The President, with a competent manager in gold mining operations, is now at the mines, and intends, before his return, to have everything arranged to work vigorously and successfully. The delay in doing this has been the cause of the great dullness in the stock; within a week or so past, however, it has been very active at about 75 or 80 cents cash, and $1 on credit. No transactions have taken place in Manassas. In Potomac Copper there has been much activity, and appearances indicate a rise in this stock. Upon the introduction of the stock of the American White Zinc Company upon the books of the Mining Board, it was for a day or two very active at from 3 to 4; now, however, it is very quiet, and no great amount could be sold without considerable depreciation in price. The Company are said to be in very successful operation, and the demand for the product of their works as great, if not greater, than their ability to supply. Hiwassee stock has fallen off to 3½, and is daily offered at $4. This is surprising, considering the favorable advices from the mine, and the quantity of rich ore they are sending to market. Parker Vein is steady at about 6¼ to 6½, at which figure we think it will remain until a decided case in the money market causes more speculation than at present. The Company have succeeded in disposing of their line of steamers, and a portion of their coal lands, and thus relieving themselves of a good portion of their liabilities. The coal land they retain *is said* to be rich, and adequate to all their uses, and capable, in time, of yielding fair returns to the stockholders.

The Potosi Lead has declared a dividend of 2½ per cent. from the earnings of the three months ending December 31st, and payable the 1st February. Their produce of metal is at present about 80 pigs of 60 pounds each per day, and their capacity is only limited by the number of miners they can procure, as galena, averaging from 60 to 70 per cent. of lead, is found on nearly the whole extent of their property.

The Springfield Copper Company has been sold out to parties in Baltimore, who will henceforth work the mine

The Dauphin and Susquehanna Coal Company have obtained a further loan of 425,000 dollars, their previously existing liabilities being as follow:—$97,000 6 per cent. bonds, due 1866; $903,000 7 per cent. bonds, due 1877; and $2,000,000 of 7 per cent bonds, due 1868, secured on railroad 64 miles long, on 45,000 acres mineral lands and buildings, etc., etc.

A new company, the College and Hepler, has been organized with a capital of half a million. Its mines are in Randolph and Davidson counties, N. C. The Hepler vein had been worked up to twenty years ago for gold, and abandoned as the miners descended to the copper ore. The College vein has been opened about 35 feet and presents a highly favorable appearance.

The stock of the Neuvitas Copper Company, incorporated in August last, was introduced to the Board on the 16th. Recent letters from the superintendent announce that the engine has been started at the mines and that he expects to ship at least 50 tons of 30 to 35 per cent. ore during the coming month. This mine is located in Cuba, 350 miles from Havana, and 24 miles from the port of Neuvitas. A railroad is in operation for 21 miles of the latter distance. The mineral is the yellow sulphuret of copper.

A gold company has been organized with a capital of two millions, under the name of the Gardiner Gold Mining Company. It has purchased the extensive mines in Spotsylvania county, Va., known as the Point of Fork property, about 15 miles west of Fredericksburg. Some washing has already been done, and the results, with some of the surface rock, been assayed, and found to contain gold to a large amount.

Cumberland Coal has fallen off this month, owing to the strikes of the miners in this region; and as the works are mostly at a standstill, we shall probably have to notice a further reduction, if some arrangement cannot be made.

It will be remembered that by the 12th section of the law of the State of New York regulating mining companies, which will be found in page 270 of our last volume, that all companies organized under the law are to publish yearly, on or before the 20th January, a report on oath of their capital, amount paid in, and amount of debts. Many of the companies have failed to do so this year. We subjoin a few that have come to our notice:—

	CAPITAL.	AM'T PAID IN.	DEBTS.	PRESIDENT.
North Eastern Co. . .	$400,000	$40,000	None.	Wm. A. Foster.
Vanderburg Mining Co. . .	1,200,000	1,200,000	2,000	Wm. Furniss.
[illegible] Mining Co. . .	[illegible]	Not given.	2,500	S. G. Davis.
North River Mining and Quarrying Co.	750,000	Not given.	60,000	P. Smith.

A new iron company, the Union Iron Company, have just issued their report. Their property is located in Essex county, and contains large deposits of very rich ores. Their capital is $300,000, in shares of $100 each.

Of the Lake Superior mines lately operated in, in this market, Toltec, Algomah, Ripley, and Isle Royale, have been the favorites. The first will, without doubt, prove one of the very best mines in the country, and later, as its resources are developed, take rank with the Pittsburg, Minnesota, North American, and Cliff, which are the wonder and astonishment of all who have have seen them. We consider it *cheap* at the present price, and parties who buy it to hold will have no cause to regret the investment of their capital. The others require more development, but promise extremely well, particularly Isle Royale. It is our firm conviction, that daily experience will justify our observation, that a judicious investment of capital in mining enterprises, but particularly in the Lake Superior companies, will yield a larger and surer return than any other.

The Minnesota has commenced the payment of dividends, by returning $30 per share to its stockholders, being $8 per share more than was ever called in upon the stock, and will go on with regular payments hereafter. This is but the commencement of the splendid returns which in a year or two will be given to the stockholders of the various companies in that rich metaliferous region, which has so far been the astonishment of all who have visited it, and will yet be the wonder of the world.

Fluctuations for January, 1854, in the different Mining Stocks sold at the New York Stock Exchange and Mining Boards, showing their Highest and Lowest Points, and the Date, with the Market Value on January 20th, Gain or Loss from December 20th, and number of Shares sold in each.

NAME OF STOCK.	SHARES.	PAR	HIGHEST SALES.	DAY	LOWEST SALES.	DAY	MARKET VALUE.	GAIN OR LOSS: Gain	Loss	SHARES SOLD.
Algomah	20,000	25	4½	18	3½	6	4	½		400
American White Zinc			4½	16	3	23	4	1	—	3,450
Buckingham	100,000	5	1½	20	—		1½	—	½	100
Caledonia	—	—	4½	12	4	4	4½	—	—	7,600
Charlotte Copper	—	—	2½	3			2½	—	—	200
Conrad Hill	—	—	⅞	10	¾	20	¾	—	⅛	2,700
Copper Falls	10,000	30	54	25	—		54	—		20
Cumberland Coal	50,000	100	36½	24	33	19	27½	—	1½	28,705
Dauphin and Susquehanna	22,000	50	—	—	—		27	—	1	No sale
Do. 7 per cent. Bonds		—	—		—		45½	—	1½	No sale
Dolly Hyde	—	—	5	6	4	30	5	1	—	250
Douglas Houghton			6	17	—	—				50
Fulton Copper	100,000	5	2	20	1½	14	2	¼	—	1,575
Gardiner [illegible]	—		1½	22	1½	31	1½			4,300
Gold Hill	200,000	5	3½	20	2	29	3½		½	11,500
Hiwassee Copper		—	4	21	3½	30	4	—	—	300
Isle Royale	12,000	10	25	13			25	—	—	20
Lindsay	100,000	10	¾	20	½	19	¾	—	—	1,550
McCulloch Gold	200,000	5	3½	29	3	17	3½	½		2,750
Ma[illegible]	20,000	5	1½	11	—	—	1½	—	—	20
National	10,000	25	33¼	11	—		27½	—	—	100
Ne[illegible]			2	16			2	—		50
New Creek Coal	200,000	10	2¾	17	2½	21	2½	—	—	4,750
New Jersey Zinc	25,000	12½	10	6	9½	27	9½	—	—	10,700
North Carolina Copper	100,000	5	5½	12	4½	21	5½	1	—	12,900
Ocean Land and Marble			2	1	2	11	2		—	400
Parker Vein	20,000	100	8½	4	6	16	6½	—	2	27,700
Pennsylvania Coal	60,000	50	110¼	7	100	21	109	—		1,900
Pennsylvania & Lehigh Zinc	100,000	10	3½	20	2½	20	2½	—	½	4,250
Passaic Mining and Manuf.	20,000	100	14	4	10	14	11		3	500
Phoenix Gold			1	4	½	14	½		—	6,340
Potomac	100,000	10	1	20	¾	24	1	—	—	2,100
[illegible] Lead	20,000	5	5½	29	5½	4	5½	—		1,550
Ripley	40,000	12½	4	12	3½	18	4	—	—	2,200
Tr[illegible]	21,000	20	12¼	18	11½	[illegible]	12½		—	375
Ulster	100,000	5	2	12	1½	14	2	½		1,200
Winthrop	20,000	25	2¼	11	—	—	2½	—	—	100

BOSTON MINING SHARE MARKET.

Boston, *Jan.* 20, 1854.

The new year has opened with brightened prospects for *Mining Interests*, and the stocks of all the leading companies have materially advanced within a month past. Buyers come in more plenty, and the shares that were dull at lower prices are quickly taken up at the higher rates. This can be accounted for, in part, by an increased supply of capital seeking employment, and a slight revival of speculative feeling, but more particularly to the increasing confidence of the public generally in mining enterprises, strengthened as it is by the frequent arrival of the most encouraging accounts from the mines at Lake Superior. The last mail was very strong in the amount of proof which it brought, more than sustaining all previous advices, and placing some of the companies in a much more favorable position than ever before.

The most prominent stock this month has been the *National*, which steadily improved from 25 to 33, and that with the sale of but few shares, holders being unwilling to part with their stock even at this advance of more than fifteen hundred per cent. on the amount ($2) yet paid in. The fact of this Company having struck the *Minnesota* vein renders the stock at once valuable, and will materially shorten the time to elapse before the payment of regular dividends. Thus far it has been decidedly one of the most successful at the Lake. *Copper Falls* continues to advance, and has gained from 52½ to 56 since our last, notwithstanding at that time it stood $7½ per share higher than the previous month. It is estimated that the Company have *now on the surface* nearly 3,000 tons of stamp work, and by June next they will have many thousands of fathoms of ground ready for stoping (taking out the copper), and also have attained, says Mr. Hill, the agent, a position among the largest and most profitable mines in the world.

Toltec stock is in quick demand at 12½, a rise of 1½ per share within a few weeks, and the prospect is favorable for a still further advance. This mine has one of the best defined veins on Lake Superior, and it never looked better than at last advices. The stock is considered one of the cheapest on the list, and if previous favorable accounts are sustained, as there is every reason to anticipate, it would not surprise us to see the shares selling at double the present value, within six months to a year. The *Algomah*, which has the "Toltec" vein, is in active demand at 4½ bid, being a handsome advance over prices a few weeks since. This stock is somewhat of a favorite with operators in "Coppers," and its brilliant prospects have attracted a large number of buyers. Among the low-priced Companies it ranks A No. 1.

Isle Royale is in high favor, and but few shares are offered for sale, the stock being about $3 per share higher than one month since. We do not think 2 or 300 shares of this stock could be obtained without putting up the price about $2. This Company has a most excellent vein, large and well charged with copper, which is anticipated by its friends to prove one of the most productive in the whole mining region. *Forest* has been more in demand, and advanced from 9 to 10½. The agent of this Company promises to have 100 tons of copper ready for shipment at the opening of navigation, and altogether the prospects of the mine are looking more prosperous than at any previous time for months. At a meeting of the stockholders, held January 19, the annual report, giving a detailed statement of the affairs of the Company, was read and accepted. Forty-one tons of copper have been taken out during the year, of which 36 tons were sent to market. The amount of funds in the treasurer's hands, after paying all liabilities, is about $12,000. They own a very large tract of land, a great part of which has not yet been developed.

The following assessments have been called for since our last, one of which (the Star) is already due, and partly paid in:

COMPANY	AMOUNT PER SHARE.	WHEN PAYABLE.	WHERE PAYABLE.
Star, . . .	$1	Jan. 6. .	Boston
San Antonio, . .	50 cts. . .	Jan. 14. . .	New York.
Shawmut, . . .	50 cts. .	Feb. 10. . .	Boston.
Shawmut, . .	50 cts. .	May 1. . .	Boston
Dana, . . .	50 cts. . .	Feb. 15. . .	Boston.
Native, . . .	$1 . .	Feb. 16. . .	Boston.
Norwich, . . .	50 cts. . .	Feb. 15. . .	New York.

As a natural result, the announcement of an assessment causes a decline in the stock to be assessed, but the Star has proved an exception, and steadily advanced from 4½ to 6½ bid, assessment paid. The stock is very firm, and could not be purchased much, if any, less than $7 per share. The shares are seldom in the market, and no sales have been made for some months, holders having a strong faith in the ultimate value of their property. The *San Antonio* and *Norwich*, are two of the several Companies comprising the "*American Mining Company*," the Trustees' office of which is at Windsor, Vt., with an agency in New York City. The first mentioned stock has never sold here, but the *Norwich* can be obtained at about $10 per share. *Shawmut* has declined to 75 cents per share, at which price there is a moderate demand for the stock. *Dana* is steady at 1½, and it is said that the Company have discovered a new vein, which gives fair promise of being profitable. The assessment, however, will act as a barrier to any improvement in the stock for the present, unless something new should occur at the mine. *Native* has declined to $1 per share, and no buyers at that. This Company has been very unsuccessful thus far, but the managers are determined to push their work with vigor, and a few months may develop brighter prospects for the shareholders.

Bohemian Copper Company has been very dull and heavy, without sales for several months, but recent letters speak more favorably, and it is thought that they have the *Toltec* vein, their location being in the immediate vicinity of the latter Company. The stock is now in demand here at $4 per share; and will become of much greater value if future accounts realize the present anticipations. The head-quarters of this Company are in Philadelphia. *Fulton* declined to 1¼, but has since rallied, and 1⅜ is now the price. There are not so many buyers in this market as formerly. *Glen* is in good demand at 2¾ bid, 3 asked. Advices from this mine are favorable, and the small amount of stock yet issued (2,000 shares only) prevents the market from being over-supplied. *Phœnix* is firm at 7¼ bid, assessment paid, which is a clear rise of $1¼ per share within less than a month. *Ripley* sells at about 3⅞, and operators are waiting advices from the mine. The friends of the Company think they shall cut the *Isle Royale* vein, which, in addition to several very fine veins already discovered, would insure the success of the mine. This Company has a large number of shares (40,000), which operates against it, though as yet only about half of them have been issued. The stock is in good favor, however, at present rates, and is more likely to advance than recede.

Dividends.—Although we cannot present a very extended list under this head, what we have is of the first class, and the time is not very far in the future when regular semi-annual dividends on *Copper Mining shares* will become matters of fact. The *Minnesota* Company have declared their first *cash* dividend of $30 per share, while the whole amount paid in by the stockholders is only $22. The Company have also previously made dividends of new Companies, set off from the original property. A holder of 100 shares from the beginning could now realize about $20,000 for $2,200 paid in on his stock. The Minnesota has been in operation some five years, and its success presents a bright picture of mining operations, but we believe that other mines, now rapidly approaching the dividend time, will fully, if not more than equal it.

The *Pittsburg* Copper Company will pay a *semi-annual* dividend in

February of not less than $7½, and probably $10, per share. The last two dividends of this Company were $7½ each. Previous to this, $44 had been received in dividends by the stockholders, from May, 1849, the date of the first payment.

The following table of the "ups and downs" of Copper stocks for Dec. 1853, presents an improvement in prices, in a majority of the leading stocks, although transactions have not been to so large an extent as in some previous months. This result is more from the fact that parties were less disposed to sell than any lack of purchasers at current rates. Probably three times the number of shares would have been taken up, if offered for sale. It will be noticed that the present quotations (Jan 20) are generally an improvement over those of Dec. 31, and the prospect is still good for further advance. The regular semi-monthly Copper Mail is now over due, and will doubtless bring favorable letters from several of the mines, which will of course have its effect on the stocks of the various Companies.

BOSTON MINING SHARE LIST.

Fluctuations for December, 1853, in thirty-one different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their Highest and Lowest Points and the Date with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

Mining Stocks, Boston.	Nominal Capital.	Shares.	Par.	Paid in Jan. 20.	Highest Sales.	Day.	Lowest Sales.	Day.	Value Dec. 31.	Gain.	Loss.	Shares sold in December.	Value Jan. 20.
Adventure, Copper	$250,000	10,000	25	$11.00	—	—	—	—	4	0	0	No sale	4
Algomah	500,000	20,000	25	1.37½	3½	17	2½	2	3½	½	—	2,544	4½
Bay State	500,000	20,000	25	†2.00	—	—	—	—	1		½	No sale.	1
Bohemian		10,000		-	—	—	—	-	3½	2	—	No sale	4
Boston	500,000	20,000	25	†9.00			—	—	1	-	½	No sale	½
Copper Falls	800,000	10,000	30	18.00	58	31	48	2	53	5	—	725	56
Dana	500,000	20,000	25	1.12½	3	9	1½	28	2	½	—	1,468	1½
Forest	200,000	16,000	20	15.00	10	13	8½	22	8½	-	1	758	10½
Hilton	500,000	100,000	5	†2.00	1½	28	1½	1	1½	0	0	8,900	1½
Gratiot	500,000	20,000	25	†3.00	2	15	1½	18	2	0	0	230	2½
Isle Royale	120,000	12,000	10	6.00	17½	5	16	18	17	0	0	375	20
Marquette, Sandstone	40,000	4,000	10	†8.00	½	3	$40	15	½	-	½	2,650	½
Mercantile Mining.	1,000,000	100,000	10	†2.00	—	—	—	—	½	—	1	No sale	½
Manhattan, Copper.	100,000	20,000	5	1.25	—		—	—	1	-	½	No sale	1
Minnesota	300,000	3,000	100	22.00	195	24	185	2	190	5	—	5	*165
National	250,000	10,000	25	2.00	28	8	23	10	25	2	—	106	38
Nonice	250,000	10,000	25	8.25	—	—	—	—	1½	—	1½	No sale	1
North American		10,000		20.00		—	-	—	67	0	0	No sale.	67
Norwich	100,000	20,000	5	4.00	§10½	29	§10½	22	10½	-	½	60	10
North Western		9,000	—	12.00	—	—	-	—	16	0	0	No sale	16
Phoenix	800,000	10,000	80	6.00	7	12	4½	14	6½	0	0	575	7½
Pittsburg, (Cliff).		6,000	—	18.50	130	31	140	19	150	3	—	121	150
Ridge		10,000		6.50	—	—	-	-	4½	½	-	No sale.	5½
Ripley	500,000	40,000	12½	†3.00	4	3	3½	14	3½	0	0	2,145	3½
Shawmut	500,000	20,000	25	2.00	—	—	-	—	1	—	½	No sale	½
Star	500,000	20,000	25	8.50	—	—	—	—	44	0	0	No sale	10½
Summit	500,000	40,000	12½	†3.00	—		—		4	0	0	No sale.	4
Toltec	500,000	20,000	25	4.00	11½	8	10½	21	11	0	0	2,635	12½
Winthrop.	500,000	20,000	25	.75	2½	8	2½	27	2½		½	2,098	2½
Webster	100,000	40,000	5	†2.00	1½	7	1½	3	1½	0	0	250	1½
W. Castleton State	1,000,000	50,000	20	†6.00	-	—	—	—	2½	0	0	No sale	2½

On the [illegible] of December 20 shares "Connecticut Mining Company" were sold at the Broker's Board, and are not included in the above table.

* Minnesota now sells ex dividend at $30 per share.

† Assessment paid.

‡ These are fully paid stock, not assessable.

§ The sale of Norwich was 40 cents per share, and the sale of Norwich Copper "buyer thirty" at 10½.

NEW YORK METAL MARKET.

COPPER.

South America . . per lb.	29c	a —
U. S. Soft	31½	a 32
Sheathing	32	a 33
Braziers'	37½	a —
Yellow metal	20	a —
Ingot	31	a —
Tubing	45	a —

IRON.

Iron ores, magnetic and hematite . . . per ton.	$4½	a 5½
Iron Bars, American hammered	75	a 85
Do American refined . .	85	a 90
Do Superior brands . .	—	a 100
Do. English common . .	70	a 75
Do. Refined	52½	a 55
Do. do. best . . .	—	a 90
Do. do. Swedes . . .	82½	a 95
Do. Norway bars, fork & NIFK brands	102½	a 104
Russian	86	a 94
Do. Sheet American per lb.	6c	a —
Do. do. English, No. 1 to 20	4½	a —
do. 21 to 24	5½	a —
do. 25 to 28	5½	a —

Do. Galvanized . . .	$10	a 16½
Do R. R. bars by contract p. ton	70	a 75
Do Pig American red short .	35	a 37
Do. for car wheels . . .	40	a 50
Do. White Charcoal for malleable castings . . .	45	a 50
Do. Scotch, for cash . .	35	a —

LEAD.

Galena Pig, as per quantity .	6½c	a 6¾
Spanish	6½	a 6¾
Sheet	7½	a —
Pipe	7½	a —
Old Scrap	5½	a —

SPELTER.

Spelter, as per quantity . .	6½	a 7¼
Do. in slabs	6	a 6
Do. Sheet	8½	a 9½

TIN.

Block Banca	34	a 35
Do Straits	33½	a 34
Do Spanish	28	a 30
Do. Bars	63	a 65

New York, January 2d, 1854.

LONDON METAL MARKET.

December 28, 1853.

The *London Mining Journal* gives the following quotations, to which we add the duty *ad valorem*, United States Currency, rate of freights, and Foreign Exchange.

ENGLISH IRON.

Duty 30 per cent. ad valorem.

	£	s.	d.	$	c.
Bar and bolt a . . . per ton.	£9	10	0	$45	99
* In Wales a	8	10	0	41	14
* In Liverpool a	9	10	0	45	98
* In Staffordshire a	10	10	0	50	82
Sheets, single a	12	10	0	60	50
" double a	14	0	0	67	76
Hoop a	11	15	0	56	87
Nail rod, round a	11	0	0	53	93
" square a	10	10	0	50	82
Rails (Wales) b	8	7	6	40	54
" (Staffordshire) b	8	10	0	41	14
Railway Chairs Clyde b	5	17	6	28	44
Pig, No. 1, Clyde b	4	0	0	19	76
3-5ths No. 1, and 2-5ths No. 3 . . .	4	0	0	19	76
No. 1 in Wales c	4	10	0	21	78
Scotch Pig No. 1 in London . . .	5	0	0	24	20
Stirling's Non-laminating or Hardened Surface Rails . . . £9 to	9	2	0	43 56 / 44 05	
Cold blast, No. 1 Foundry . . . £5 10s. to	6	10	0	26 62 / 31 46	
Charcoal bars	14	10	0	70	18
Stirling's Patent Toughened Pigs } Glasgow . . .	3	12	6	17	59
Ditto. Wales £4	4	5	0	20	57

FOREIGN IRON d.

Duty 30 per cent. ad valorem.

	£	s.	d.	$	c.
Swedish . . . per ton.	$12	0	0	$58	08
Russian CCND	17	0	0	82	28
Indian Charcoal Pigs in London . . .	6	0	0	29	04

FOREIGN STEEL *a.*

Duty 15 per cent. ad valorem.

		£	s.	d.	$
Swedish keg, nominal	per ton.	£16	0	0	$77 44
Ditto faggot		—	—	—	— —

SPELTER *c.*

Duty, in pigs, bars, and plates, 5; sheets, 15 per cent. ad valorem.

			$
On the spot in bars	per ton.	£00 0 to 24 5 0	102 06 / 117 87
To arrive		$00 0 to 24 10 0	104 06 / 118 06

ZINC.

Duty 15 per cent. ad valorem.

		£	s.	d.	$
In sheets *d*	per ton.	£32	0	0	134 06

ENGLISH COPPER.

Duty: bolt and braziers', 20; pig, bar, and old, 5 per cent. ad valorem; Sheathing free.

		£	s.	d.	$
Tile 14 to 28 lbs., *a*	per ton.	£126	0	0	$609 84
Tough cake *a*		126	0	0	609 84
Sheathing for ships 14 by 48, and bolts *a*	per lb.	0	1	2	28½
Sheet *a*	"	0	1	2	25½
Bottoms *a*	"	0	1	3	30½
Old *a*	"	—	—	—	—
Yellow Metal *e*	"	0	1	0	24
Wolterstedt's Pat. Met.	per cwt.	2	0	0	[illegible]

ENGLISH LEAD *a.*

Duty 20 per cent. ad valorem.

		£	s.	d.	$
Pig	per ton.	£23	0	0	$111 32
Sheets		24	0	0	116 16

FOREIGN LEAD *a.*

Duty 20 per cent. ad valorem.

		£	s.	d.	$
Spanish in bond	per ton.	£22	0	0	$106 48

ENGLISH TIN *c.*

Duty 5 per cent. ad valorem.

		£	s.	d.	$
Block	per cwt.	£6	5	0	$30 25
Ingots	"				
Bar	"	6	6	0	30 49
Refined	"				

FOREIGN TIN.

Duty 5 per cent. ad valorem.

		£	s.	d.	$
Banca	per cwt.	£6	7	0	$30 73
Straits [uncertified]	"	6	5	0	30 25

TIN PLATES.

Duty 15 per cent. ad valorem.

		£	s.	d.	$
IC Charcoal	per box.	£1	14	0	$8 23
IX Ditto	"	2	0	0	9 68
IC Coke *	"	1	7	6	6 64
IX Ditto	"	1	13	6	8 07
Canada Plates *a* ton	"	15	0	0	62 60
Quicksilver *f*	per lb.	0	2	4	57

Terms: *a*, 2½ per cent. dis.; *b*, net; *c*, 3 ditto; *d*, 1½ per cent. dis.; *e*, 2 ditto; *f*, 1½ ditto, delivered in Liverpool 10s. per ton less. † Discount 5 per cent.

* Delivered in Liverpool 10s. ($2 42) per ton less.

EXCHANGE, New York, Jan. 16, 1854.—Rates are ranging from 8½c. to 9½c. premium in favor of London.

FREIGHTS at Liverpool are about 20s. 0d. ($4.84) per ton for iron in pig or bars.

JOURNAL OF GOLD MINING OPERATIONS.

COINAGE FOR DECEMBER, 1853, AT PHILADELPHIA.

The following statement of the gold coinage at the Philadelphia Mint, for December, 1853, was made by the Treasurer of the Mint:—

GOLD.

	Pieces.	Value.
Double Eagles	31,159	$62[illegible],180
Eagles	35,063	350,630
Half Eagles	18,646	9[illegible],230
Quarter Eagles	14[illegible],124	3[illegible],810
Gold Dollars	261,572	261,572
	491,674	$1,671,378
In Bars		2,619,361

GOLD BULLION DEPOSITED.

From California	$4,395,000
From other sources	50,000
Gold deposited in December	$4 445,000
" " November	3,650,921

The annexed comparative statement will show the deposits of gold in each month for the years 1851, 1852, and 1853:—

	1851.	1852.	1853.
January	$[illegible],071,669	$4,16[illegible],645	$4,962,962
February	3,004 970	3,010,022	3,[illegible]28
March	2,88[illegible],271	3,882,156	7,[illegible]752
April	2 578,353	3,491,[illegible]37	4,7[illegible],000
May	3,259,491	4 [illegible]78	4 42[illegible],000
June	3,627,560	5,[illegible]9 474	4,545,179
July	3,127,317	4,[illegible]25,[illegible]80	3,[illegible],321
August	4,1[illegible] [illegible]18	2,671 651	4,712,000
September	4 [illegible]1,799	4,255 697	3,027,[illegible]
October	4,743 [illegible]34	4,140,[illegible]89	4,4[illegible] 000
November	5 482 454	7,379,043	3,6[illegible]
December	[illegible],641,425	3,336,981	4,44[illegible],000
Total for year	$47,028,511	$51,056,276	$5[illegible]
Increase for the year in 1853 over 1852			$[illegible],417,[illegible]11
Increase for the year in 1853 over 1851			$[illegible],445,076

The following table, compiled from the *North American*, will show the coinage at the Mint for 1853:—

GOLD.

Double Eagles	$25,226,340
Eagles	2,[illegible]30
Half Eagles	1,[illegible]0
Quarter Eagles	3,511,670
Dollars	4,096,051
Total gold coinage	$36,[illegible],621
Bars	15,[illegible],536
Total gold coinage and bars	$51,778,157

The value here given is lower than the statement of the Mint, which is $51,888,882. The number of pieces of gold coinage in 1853 was 7,258,576.

The following is a comparative statement of all the gold deposited at the Philadelphia Mint since the California discoveries. We are indebted for it to the *North American*. The gold from other sources, included in the above, will range from three to five millions:—

	1849.	1850.	1851.	1852.	1853.
January	$253,989	$1,139,959	[illegible]	$4,161,640	[illegible]
February	385,672	2,114,718	[illegible]	[illegible]	[illegible]
March	485,040	[illegible]	[illegible]	[illegible]	[illegible]
April	477,448	[illegible]	[illegible]	[illegible]	[illegible]
May	669,721	[illegible]	[illegible]	[illegible]	4,865,628
June	1,196,754	[illegible]	3,637,560	6,692,474	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	1,454,377	[illegible]	[illegible]	2,671,686	4,845,902
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	4,872,006
November	867,774	4,478,284	5,492,456	[illegible]	[illegible]
December	[illegible]	4,620,158	5,631,445	8,846,992	[illegible]
Total	$10,491,673	$33,240,458	$47,929,407	$51,056,743	$53,426,965

CALIFORNIA GOLD FIELDS.

The product of gold is as favorable as at any previous period, and as large as could be anticipated for the season of the year. No indications exist of any diminution in the yield. On the contrary, operations are daily becoming more systematic and promising.

QUARTZ MINING.

This very appropriately stands at the head of the series of mining operations in California. Not that the product of gold is greatest in this branch, not that more labor is expended in its prosecution than in any other, but it is here that the inexhaustible stores of California gold will be found ultimately to exist, and here that the largest capital will finally be invested, and the scientific, and skilful, and substantial enterprises established.

Extracting gold from quartz rock, although successfully prosecuted, is yet in its infancy. Machines for crushing the rock exist in great numbers, and under almost every variety of form, many of which are excellent for this purpose. But the point is, to extract the gold entirely from the rock after it has been reduced to a powder. With many of these machines for crushing and amalgamating, the success is quite flattering, yet, after all, the work is not perfectly done. Much here remains to be accomplished. The amalgamation thus far attempted is almost entirely a mechanical operation, and depends upon the affinity of gold for mercury. In the Ural Mountains, amalgamation is a slow and oft-repeated process. The "tailings," after one attempt, are suffered to lay exposed to the weather for a year, when the process is again repeated, and thus they are treated for three or four years. The action of atmospheric agents is thus sought to render more complete the amalgamation.

We do not regard this branch of quartz mining as having reached the perfection to which it is destined. Already, we hear of processes for the extraction of gold, of a novel character, and by agents the efficiency of which can never be questioned. We are not aware of any tests having been made of these methods, which are hardly as yet completed, but of the power of the agents there can be no question.

EXPENSES OF QUARTZ MINING.

The mining engineer of the Rocky Bar Company states the expenses of running 16 to 18 stamps in Grass Valley, to be $340, which would crush, on an average, 25 tons of rock per day. Forty stamps would crush 55 tons, on an average, at an expense of $550 These are founded by him upon the highest rate of cost and wages. He states:—

I could have the rock raised and delivered at the mill for from $6 to $8 per ton, according to locality Some of it would not cost $6, and with a railroad and tunnel, we could have it for $3 average per ton. Next year, wages will average $3 to $3½ per day.

Attwood, of the Agua Fria, is getting on with his new mill. I do not think he can commence work before Christmas He is still getting out rock very like the La Fayette rock, and has now about 1,500 tons at the mill, and his tunnel and shafts in capital working order Crosset, and the Empire Mill Company, are making money. Crosset's claims on Osborne Hill, and the Empire claims on Mount Ophir, are very rich. Your claims are recognized as the richest on Massachusetts Hill, ranking among the best in Nevada county, by all here interested in quartz mining. From such data as I have, I think from $15 to $30 per ton a very moderate estimate; in the neighborhood of shaft E the vein is certainly above that average The very surface earth averaged $5 per ton on Massachusetts Hill It has been tested, and proved to give that average, by Mr. Attwood, of the Agua Fria, and others. Your tunnel, so far as completed, is the most perfect work of the kind in California, and I prefer driving it to the vein, to erecting a pumping engine on the hill

THE NORTHERN MINES.

A practical miner in this district writes to the *Boston Journal* some very sensible observations respecting mining operations generally in the northern mines, which present a very distinct view of operations there. —

The miners work during the winter, whenever the snow is melting, upon the hills or dry diggings. When the snow is melted and, consequently, their supply of water fails they return to the creeks and river claims. Every miner is therefore allowed two claims by common usage, one in dry and another in wet diggings. The spring and fall of the year are therefore the busiest times with the miners, the other seasons being much occupied in moving and preparations. The climate, as in nearly all mountainous countries, is very healthy, and the general health, notwithstanding the great exposure that miners undergo, is remarkable In summer, at midday, the sun comes down with great power, but mornings and evenings the atmosphere is cool and refreshing.

The mountains have been generally considered barren, and their appearance does not promise anything better, but this may be attributed to the long dry seasons, and, in fact, recent developments have shown that this brown soil, when irrigated, will produce abundantly. There are many small valleys also in the mountains, of black rich soil, which are now settling rapidly; and the old assertion that California is only a mineral country is now being triumphantly refuted. The mining country generally exhibits a very marked improvement from its appearance in 1849-50. Better buildings are erected, and bridges constructed, and every thing has a more substantial appearance. In some portions of the mines can be seen telegraph wires, and railroads are talked of as a matter of course. Communication is frequent now by means of stages and express lines, which run to all quarters. There is also improvement in the mode of mining and washing the dirt, but the limits of a letter will not allow me to state it more particularly; formerly you heard of pans and rockers, now it is of toms and sluices A company, by these means, wash four times as much dirt as formerly. The quartz companies have scarcely realized expectations. The quartz is abundantly rich, but the machinery is inadequate, and the amalgamation always imperfect New diggings are constantly being discovered, but the big lumps are getting scarce. The cream of the mining district has been pretty much skimmed off; not that the deposit of gold is very materially diminished, but that it requires much more labor to obtain it. In the first two years it was common to find the gold in from six inches to six feet of dirt, but now these places have been worked over—in many places several times—until they are deemed used up. Deep excavations in the hill-sides are now made, from sixty to six hundred feet, and frequently large outlays of time and money are required for drift-timbers, flumes, sluices, dams, water-wheels, pumps, railroads, etc. These expenses, together with the additional quantity of dirt to be dug and washed, tend materially to decrease the profits of mining. Common wages, which have been eight to twelve dollars a day, have now fell to four and five, the laborer boarding himself. Good board can be obtained always for from ten to twelve dollars a week. Goods are generally double of State prices. Claims paying twelve dollars a day, generally sell for three or four hundred dollars, and as unoccupied places are scarce in old settlements, they find ready purchasers. It will be seen that these things tend to a different state of affairs in mining operations. Individual labor will continue to decrease in value, and ultimately the mines will only be worked by large companies of associated labor, or by heavy capitalists.

PLACERVILLE.

The following is a lively sketch of Placerville, among the foremost mining towns in the State:—

Placerville is one continuous street, following a deep ravine, thickly shaded on either side with hotels, shops, and dwellings, for nearly a mile and a half. Each side is walled up by high and steep hills, most of the length of the town. Formerly, the "diggings" upon this ravine were among the richest in the State. In fact, many buildings now stand upon earth worth from $100 to $5000. Digging is now being carried on right in the heart of the village, and paying liberal wages.

Our village ranks now among the largest mining towns in California. It is near the south fork of the American river, and about fifty miles east from Sacramento City, and about forty miles west of the summit of the Sierra Nevada; it is about twelve miles east of Coloma, the capital of El Dorado county, and the most populous county in the State. It was at Coloma where the first gold was discovered in May, 1848. The old saw-mill—famous for its associations with this discovery, the results of which have affected every government in Christendom—stands in a field, near the river, solitary and alone in its dilapidated glory.

It is a fact worthy of observation, and one that it would be well for those croakers about the early exhaustion of our mines to note, that the miners are here working their claims at good paying rates.

Placerville is in the heart of a rich mining section; around, are nothing but hills and ravines. These hills, many of them, are pierced with shafts and tunnels. Within a radius of five miles, it is safe, I think, to affirm that there are but few places that would not richly reward the miner for his industry for working them. Were we favored with an abundance of water, as we shall be when certain great public improvements are completed, it is doubtful if there is any place in the State where deep or coyote "diggings" could be prosecuted so extensively and advantageously as in and about Placerville.

About one mile towards Diamond Springs is Coon Hollow, so famous for its deep deposits, and the fineness of its gold. About four miles on the Sacramento road, the village of Diamond Springs is located. The magnificent improvement of Messrs. Bradley, Burlan & Co. has afforded an abundance of water. This is one of the Water Companies that has paid well.

Mudtown, Carson Springs, Reservoir Hill, and Negro Hill, are famous for the extent and richness of their diggings. As soon as the wet season shall "set in," a new life will be manifested in our affairs. Placerville is famous as a route for the overland immigration to take on their way to the Sacramento or San Joaquin valleys.

DUXBURY BILL FLUME.

This is one of those large constructions for conveying aside the water of the Feather river, in order to allow the miners to obtain the gold in its bed. One can form some idea of the enterprise of the Water Companies from the extent of this flume :—

The river is here arrested by a properly constructed dam, and made to flow through a flume built of plank, forty feet in width and six feet in depth. This enormous body of water flows through nine hundred feet, confined in these dimensions, with great turbulence and power, carrying eight large water wheels, which are applied to pumps for the more effectual drainage of the river bed, where the hands are at work and the gold is found. On my arrival, I descended to the bed of the river to view the operations, and I may say my pathway was literally strewn with gold. I almost felt the inclination to dance on it, after the manner of a prominent citizen of this city, of whom it is related that on the occasion of a certain influx of fortune's favors, he strewed his gold upon the floor, and thereon danced the polka.

While reflecting on the shining particles that lay sparkling in the sun, my attention was called to another place, where was deposited in a tin pan the proceeds of the day's labor. I lifted it, and judged it to weigh about thirty pounds, which I was told was below their average for the last three days. This was the Union claim. The flume before mentioned is owned by three or more companies, all adjoining—the Duxbury, or Sailor Claim, the Union, and the South Cove Claim. This latter is subdivided between three or four companies. The claims have been occupied since 1849, but until this season fortune has not favored them, because of early rains, &c.; but by Yankee perseverance, aided by a propitious season, many of them will now be able to visit or return to their fatherland. The Union claim has paid the best, it having yielded fifty pounds a day, or about $10,000. Their first week, their earnings amounted to $40,000. The other claims pay very well, and the prospect is that they will pay quite as well as the Union. Owing to favorable weather, the wet diggings have turned out well this season, and you will probably see a corresponding increase in the receipts of gold dust. The dry diggings this year also paid well for the same cause, and therefore the California gold crop for 1853 will be unprecedented.

THE WATER COMPANIES' UNION.

The Mining Water Companies propose to form a General Board, by which the interests of Water Companies shall be looked after. The miners oppose this design, and one of them, in arguing against it, presents a distinct view of the miner's side of the question. It is a subject of high importance to the mining interests of California :—

It is a well established fact that these water companies, where and when properly conducted, have met with most unbounded success even as isolated or individual companies, without any special chartered privileges or legislative enactments, yet, I cannot possibly concede them the right to legislative enactments, any further than any other enterprises of the day, so long as common usage has defined pretty clearly what constituted right and wrong, as I contend that it is utterly impossible for any legislative body to know the actual wants and necessities of the mining community; and therefore it would be unjust to pass laws which would commence a feudal system, and thus spread disorganization amongst the two great interests of the State, which at present is one and inseparable—the mining and water interests,—and as the organization of this board, and its continuance, is but the prelude to a state of differences between the companies and the miners, its organization is much to be deplored, as it was totally uncalled for originally. The very fact that all the companies throughout the State should be called upon to espouse the cause of any one particular company's difficulties is, in itself, sufficient evidence to imprint monopoly and combination of monopoly upon the whole Board; and although the nucleus or body does embrace a capital of some four millions of dollars, yet the number of independent companies, outside, are quite equal, if not superior, in both capital and works. And as to the collection, compilation, and publication of various statistics, such as altitudes, latitudes, and longitudes—these can, and will, I have no doubt, be forwarded and treasured up in the archives of our State, at as early a day as possible, just as well by these same isolated companies, as if they were within the pale of the Great Union.

Again, as to this Board inspiring confidence in the minds of the public by their co-operations, and thus inducing the investment of capital for the extension of these works. This may appear practicable to those companies whose resources are limited, and whose financial affairs are in a crippled state, and need stock-jobbers and brokers to force their stock into market; but surely, one of foresight would much rather risk investments in the stock of an independent company, whose dependence was upon the good will of the community and the permanency and soundness of their constructions, added to the ability of the management of the same.

The securing of the right of way, of which mention is so often made, surely needs no legislative action, as matters of this kind are easily remedied by either arbitration or common law, which will define an action of trespass as well probably as any new code which may be enacted to suit this particular case. However, I believe, more imaginary than real causes have presented themselves to these water companies.

AUSTRALIAN GOLD FIELDS.

The latest accounts from Australia represent the yield of gold as greatly on the increase. Wonderful stories are told of the amounts obtained by individuals. By the accounts we are also furnished with statistics by which positive and reliable estimates may be made of the product of Australia. These show that the yield of gold fluctuates at different periods, but that it is, however, on the whole, declining in amount. We will proceed to an examination of them in connection with the political troubles in that country. It must be borne in mind that the number of gold diggers has been from the outset constantly on the increase.

DECLINE OF THE YIELD.

The political troubles in Australia owe their origin entirely to the same circumstances connected with her gold fields. The first of these difficulties occurred in the early part of 1853, and the strife between the local government, especially in the colony of Victoria, and the miners has steadily continued until the government has yielded. The point at issue was the price exacted for licenses to dig gold. The miners resisted it as too exorbitant. But why was this resistance made? The statistics of the gold fields can answer this question. They show that the resistance to the license fee commenced soon after the decline of gold, and has steadily increased as the decline advanced. But in order to set this point in its true light, let us advert to the proceedings of resistance by the miners, the acquiescence of the government, and the actual yield of gold.

The course of opposition on the part of the miners is very fully sketched in the *London Times*, and ascribed to the lawless spirit of the miners. The facts are what we want, without regard to any imaginary cause of them. They were as follows.—

On the 7th of May, 1852, Mr. Latrobe, the Governor of Port Philip, having announced his intention of *raising the license fee from thirty shillings to three pounds a month*, the miners assembled together to the number of a thousand, and passed a resolution pledging themselves to protect any miner against whom the fee might be sought to be enforced. *The Government gave way without a struggle*, and the miners were for a moment satisfied. In June and July, 1853, meetings were held denouncing the license fee, and agreeing to a memorial to the Governor praying for its reduction to ten shillings. At these meetings the most sanguinary threats were uttered, and one of them concluded with an attack on the police, who fled from it in terror. On the 1st of August the deputation waited on the Governor with a memorial, signed by several thousand miners, requiring the immediate reduction of the license fee, as established by law, from thirty to ten shillings.

Mr. Latrobe answered, "What you ask me is impossible; I cannot destroy the law; I am sworn to do my duty, and am prepared for anything. While the license fee is law it must be obeyed; there are other and more important interests than the gold-diggers' to be considered." This answer brought matters to a crisis. The miners assembled with flags and agreed to pay no more than ten shillings license fee, and to appoint a deputation to tender that sum to the Commissioner. In answer to this demonstration, Mr. Latrobe published a letter in which he argued the matter in dispute with calmness and ability. On the 28th of August, a tumultuous meeting was held at Bendigo, and the ten shillings, in full payment for licenses, tendered to and refused by the Commissioner. Guns were fired, a badge of resistance—a red ribbon—was adopted, the miners abstained from taking out licenses for the next month, and separated, after announcing their intention to reassemble on the 1st of September. They had no occasion to do so; on the 30th day of that very August, on the 1st of which Mr. Latrobe had so emphatically refused to lower the license fee, the Legislative Council of Victoria met, and it was thus that a panic-stricken Governor addressed a craven Legislature: "The objections to the present license fee, and the practical difficulties in the way of collecting it, have forced themselves latterly so forcibly upon me, that *I am disposed to propose to you its total abolition*, merely reserving a registration fee for police purposes. A loss of revenue to a large amount will thus be incurred, which I propose to supply by a revision of the tariff, including an export duty on gold." On the 1st of September the gum trees at the gold-fields were placarded with notices of the intention of the Government, but drawn up in such abject terror, that of two documents, prepared on the same day, one asserted and the other denied that the license fee for the current month would be collected. A hurried committee of the Legislative Council recommended, as a matter of urgency, the passing of a temporary act, fixing the license fee at forty shillings for the remaining three months of the year, a sum which, after the declaration of the Governor, will, of course, never be collected, and can only be considered as a decent prelude to allowing the tax to drop altogether.

Of course, the abandonment of the license fee in Victoria will draw after it its abolition in New South Wales, and just at the moment when an increased revenue is required, the colonies will find themselves stripped of that they already possess. We are weary of the part of Cassandra, but if this plague can be arrested, the Home Government ought not to lose one moment in taking the most efficient and coercive measures for the purpose; and, if it cannot, they had better surrender a government which they administer under the dictation of a mob comprising in its numbers the most desperate of adventurers, and the vilest of criminals.

In October, 1852, the yield of gold from Mount Alexander was 350,000 ounces, which has been equalled at no subsequent period. The Melbourne press furnishes the following as the amount of gold brought to that city in the six months previous to April, 1853 :—

		Ounces.
Four weeks ending	November 13, 1852	314,141
Do.	December 11, 1852	208,153
Do.	January 8, 1853	187,854
Do.	February 5, 1853	185,469
Do.	March 5, 1853	168,620
Do.	April 1, 1853	131,314

From the same quarter we are furnished with the yield of Mount Alexander and Ballarat for seven months of 1852 and 1853 :—

	1852.	1853
January	58,609	156,456
February	55,953	142,044
March	61,389	133,635
April	67,568	138,277
May	69,448	124,862
June	108,650	106,142
July	288,546	165,779

During this period the number of diggers has increased to 100,000, who, if there had been no decline in the richness of the fields, should have produced a constantly increasing amount of gold.

We perceive that these views are sustained by a correspondent of the *London Mining Journal*, whence we have the following particulars :—

Among the recent dispatches from Australia we have received a communication from Mr. Evans Hopkins, under date August 1st, containing some interesting and indeed important remarks, founded, we have no doubt, on that close and philosophic observation which has uniformly marked his investigations. He states that facts are now getting too glaring to allow the local press and interested parties any longer to oppose his argument that the gold fields have been falling off in produce since October, 1852, although the diggers have increased in number, and new fields discovered. There are *no gold mines* in this colony; the few quartz veins discovered in Sydney and New South Wales are of the general character, and similarly poor in produce, with those seen in other parts of the world; and those who have tried them have hitherto only met with disappointment, and they can ever be considered only as speculations. The gold is a mere superficial deposit on the edges of the primary slates, and very extensive areas are getting exhausted; upwards of 100,000 persons engaged in digging and washing, soon sweep over the gold crop. The produce per head is now getting so low as not to afford the payment of license, and the Government is afraid to grant licenses to companies of the worked-out ground, which has been so exhausted as to render it unprofitable for re-working with such limited resources as the colony presents. The excitement must calm down, further discoveries be made, and *leases* granted before any *bona fide* company can undertake digging with any chance of success.

The opinion here expressed as to the falling off of the gold crop in recent months, is supported by some portions of the colonial press. The *Melbourne Argus* states that the yield, taken as a whole, during the last two months, (July and August, 1853,) has not realized general expectations, looking to the period of the year, and the large number congregated at the diggings, generally calculated at a rough estimate at 100,000, which very far exceeds the number employed at the corresponding period of the previous year, yet the quantity of gold does not keep pace with the increasing population busily employed upon the gold fields.

The yield from Mount Alexander for July, 1852, was 282,546 ozs., while that of July last only reached 137,666 ozs. It is curious to observe that the yield reached its climax in October, 1852, when it was about 350,000 ozs. per month; since which time it has gradually decreased to about 170,000 ozs., or less than one-half. The price in the mean time, which was last year £3 per oz., has gradually advanced till it is now £3 17*s.* 6*d.*, at which it remains firm, yielding but a small return to the broker, and maintained at that high rate in consequence of the advanced per centage charged by the banks for the exchanges. To do justice, however, to the subject we add the latest reports from the Colony of Victoria, dated September 23d, 1853:—

THE GOLD FIELDS.

The improvement reported in our last summary has become more decided. The Goulburn diggings, from which flattering accounts were received about five weeks ago, have not fulfilled the expectations at first formed, though recent information gives a more favorable view of them. They are now spreading over a large extent of territory, and a considerable number of diggers seem determined to give them a fair trial. Great things are expected of the Ovens during the ensuing summer. Bendigo also continues to maintain its reputation. But the chief talk of late has been about Ballarat, the first of our gold fields, and still worthy of being ranked among the best. At the close of last month several diggers there came upon what they called a regular "table of gold," and those who were so fortunate as to strike the line took almost fabulous quantities out of their claims, which from their richness received the appellation of the "jewellers' shops." The escort returns having confirmed the current reports, a "rush" was the immediate consequence, though from the nature of the new diggings in that quarter multitudes will be doomed to disappointment. All the heavy finds have been obtained by deep sinking; and the reader will see that the term is used with some degree of propriety, when we inform him that the depth of the holes is frequently from 60 to 120 feet, and that many very productive ones have lately been above 100. The gold is found in the beds of what may be called subterraneous creeks—that is, creeks which have formerly been on the surface, but are now buried beneath the deposits of more recent times. This being the case, there is nothing on the present surface to indicate the direction of the aboriginal channel. As described by the diggers themselves, the gold is found in a gutter from six to eight feet wide at the top, and two to four feet at the bottom. It is obvious that there must be great uncertainty in finding gold where it is confined to such a narrow and capricious line. At this moment some are sinking for this gutter over a width of three hundred yards. The result of such a mode of operation is, that not more than one hole in fifty hits the line, and the rest are what the diggers call "shicers." Some of the holes in Canadian-gully have been estimated to yield gold to the value of £2,000 per square foot, but this is probably an exaggeration—at least we have it on good authority that one hole (one of the richest) was valued at £800 per running foot, and as the gutter was ten feet wide, it would give £80 for the square foot, instead of the £1,200 or £2,000 mentioned by a contemporary.

Experiments in deep sinking have also been going on for some time at Bendigo, with the view of reaching a second bottom, and, should experience confirm the conjectures of speculation as to there being several auriferous bottoms, we shall enter upon a new era in gold digging. There might, in that case, arise a necessity for a different set of regulations for the management of the gold fields. Mining would come to be followed as a profession, in which capital and co-operation would be indispensable requisites to continuous industry and success.

Since the date of our last summary (Aug. 18), the escorts have brought down 258,927 ozs. The returns show a steady weekly increase, with the exception of last week, which exhibits a short-coming of no less than 12,000 ozs., taking the average returns for the preceding four weeks. This is attributable, no doubt, to the recent agitation in that locality, which has thus cost the diggers about £50,000! It may have appeared a small matter, looking only at the loss of time, to devote a day to a great demonstration; but it makes a different figure when considered statistically. Had the statistics of industry been always preserved with the same accuracy, and been so immediately resolvable into a demonstration of pecuniary profit or loss, the industrial classes might have received many a salutary lesson.

In the table of receipts, which we subjoin, the returns by the private escort should be added to those from Bendigo and M'Ivor, but as we are unable to give the exact share due to each, we enter them separately.

GOLD RECEIVED BY ESCORT SINCE AUGUST 13, 1853.

	Aug 20.	Aug 27.	Sept. 3.	Sept 10.	Sept. 17.
Bendigo, &c. . .	26,167	35,360	[illegible]	41,681	21,723
M'Ivor . . .	4,438	1,403	2,507	1,700	1,683
Private escort . .	6,318	4,552	4,846	3,030	—
Ballarat . . .	4,739	5,945	5,577	15,257	13,615
Ovens . . .	5,746	—	3,995	—	5,858
Goulburn . .	—	—	—	1,970	456
Total . .	44,402	47,265	60,892	63,583	42,780

CONRAD HILL GOLD MINE.

The following is the report of Dr. C. T. Jackson on this mine:—

SIR—I have the honor of submitting to you my report of an examination of the mining property on Conrad Hill, in Davidson county, North Carolina.

This mineral land has long been known, on account of the large product of gold that has been extracted from the Conrad Hill mines, opened by Governor Morehead and others, in the immediate vicinity, or adjoining the lands belonging to your company. These old workings gave me a good opportunity of examining the position and character of the veins which pass directly into your property at a lower level.

I found the old workings very irregularly opened, the richest portions of this lode having been followed without regard to system, so that the ground is very much cut up by excavations of the most singular character. The work was commenced on a slope, following a vein of quartz containing iron and copper pyrites, mixed with particles of gold, and an iron ochre, full of small particles of gold rarely visible to the naked eye. The slopes were also worked out to a considerable extent in different directions. On examining this vein, I found the direction of the dip to be S. 86° W., and the angle from the horizon 30°. The thickness of the vein is eight feet, and it is composed of quartz, hematite iron ore, iron pyrites, and a little copper pyrites, the whole containing fine particles of gold.

This was observed along a sloping shaft for the distance of 160 feet. Further down, I find the vein runs north and south, with a dip of 45° to the westward, and the vein is three feet wide. I observed a cross-course vein running N. E. and S. W., which is rich in gold, and measures five to six feet in thickness, or width. At another point I found the dip to be 40° to the westward.

I observed that the proportion of copper ore increased as we penetrated deeper into the mine, so as to indicate the probable occurrence of a good lode of copper pyrites. At a greater depth, branches of compact malachite, or green carbonate of copper, similar to that found in the Siberian mines, were observed in the quartz vein in several places, and some of them were two to three inches thick. Specimens of native copper, and of red oxide of copper, were also obtained from the auriferous quartz vein.

I had a portion of the gold-bearing ferruginous rock of the mine pulverized and worked for gold, and found that it was quite richly impregnated with that metal. About a quart of the ore was washed in a pan, and yielded an amount of gold estimated to be equal in value to $5 to $6 per bushel. I was informed that Mr. T. P. Allen had stated that he has obtained $7 per bushel from the richest part of Governor Morehead's mine, which is but a continuation of the same lodes that are about to be worked on your property. The general average of the ore in gold may be safely estimated at $2 per bushel.

I also examined the preparations which Mr. J. Cammann, your Superintendent, was making for opening the mines, and found his shafts were well placed, and were admirably constructed and timbered, and that all was properly done. He remarked that he hoped the Directors would remember that it was a slow operation to clear out and re-timber an old mine that had been originally opened in so unsystematic a manner.

I have great confidence in the success of this mine, and am of opinion that the proportion of copper will increase in the lode as it descends. It is well known that it has already been proved to be a rich gold mine, and it must give a still richer yield of gold when good machinery is in operation for grinding the ore and amalgamating the gold.

With great respect, I am your obedient servant,
CHAS. T. JACKSON, *Geologist and Chemist.*

To N. K. ANTHONY.
NEW YORK, *Oct. 15, 1853.*

THE GOLD REGION OF GUYAPPA, IN NICARAGUA.

That one of the finest mineral countries in the world, lying on a high road of our own commerce, should have remained unoccupied by Americans to the present time, would be inexplicable, were it not a parallel of the same negligence which left undiscovered so long the gold mines of California and Australia.

Those who have resided for any length of time in Nicaragua, or who have conversed freely with travellers and natives of that region, will have heard of the "Guyappa gold," brought by the Indians to the seacoast of Honduras, and reputed the purest in the world. Time out of mind, this gold has been used by the natives of Central America for ornamental purposes, but the mines from which it is taken have not been worked by Europeans. This is the gold and silver region alluded to in our article. It is near to one of those natural high roads of our own commerce, now being surveyed for a transit and railroad by a wealthy organization in New York and Washington. The transit will be half by river navigation from near Omoa, on the Gulf of Honduras, and the remainder, by a straight and easy grade, to the Gulf of Fonseca, on the Pacific side. The route will be some four hundred miles shorter than that of Nicaragua on the eastern side, and a day's sail less on this. The transit itself will be through a delightful climate three degrees north of Lake Nicaragua, and over a country of which the mineral wealth in silver is unsurpassed by any in the world. The gold region, which is compared by those who have explored it with the finest in California, lies due east, by easy access, from the projected line of transit. It is bounded east by the magnificent valley of Lepaguare, into which the government of Honduras have made recent efforts to entice a colony of Americans. It will be seen by glancing at a good map of Central America, that the river Guyappa is the branch of a larger river between the district of Oloncho and the valley of Lepaguare, and empties into the Carribean a little to the south of Truxillo. We have before us a mass of unpublished testimony, procured by competent travellers to that region, showing its peculiar fitness for all purposes of gold and silver mining, and general colonization. Every variety of gold deposit has been found upon the river, and the lesser particles are diffused through the soil and sands of the entire country. Last year a company was organized in New York for the exploration of this attractive region, but the project, limited to a few persons, was defeated by the death of the principal manager.

JOURNAL OF COPPER MINING OPERATIONS.

LAKE SUPERIOR MINERAL REGION.

A brief but general view of the aspect of the mining interest in the Lake Superior Region is presented in the following remarks, which form the introduction to the Report of the Summit Copper Company: —

The mineral district of Lake Superior has assumed an importance which is attracting the attention of capitalists both at home and abroad, and its development now ranks as one of the important commercial interests of the country; and, though little has yet been done, the product of the present year will probably reach the amount of *three thousand tons* of copper, thereby contributing nearly *one and a half millions of dollars* to the wealth of the country; and the period is not far distant when the product will be equal to the wants of our own country; and when mining operations shall be carried on, on the comprehensive system which characterizes similar pursuits in other countries, it is probable that the mineral region of Lake Superior will become one of the principal sources of supply for the world.

It is an established fact that the copper veins of the Lake Superior district surpass in richness any which have yet been discovered, and in no other locality is the metal found in its native state in such purity and quantity as here. In the "Cliff" mine, single masses of over eighty tons have been met with, and in the Minnesota, they have recently exposed a mass of seventy five tons, while on the Copper Falls location, masses of thirty and forty tons are encountered, and the mine is yet in its infancy.

Hitherto this subject has failed to arrest the public attention, and the attempts which have been made to open and work the promising veins have been looked upon as wild speculations, except by the comparatively few who had investigated the subject; but the success which has attended the operations of the Cliff, Minnesota, Copper Falls, and other mines, has produced a wonderful change in the public mind, and "copper stocks" are advancing in favor daily.

The scarcity of copper, and the great advance which has taken place in the price, together with the favorable advices which come to hand by each successive mail from Lake Superior, of the development and progress of the several mines in operation, have entirely changed the feeling which has hitherto prevailed, and there is a strong disposition manifested by all parties, (many of whom have hitherto looked with doubt and distrust upon mining operations,) to secure an interest in mines, the productiveness of which has already been established or in those which are less advanced, but which are known to be under good management, and which give good promise of success.

When operations were first commenced in this district, the country was an unbroken wilderness—many hundred miles beyond the confines of civilization, and but little was known of the character and nature of the veins. It was difficult to secure capital to "prove up" the country, and the undertaking was beset with almost insurmountable obstacles. The want of experience and a proper knowledge of the country, led to the expenditure of large sums of money without any profitable result. Nearly all who were interested in the first attempts to work the mines on the southern shore of Lake Superior, became discouraged, and declined to pay further assessments on their stock; and as the Companies had no capital, except such as was realized from assessments on the shareholders from time to time, most of them failed and abandoned the undertaking. Many of the shareholders in the Copper Falls Company forfeited the stock rather than pay an assessment of *fifty cents per* *shore;* and the immense masses and rich deposits which have rewarded the proprietors of the Cliff Mine, might have remained undisturbed for a much longer period, but for the great confidence which the President of the Company had in the value and ultimate success of the mine, which induced him to make liberal advances from his private purse.

But the whole aspect of things is now changed. The country has been thoroughly explored, and science and experience have established the character of the veins, and designated the points where they may be profitably worked, and the manner in which they should be opened. Experience has proved that a mine cannot be made to pay except by a liberal expenditure of money. The success which has attended the Cliff and other mines, establishes the fact of the great value of any well defined vein, favorably located, when efficiently and properly opened and worked. *Notwithstanding the obstacles and difficulties which the Cliff Mine encountered in its early history, it has already paid back four times the amount of its original capital. Its net earnings for the year 1852 were one hundred per cent. on its capital, and its estimated product for the present year, at the price of copper now current, will be equal to two hundred per cent. net on its capital, and this result has been achieved with the comparatively small force of about eighty miners, and the vein has been opened only 1,200 feet in extent, and some 300 feet in depth.*

Several of the mines now working promise as favorable results when opened to the same extent. It is believed that no mineral district in the world can be worked with such certainty of success as the veins on the south shore of Lake Superior, and the time has arrived when they should be developed upon the extensive and comprehensive principle of legitimate and enlightened commercial enterprise. This is demanded by their importance, magnitude, and productiveness. It is important that companies should be organized with ample capital at the start, to mature and develop the works, and with means in hand to bring the enterprise to successful results with as little delay as possible, and not be embarrassed with prolonged liabilities to be met, with repeated calls of assessments wholly inadequate to a vigorous and profitable system of mining. This is presented as an important and distinctive feature of the Summit Copper Mining Company, it being the first company which has started with an ample working capital paid up at the outset, sufficient to open the mine, provide the necessary machinery, and place it in a condition to pay dividends.

The advantages of this plan are obvious, as the history of all mining enterprises has shown that they can only be made profitable by a liberal and judicious expenditure of capital at the outset. It is reasonable to believe that a mine can be opened and made to pay in a much shorter period, with ample means in hand, than by attempting to make the mine pay its way by working a small force, or by calling in feeble and insufficient assessments from time to time, under which system a mine is slowly developed, and if eventually successful, it is after a long period of unnecessary delay.

Fulton Mine. –From the Report of the Superintendent of the Mine, Mr. John Bacon, dated November 13, 1853, we make the following extracts relative to the operations of the last year, and the prospects of the Company:—

My first duty was to employ all hands in repairing the old buildings, and in the erection of new ones; the result of which may be summed up thus:— A thorough repair of the buildings on the location; the erection of two dwelling-houses, each 32 feet by 22 feet; an office, 32 feet by 22 feet; and a warehouse attached, 32 feet by 12 feet; a carpenter's shop, of same dimensions; a barn, 36 feet by 24 feet; and a whim house, 44 feet by 42 feet.

The whole of these have been built in the most substantial and approved manner, with dressed timber, and covered with shingles of the best quality.

After clearing about ten acres of land, suitable for cultivation, and preparing a sufficient supply of charcoal for current and winter use, we were ready to apply ourselves directly to the Mine. This brought us to the 18th of July.

From that date until 24th of September, when I left the location, the work has progressed rapidly and successfully, the results far exceeding my most sanguine expectations.

The adit level has been driven on the course of the lode over *four hundred feet*, from the base toward the centre of the uplift; and requires to be worked about three hundred feet additional, to reach the indicated point.

In opening the mine, *four shafts* are being sunk.

Shaft No. 1, is about 164 feet south of the mouth of the adit, and is opened into it at the depth of 21 feet.

Shaft No. 2, is about 120 feet south of No. 1, and also cuts the adit at the depth of 42 feet.

Shaft No. 3, is about 240 feet on the level south of No. 2, and is opened into the adit 86 feet from the surface.

Shaft No. 4, is on the summit, and distant from No. 3, about 177 feet, on the level; it has attained the depth of 65 feet, and requires to be sunk 45 feet deeper to reach the adit level. It is now under contract to that point, and will be completed by 15th of December. This shaft is perpendicular, being intended mainly as a working shaft; the other three follow the lode and dip with the vein.

Two sets of miners are employed at the foot of No. 3, in extending the adit, one driving south, the other north. At this point the lode is from *one and a half* to *two feet* thick, and yields richly in barrel and stamp work.

One set of miners are employed at the foot of No. 2, in driving the adit southward; and another set in stoping the back from No. 2 south. The lode in this shaft is well defined, and carries good stamp-work.

One set of miners has been engaged in enlarging and extending the old drift connecting Nos. 3 and 4, about 30 feet below the surface at No. 3, and opened a deposit of masses of native copper, varying in weight from 100 lbs. to 630 lbs. Throughout the drift, the lode is about *two feet thick*, and exceedingly rich in barrel and stamp work. I contemplate putting a large force to stope out the section between these two shafts, so soon as the adit level is opened to No. 3, and the water thus drawn off without lifting, and confidently expect it to yield largely and profitably

During the time engaged in forwarding the mining operations, an excellent whim has been erected, at a point where its power can be employed both in shafts Nos. 3 and 4, with equal efficiency.

At the time I left the mine, besides the quantity of ore I brought down to have tested by actual smelting, the result of which I append as a part of this report, and the large quantity of specimens now remaining at the office of the Company, there were ready for shipment, and waiting your order, over fifty tons of native copper, barrel, and stamp work, of similar quality

We have had but little opportunity to comply with that portion of your instructions, enjoining a vigorous examination for other mines on the lands of the Company

The small party that could be spared on that duty, for a limited time, have opened the ground in the low lands, at several points north of the present workings, to test the character of the rock, and in every case have found it to be a healthy trap. The high grounds were also examined with the same views, and like results, thus establishing the metalliferous character of the rock which underlies the tract partially examined. Early in the coming season, a sufficient force will be detailed to prospect it thoroughly, and from the favorable indications, I do not doubt of success.

Dear Sir:—We have smelted the ore delivered by you for that purpose, viz.:—

6 masses, marked F. M. Co.,			1246 lbs.	
4 bbls.	"	"	2358	
				3604 lbs.,

and have obtained from it 1267 lbs. of copper.

The yield of the copper is as follows, viz. :—

2 masses,	{ 91, [illegible] }	476 lbs.	70	per cent.		$33.90
2 masses,	{ 402, 368 }	770	"	55	"	423.50
2 bbls.		865	"	40	"	346
4 do.		1493	"	11	"	164.23
Total yield						1267

Truly yours,

JOHN BACON. J. R. GROUT, *Agent.*

DETROIT, *October 10th, 1848.*

Summit Copper Mining Company.—The property of this company is located at Point Keweenaw, on Lake Superior. The Company is organized under the general mining law of Michigan. The officers are John S. Eldridge, President; A. W. Spencer, Secretary and Treasurer; Samuel W. Hill, General Superintendent:—J. S. Eldridge, T. H. Perkins, Jr., Horatio Bigelow, Joseph W. Clark, and S. W. Hill, are the Directors. The report of the officers states that the capital is all paid in, and one hundred thousand dollars is devoted to working the mine.

The report of Mr. J. D. Whitney, upon this mine, presents the following favorable considerations:—

At the time I was there, though several veins had been discovered, the main or most important lode, designated by Mr. Stevens as "Vein No. 1," had not been found; I cannot, therefore, speak from personal knowledge as to this vein, but must refer you to the report of Wm H Stevens, Esq., whose skill and experience in exploring, and whose familiarity with the mineral region of Lake Superior, are well known to you.

I can, however, give you some hints with regard to the situation of the location and the facilities for working the veins upon it which may be of service to you; in the mean time referring you, for farther information, to our Report on the Geology of the Lake Superior Land District, which will be published this winter by order of Congress, and which will contain all the information of importance to the practical miner and the capitalist, which I was able to collect during the past summer.

The location of the "Summit Mining Company," comprising a portion of Sections 19 and 30, in Township 58 North, Range 3[illegible] West of the principal meridian of Michigan, is probably as favorably situated as any tract on Lake Superior, both with regard to its geological position, the facilities for opening and working a mine, and for convenience of transportation to and from the Lake. The distance from the principal vein to Eagle Harbor is three miles; and a plank road ought to be constructed through the break in the trap-range, a little to the west, which will serve the purpose of a number of different companies now at work along the bluffs east and west, and which will furnish a cheap and excellent means of communication with a good harbor.

The location, comprising about 800 acres, is of sufficient extent to afford an abundant supply of timber for use in the mine, building houses, and other purposes. There is an abundance of water for stamping and washing the ores, and supplying steam-engines.

The geological position of the location is such as to make it, *a priori*, highly probable that one or more good workable veins of native copper would be found upon it. It is situated upon the great metalliferous belt of Keweenaw Point, and lies immediately to the south of the thin belt of conglomerate which separates the hard, crystalline, non-metalliferous trappean rock on the north from the productive amygdaloid on the south. It is in this amygdaloidal belt and in close proximity to the conglomerate that the rich copper bearing veins of Keweenaw Point are now being worked, as a glance at the geological map of this region will show. The productive veins cut the trappean rocks at a right angle with the strike of the belts of igneous and sedimentary rock, which is here nearly east and west, and generally have a nearly vertical dip. They have been found to hold their metallic contents undiminished in quantity almost close up to the conglomerate, and have, in no instance, been found to run out on being worked to the south. The advantages which this position of the veins gives for working them are very great. An adit level may be run in on the course of the vein, thus proving it as the work progresses at a constantly increasing depth, since the ground rises rapidly to the north. The veins are very free from water, so that they may be worked to a considerable depth, and the mine thoroughly proved without the necessity of putting up expensive machinery. The character of the veinstone of the really metalliferous veins, and the whole aspect of the veins in this geological position, is very much the same, from the Cliff Mine east as far as the Dana Mine, which is less than half a mile west of the principal vein of the Summit Co. Vein No. 1 resembles very much the principal vein of the Dana Mining Co., which is now being worked with flattering prospects of success. In fact the gangues of these two mines could hardly be distinguished from each other in hand-specimens. They consist of chlorite, prehnite, quartz, calc spar, and smaller proportions of some of the zeolitic minerals. The principal vein of the Summit Co. appears, from the specimens which I have examined, to be unusually rich in silver, and it is to be hoped that the yield of this metal may be found to add materially to the value of the mine.

At the time of my visit to this location, explorations had just commenced upon it, and had shown the presence of several veins of promise, similar in general character to those now working in the neighborhood. Vein No. 1 seems, from Mr. Stevens's account, and from the specimens I have examined, to be one of high value, and I should not hesitate to advise its being thoroughly proved by sinking and driving upon it, as I consider that the chances are decidedly in favor of its being profitably worked.

The following is the report of Mr. W. H. Stevens, referred to in the remarks of Mr. Whitney.

The mining location of the Summit Mining Company is situated upon Sections 19 and 30, in Township 58 North, Range 30 West of the meridian of Michigan, and contains about eight hundred acres of mineral land, all of which lies on the great metalliferous range of Keweenaw Point. Its distance from Eagle Harbor is less than three and a half miles; and a good road can be made to that point at a moderate expense, and with gentle ascending and descending grades.

The entire location is covered by a beautiful growth of maple, birch, pine, basswood, balsam, spruce and cedar, sufficient for building and for all mining purposes, for many years. There is a small stream passing close by the mine, that will at all times afford all water that will be required for stamping, washing, steam-engine, etc.

Upon this location there are three large, well-defined and true native copper-bearing veins, all of which are composed of much the same material, situated in the same metalliferous range of rock, and within half a mile of each other, on which account a description of one will answer for all.

Vein No. 1 has been opened at several different points within some two thousand feet, by cross cutting at the surface. It will average from 2 to 2½ feet in width. The direction is N. 10° W., and its dip nearly vertical. The vein stone is a mixture of calc spar, quartz, prehnite, chlorite and laumonite, and it is as thoroughly charged with native copper as any vein I ever saw, while the proportion of silver exceeds that of any mine which has been opened on the south shore of Lake Superior. The vein is well defined, with two good, smooth walls lined with laumonite. It shows a combed structure, the vein-stone forming layers parallel with the course of the vein. Decomposition has taken place at the surface to some extent, leaving considerable masses of pure copper enveloped in the decomposed vein-stone and carbonate of copper. I can safely state that all the evidence which can be expected, or asked for, is here present to justify any scientific or practical man in asserting that this is a true native copper bearing vein of secondary completion, and that it will, when opened sufficiently, make a dividend-paying mine.

The veins on this location are so situated upon the southern escarpment of the trappean range, that an adit level can be driven in on their course, thus affording every facility for opening, draining, and working the mine, for some twelve hundred feet in length, and two hundred feet in depth, and all directly on the course of the vein where it will produce copper; and should it prove as productive as surface indications promise, it will pay a considerable portion of its expenses while the level is being driven, and as soon as stoping is commenced it will pay a handsome profit, which will be increased as the work progresses and the force is increased. These veins are composed of the same material and have the same geological position as the Cliff (Pittsburg and Boston), North-Western, North-West, and other productive mines in the country, and in every particular compare favorably with them. The principal vein produces more silver than any other mine thus far opened in the country, in proportion to the amount of work done.

My explorations were made upon this tract with a view to future mining operations, and taking into view the advantages of timber in the immediate vicinity, water at the mine, the proximity of a good harbor, the great facilities for draining and working a mine, and, above all, the promising character of the veins, I can safely recommend it upon its merits as too valuable not to be opened and worked, especially at the present prices of copper and silver.

TOLTEC CONSOLIDATED MINING COMPANY OF LAKE SUPERIOR.

Shaft No. 1, 60 feet; shaft No. 2, 201 feet; shaft No. 3, 220 feet; shaft No. 4, 145 feet; together 626 feet of shafts. The 10 fathom level is driven 1073 feet; the 20 fathom level is driven 428 feet; 1350 feet has been stoped, thus making about 15,334 cubic feet of mineral matter raised to the surface, which will produce 76¾ tons of pure copper, and by thus driving the levels and sinking the shafts 115,760 cubic feet have been opened and prepared for stoping, which will produce 578¼ tons of pure copper.

The cost of sinking shafts and driving levels at this mine will average about 20 cents per cubic foot, while it costs only about 10 cents per cubic foot for stoping. Thus it will be seen that to stope 347,280 cubic feet of ground will cost $34,728 and will produce 578¼ tons of pure copper, which, at 25 cents per lb., would amount to $289,100.

This estimate is based upon an average of one foot width of vein and containing five per cent. of copper (including mass, barrel, and stamp copper), when in fact it is seldom worked when it is less than a foot wide.

Through a great portion of this mine it is from 20 inches to 3 feet wide, and at several points swells to 3½ to 4 feet in width, well charged with masses of 2,000 lbs. downwards to barrel and rich stamp work.

It is a true vein of secondary completion, has good and well-defined walls, a combed structure, and perfect cleavage.

It will be a profitable, dividend paying mine, as soon as the stamps are put into active operation, and the copper prepared for market.

ALGOMAH MINING COMPANY.

The mine is situated on the east side of the Toltec, and this Company is working the same vein by sinking two shafts, and driving an adit level, which will connect the shafts at a depth of 40 feet from the surface, thus draining and ventilating the mine.

The vein, at this point, is composed of the same materials—has good and well-defined walls, and in every particular compares well with the Toltec mine.

It is safe to estimate the value of this mine the same as the Toltec, taking into consideration the difference of work done.

THE ISLE ROYALE AND PORTAGE MINES.

The Isle Royale and Portage mines are truly mammoth veins, varying in width from five or six feet to between twenty and thirty feet. The greatest depth attained in the former is now 130 feet, and abounds in small mass and barrel copper, rather than stamp work. There is no doubt in my mind these are good, true, and well defined veins, and, judging from what is now in sight, I am satisfied that ere long they will be dividend-paying mines. The present force employed is 80 men, including 36 miners.

The Portage and Albion both have the Isle Royale vein, but are now at work on another of the same character, and of equal width and promise, and will undoubtedly make good dividend paying mines. This same range undoubtedly extends a long distance, probably throughout the formation. The Huron Mining Company are at work on the same vein some miles south west, and there is no doubt that it extends through the Ripley, Washington, and other mines to the north-east.

The Fulton continues to look well. The vein, in some points, is full two feet wide, carrying rich stamp and barrel work. The Company have 70 men employed, of whom 34 are miners. The greatest depth attained is [illegible] feet.

W. H. STEVENS.

Extracts from letters received from Lake Superior, dated 15th December, 1853.—

The Cliff continues to show *masses* as usual. Their principal mine-work this winter is in sinking shafts and extending levels, preparatory to stoping during the summer, when the copper, as fast as raised from the mine, can be sent to market.

At the North American they are sinking shafts and driving levels, to open their mine on a more extensive scale. The vein proves exceedingly rich in all places of working, carrying mass and barrel copper. There is some 20 tons, of the 200 tons mass, still in the mine, besides many smaller masses of two and three tons and upwards.

The Copper Falls mines are being opened upon a more extensive scale than any other on the Lake. The deep adit level commenced in October last, at the base of the mountain, will drain the mine about 500 feet deep, and open an immense block of ground for stoping, at a much less expense than is usually incurred. Their vein is now opened some 1,500 feet in length and 250 feet deep, from which has been taken more than 150 tons copper, and there is now more than 100 tons of mass and barrel copper in sight in the mine. The present appearance of their working fully warrants the opinion that their shipments of copper next season will be upwards of 500 tons.

W. H. STEVENS, 51 Wall st., New York.

January 23d, 1853.

THE COLLEGE AND HEPLER COPPER MINES.

We take the following extracts from the report of Dr. Eights on these mines:—

The Hepler vein is situated about twenty miles in a south-westerly direction from Greensboro', and but a short distance from the route of the Great Central Railroad, from the north. It occupies a position at the commencement of one of those slight depressions in the soil, which extends in a northern direction, and terminates in a salt ravine. The limit of this vein in extent is at present not definitely known, but from the indications presented to view, there can exist little doubt but that it continues along its course for some miles in either direction. It pursues its range in a direct line from the north-east to the south-west, which perfectly corresponds to the course of the complete vein system throughout the state. Its breadth is various, converging in some places in such a manner as to bring the walls in immediate contact, and then again suddenly swelling out into extensive masses, which may be seen successively to alternate throughout its whole extent. The matrix of the vein is white quartz, frequently colored of a rusty brown, from the oxidation of the iron which it contains.

The next vein which became the subject of our investigation was that which is termed the "College Mine," situated about thirteen miles from Greensboro', in nearly the same direction with the other, and about equally distant from the railroad track. Its position is very interesting, being placed at the juncture of two small streams, where they intersect each other at nearly right angles. One of these streams seems to follow, in a manner, the course of the true vein, while the other, without doubt, will be found to continue in the direction of a cross course to the principal vein, meeting directly at the touching point of the steams near where the shaft is sunk into the vein. The white quartz matrix, at this place, presents a beautiful appearance, cropping out at the surface of the ground for some considerable distance in breadth, and exhibiting the bright and pure marks of copper pyrites, of various dimensions, and at somewhat regular intervals throughout its whole extent. This surface copper is generally united with combinations of crystallized iron pyrites, which seems gradually to disappear as the vein increases in depth, until it is scarcely to be found, but in the smallest granulated proportions. The shaft has here been sunk into the vein for the distance of about fourteen feet, and many exceedingly rich and beautiful specimens of copper pyrites have been thrown up from that depth; and what seems very interesting to us is, that they do not appear to be associated with any other mineral of the vein, but dispersed at short intervals in quite extensive masses, through what appears to be nearly pure white quartz. This matrix, however, upon a closer inspection, is found to contain among its constituent parts a very large proportion of carbonate of lime, which causes it freely to effervesce upon the application of acids.

MANASSAS COPPER MINE.

This mine is in the neighborhood of Manassas Gap, Fauquier Co., Virginia. From a report of Prof. Piggot, under date of November 12th, 1853, we make the following extracts relative to the progress of operations at the mine:

Considerable progress has been made in excavation since my visit in March last. A shaft has been sunk to the depth of about 66 feet, cutting a vein of red oxide of copper near the top of the hill and at a distance of about 20 feet below the surface. I saw several tons of ore of fine quality lying near the shaft, and taken, as I was informed, from the vein alluded to. From near the bottom of the shaft a drift is being made in a north-westerly direction with a view of cutting some of the veins at this high level.

Lower down the hill a pit has been sunk to the depth of about 12 feet. This also cuts near the surface a bed of very fine red oxide of copper. Several tons of very rich ore lie also about the mouth of this shaft.

Still lower, an adit 125 feet long has been made, which is expected to cut some of the veins of red oxide at about 250 feet vertically below the surface. It is not perfectly straight, but its general direction is north-west. In this adit a lode has been opened, to which I will presently allude.

A very considerable quantity of ore has been taken out of the different trial shafts, etc., already spoken of. Much of this could be sent directly to market, and with a little breaking and culling by hand, several tons (say from 30 to 50) of a high per centage could be immediately obtained.

There is also much excellent ore in the boulders which lie scattered over the surface. Breaking them at random as I climbed up the hill, several fine specimens of the red oxide ore were obtained. It would be idle to offer a conjecture as to the amount of metal thus offering itself to the Company, but it is probably very large, and it could be easily collected.

I have seen no reason to change the favorable opinion already expressed in my report of last March. The ore at the summit of the hill near the surface, and that contained in the boulders, is of the same character—red and black oxide (the former in greatest abundance) and native copper, disseminated through an epidote gangue. Of this there must be a great quantity, since every trial shaft which has been sunk, as well as every open cut which has been made in suitable places, has turned out notable quantities of this valuable ore.

The veins in the railroad cut spoken of in a previous report, contain the different sulphurets of copper. A very large quartzose lode has been opened by the excavations for grading the railroad. It has, however, been cut only on the upper surface or back, so that no definite opinion can be formed of its value, but from its appearance will probably produce well. This could probably be determined by sinking a trial shaft or series of pits to the southeast of Mr. Hall's house, or by driving an adit to the south of the railroad as recommended by Mr. Silliman.

In the adit, as anticipated by Mr. Silliman, the back of a very powerful lode has been opened at about 60 feet horizontally from the surface. This lode is at least 12 feet across in the diagonal section which the drift has made—its walls, as far as can be at present seen, are perfectly well defined. The slate around it seems condensed and otherwise altered as if by the agency of fire, and the strata are dislocated. The body of the lode, as nearly as can be determined from the slight opening that has been made into it, appears to be composed of the same igneous rock which constitutes the vein stone in the other lodes on the property. Quartz is also found abundantly in it, and yellow sulphuret and vitreous copper are diffused through both it and the slate immediately covering it. This vein ought certainly to be opened and examined, as its appearances are very promising. This could be done without disturbing the floor of the adit, by cutting it through upon the north side of that drift.

The direction of this lode is, like the others, north and south, with an inclination to the east.

At the head of the adit, about 125 feet from the opening, the back of another quartzose lode had just been reached and exposed when I left.

Thus much has already been done with trifling labor compared with that usually demanded for mining explorations. From the abundance of surface copper, and the numerous indications of metal, it cannot be reasonably doubted that other veins will be exposed during the progress of the excavations. There is every reason to hope and expect a large return from this property when the resources of the place shall have been fully developed. Like all mining operations it requires time and energy to make it productive.

NEUVITAS COPPER MINE.

From the statement of the President, Mr. F. G. May, we gather the following particulars relative to the operations of the Neuvitas Copper Co.:—

A letter received on the 10th of November from Mr. John Eaton, states, in a postscript, that the engine and machinery had just arrived safely at the bay of Mayanabo, the nearest point for shipment on the Neuvitas railroad. The season of incessant rain having closed two months since, and, inasmuch as the mine is located only three miles distant from the railroad, and at a point 24 miles from the bay of Mayanabo, there is no doubt that at this time our engineer, Mr. Rupert, and his assistants, have accomplished the erection of the engine, engine-house, and other preliminary work.

Mr. Hugh McCafferty, the superintendent of the mine, having sailed on the 8th of November with the pumps for exhausting the water in the shaft, the rollers and crushers for preparing the ore for market, tools for the workmen, powder for blasting, etc., the weather being pleasant, has no doubt arrived in Cuba, and is now at the mine, prosecuting the work in the shaft, and other duties, with his known industry and perseverance.

The location of the mine is quite favorable, situated about 350 miles from Havana, and about midway between Principe and Neuvitas, being 24 miles from the latter port, of which distance 21 miles can be accomplished by railroad.

The vein is about 5 to 8 feet wide between the walls, carrying a lode of rich yellow sulphuret of copper, averaging nearly 4 feet in width, yielding from 20 to 28 per cent. of metal under smelting process.

There have been three shafts sunk on this property, two of which are trial shafts, and one sunk for an engine shaft to the depth of 46 feet, heavily timbered with the tropical hard wood found upon the island, and which bears such a veritable character for durability and strength. An ample supply of the same excellent quality of timber is on hand for continuing the woodwork of the shaft as it progresses, and much of it is already hewn out, and cut in the right dimensions, to be used as soon as required.

The shaft has been carried down to a point where the work can be pushed forward with a speedy profit, having reached the bed of ore, and only awaiting the placing of an engine to remove the water, to enable the ore to be raised and ready for shipment. A quantity of the ore taken from the shaft by a common windlass, during its construction, is at the mouth of the pit, and will be shipped to this port during the present season. One hundred tons, raised by a windlass, have already been shipped from this mine to Swansea, England, sixty tons of which yielded 28 per cent. of copper. The ore is remarkably clear and clean; free from gangue stone, and can be worked with ease and rapidity.

There are two houses built on the grounds—one for the superintendent, and one for the laborers, 50 by 40 feet.

Timber requisite for the use of the mine is on the ground. About one hundred and twenty-five cords of wood, for fuel for running the engine, is cut and in readiness for use.

The machinery now at the mine consists of a forty-horse-power engine, built expressly for the Company, by Messrs. Field & Bro., of North Point Foundry, Jersey City. The engine is of a substantial character, and is an excellent piece of workmanship. There is a lift of pumps of 14-inch cylinder, amply sufficient to exhaust the water from the shaft for years to come. The rollers and crushers, for preparing the ore for market, were also newly made at the same foundry; they are heavy and strong, and promise to be very durable.

A sufficient quantity of tools for the miners, carpenters, and blacksmiths, with a portable blacksmiths' forge, were shipped at the same time.

THE ELIZABETH MINE.

A Committee of the Directors of the Ocoee Company, Messrs. May and Hickok, have made an examination of the Elizabeth Mine, the condition of which is thus stated:—

The surface improvements consist of several buildings erected with a degree of taste and permanency seldom witnessed in buildings connected with mines. They were made mostly from stone taken out in sinking the shaft. One, a story and a half high, with three apartments on each floor; up-stairs used for lodging-rooms; lower rooms, two are for the use of the Company, one is occupied by one of the men employed on the work. There is a blacksmith shop about twenty feet square, a powder magazine, a good engine-house and stack. The whim capstan and fixtures were in perfect order, and sufficient for the use of the mine for years to come.

After making a minute examination of what was on the surface, we descended the shaft, which was commenced by Capt. Blewett at the surface; it is now one hundred and forty feet deep, about eight feet by ten feet inside of timber; has a division near the middle, one part for the cable to run in, the other occupied by the pump and ladder. It is timbered in a very substantial manner, with white oak, to the depth of about one hundred feet, having heavy corner posts, with cross beams framed in. At the depth of thirty feet an adit had been driven up to receive the water from the pump, and at the depth of eighty feet there is a cross-cut communicating with the old mine formerly worked for iron. This opened the works, which were only useful for ventilation, after a heavy outlay of timbering, etc.; at this point the vein was thirty feet from the shaft. The vein dips at an angle of about forty-five degrees, to the depth of one hundred and fourteen feet, where it changes and appears nearly horizontal as the shaft passes through the hanging wall.

The shaft is sunk twenty-six feet in the vein, but not through it.

Captain Blewett proposes to go down ten feet lower with the shaft, then drive a level on the vein. The shaft passed through a hard gneiss rock; the vein gangue is the calcareous spar, containing iron, and yellow copper pyrites, with some blende. As we descend on the lode it improves in copper; the other accompaniments diminishing. Much of the vein as it is thrown out will yield from seven to ten per cent. of copper. Should this immense vein extend across the Company's property, which is about one-third of a mile in breadth, carrying no more copper than it does now, it will prove of very great value.

There is enough ore out, we should judge, to make thirty tons of fifteen per cent. ore if dressed. If dressing tables could be arranged this fall, we would recommend that the ore be prepared for market before winter sets in.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

LEAD TRADE OF THE UPPER MISSISSIPPI.

We make room for the following abstract of the lead trade of the Upper Mississippi, as being more complete than any previous statement which has appeared.—

Years.	No. of Pigs produced.	Weight in pounds.	Price of 1,000 lbs. Mineral.	Price of 100 lbs. Lead.	Actual value in Galena.
1842 . .	447,909	31,353,630	$12 85	$2 64	$702,321 31
1843 . .	559,261	39,148,270	12 60	2 54	916,089 51
1844 . .	624,672	43,727,040	16 68	3 52	1,220,857 19
1845 . .	778,498	54,494,860	17 67	3 96	1,613,247 93
1846 . .	732,403	51,268,210	17 38	2 83	1,441,611 26
1847 . .	772,656	54,085,920	19 16	3 17	1,714,323 65
1848 . .	681,969	47,737,830	19 62	3 24	1,546,703 69
1849 . .	628,934	44,025,380	22 13	3 67	1,615,731 44
1850 . .	568,589	39,801,230	24 10	4 20	1,671,551 66
1851 . .	474,115	33,188,050	23 51	4 03	1,334,462 44
1852 . .	408,628	28,603,960	23 87	4 12	1,178,443 05
1853 . .	425,814	29,806,980	24 41	5 60	1,669,383 90
Total . .	7,103,448	497,241,360			$16,657,958 96

We also have the following statement of the shipment of lead from the Upper Mississippi Mines from March 21 to December 1, inclusive:—

Places from whence shipped. Shipped south via river.	No. of Pigs.	Weight in pounds.	Value at Mines.
From Galena	318,543	22,[illegible]5,[illegible]10	$1,224,240 55
From Dubuque	43,852	3,0[illegible],440	17[illegible],350 20
From Potosi	28,086	1,616,[illegible]20	48,8[illegible]1 10
From Cassville	14,106	98[illegible],020	54,616 10
From Buena Vista	2,676	167,380	10,353 60
From Mines on the east side of river to the Lakes . .	25,471	1,642,970	90,368 05
Total	425,814	29,336,990	$1,689,386 90

The above statements show the importance of the lead trade of the Galena mines—their product amounting in twelve years to nearly seventeen millions of dollars.

The silver coinage of the Philadelphia Mint during 1853 was as follows:—

Pieces.	Value.
55,7[illegible]1,068	$7,852,571

The silver coinage for December, 1853, at the same Mint, was as follows:—

7,110 Dollars	$7,110
448,700 Half Dollars	224,350
268,000 Quarter Dollars	67,000
3,6[illegible],[illegible]00 Dimes	368,500
5,040,000 Half Dimes	252,000
9,4[illegible]1,810	$914,260

THE LEAD MINES OF WISCONSIN.

The following interesting particulars of lead mining operations were furnished by a correspondent to the *New York Tribune*:—

The great lead region of the Upper Mississippi lies chiefly in Wisconsin. Prof Owen, United States geologist, says:—"The lead region includes a strip of about eight townships of land in Iowa, ten townships in the north-west corner of Illinois, and a lot of sixty-two townships in Wisconsin. The entire district includes about eighty townships, or two thousand eight hundred and eighty square miles." The mineral townships of Wisconsin are nearly all in Grant, Iowa and La Fayette counties; a few mines are being worked in Dane and Greene counties, but their product is small. The largest mining business has always been done in Grant, though it frequently happens that miners are most lucky in other sections. At this time, there are extensive *leads* worked at Shullsburgh in La Fayette county, and at Beetown, Hazel Green, Wingville, and Fairplay, in Grant county. They are also doing an excellent business at Highland, in Iowa county, where the principal *black-jack* or zinc mines exist. The magnesian or mineral rock, in which the lead ore is always imbedded, lies deeper in the south tier of mineral towns than in the north tier, owing to the dip or pitch of the rock strata as you approach the south and the rise of the north. The mineral rock outcrops along the bluffs on the south side of Wisconsin River, and passes under the coralline layer of limestone in Illinois a few miles south of Galena. Hence, miners have to sink deeper in the south than in the north sections of the mines; the mineral rock is also much thicker as you approach the south. Geologists estimate the thickness of the lead-bearing rock, in the southern mines, at 400 feet and upward. The lower magnesian lime rock underlies the upper magnesian, and is thought to be inferior as a producer of lead. At the depth of about 74 feet, the water becomes a great obstacle to miners. They frequently put on pumping machinery worked by horse power, but with the best of these, they are only able to lower the water about a dozen feet. The American Mining Company, whose head-quarters are in New York, have erected expensive machinery, driven by steam power, at the Fairplay mines, by which they expect to drain a section or more of land to the depth of 100 to 200 feet.

From reports, their expectations will be fully realized. The mineral lands are generally owned by residents, who leave them free for all to work upon, at a fifth to a seventh of the mineral for rent. There are certain usages which uniform custom establishes as the law of miners, rather than the law of statutes; and the equity of such usages is conceded by courts. The land proprietor cannot charge a higher rent for a new and valuable discovery, than was the custom before for very small discoveries. One miner cannot dig in bounds, or within the run of another's *lead.* The following is the usual method pursued by miners in working:—Ten men compose a company, forming a partnership; they work alternately in the shaft and at the windlass. The less energetic companies work over old diggings, and seldom accomplish more than to find little patches and small particles of ore, left by former operators. Such as have strong inclinations to make fortunes, go to "prospecting," which means hunting over unexplored grounds. Each spot is proved and abandoned as the appearance of clay, rock and other matters seem to direct. Miners are excellent judges of "the signs." Weeks, months, years may elapse before any valuable discovery is made. Poverty usually gnaws at the stomach and renders thread-bare several suits of clothes before pay day comes round. It requires strong faith, unflinching endurance, and the luck of a fortunate gambler for a successful miner. It would be difficult to state the profits of mining. The yield is so variable, and so frequently do miners spend months without raising a pound of mineral. One thing is an established certainty: miners generally have plenty of money, and they spend it freely for every kind of purpose. Sometimes a company light upon an immense fortune for the labor of a few days or weeks. When they work on old diggings the average *per diem* may be about $2 to each partner. A good miner gets about $1.50 on wages. For the purpose of showing the yield of the Wisconsin Mines, the following statistics are presented, from an official report to the Legislature of Wisconsin:—The average shipment of lead annually from Galena, Ill., for eleven years preceding 1851, was 41,727,028 pounds; estimated value, $1,660,[illegible]. It is estimated that at least nine-tenths of the lead shipped from Galena is raised in Wisconsin, and not more than one-tenth of the entire product is raised in Illinois or Iowa. There are, also, large shipments from the ports of Potosi, Cassville and other points in Grant county. The lead exports annually produce about $[illegible].51 to every man, woman and child in the mining counties, and an annual yielded return of 34 cents upon every dollar of taxable property in the mines. It is doubtful whether the proportions are so high at this time, since agriculture is fast becoming a leading occupation and mining only a second or minor pursuit. It would be safe, however, to say that more lead has been raised the past year than in any former one.

From the same source we have these additional particulars:—

The high price our great staple has borne this year is giving an impetus to the mining interest. The amount shipped this season will show a large increase over the last. Many rich lodes have been discovered in the vicinity of Galena, which are being profitably worked. Capitalists are coming in and investing their means in our mines. One company, ten miles north, near Sinsinawa Mound, are sinking a deep shaft, using a powerful engine, with pumping apparatus, in order to drain the ground in that section, and also to test the practicability of working the mines to a much greater depth than they have been heretofore. I have no doubt they will be successful in the enterprise. As yet we have but skimmed the surface of our mineral grounds. So soon as capital and labor are scientifically applied in developing the mineral resources of this country, the results will prove to be beyond our most sanguine anticipations. The formation of this whole country is in vast basins. It is only on the edges or outcrop of these where the most of the mineral has been raised. Within these basins, when shafts are sunk to a greater depth, will be found inexhaustible stores of mineral wealth.

American Mining Company.—The operations of this Company are thus stated in one of the publications at Galena :—

This Company, engaged in the erection of extensive works near Fair Play, for the purpose of making a systematic search for lead, is a very heavy concern. It has mines in Cuba, in New Grenada, in North Carolina, on Lake Superior, and in Pennsylvania, and, if we mistake not, in New England. All operations connected with the concern are conducted in silence, but with diligence and effect. So marked is the policy of the Company in this respect, that, though its agents have now been at work nearly a year, in securing lands and putting up machinery, we suppose there are not half the people, even in Galena, who know of the existence and purpose of such an organization.

So far as we can learn, their prospects here are of the most flattering character. They seem to have made a good location; to have been fortunate in choice of machinery, and in the selection of men. Success seems certain. We think it beyond any reasonable doubt, basing our opinion upon what little we know of the geological formation of the country, that the American Mining Company will demonstrate, conclusively, the existence and accessibility of large bodies of mineral, at depths which have never before been reached. If our anticipations are realized, the effect upon the general prosperity of the mining district can hardly be calculated.

SILVER MINE OF DUACA.

To the Editor of the Mining Magazine.

SIR.—This mine is situated in the village of Duaca, seven leagues (12 miles) from Barquisimeto, the capital of the Province in Venezuela, and seventy leagues from Caraccas, the capital of the Republic. It is in 71° 37′ long. west of Paris, and 9° 56′ north latitude, and 1,050 varas (yards less 8 per cent.) above the level of the sea. The temperature of the neighborhood is 17° 20′ centrigrade, and in the adjacent mountains the thermometer falls as low as 13°. The climate is very salubrious—no epidemic sickness or fever of any kind has ever made its appearance there.

There are in the circuit close around the mines, several streams of fresh water. The soil is dry and accessible to all winds. The population of this province is 17[illegible],000, and that of the village of Duaca about 4,000, who are people of mild character and good morals.

Duaca is sixty miles from the seashore, and not far from the navigable river of Facuzo, to which there is a road which may be easily put in order for wheel carriages, or upon which a railway could be laid at inconsiderable expense, as there is hard and good timber in the adjoining fields.

In the region around for about ninety square miles, all the productions of the temperate zone will flourish. The land is well watered and well timbered. It is national property and can be bought at a trifling rate, (say a dollar and a half for a square of a hundred varas). Emigrants can obtain them without paying for them, if put under cultivation in four years.

The Duaca silver and gold mine has three veins, two of silver and gold, or auriferous silver in quartz, and one of copper. Each of the veins is 600 varas by 150, which, according to law and the inclination of the veins, is one lot, or *pertenencia.** This mineral territory is very extensive and rich. By the

* This sentence of our correspondent will not be understood by all our readers without a little explanation. The law of the State [illegible], of that of Mexico, declares a certain length and breadth on the vein to constitute [illegible]. But the inclination of the veins, under the laws of Mexico, to be taken into account, as may be illustrated by the following extract from the Royal Ordinances for New Spain.

"When the vein is perpendicular to the horizon (a case which rarely occurs), a hundred level yards shall be measured on either side of the vein or divided on both sides.

"But where the vein is in an inclined direction, which is the most usual case, its greater or less degree of inclination shall be attended to in the following manner :—

assays made of ore found here, the mine presents a prospect of being richer than the famous mines of Guanaxuato, in Mexico. The minerals here are very abundant and rich, and the assays always rich; the highest, obtained from over 80 feet below the surface, has been 19 per cent. of silver, comprising 6 per cent. of gold.

RIVILLA SILVER AND GOLD MINE.

There is in Carrupano, at two or three miles from the Gran Probre silver mine, another mine called Rivilla. It is now worked under the direction of Mr. Charles Kessler, by a company which was formed at Caraccas, with a capital of $20,000. This mine is very rich, and the assays made were $2,000, $1,000, and $500 to the ton of ore. The directing engineer is at present in the United States collecting miners, and the implements necessary for working the mine. These veins were discovered by him; one of them is auriferous silver, and the other copper and gold.

The district in which this and the Gran Probre mine is situated, is only six miles from the seaport of Carrupano, and very rich in minerals, veins of ore are found in the hills as the roads are opened or the soil disturbed.

MIDDLETOWN SILVER LEAD MINE.

This mine is situated in the vicinity of Middletown, Connecticut. From the recent report by Prof. Charles A. Shepard, we gather such particulars as describe the progress of operations since our last notice of the mine in Vol. I. No. 2.

I have attentively perused the reports of Dr. James G. Percival and Mr. J. D. Whitney; and so far as the laying down of the veins, and the description of their magnitude and the character of the formation in which they occur, are concerned, I quite agree with the statements they have put forth. Some slight changes, however, have doubtless taken place in the character of the indications, as the explorations have been carried forward, since the date of their reports. I do not find, for instance, more than mere traces of calcareous spar (carbonate of lime) or of fluor spar. Heavy spar (sulphate of barytes), native silver, or any ore of nickel, are not at present to be recognized among the produce of the mine. But I detected occasional crystals of arsenical iron (mispickel), an ore which often accompanies cobalt and nickel, (as, for example, at the neighboring mine of Chatham, four miles distant.) It is likewise a frequent attendant of tin and silver; and on the whole, is an omen highly favorable to the mine. I was much struck also with the inspection of a number of specimens of iron pyrites, in long, slender crystals, implanted upon crystals of calcareous spar. They are precisely identical in character with a specimen from the silver mining districts of Saxony, which was sent to me by Prof. Breithaupt, of the Royal School of Mines at Freiberg, and which I have never seen from any other locality. I noticed likewise one specimen of nearly compact lead ore, which had evidently formed a bounding surface of the vein, upon which were numerous crystals of carbonate of lead, by which I was

* If to one yard perpendicular the inclination be from three fingers to two palms, the same hundred yards shall be allowed for the square as in the case of the vein being perpendicular.

* If to the said perpendicular yard there be an inclination of

2	palms and	3	fingers,	the square shall be of		112½	yards.
2	"	6	"	"		125	"
2	"	9	"	"		137½	"
3	"	0	"	"		150	"
3	"	3	"	"		162½	"
3	"	6	"	"		175	"
3	"	9	"	"		187½	"
4	"	0	"	"		200	"

strongly reminded of the silver-lead mine, known as the Washington Mine, in Davidson county, North Carolina.

But the most remarkable change in the mine, relates to the occurence of a rich and valuable copper ore, at present visible on the bottom of the main lode.

ORES OF THE MINE.

My attention has been particularly directed to the determination of the ores afforded by the mine, and to the proportion of silver they respectively contain.

Passing by the carbonate of lead (white lead ore) as too trifling in quantity to deserve more than merely to be mentioned, we have at the Middletown mine, three varieties of galena, viz.: 1. the *coarsely cubical* (including the regularly crystallized, which is very uncommon); 2. the *feathery* (or curved lamellar and sub-fibrous); and 3. the fine *steel ore*.

The proportions in which they appear to exist, so far as at present developed, are 7-8ths for the first variety, about 1-16th for the second, and 1-40th for the last,—thus leaving a small portion of the produce of the mine unaccounted for, and which may be set down partly to errors in fixing these proportions, and partly to the intermediate character of a portion of the ores, which occupy a midway position between one or the other of these varieties.

It thus appears that the steel ore is not an abundant produce of the mine, although its presence has been particularly sought under the impression of its superior value for silver. Nor do I think from present appearances at the mine, that it is likely to prove more abundant in the future workings than it has been in the past—a circumstance on which the Company will, I am confident, rather congratulate themselves than otherwise, since it turns out to be the poorest ore of the three for silver, besides having the further disadvantage of containing a notable proportion of the worthless blende and iron pyrites, in such a state of close admixture as greatly to injure its value for lead itself.

Desirous of settling the practical value of your ores in the most conclusive manner possible, I was supplied with three samples of them by Mr. Johnson, for an assay by Hugh L. Pattinson, Esq., the highest authority in England in whatever relates to the entire business of silver-leads. I herewith annex Mr. Pattinson's letter to me containing the results obtained:—

10 GREY ST., NEWCASTLE-ON-TYNE,
4th August, 18[illegible].

PROF. SHEPARD:

My dear Sir:—The three samples of silver-lead ore you left with me have been carefully assayed, and the result is, as I expected, pretty near that of the former trials.

	Lead per cent.	Silver in 2240 lbs. of the lead. oz.	dwts.	gr.	
No. 1	13, 5	75	9	23	(troy)
" 2.	31, 0	35	5	14	"
" 3.	23, 3	26	13	3	"

The lead produce is not of much consequence, because each sample contains foreign matter, from which it would be freed by washing, when produced in the large way.

Yours very truly,
H. L. PATTINSON.

Numbers 2 and 3 are both of the fine-grained, or steel-ore variety, whose yield in silver is little more than half that of Number 1, the coarse cubical ore.

The inspection of Number 3 becomes highly interesting, as confirming the view here presented of the value of an ore which had been selected expressly by Mr. Johnson, in order to establish the favorable opinion of the mine as described in the previous reports; and although the specimen appears to the naked eye as chiefly composed of lead ore, the produce of lead is not above one-third what it would have been, in a stone of pure, coarse-grained, or feathery ore.

The feathery ore not having been distinguished prior to my selection of samples at the Company's office, in New York, no specimen of it was taken with me for assay in England. I have therefore devoted my attention particularly to its examination since my return. In some respects it is a very peculiar variety of galena, and at first I thought it contained traces of the metal antimony, and was uncommonly rich in silver. Subsequent trials, however, satisfied me that neither of these suppositions were true of this variety taken as a whole, though it occasionally gave indications of antimony, and was sometimes highly argentiferous, one specimen having yielded as high as 90 ozs. to the ton of lead (of 2,000 lbs.) Its average produce is 56 ozs. 12 dwts. to the ton of lead. As a silver-lead, therefore, it occupies an intermediate position between the coarsely cubical and the steel ore.

I have occupied myself also with several trials of the coarsely cubical and the steel ore, as recently furnished by the mine, which have been attended with results strikingly coincident with those obtained by Mr. Pattinson.

The important conclusion arrived at, therefore, and which may now be deemed perfectly secure, is this, that *seven-eighths of the Middletown lead-ore contains silver, as high as 75 ozs. to the ton of lead*, and that the remaining one-eighth will average as high as thirty-five ounces.

INDICATIONS FOR COPPER.

It remains to treat of the promising indications for copper which your mine has very lately begun to present.

Yellow copper pyrites had been visible in traces throughout the different veins, from the first, usually in little angular masses of the size of a pea, sometimes as large as a chestnut, and again in little threads or strings, more or less mixed up with the blende (sulphuret of zinc), galena, and iron pyrites. But it had shown no tendency to the formation of a vein by itself, to the exclusion of the other ores, until the present depth of 170 feet from the outcrop (equaling about 100 feet perpendicularly from the surface) of the main lode, on the east side of the brook. On my first visit to the mine after my arrival from England, my attention was called to several large stones of this copper ore, freshly brought up from this part of the mine, but I did not then suppose that they formed portions of a continuous vein. On re-visiting the mine one week after, however, and descending to its bottom, I was agreeably surprised to notice, for a distance of several fathoms, to the west of the sump, in the lowest part of the mine (and quite to the end of the adit), *a well-defined rib of handsome copper ore*. It was sometimes for a short distance split into two seams, by the intervention of a few inches of the quartzy vein-stone. The entire thickness of the copper often averaged two and a half inches. It is massive in its character, free from all intermixture of crystals or of other ores.

In a level 60 feet higher up upon the vein, I had noticed iron pyrites to be rather abundant in portions of the lode which had been left standing as too poor to be taken down for lead, and it now appeared, in accordance with what has often been observed elsewhere, that the copper pyrites had been substituted, as the vein descended, for this worthless *mundick* of the miner (as it is called) of the upper levels.*

Already a ton or more of excellent ore has been raised. And when we remember that it accords with the most extensive experience in British mines, that copper rarely "*makes*" to any valuable extent before sinking to fifty fathoms from the top of the ground, this discovery has a still greater significance.

Indeed it has occurred to me in connection with this discovery, that your property, when fully explored, will be found to embrace two systems of veins

* It has passed into a proverb with miners, that all good copper lodes have mundick near their outcrops, or upon their backs.

or lodes—one set consisting of east and west veins (to which the main lode containing the copper belongs), and another running north and south (to which at least one of the lead veins on the west of the brook belongs). The former of these sets may be expected to carry copper, and the latter silver and lead, in accordance with what has long ago been recognized in the great mining district of Cornwall, where the tin and the copper occur in the east and west veins, and the lead and silver in the *contra* lodes, or those whose general direction is north and south.

In concluding this report upon your mine, I cannot refrain from observing that as yet it can scarcely be said to be opened, inasmuch as your workings have penetrated in the deepest place only about one hundred feet in depth, and have been confined almost entirely to one spot, whereas the veins extend in one direction upon your land, at least one-third of a mile, not including the portion beneath the bed of the river, where it is highly probable they will one day be wrought also. To pronounce with an approach to certainty, therefore, upon its character as a repository of mineral wealth in the present stage of its exploration, is plainly impossible. We can only describe such minerals as have up to this time been brought to light, together with those general features in the geological formation which may serve to connect the locality, in some sort, with old and well-established mines. In this latter particular, I feel fully justified in calling your attention with much emphasis to the striking resemblance of the vein-stone at Middletown, to that of the silver mines in the two great mining districts of Freiberg in Saxony, and Guanaxuato in Mexico.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE OF 1853.

The results of the coal trade of 1853 have been prepared with great care by Mr. Bannan, of Pottsville, to whose *Journal* we are indebted for the principal statement respecting them.

The following is the official quantity of anthracite coal sent to market, in 1853, from the different regions:—

Schuylkill.	1853.	Increase.	Decrease.
Railroad	[illegible]		[illegible]
Canal	[illegible]	88,657	—
Pinegrove	80,660	[illegible]	—
Schuylkill total	2,551,603	102,774	68,664
Lehigh Coal Region	[illegible]	–	[illegible]
Delaware and Hudson Co.	[illegible]		2,644
Pennsylvania Coal Co.	[illegible]	86,3[illegible]1	
Wilkesbarre	442,511	[illegible]	
Shamokin	[illegible]	—	10,346
	5,097,144	[illegible]	115,126
Wiconisco (semi-bit.)	[illegible]	2,150	
Dauphin do	23,000	—	4,639
	5,195,151	321,445	119,765
		119,765	
Increase in 1853		201,680 tons.	

Of the increase this year, Schuylkill county sent only 34,310 tons. More than the whole increase for the year was derived from the Wyoming region, near Wilkesbarre and Pittston, which was sent to market by the Pennsylvania Coal Company, *via* Delaware and Hudson Canal, and down the North Branch of the Susquehanna.

Schuylkill county has again supplied more than half the quantity of anthracite sent to market, in 1853, as the following shows.—

	Tons.
From Schuylkill county	2,551,603
From all other regions	2,545,541
Total quantity of anthracite sent to market .	5,097,144

The whole quantity of anthracite (and semi-bituminous, from the western end of the region) sent to market was:—

	Tons.
In 1853	5,195,151
In 1852	4,993,471
Increase in 1853	201,680
Add increase from Cumberland and foreign coal .	229,800
	431,480

Showing an increased supply of anthracite and bituminous coals, destined for the sea board, of 431,480 tons against 640,512 tons derived from the same sources last year.

The consumption of coal does not increase as rapidly as was supposed. In 1852, the increase was less than thirteen per cent and left a surplus in the market. This year the increased supply is less than nine per cent. from all sources. This, of course, is to be attributed to the high prices of coal during the latter part of the year—but taking the average of the last three years, the increase will not average over 12 per cent, if it will reach it. We see no good reason to believe that this average per centage in the demand is likely to be exceeded the present year, which would require an increase in the supply of about 623,000 tons, in 1854, from all sources, to keep the market healthy.

LEHIGH COAL TRADE.

The quantity of coal sent to market from the Lehigh region, in 1853, was derived from the following points:—

	1852.	1853.
Summit Mines	[illegible]	[illegible]
Room Run	[illegible],451	83,721
Beaver Meadow Co.	46,280	55,907
Spring Mountain, (Milnes)	139,627	125,137
Coleraine, (Cleaver)	37,781	58,012
Cranberry Coal, (Pardee)	48,920	51,217
Sugar Loaf, (Pardee)	41,768	44,[illegible]14
E. Sugar Loaf (P. and Carter)	12,566	[illegible]
Hazleton Coal Co.	[illegible]	124,[illegible]
Buck Mountain Co.	101,[illegible]	77,[illegible]
Wyoming	41,890	28,285
	1,113,924	1,080,546
	1,080,546	
Decrease in 1853	83,478 tons	

There would have been a considerable increase from the Lehigh region, in 1853, if so many breaks had not occurred in the Delaware Division of the Pennsylvania Canal, which greatly retarded the trade. If similar difficulties do not occur, the supply from this region can be increased from 100,000 to 125,000 tons in 1854.

STATISTICS OF THE ANTHRACITE REGION.

The following is a summary of an extensive table contained in the columns of the *Pottsville Journal.* This table embraced all the collieries in operation in the Schuylkill Coal Region up to June, 1853, except two collieries on the Lorberry Creek Railroad, Messrs. Wheeler and Miller's, and Greenawalt and George's. Messrs. Wheeler and Miller shipped last year 12,447 tons, and Greenawalt and George 692 tons. There is about two miles of underground railroad in the Lorberry Creek region, not in the table. From this chart we sum up the following information:—

Total number of Collieries	118
Red Ash do.	63
White Ash do.	55
Number of operators	92
Under ground railroads, miles	12½
Of which through solid rock, do.	6½
Steam engines employed in mining	210
Aggregate horse power	7,071
Equal to man-power, number	42,426
Power for hoisting and pumping, horses . . .	3,805
For pumping only, do . . .	1,375
For breaking and screening coal, do. . . .	1,891
Miners and laborers employed at Collieries . . .	9,792
Horses	468
Mules	569
Miners' houses out of towns	2,756
Whole capital invested in these Collieries . . .	$3,462,000
By individual operators, about	2,500,000
Deepest slope, yards	353
Shortest do	28
Thickest vein, worked at Heckscherville, feet . . .	50
Smallest do. . .	2

We have also gleaned the following from this table:—

All the coal lands now worked in the county are owned by *six* corporations and about sixty individuals. About twenty five of the owners reside in Schuylkill county, and the balance abroad. The proportion belonging to residents is small compared to that owned by persons residing abroad. In looking over the names of the owners in the table, it may appear doubtful whether these landholders possess the ability to make the necessary improvements for working their coal lands, or not, without acts of incorporation.

Not one solitary ton of coal was mined by any corporation in Schuylkill county during the year 1853—the whole product of two millions five hundred and fifty-one thousand six hundred and three tons was mined by individuals.

The coal rent will average about thirty cents a ton. The product of 1852, in Schuylkill county, was 2,551,603 tons. This would give an income of $765,480 to the landholders, in the shape of rents, for the year.

THE CUMBERLAND COAL TRADE FROM 1842 TO 1853, INCLUSIVE.

Years.	Jennings R. Valley. Tons.	Braddock's Run Valley. Tons.	Piedmont Region. Tons.	Total. Tons.
1842	757	951		1,708
1843	3,661	6,421		10,082
1844	5,156	9,734		14,890
1845	13,738	10,915		24,653
1846	11,240	18,555		29,795
1847	20,615	32,325		52,940
1848	36,571	43,000		79,571
1849	65,676	76,773		142,449
1850	76,930	119,918		196,848
1851	122,331	135,348		257,679
1852	174,501	159,677		334,178
1853	234,441	225,618	78,725	534,860
	764,027	841,020	78,725	1,678,778

THE CUMBERLAND COAL TRADE FOR THE YEAR 1853, IN DETAIL.

1853.	Jennings's R. Valley		Braddock's R. Valley.		Piedmont Region.		Aggregate.	
Month.	R. Road.	Canal.	R. Road.	Canal.	R. Road.	Canal.	R. Road.	Canal.
January.	11,645	1,023	[illegible]	1,451			[illegible]	2,474
February.	7,760	860	[illegible]	559			[illegible]	[illegible]
March.	11,902	9,896	11,102	[illegible]			[illegible]	[illegible]
April.	11,703	[illegible]	11,928	[illegible]			[illegible]	19,942
May.	[illegible]	[illegible]	[illegible]	9,165			[illegible]	23,549
June.	13,771	7,316	[illegible]	6,375			[illegible]	[illegible]
July.	14,830	[illegible]	[illegible]	[illegible]			25,473	[illegible]
August.	[illegible]	[illegible]	[illegible]	[illegible]	For the Season		[illegible]	[illegible]
September.	[illegible]	[illegible]	19,888	7,004			[illegible]	14,970
October.	[illegible]	[illegible]	[illegible]	7,366			[illegible]	14,756
November.	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]
December.	14,645	[illegible]	17,302	[illegible]			[illegible]	[illegible]
Totals.	150,382	64,060	155,276	[illegible]	70,560	5,165	376,220	137,760

The above tables were prepared by Mr C. Slack, the Superintendent of the Mount Savage Railroad, who has paid special attention to the subject for the last ten years.

The quantity of coal received at Boston in 1852 and 1853 was as follows:—

	1852.	1853.
Anthracite	431,270	362,006
Virginia—bushels	[illegible]	[illegible]
Foreign coal—tons	[illegible]	46,069
Do.—tons	9,343	5,242

Showing a falling off in anthracite of 69,264 tons in 1853, while there is no corresponding increase from other quarters.

PARKER VEIN COAL COMPANY.

This Company have sold their Caledonia Mines, consisting of 352 acres of big vein coal, to the Caledonia Company, on terms that will net more than $1,000 per acre. The Caledonia Company have organized, and will continue the working of the mines without interruption. The Caledonia Mines form no part of the great Totten and Jackson estates, which comprise 1,200 acres of the big vein, on which the Parker Vein company are at work mining the great bulk of their coal now coming to market. The Parker Coal Company has sold its line of steamships, comprising ten first class vessels, to a new company, formed for the especial purpose of carrying on the freighting business between New York and Baltimore. The new company will, it is said, immediately increase the number sufficient to meet the wants of the community.—*Cumberland Journal.*

WHITE ASH VEINS IN SCHUYLKILL COUNTY.

The following conclusions are drawn from the results obtained in boring for coal in the Schuylkill valley. The author, who is the editor of the *Pottsville Register*, writes in a sanguine spirit; yet the collieries of England far transcend any expectation here expressed:—

On the 28th of October last, the fact was established that this company had, at a depth of 384 feet 5 inches, reached the white ash veins on their property. Now, the completion of the process of development proves that the chief white ash veins of the anthracite region are these—one eight feet in thickness, and the other twenty five feet in thickness—twenty-one feet of slate intervening—making thirty-three feet of solid coal, as confirmed by the boring. There is, therefore, no basis for skepticism in relation to the existence of the white ash coal, and in an inexhaustible supply on this land, nor of its future availability and value. In the slate, under the eight feet vein, a stratum of iron ore was passed through, which was about twelve inches in thickness, and that this valuable vein of iron ore extends throughout all the land of that locality, is proved by the discovery of the same vein on E. W. McGinnes' shaft, sunk on the St. Clair tract adjoining. This theory has been long urged and sustained by BURD PATTERSON, Esq., of Pottsville; but as he stood alone in the matter it required this development to confirm it. The ore can be easily mined in large quantities by blasting, and the minimum value, when brought up to the surface, will be $1 50 per ton.

In the increasing demand for anthracite coal, the supply of which, the miners say, will never again be in excess, it is a fortunate result for the consumer that the existence of the white ash, in the first coal field is confirmed; as they will, at no distant day, receive from this region, hundreds of thousands of tons not calculated upon, and that will assist to furnish the supply, and prevent the too rapid enhancement of the price, which, from the present supply and demand, bears a really threatening aspect.

The white ash coal, in the first coal field, must be reached by shafting, a mode as practicable as by slopes, involving the same amount of power to bring it to the surface, but with more relative capacity. A shaft can be put down to the basin, and be furnished with all the necessary machinery and buildings, for a sum not exceeding one hundred thousand dollars, and from this shaft an annual product of at least five hundred thousand tons can be brought up to the surface. The coal exists in such quantities as to be inexhaustible, unless we feel disposed to originate calculations of exhaustibility based upon centuries and centuries ahead.

A single shaft, with its apparently huge products, can be followed by others, as the restriction relative to practicability and location, can only have an existence for want of capital, even on the lands of this company. We presume the public mind is not yet prepared for such seemingly immense operations and results, although they have been shadowed forth for years, by those familiar with the coal mining region, and who were practically intelligent in relation to its formation and contents. We can, however, assure it, that with the increasing demand for coal, there will be in the first coal field, operations that will effectually transcend the ideas of capacity and production herein indicated.

The annexed statement relates to the McGinnes shaft, of which mention is made above:—

The McGinnes shaft, of which you have heard so much, has demonstrated the theory, that the large white ash veins underlie not only our own valley, but the whole valley between the Broad and Sharp Mountains. The coal was reached in this shaft at the depth of about 450 feet, where the veins lie nearly flat, having but little dip; the coal is very pure and hard. This shaft is located near the middle of the Carey property, and opens an immense field of coal in every direction, which will require ages to exhaust.

PITTSBURG COAL TRADE.

A most extensive estimate of the coal trade and consumption, at Pittsburgh, has been prepared by Mr. H. Haupt, who is already favorably known to the public as a writer of an important work on a branch of engineering. No one can avoid being surprised at the magnitude to which this business has very quietly grown.—

The coal trade of the city of Pittsburg, and its vicinity, is one of the most important sources of its wealth, whether we regard it for its intrinsic value, or for its influence in sustaining the great manufacturing interests of that vast workshop, of which Pennsylvania is justly proud. It is yet in its infancy.

The extent can hardly be estimated with accuracy. We may approximate to a judgment of what it will be in a few years, when the present system of internal improvements shall have fully developed the resources of the country, by a calculation of its present extent. Its adaptation to the manufacture of iron in all its forms, is just beginning to be felt. Its value for generating steam is hardly yet realized; and in this age of progress, when days and weeks are compressed into minutes, the value of this source of power, of the almost infinite millions of tons of coal in our western coal fields, can hardly be appreciated.

It is difficult to get a precise measure of the coal trade of the city of Pittsburg and its vicinity. Perhaps the most accurate way to make an estimate of the quantity and value of this trade will be to average it under its different heads of supply and use, and we will then have figures founded upon a statement of facts which will be easily understood by any person the least conversant with its use, and the general result of which will commend itself to all. For this purpose the coal trade of Pittsburg and its vicinity may be divided into four general classes:—

First, that which is used for domestic purposes.

Second, that which is used for manufacturing purposes.

Third, that which is used for generating steam on the boats, and in and about the city for steam-engines.

Fourth, that which is exported.

First, then, that which is used for domestic purposes. This is supplied mainly by retail dealers, and is distributed among the people in carts and wagons from the pits in the neighborhood, and from *flat-boats* on the Allegheny and Monongahela rivers, in which it is brought to the city from a distance of five, ten, and even twenty miles; and when I speak of Pittsburg here, I mean it and the city of Alleghany and the villages adjacent for three or four miles round the junction of the Alleghany and Monongahela rivers.

The population of this portion of country may be safely estimated at one hundred and fifty thousand persons. This, at the rate of five persons to each family (which is, I believe, the usual allowance), would make for the district thirty thousand families. I then assume that each family will burn three fires through the year (in this is included stores, shops, offices, and all places of business, as well as dwelling houses), and at this rate it would be perfectly safe to allow for each family four hundred bushels of coal per year. This estimate would make the consumption of coal for domestic purposes amount to the sum of twelve millions of bushels per year.

The next item, is the amount of coal consumed for manufacturing purposes. I give below the data upon which I found my estimate, and as I have taken considerable trouble with it, I think it may be relied upon as correct.

There are in the city of Pittsburg and its vicinity seventeen large rolling mills, and these would consume while running, on an average, fifteen hundred bushels of coal per day; which would give an aggregate of 25,500 bushels per day. And supposing each mill to run 250 days in the year, the annual consumption would be (6,375,000 bushels), six million three hundred and seventy-five thousand bushels.

There are in the same bounds, twelve principal or large foundries, and these, with the engines used in them, would consume about (150) one hundred and fifty bushels each per day, making a daily consumption of (1800) eighteen hundred bushels, and at 300 days per year would give a yearly consumption of (540,000) five hundred and forty thousand bushels.

There are twenty glass houses, each of which would consume about (100) one hundred bushels per day; making a daily consumption of (2,000) two thousand bushels per day, and a yearly consumption of (600,000) six hundred thousand bushels.

These twenty engines and machine shops, which, with their engines, forge fires, etc., will consume each one hundred bushels per day, making a daily aggregate of (2,000) two thousand bushels, and a yearly consumption of (600,000) six hundred thousand bushels.

There are five large cotton factories, which consume yearly about (100,000) one hundred thousand bushels.

The gas works of the two cities consume about (200,000) two hundred thousand bushels per year.

The public buildings, including hospitals, jail, penitentiary, court-house, banks, churches, etc., consume about 200,000 bushels per year.

The water works and Alleghany arsenal, will consume about (150,000) one hundred and fifty thousand bushels per year.

There are then from one hundred to one hundred and fifty other steam-engines used for various purposes, which it would be almost impossible to specify, for instance, for flouring mills, oil mills, saw mills, planing mills, tanneries, stone cutting establishments, etc., etc., which would consume each 20 bushels per day, or an aggregate of 3,000 bushels per day, making a yearly consumption of (900,000) nine hundred thousand bushels.

Next we have the steamboats which daily leave the wharves of the two cities and consume coal. For these we may safely estimate that there are eight boats leave the wharf daily during seven months of the year, during which there is constant navigation of the rivers; and in this is included the various boats of all classes. During a large portion of the year there are this number of boats on the Ohio alone daily, some of which take as much as (1500) fifteen hundred bushels each, so that this estimate is fully within the limits, and it will be moderate to allow for each boat (500) five hundred bushels per day, which makes a daily demand from this source of 4,000 bushels, and for two hundred and ten days consumption it would require (840,000) eight hundred and forty thousand bushels per year.

By adding the foregoing amounts, we have as follows:—

For Domestic uses,	12,000,000
" Rolling Mills,	[illegible]
" Foundries,	[illegible]
" Glass Houses,	600,000
" Engines and machine shops,	600,000
" Cotton Factories,	100,000
" Gas Works,	200,000
" Public Buildings,	150,000
" Miscellaneous Engines, etc.,	900,000
" Steamboats,	840,000
Total for home consumption	22,305,000

Twenty two million three hundred and five thousand bushels.

The next item is the amount of coal exported; and that is made up of what is taken to Cincinnati, Louisville, New Orleans, and other places on the Ohio and Mississippi rivers. This is chiefly sent down in flat-boats, which are floated down the rivers in times of high water, each boat containing from eight to twelve thousand bushels, and drawing from seven to nine feet of water. During the last year a large amount of coal has been taken to Cincinnati in barges, towed by a steamboat. For a part of this we have an accurate account in the statement of the Monongahela Navigation Company. The amount of bushels of coal that was taken through locks in boats was (9,903,921) nine million nine hundred and three thousand nine hundred and twenty-one bushels in the year A. D. 1852. This was all for export. (That in boats is for city or home consumption,) which amounts to nearly five million bushels, and which, of course, is a part of the former estimate for domestic consumption.

There is then a large amount of coal loaded below the locks, and of which we can have no official statement, and I suppose I will be below the amount when I say it will amount to four million bushels per year. There is also some Pittsburg coal sent to Cleveland and Philadelphia, but that trade is yet in its infancy, and its importance will not be felt until, as I said before, the business of our railroads gets to be permanent and fixed, and then it may be almost beyond computation. At present, I suppose one half of a million bushels would cover the amount.

We have then the following amount:—

Amount of coal consumed in and about the City of Pittsburg,	22,305,000
Amount of coal exported from Pittsburg to other places,	14,401,921
Total,	36,706,921

CONSUMPTION OF COAL IN CINCINNATI.

The annual consumption of coal in Cincinnati is stated to have been, at the three different periods specified, as follows:—

	Tons.
1840	24,000
1846	52,000
1852	170,000

THE HAMPSHIRE COAL COMPANY.

The Company was chartered by the Legislature of Virginia, but is authorized by an act of the Maryland Legislature to hold lands in this state. Their property lies in both states, and, besides the "Oliver Lands," includes a portion of the big vein coal of the George's Creek Valley. We understand they contemplate a speedy commencement of operations.—*Cumberland Journal.*

THE PICKELL MINING COMPANY.

This Company, the stock of which we believe is owned entirely in Baltimore, have opened one of their mines, in the George's Creek Valley, and are making arrangements for the speedy commencement of mining operations. Their mines, we understand, are under the charge of Douglas Percy, Esq., one of the most experienced miners in this region.

ANTHRACITE FOR LOCOMOTIVES.

The annual report of the Reading Railroad Company contains some facts relative to the use of anthracite coal in their locomotives.

The cost of transportation has been reduced in every department as follows:—

On coal	1.08 cents per ton.
On merchandise	4.02 do.
On passengers	23.98 for each through passenger.

It is to be observed that this economy has been attained during a period remarkable for the high price of materials and labor, and for that reason, especially, cannot fail to be a source of great satisfaction. Nothing can more clearly demonstrate the prosperity of any public work than such results as the operations of the past year present. This diminution of expenses in the transportation of coal may properly be attributed to the increased use of anthracite coal as fuel in the locomotives, and from the same cause a still further reduction may naturally be expected.

The use of this fuel in the locomotive has been gradually and regularly increasing. Sixty per cent. of the coal transportation of the last year has been accomplished by it, and it is intended, as soon as practicable, to use it exclusively for that purpose.

These results, demonstrating, as they do, both its adaptability and its economy, are not only highly advantageous to the Company, directly, but cannot fail to prove most beneficial, by inducing a more general use of that fuel for this purpose.

CHESAPEAKE COAL COMPANY.

The Company owns several thousand acres of land, a portion of which is covered with valuable timber, and the balance underlaid with coal. There are three veins or seams. The first, besides possessing all the requisites for domestic purposes, is said to be a very rich gas coal. It is remarkably hard and durable, and partakes largely of a bituminous nature, more so, perhaps, than Maryland coal generally. Being peculiarly adapted to the manufacture of gas, we doubt not that it will be in great demand in a short time, both here and elsewhere.

The second stratum partakes more of the nature of what is termed a good coal for coke, the manufacture of which is greatly on the increase, and already constitutes quite an item of trade from this region—large quantities of which are being used for manufacturing purposes, and as a fuel for locomotives.

The third stratum, about four feet in thickness, is an excellent coal for domestic purposes.—*Cumberland Telegraph.*

FRENCH DUTIES ON IRON AND COAL.

The *Moniteur* of Paris contains a decree of the French Emperor reducing the duties on wrought iron imported into France by the maritime zone about ten per cent., and the duties on cast iron by about thirty to forty per cent., from the former rate. The effect of this measure seems to be to equalize the duties on foreign iron by reducing them to the rate previously levied on Belgian produce only; and a similar measure has been applied to coal, the duty having been lowered in the restricted zone from 5d. to 3d. per kilos. As far as it goes, this removal of a mischievous differential duty, which limited the supply, injured the revenue, and benefitted no one but a small class of ironmasters, is creditable to the Imperial Government; and it ought to be well understood in France that it has been adopted solely from a view to the national interests of that country, and not as the result of negotiation with any foreign power. Our wonder has long been much more excited by the pertinacity with which France has continued to set an artificial and excessive price on raw materials of primary necessity to the progress of mechanism and civilization, than by her declining to open her ports to an important medium of exchange with this country. But we are aware that public opinion in France is so little formed on these subjects that the Government has more difficulty in carrying such a measure than in doing many other things of a less creditable character. If it were not that the huge population of this metropolis has submitted and still submits to pay a large municipal duty on coal under the obnoxious form of an *octroi*, we should say that no impost could be devised more intolerable to an intelligent community, more onerous to manufacturers, more irksome to the comforts of the middle classes, or more cruel to the necessities of the poor. In the climate it is our fate to inhabit, and with the pursuits and employments which constitute the chief subsistence of this country and the north of France, cheap fuel is one of the greatest blessings we can enjoy; and the duty of 5 francs a ton levied on sea coal in the French ports acts as a restriction on all the productive powers lost by that increase in the price of the article. It will now be reduced to 3 francs, and we trust before long it will disappear altogether. Strictly speaking, and in a narrower view of the subject, this country has no interest in supplying France with the raw material for those works of industry and of art in which she is our most brilliant competitor, and the demand for British coal and iron abroad only tends to increase the price of those commodities to the home consumer. With the exception of the class of coal owners and ironmasters, the direct advantage of this change is in favor of France, who obtains what is essential to her manufactures and railroads on easier terms. But the indirect advantage to other nations largely compensates for this difference. We acquire a more extensive medium of exchange with that country; we unite by closer ties the industry and material welfare of two great nations; and we strengthen those common interests which are independent of the vicissitudes of mere political combinations.

IRON AND ZINC.

AMERICAN WHITE ZINC COMPANY.

This Company is engaged in the manufacture of zinc paint. The directors of the company are S. N. Crittenden, J. B. Salisbury, Smith Gardner, and J. C. Griffin. From a report which they have made to the stockholders, we extract the subjoined statements: —

The American White Zinc Company was organized in October, 1852, under the general manufacturing law of the state of New York, with a capital stock of $300,000, all paid in. The works of the Company are located on Imlay street, in South Brooklyn, and consist of a two-story brick building, 100 feet square, of the most substantial character, and a steam-engine of 50 horse power, and five lots of ground, 25 by 110 feet. The Company are working under the Gardner process, which they have bought of Smith Gardner (the inventor).

It is a fact well known to chemists, that in converting the pure metallic zinc into oxide there is a gain of 24$\frac{1}{16}$ per cent. So that the Company, notwithstanding the slight loss attending all manufacturing operations, are sure of a net gain of 20 per cent. In addition to which, we have a decided advantage over the imported oxide, as there is a duty of 20 per cent. upon the white oxide of zinc, and the duty upon the metal is 5 per cent. only, which affords the American White Zinc Company an advantage of more than 15 per cent. over the imported article.

Further, by the use of the metal a great saving of fuel is effected, and the quality of the oxide more uniform than can be produced when manufactured direct from ores, as in the ores are a large per centage of impurities which must affect the quality; in fact, the attempts to produce zinc paint from ores, at a low price and of a uniform quality, were long since abandoned in Europe, after repeated trials, and all the companies now engaged in the manufacture of zinc paint in Europe, first make the metal from the ore, and from the metal the oxide, which fact has only to be known to insure the preference to our own paint.

The American White Zinc Company have now been engaged some weeks making from five to ten and twelve tons per day, and which has met with a ready sale, and numberless certificates can be produced from practical painters of its superiority over all others for color, and particularly for body. And we are now constantly receiving orders up to our present capacity of manufacture.

We are also enabled to say, that arrangements have been made for a full supply of the metal from Silesia to the amount of 20,000 tons annually.

We annex a statement of our daily business, only varied by increasing the amount from ten to twelve and fifteen tons per day; and taking the ten tons as our daily average of business, we give the following as *facts which may be relied upon*: —

10 tons Spelter — 20,000 lbs. a 5½ cts.	$1,100 00
4 " Coal, a $5	20 00
Packages, (barrels and casks.)	100 00
450 gallons Linseed Oil, a 70 cts.	315 00
2 Engineers, a 16s. 4 Firemen, a 12s.—15 Laborers, a 10s. per day	28 75
Cartage	15 00
Insurance, $365 per annum	1 00
	$1,616 75

SALES.

10 tons Spelter equals	20,000 lbs.	
20 per cent. gain in weight	4,000	
Weight 450 gallons Oil	3,600	
	27,600 lbs. a 8½ cts.	$2,346 00
		$729 25
Deduct Commission and Guarantee, 5 per cent.		117 30
Net profit per day		$611 95
300 days gives per annum	$183,585 00	
Deduct for additional contingencies, 20 per cent.	36,717 00	
	$146,868 00 net profit per annum.	

A fraction over 48 per cent. on our capital of $300,000, and working only 10 tons per day, which we can very materially increase, and our expenses not be increased in the same ratio.

TAGUARA IRON MINE.

Four and a half hour's ride from Caraccas and about four hours from La Guyra, the principal port of Venezuela, is situated the cane plantation called Taguara, where the oxide of iron ore has been found in great abundance. As there is a vein of iron or quartz, works are about to be constructed to ascertain whether this is not the iron cap which often covers rich mines of silver or gold. The working of this mine, situated so near the capital of the Republic, where no iron mines are in operation, nor iron foundries of any kind established, is regarded as a good investment. There is a water-wheel at work on the property at the cane mill, and water and fuel are abundant; a road is also in contemplation to Caraccas. A more thorough exploration of this mine is shortly to be made.

THE ACTIVITY OF THE IRON MANUFACTURE.

The present activity of the iron business is well illustrated in the following remarks relating to its condition in a district of Maryland :—

It is calculated that the iron manufacturers of this country have a sure demand before them of various iron fabrics—a demand that will require all and more than all their capacity of supply. The calculation is well adapted, nevertheless, to indicate the increasing importance of the iron trade and manufactures of the country. One thing is evident. As long as the demand shall exceed the capacity of our furnaces to supply it, the high price of foreign iron will operate as a bounty and take the place that far of a protective tariff. The iron interests may, therefore, take care of themselves very well for some time to come.

It is for these reasons, we suppose, that the present activity exists in the manufacture of iron throughout the country. Everywhere we hear of old furnaces going into blast, and new ones in the process of erection—and in all cases the business is represented to be highly remunerative. In Maryland, particularly, abounding as she does in iron and coal, this is the case; and our western county of Alleghany does not present an exception to the rule.

The abundance of iron ore in Alleghany county can no longer be doubted. Recent discoveries and explorations prove that it is found in almost exhaustless quantities from the Youghigheny river on the west to the Warrior mountain on the east. In the former region the quality is not only very superior, but the quantity is especially represented as vast; in the latter a similar condition of things is said to exist. In the intermediate portions of the county, especially in the Frostburg coal region, new revelations are being daily made that prove the existence of pure and abundant veins of the richest ores, in addition to those already discovered on the surface.

Thus a new impulse has been communicated to the iron business of our county, and under its influence we already see the beginning of a new state of things. The furnace in the George's Creek Valley is soon to go into blast. The Lena Furnace at Cumberland has been purchased by northern parties, and is to be put into order for the commencement of operations. The furnaces at Mount Savage are pouring out their liquid streams, while the rolling mill at the same place speedily converts them into superior railroad bars. Everything betokens an unusual activity in the iron business of the county.

POTOMAC FURNACE SOLD.

The Potomac Furnace, in Loudon county, Va., opposite the Point of Rocks, has been purchased by M. P. O'Hern, Esq., of Baltimore, and Col. J. W. Geary, of Pennsylvania, for the sum of one hundred thousand dollars. They have, we understand, secured the right to lay a railroad from the Mine Hill, across the bridge, to the ten acres of land on the Maryland side of the river, which can be done at a trifling expenditure beyond the costs of the rail.

The purchasers, it is understood, intend erecting new furnaces, forges, a foundry and rolling mills, and thus to bring into active operation the great capabilities of this location. The location has perhaps better facilities for the cheap manufacture of iron than any other similar establishment in the country. About half a mile in the rear of the furnace rises an iron mound or hill, the base of which covers about one hundred and sixty acres of land—the whole a solid mass of iron ore, easily removed from its bed, and delivered at the furnace.

IRON ORE IN SCHUYLKILL COUNTY.

We learn that a valuable vein of iron ore has been struck in the shaft recently sunk at St. Clair, in this county, by Carry & Hart. It is in the slate, just below one of the large coal veins, and can be worked, as we are informed, at a very small cost. This is, we believe, the first workable vein of ore that has been opened in this anthracite coal region, and its discovery must add largely to the value of coal property generally, as the fuel and the ore can be taken from the same opening; and as limestone abounds in the immediate neighborhood, it seems fair to infer that iron may be made at considerable lower cost than has yet been done in any part of the Union. It is proposed at once to repair and enlarge the furnace at St. Clair, built some years since by Mr. Burd Patterson, and the hope may be indulged that this may prove to be but the first step towards the establishment of a great iron manufacture in the coal regions.—*Tamaqua Gazette.*

HAVERSTRAW MINING AND IRON COMPANY.

This Company have an estate of about 750 acres, situated on the west bank of the Hudson, about five miles from the river, and thirty-four miles from New York. The mine was formerly known as the Horsenclever mine, and was worked some thirty years since, but suspended for want of capital. The mine is supposed to be inexhaustible, and the ore, according to the representations of the parties concerned, can be mined at 25 cents per ton, and delivered on the bank of the river at 75 cents per ton. The ore is of the magnetic description, and by analysis of Mr. R. O. Doremus, chemist, is found to contain

Iron	69 33
Oxygen	21 55
Sulphur	8.12

About 2,000 tons of this ore has been mined, and it has been tested by making it into pig, blooms, and boiler iron.

CORRUGATED IRON PLATES.

In this invention it is claimed that rolling the iron in small curves or arches, instead of planes, gives it largely increased strength. The inventor, Mr. Richard Montgomery, thus describes his invention and various tests to which it has been put:—

The boiler plate now in use is rolled in planes. This Invention consists in the employment of corrugated plates of metal in the construction of cylindrical flues, curved fire arches, and curved shells of boilers. The plates are rolled into curves or arches. The roll is so constructed as to leave a margin or flange on each of the four sides of the plate, for punching and riveting.

The simplicity of the invention is evident. It borrows from the science of architecture the *principle of the arch*, and impresses it upon the manufactured iron, and thus imparts to shells of iron, rolled into this new form, a strength at least ten times greater than that possessed by plates at present in use. *It is equivalent to the discovery of a new metal of increased strength.*

The "Corrugated Boiler Plate" is intended to be used in the construction of all forms of boilers, flues, and locomotives. The following are some of its manifest advantages:—

Various tests have been applied to the corrugated iron in New York and elsewhere. In New York the test was as follows: Four strips of boiler iron were used one-fourth of an inch thick, 7 feet 11 inches in length, *two* of them were bent in the form of an arch in the direction of their length, the remaining two strips were corrugated by passing them through rollers of the required shape, the rise of each corrugation being one inch. The curved ribs were placed in pairs, side by side, and weighed with pig iron. The first pair, consisting of plain iron, yielded with a pressure of 3120 lbs.; the pair of corrugated strips were loaded with 15,091 lbs. and afterwards with 27,000 lbs. without any perceptible deflection. The subscriber prepared in New York a boiler six feet long. The flue was made of plain boiler plate *one quarter* of an inch thick and *nine inches* in diameter, the outer shell was made of corrugated iron *one eighth of an inch* thick, and 20 inches in diameter. Hydraulic pressure was applied to the boiler and the *flue collapsed*, without affecting the thin outer shell of corrugated metal.

In addition it is charged that about 30 per cent. is saved in the construction of boilers with the corrugated plates, besides a great saving in space—about 8 feet in 30. The corrugated boiler also presents one-third more fire surface than the present boiler. The advantages claimed for this discovery are, greater strength, safety to life, economy of space, economy of expense, economy of fuel, less draught of boats, detection of defects in iron, greater generation of steam, durability, economy of repairs, and increased diameter of flues and boilers.

CAST-IRON RAILS FOR RAILROADS.

In Vol. II., No. 1, of this Magazine, we noticed the examination by Mr. R. W. Hughes of the question, Why cannot cast-iron rails be used for railroads? We return to the subject again in order to present the complete view of it taken by the author. Without following further the quotations from the report of Mr. Ellwood Morris, alluded to in the former number, and also the suggestion that a rod of wrought iron of about half an inch in diameter should be cast in the centre of the head or top table of the bar, we proceed to the concluding portion of the argument.—

An elaborate and able report was made by a select committee of the Pennsylvania Legislature in 1843, on the propriety of relaying the State railroads with cast-iron rails. This report, together with the facts and arguments in our former article, we deem conclusive as to the commercial and practical adoption of cast iron rails. It is impossible to controvert them with argument, and we feel just as confident that actual experience will confirm the deductions of the report.

The rapid destructableness of wrought-iron rails has been more and more apparent from the day the report was made, up to the present time. This results from two causes: first, from the increased weight of the locomotive, and secondly, from the great demand for railroad iron. This latter cause induces a demand for all material which can be made into railway bars; and the consequent hurry in which they are made, withdraws from them that special attention which was devoted to their manufacture in earlier days.

We therefore repeat our conviction, that cast-iron rails may be made which will prove better, in all respects, than most of the English rails we are daily importing.

Why have not cast-iron rails been generally introduced? To this there are several answers, and not one affects their fitness for this purpose. Since the introduction of railroads, the world has never stood still long enough to think. A railway mania pervades the land, and it has crushed every obstacle which has opposed it. Reflection would have required time, and none of the persons or States which have been engaged in the eager race of internal improvement, would consent to exercise it, but preferred imitation. Hence the fact, that the railway system has undergone no positive changes since its first introduction—with the exception of the now *universal adoption of cast-iron wheels instead of wrought iron*—a matter taken up, as it were, on the wayside, in order to supply the absolute demand for constant repairs resulting from the use of wrought iron wheels.

Secondly. Whose duty was it to introduce cast-iron rails? That of chartered companies, in which it was every man's business who had a personal interest in the road,—and what is every man's business, is generally regarded as nobody's.

The construction of roads is always left to the engineer, and suggestions as to the mode of building them would be expected to come from him. But he, like the rest of the world, has had little time for study and reflection, and, deriving a comfortable living from the present plan of railway, would not be apt to originate suggestions where failure would involve him in loss of professional reputation.

Captain Moering, an engineer in the service of Austria, writing upon this subject, says "he eagerly sought, in this country, from engineers and others conversant with the subject, information relative to cast iron rails, and after a deliberate examination of the questions which arose, he was impelled to the conclusion that *cast-iron rails had not been rejected from the American railways in consequence of any defect inherent in that material*," but that "this rejection, or omission, appears to have resulted partly from the surprising celerity with which these works were simultaneously urged forward; partly from the inexperience of many of the engineers necessarily employed, in consequence of the great demand at the time for men of that profession having induced a number of unqualified persons to throw themselves into it; partly from a want of due deliberation consequent upon the rapid progress of the railways, which favored imitation, rather than reflection; partly from the vigor with which rolled-iron rails, *then exempt from duty by law*, were pushed into use in every quarter of the country by interested parties, and partly from a long chain of fortuitous circumstances, which conduced to the results we have witnessed, *without deciding the merits of the technical questions involved.*"

If railroads were private enterprises, we have no doubt cast iron rails would long since have been brought into use; for the projector being the owner, upon him alone would fall the failure; but with chartered companies, each member is unwilling to take the responsibility of suggesting anything new, for fear of failure.

Upon an examination of the report, as well as our references in a former article, it will be seen that the only suggestions heretofore made, and deemed sufficient to render cast iron rails entirely suitable for railways, were, first, to lay them on continuous wooden sills; secondly, to increase the weight of the cast-iron over the wrought-iron rail in the proportion of 6 to 7; and, to make assurance doubly sure, as it is expressed, to cast, as suggested by Mr. Morris, a small wrought-iron rod in the top table of the cast-iron rail, so as to keep the parts together in the event of fracture.

At first view this seems a great additional safeguard, and ought to have insured the adoption of cast-iron rails; but we are assured by one who has paid a great deal of attention to the subject, that the suggestion was impracticable—the rod, upon coming in contact with the melted iron, being twisted by expansion out of line with the cast iron at many points. Besides, it is questionable whether so small a rod would not itself become so much hardened, as to impart but little additional strength to the cast iron. That the rod would not be kept in line, one time in ten, when merely laid in the mould, he satisfied himself by actual experiment. This may have had its effect on the recommendation contained in the report we publish.

But the other suggestions render the use of cast iron rails entirely practicable; and we have lately seen a section of cast-iron rails, with a wrought iron rod cast throughout their centre—a feat which has been rendered practicable by a very simple device, and which enables the road to be so constructed that it is impossible, even in the event of a fracture of one of the rails, for it to get out of place. If, therefore, the rails be laid on continuous wooden bearings, the fracture of the rail would only make another joint to it, and nothing more. There is thus provided, what we believe every practical man will pronounce, who will examine it, a far better and more economical material for our railroads than the present wrought-iron rails.

We, therefore, in this substitution of cast iron for wrought-iron rails, propose a protective tariff, such as no one can reasonably oppose.

We say the State, in building her railroads, should use for that purpose her own iron, particularly when she has often to dig it up out of her way to locate the track, of a far better quality than she can import.

And while she may not deny to her railroad companies the privilege of using what iron they please, or buying it where they choose, she can simply say, I cannot be a partner with you, unless you agree to use cast iron, after demonstration of its fitness for rails.

COAL AND IRON.

To the Editor of the Mining Magazine.

The day is within the compass of my recollection, in which few of the ironmasters knew that puddling was taking out of the pig iron the carbon that the blast furnace put into it, or that there is, so to speak, only *one iron* with various impurities. They knew that only white ash coal, with cold blast, would produce highly carbonated or foundry pig, with a good "burden" or heavy proportion of ore; that calcareous iron stone produces the finest foundry iron and finest surface on castings; argillaceous iron stone, the "strongbodied" malleable iron, and silicious iron stone, inferior iron for all purposes. It may be worthy of the notice of geologists, as the surface of this country is so much more of a sandy nature than Britain, whether clay districts have iron stone of an argillaceous quality. It is natural that clay by its fine texture should separate from the iron of the ore more perfectly than silex, combining more perfectly with the lime to form cinder. Silex in the limestone is also detrimental, and causes great waste of fuel in the furnace. It is a mixture of coals of white, fawn, and deeper-colored ash, which produces the forge pig of Wales, so quickly converted to malleable iron by puddling.

At Lowmoor, in the north of England, by the use of a tender coal caked in ovens, the finest puddled bar iron is made, which sells for axles and tires, at treble the price of the Welsh bar; but from that place through England, and to the west of Wales, the "red short" quality of bar iron increases, and the "cold short," with an equal amount of labor in the manufacture, decreases. The best cable bolts are made of Monmouthshire, or Welsh iron, though at a red heat more apt to "crack" in bending (red short). The brittle or cold short iron of the Sheffield district will bear any amount of "hammer" at any heat.

Thus "good iron," and "bad iron," I think are unmeaning terms. The question is, the purpose which it is for. Staffordshire and Shropshire (midway of the line mentioned) produce the best iron for general purposes, being midway as to "red short" and "cold short." Wales does not produce iron fit for making horse-shoes.

Through the midland districts of England, in the line mentioned, there is only one white ash seam, the slate coal or splint. It will not take the carbon from pig in the refinery, and red ash coke is used. It will be at once seen that if puddling be the abstracting of carbon put in by the blast furnace, that the *quantum* so put into the pig is a nice point. About half as much iron could be puddled per man, daily, in Yorkshire, as now in Wales.

It will be for practical men to ascertain which of the coal fields from Carbondale westward, and which of the seams, or what amalgamation of them, as in Wales, will be "the mark" for forge pig of the best nature, and which may be puddled with the least labor, fuel, and waste of iron. The color of the ash is the only practical guide. At a furnace I erected, I laid on the bank four heaps or stacks of four seams, and foretold that they would carry weight of ore larger in proportion to their distance from the furnace, and it proved so. These were of the inferior anthracite of Wales, a free burning, more tender coal than the seams at Pittston. The more so, the less is the weekly make of pig at each furnace. A third of coke of bituminous coal trebled the make at one mill. It is a mistake to suppose that profit at a blast furnace is in proportion to the make. Mr. Hill, whom Sir Humphrey Davy complimented on his knowledge of chemistry, and whose coal and iron stone are the most costly of any at Merthyr, Wales, would only allow 1½ lbs. per inch pressure of blast. Others there allowed 3 lbs.; but some would give anthracite from 10 to 20 here.

The best coal for making pig iron in Wales, (the "old coal,") is too slow driving in the furnace. One third of that, with one-third of the three-quarters coal, allows of a third of other seams; but mark, the best puddling coal (the Droydig) is quite unfit for making pig iron. The use of anthracite is a failure in Wales. It is too friable in the furnace, and the hard is too valuable.

SOME FACTS OF THE ENGLISH IRON TRADE.

The total export trade of the United Kingdom exceeds £72,000,000, of which iron, in its various branches, contributes not less than £15,000,000. From 250,000 tons, at the beginning of the present century, the production of iron has increased to nearly 2,500,000. There are 7,088 miles of railway completed in the United Kingdom; and, on a moderate computation, more than 25,000 miles of rails have issued from the various iron works of the country to form the road for this new system of intercommunication. Here is a veritable girdle for the earth! Mythology bestowed upon its goddess of beauty the love-exciting cestus; industry and science have given to Terra, the mother of the Titans and the giants, a girdle of iron of from 70 lbs. to 80 lbs. weight for every yard of its length, to say nothing of the "chains" and "bolts" required to secure this modern "cestus" to its place—a girdle more than sufficient to encircle the globe, while its aggregate weight cannot be less than 1,400,000 tons. That greatest triumph of modern engineering science, the Menai tubular-bridge, required to form its giant sides 3,454 tons, its top 2,962, and its bottom 2,944 tons of iron; while one million iron rivets secure the rigid structure, the entire weight of which is 11,468 tons. The mines of the United Kingdom have also been called upon to furnish the material for the great suspension bridge over the Dnieper—a bridge half a mile in length, which swallowed up in its construction 3,000 tons of iron, which required sixteen vessels to convey the material from Liverpool to Odessa, and from that port the labor of oxen drew it a distance of 400 miles over a country destitute of roads. On the Clyde, 10,820 persons are employed in the construction of iron steamers, whose yearly earnings amount to nearly half a million. Of 123 steamers built in Glasgow and Greenock, 122 are of iron and one only of wood; their tonnage is 70,411, and their horse-power 22,405. Of 66 steamers constructed at Port Glasgow, 53 are of iron, and their tonnage is 47,290 tons; and Dumbarton builds 58 iron steamers, with a tonnage of 29,760 tons.

We might, if disposed, trace the extended uses of iron in the present day through numerous other channels, affecting in a thousand modes the comfort and happiness of the community, till we remembered that the pen with which we write was but one of 180,000,000 manufactured last year in a single establishment at Birmingham, where one thousand persons were constantly employed in converting 268,000 lbs. or 120 tons of metal into steel pens. But while considering the extended uses of iron, we could not forget that, notwithstanding the vast increase in the demand, the prices of the articles produced have fallen within the present century from 60 to 85 per cent.

CONTENTS OF FURNACES.

The total produce of pig iron for the year 1850 has been estimated at 2,380,000 tons. In order to produce this quantity there were consumed 9,500,000 tons of coal, 2,500,000 tons of limestone, and the ores operated upon could not have been less than 7,000,000 tons. But the most remarkable fact in connection with the iron trade is the immense weight of atmospheric air required in the various blast furnaces, and which, although generally considered as so light in its nature, has yet considerably exceeded in weight that of all the other materials consumed. One of the large furnaces of South Wales consumes 12,508 cubic feet of air each minute in supplying the oxygen necessary to the combustion of the fuel. To supply the air consumed on an average in each furnace requires an engine of 25 horse-power. Engines of nearly 12,000 horse-power are constantly employed to drive the "breath of life" into the glowing masses within the furnaces of the United Kingdom. Each furnace on an average sucks in 17,000 gallons of air per minute, or about five tons weight per hour. The number of furnaces in blast in 1850 was 459; the aggregate weight of air therefore required during that period to keep life in these fiery monsters was not less than 55,080 tons daily, or 20,049,000 tons during the year—a quantity exceeding in weight the totals of the coals, ore, and limestone consumed in the process of smelting.

SOURCES OF SUPPLY.

The districts which produce the largest quantities of iron are South Wales, Shropshire, Staffordshire, and the northern districts. The clay ironstone beds of the coal measures furnish the greater proportion of the ore required. The carboniferous and mountain limestones of Lancashire, Cumberland, Durham, Forest of Dean, and Derbyshire contain valuable beds and veins of hematite, from which large quantities of iron are obtained. The green sand of Sussex also contains iron in such quantities as to lead to the opinion that ere long that county will become the seat of a considerable iron trade. Ironstone is also found in the county of Northampton. In Ireland, in the county of Leitrim and near Limerick, the ores equal in richness those of Staffordshire and South Wales, and closely approach those obtained from the Scottish "Black Band." In the counties of Roscommon and Wicklow iron ores may also be obtained in large quantities, and of excellent quality. One of the greatest advantages which this country possesses in connection with the iron trade is the existence, in close proximity to the ore, of the fuel required for its smelting. In the South Staffordshire district Nature has been lavish of its gifts in this respect, as the coal, the iron ore, the limestone for flux, and the refractory clay required for the construction of the furnaces are all found grouped together in the same locality. At Dudley is found the famous "ten-yard seam" of coal, being thirty feet thick; and in some of the coal fields of South Wales the produce is not less than 9,000 tons per acre. In the rich black land of Scotland coal is also found associated with the iron ores. The average yield of iron from the ores of the South Wales district is about 33 per cent., the South Staffordshire district 30 per cent., while in some parts of Lancashire and West Cumberland the ores are so rich as to yield from 60 to 65 per cent.

The following table shows the production of each district in the five years 1823, 1825, 1830, 1840, and 1850:—

Districts.	1823.	1825.	1830.	1840.	1850.
	Tons.	Tons.	Tons.	Tons.	Tons.
South Wales	15[illegible]	228,500	277,600	50[illegible]	70[illegible]
Staffordshire	133,500	171,700	212,400	427,650	655,000
Shropshire	57,[illegible]00	86,300	73,400	82,750	[illegible],000
Yorkshire	27,[illegible]00	35,500	28,[illegible]00	56,000	45,000
Scotland	21,500	29,200	37,500	241,000	690,000
Derbyshire	14,000	15,100	17,900	31,000	[illegible]
North Wales	—	13,100	—	26,500	1[illegible],000
Northumberland	—		—	11,000	[illegible],000
Forest of Dean	2,320	3,000	5,220	15,500	20,[illegible]00
Lancashire	—	—	—	—	10,000
Totals	442,000	581,300	653,400	1,396,400	2,850,000

Some interesting results may be ascertained from these tables by a comparison of the number of furnaces in each year with the amount of iron produced and the average produce of each furnace. The results are shown as follows:—

	Number of Furnaces.	Total Produce.	Average Produce of each Furnace.
		Tons.	Tons.
1823	258	442,000	1,700
1825	262	581,300	2,200
1830	359	653,400	1,800
1840	402	1,396,400	2,400
1850	459	2,250,000	5,200

From this it will be seen that, while the production of iron has increased 570 per cent., the number of furnaces has increased 180 per cent., and their average yield not less than 370 per cent.

The proportion of percentages of increase in the number of furnaces in the undermentioned districts, since 1823, as compared with the total quantities of iron produced therein during the same period, is thus shown:—

Districts.	Increase per cent. in number of furnaces.	Increase per cent. of production.	Excess per cent. of production over increase of furnaces.
Scotland . . .	1,250	2,800	1,550
Staffordshire . .	140	500	360
Derbyshire . .	140	430	290
South Wales . . .	200	400	200
	Decrease.		
Shropshire . .	40	60	20
Yorkshire . . .	40	150	190

The extraordinary development of the power of production, which has enabled Scotland, with an addition to her furnaces of 1,250 per cent., to increase the quantity of iron produced by more than 2,800 per cent, is mainly to be attributed to the almost universal adoption of the hot blast—a system more generally in use in Scotland than in other parts. The more extended application of chemical and mechanical science may, however, be traced in the fact of the increased productiveness of each district. In the case of Shropshire the decrease in the number of furnaces is not easily accounted for, when taken in connection with the increased quantity of iron produced. The ore in this district is exceedingly rich, and the hot blast, we are informed, is in very general use in the county. It remains on this part of the subject but to notice the total quantities of iron produced and the number of furnaces in the different periods for which any record exists. These will be found in the following table:—

Years.	Furnaces.	Tons.	Years.	Furnaces.	Tons.
1740	59	17,350	1828	278	702,000
1750	—	22,000	1830	[illegible]	678,417
1788	85	68,000	1835		1,000,000
1796	121	12[illegible],000	1836	—	1,200,000
1803	168	170,000	—		
1806	169	250,000	1840	402	1,396,400
1820	—	400,000	1847	433	1,[illegible],600
1823	258	442,000	1848	452	2,[illegible],736
1826	262	581,000	1850	467	2,380,000

The value of the enormous quantity of pig iron produced in 1850 may be estimated at about 50s per ton, which would give as the value of the rough iron smelted in that year a sum of £5,950,000. The value of the material after the further application of labor is, of course, very considerably increased. In some few instances, such an amount of labor is bestowed upon iron, when converted into steel, as to cause it to realize as much as the more precious metals. A piece of iron small in weight will, by being made into watch-springs, yield a very large return for the labor expended upon it. A fair mode of estimating the value of a portion of the manufactured iron may be obtained from the table of exports. Thus, in 1850 the exports of iron, cast and wrought of all descriptions, exclusive of hardware, cutlery, and machinery, amounted in quantity to 801,758 tons, and the declared value was £3,864,000, being at the rate of £4 15s per ton. If we estimate the whole of the iron manufactured in this country, at this rate, it will give as the value of the iron manufactures in 1850 a sum of £11,305,000. This, however, as we have said, does not include machinery or mill-work, or the finer proportions of the manufacture involved in the production of hardware and cutlery; and it will probably not be too much to place the entire value of the iron manufactured at a sum of £20,000,000.

The average prices of "pig" and "bar" iron, so far as the returns can be traced back, are shown in the following table, in part taken from "Porter's Progress of the Nation":—

Years.	Pig Iron per ton.	Bar Iron per ton.	Years.	Pig Iron per ton.	Bar Iron per ton.
1806	—	£17 10 0	1841	£3 7 6	£9 0 0
1810	—	14 10 0	1842	2 10 0	6 10 0
1815	—	13 5 0	1843	2 15 0	5 5 0
1820	—	11 0 0	1844	2 14 0	4 15 0
1825	—	14 0 0	1845	4 0 0	6 10 0
1830	—	6 13 6	1846	3 12 6	9 15 0
1835	£4 2 6	6 10 0	1847	3 5 0	10 0 0
1836	6 18 0	10 10 0	1848	2 4 6	8 0 0
1837	4 12 0	10 10 0	1849	2 6 0	6 0 0
1838	4 10 0	9 15 0	1850	2 10 0	5 10 0
1839	4 5 0	10 5 0	1851	2 6 6	5 12 6
1840	3 18 0	9 0 0	1852	2 5 6	5 15 0

The monthly trade and navigation returns just printed show that, during the ten months ending November 5 of 1853, the exports of iron of all kinds exceed by more than 60 per cent. the exports of the ten months ending November, 1851; they reach altogether to upwards of £13,700,000. This enormous sum is made up as follows:—

Hardware and cutlery	£2,991,600
Machinery and mill-work	1,774,700
Pig iron	890,400
Bar, bolt, and rod	4,89[illegible],500
Wire	17[illegible],800
Cast	477,[illegible]
Wrought of all sorts	2,[illegible]
Steel unwrought	66[illegible],100
	£13,795,700

FRENCH IRON AND COAL DUTIES.

The decree which has been published to reduce the import duties upon iron and coal is as follows:—

Napoleon, by the Grace of God and the will of the Nation, Emperor of the French, to all present and to come, our greeting.

On the report of our Minister the Secretary of State for the Department of Agriculture and Public Works,

With reference to the law of the 17th of December, 1829 (Art. 34),

And after taking the advice of our Superior Council of Commerce, Agriculture, and Industry, we have decreed and decree as follows.—

Art. 1.—The duties to be levied upon foreign coal and iron are fixed as follows.—

COAL PER 100 KILOGRAMMES.

Coal, by sea.—From Sables d'Olonne, exclusively, to Dunkirk, inclusively, in French vessels, 30c.; in foreign vessels, 60c.; by all other ports, in French vessels, 15c.; in foreign vessels, 65c.

Coal, by land.—From the sea to Halluin, exclusively, 30c.; by all other ports, the existing duties.

Coke.—One half above the duties on coal.

Coal ashes.—The existing duties.

IRON PER 100 KILOGRAMMES.

Pig iron weighing 15 kilogrammes or more, by sea, in French vessels, f.5; in foreign vessels, f.5 50; ditto, by land, from Blanc Misseron inclusively to Mongenevre exclusively from the adjacent countries, f.4; from all other places, f.5.

In bars (*étiré*), without regard to the mode of fabrication, in French vessels and by land, flat bars of 458 millimetres, and more, the length multiplied by the thickness, f.12, 218 millimetres inclusive to 458 millimetres exclusive, f.14, less than 213 millimetres, same thickness, ditto, f.16. In square bars of 22 millimetres and more on each side, f.12; 15 millimetres inclusive to 22 millimetres exclusive, ditto, f.14, less than 15 millimetres, ditto, f.16. In round bars of 15 millimetres and more in diameter, f.14; less than 15 millimetres, ditto, f.16. By foreign vessels, the above duties and one-tenth more.

In rails.—Same duties as those on bar iron, according to their dimensions.

In plates, or *laminé noir tôle*.—In French vessels, f.25; in foreign vessels and by land, f.27.50.

Steel in bars, cast or wrought.—In French vessels, f.40; in foreign vessels and by land, f.44.

ART. 2.—From the 1st of January, 1855, the duty on iron shall be levied according to the following table:—

Raw pigs, weighing 15 kilogrammes and more, per 100 kilogrammes, by sea, in French vessels, f.4; in foreign vessels, f.4.40, ditto, by land, f.4.

Bars, without regard to the mode of fabrication, in French vessels, and by land, in flat bars of 458 millimetres and more, the length multiplied by the thickness, f.10; 213 millimetres inclusively to 458 millimetres exclusively, f.12, less than 213 millimetres, 213 millimetres, ditto, f.14. In square bars of 22 millimetres and more on each side, f.10; 15 millimetres inclusive to 22 millimetres exclusively, f.12; less than 15 millimetres, ditto, f.14. If round bars of 15 millimetres and more in diameter, f.12; less than 15 millimetres, ditto, f.14.

The same by foreign vessels—the above duties and one-tenth more.

Iron in rails—the same duties as on bar iron, according to their dimensions.

Iron plates.—In French vessels, f.20; in foreign vessels and by land, f.22.

Steel in bars, cast or wrought.—In French vessels, f.30; in foreign vessels and by land, f.33.

ART. 3.—The laws, decrees, and ordinances which are not opposed to the present decree remain in full force.

ART. 4.—Our Minister of Agriculture, of Commerce, and Public Works, and our Minister of Finance, in their respective departments, are intrusted with the execution of this decree.

Done at the Palace of Fontainebleau on the 22d of November, 1853.

NAPOLEON.

Countersigned by the Minister Secretary of State for the Department of Agriculture, Commerce, and Public Works. P. MAGNE.

The result comparatively is as follows:—

		Former Duties, per ton.	Duties per ton, till Jan. 1, 1855.	After Jan. 1, 1855.
		£ s. d.	£ s. d.	£ s. d.
Pig iron		2 14 8	2 4 0	1 13 4
Iron in bars according to dimensions*	from	6 12 0	5 5 10	4 8 0
	to	9 4 10	7 0 10	6 8 4
Iron plates		17 12 0	11 0 0	8 16 0
Steel in bars—cast		26 8 0	17 12 0	13 4 0
Do. wrought		52 16 0		

British iron is not at present largely consumed in France, but henceforth it is likely to be used to a large extent, especially in 1855, when a further reduction is to take place. The importation of English coal into France is large at this moment, and employs a great number of vessels of both countries. It is likely to be much promoted now, and English coal reaching Rouen, Dieppe, or Boulogne, will only pay a surtax of 1s. 4½d. over Belgian coal, instead of 3s. 2½d., as before.

IMPORTATION OF COAL AND IRON INTO FRANCE IN 1852.

The following figures regarding the French imports of coal and iron, extracted from official documents published by the French customs department,

* Rails, the same as iron bars, according to dimensions.

will be found interesting at the present time, and afford important data for future reference. The import of coal from England into France, in 1852, amounted to 601,613 tons of 1,000 kilogrammes (2,210 lbs.), and that of coke to 2,753 tons. In the same year France received 1,742,155 tons of coal, and 169,398 tons of coke from Belgium. Coal was also obtained in considerable quantities from Rhenish Prussia. As regards pig iron, the total amount imported into France in 1852, was 46,241 tons, of which 15,002 were from England, and 26,416 from Belgium. She also received 1,841 tons of iron in bars, and 270 tons of steel from England. In connection with these statements, it may be remarked that it was only Belgian pig iron which (exceptionally) enjoyed, under the former French tariff, the reduced charges that are now made general; and that iron in bars or wrought, whether coming from Belgium or from England, was alike subjected to the excessive rates that prevailed up to the publication of the recent decree.

QUARRIES AND CLAYS.

THE BROCK QUARRIES.

These quarries, located at Guilford, Vermont, belong to a company entitled the New England Mining and Quarrying Co. Its officers are Geo. Kendall, President, A. B. Barnard, Treasurer, B. D. Harris, Secretary. The report of the officers, just made, contains the following statement respecting the organization of the Company and their property :—

The capital stock of the corporation is divided into twenty thousand shares of ten dollars each, eight thousand and six hundred of which shares the Company now holds in reserve, as a working capital.

An examination of the charter, to which attention is invited, will show that its provisions are exceedingly liberal, giving the Company powers rarely possessed by corporative bodies. In addition to its capital of $200,000, which is already located on valuable slate quarries in Southern Vermont, the Company has power, by its charter, to locate and work, outside the limits of Vermont, any number of branch mines and quarries, *as separate and distinct interests*, to the amount of $100,000 each.

No individual liability is incurred by any stockholder in this Company or any of its branches.

The office of the Company is at Brattleboro', Vermont, where the Secretary resides, and where the books of record and transfer are kept; but the Company has a general agency office, at New York.

It is the intention of the Company to locate branch mines and quarries from time to time, as they may be offered, and, on rigid investigation, prove worthy of pursuit. The Company does not owe a dollar, and the present board of directors do not propose to incur any debts whatever.

The slate property of the Company, in Vernon and Guilford, Windham county, Vermont, covers an area of about four hundred acres, embracing, it is confidently believed, all the valuable slate formations in the Connecticut River Valley. These quarries have been successfully worked, to a greater or less extent, by individual enterprise, for the last fifty years. A moment's consideration of the fact that individuals have been able to realize handsome profits from the manufacture of these slate in years past, without railroad or water facilities for transportation, and when wooden roofing material was far more plenty and less expensive than now, will convince any candid mind that the same quarries, worked by an efficient organization on a large scale, with the most favorable transportation facilities, cannot fail to be highly remunerative.

The expense of slate, compared with other roofing material, may be briefly stated. It is believed that the slate from these quarries can be furnished, leaving a liberal margin for profits, contingencies, etc., at a price but little exceeding the cost of first quality shingles. Tin roofing costs $3 per square —100 feet—with an annual expense of about $1 the square for paint; while slate can be furnished and laid on the roof, within two hundred miles of the quarry, at from $6 to $7 the square; and, when once on the roof, they endure for all time, besides being a great protection against fire.

Of these quarries C. B. Adams (Vermont State Geologist) says, in his first report on the geology of Vermont, in 1845:—

The south-east part of this state has justly been celebrated for its roofing slate. There are several quarries in the argillaceous slate, which are more or less wrought, but the expense of transportation to market renders them at present of comparatively little value except for the supply of the vicinity. The opening of the Brattleboro' Railroad will doubtless add greatly to their value, and however extensive the demand may become, the supply cannot fail. Several of the quarries present the remarkable appearance of having been crushed over, by a force acting from above to the north-west.

* * * * * * * * *

Bruce's Quarry has been very extensively wrought, but at present only one person is employed in getting out slate. The laminæ (strata very regular—having a direction of North, 5° East, and dip 72° West) costituting an elevated ridge parallel to and within five to ten rods of an excellent road. They are quarried and removed with great facility. The layers are very uniform, and slate of any required dimensions may be obtained.

JORDAN'S PATENT SLATE-PLANING MACHINE.

Mr. Jordan's object in this invention is to effect a considerable saving both of expense and time in the operations of planing slate. The complete success of his attempt may be gathered from the following description of his machine, which has two or more sets of cutters, or tools of different characters, which act in succession on the plate or slab of slate to be planed, and produce thereon a smooth and even surface whilst it is passing once only through the machine. He generally employs two sets of tools; the first set being composed of grooving cutters of the ordinary construction, and the second set of planing cutters, which are also of the construction commonly used, the depth to which these cutters are to work being regulated by means of a screw or other contrivance, which is arranged so as to act on the frame in which the said cutters are mounted.

The foundation or bed-plate is furnished with rollers on each side, on which the moving table is supported and travels; the top surfaces of these rollers are adjusted to the same horizontal plane, and the bottom surfaces of the rails which are cast underneath the moving table, are planed truly parallel to the top of the table, the outer sides of these rails are also planed to suit the distance between the guide surfaces of the bed-plate, so as to prevent any lateral motion of the moving table, and at the same time admit of its having perfect freedom of motion in a longitudinal direction. The traversing movement of the table is obtained by a screw, or by a rack and pinion, or other equivalent arrangement. The slab of slate being planed is operated on by the tools, which are called grooving-tools, and by the plane-irons, both sets of tools being mounted in the same bridge, which is capable of sliding up and down between the standards, when acted on as hereinafter explained. The grooving-tools in front of the bridge form a series of grooves over the entire width of the rough slab, the extreme depth of all the grooves corresponding to the same horizontal plane by previous adjustment of the tools. The cutting-edges of the plane irons are adjusted also to the same horizontal plane, but so as to cut a little deeper than the grooving-tools, and thus remove all traces of the grooves, and at the same time clear away the parts between them, leaving a perfectly planed surface at one cut.

The tool-bridge is raised and lowered between the standards by the screws, which work through nuts tapped in the bridge, and are turned by the bevil-wheels mounted on the shaft, which is set in motion by the hand wheel. By this means the machine can be adjusted for planing slabs of different thicknesses; but when it is employed on one particular thickness, the bridge is clamped to the standards by the screws, and the tools have no movement whatever until that thickness of work is completed, or until they require sharpening.

It will readily be seen that according to these arrangements the operation of slate-planing can be performed with much greater despatch and certainty than by the usual methods adopted, all movement of the cutters during a course of work being avoided, and each slab finished on one side at a single stroke of the machine, while the power requisite to produce this effect can be readily obtained, a large proportion of the resisting force of the material being destroyed by the grooving of its surface.—*London Mechanics' Magazine.*

MISCELLANIES.

MOULDS FOR CASTING.

Mr. John Hetherington, of Manchester, and Mr. John and Edward Dugdale, of Blackburn, have patented some improvements in constructing and applying models or patterns for moulding, preparatory to casting iron, brass, and other metals for various purposes. This invention consists of certain improvements on a method of forming models or patterns patented by Peter Fairbairn and John Hetherington, in 1851. According to these improvements, the pattern or model required is moulded in the ordinary manner, so that one-half of it is in one part of the box, and the other part in the other half. After the patterns or models have been removed, the box is put together again, the two halves being kept separate by a distance equal to the thickness of the plate required, and the sides of the box are then stopped before the molten metal is poured in.

BENDING SHEET METAL.

Solomon G. Booth, of New York City, has invented an improvement in machinery for bending or corrugating sheet metal, to make the beams known as "Montgomery's Patent Sheet Metal Beam," or for forming, on sheet metal, corrugations of greater depth than can be formed by any means now in use. The machinery employed consists of a swage and die, and the nature of the invention consists in forming the die in two or more parts fitted to work one within the other, so as to make the corrugations of any required depth, without breaking or in any way injuring the sheet metal. It also consists in a certain arrangement of the mechanism which operates the dies whereby the different parts of the die are enabled to be conveniently brought into operation successively upon the metal. A patent has been applied for.

STEAM HAMMERS.

Messrs. Balmforth, of Clayton, Lancaster, England, iron masters, have patented some improvements relating to steam tilt-hammers, and which consist mainly in the employment of an oscillating steam cylinder, having its piston-rod connected direct to the helve of the hammer-head, and beneath the helve in such a position as to allow clear access to the hammer from all sides. The axes on which the hammer tilts are furnished with screw bearings, to enable one side to be raised more than the other, and thus allow of irregularly-formed masses being forged. A modification of the machine enables it to be used for riveting.

MINERAL MANURES IN TENNESSEE.

The seventh report of the late State geologist contains an account of the green sand of McNairy county, which is said to be "in the form of small dark grains of the size of gunpowder, of an olive or blackish green color, not gritty, but easily crumbled between the fingers." Sometimes these grains merely adhere together in lumps, but then again are cemented by the calcareous matter of the marl. The analysis of the green sand shows it to be a true silicate of potash, the principal ingredients being silica, potash, carbonate of lime, alumina, and protoxide of iron. The marl also contains an important proportion of carbonate of lime, the two deposits in this respect differing from the New Jersey marl. In these marls and green sands, *as well as in her already productive soils*, consists the wealth of West Tennessee. The immediate spots where they form the surface rock, may be unproductive, but it is the unproductiveness of excessive fatness or richness. Marl and green sands only display their wonder-working properties when placed within the influence of organic matter. They are mineral manures, and to promote the growth of vegetation there must be in the soil a proportion of decomposing vegetable matter with which it readily forms soluble compounds. Their beneficial effects are observable, as well in renovating worn-out lands, as in tempering the quality of black alluvial soils. To the first, they will restore the proportion of lime and potash which an exhausting system of tillage had removed in the form of crops—to the second, they will serve to open the mass of vegetable matter, and, by forming new compounds, warm up the cold alluvium, and render it fit for cultivation.

AUSTRALIAN TIN.

It appears that the dark glass like grains generally supposed to be iron-dust, which were found to be so difficult to be separated from the grains of gold by the Ovens diggers, have been tested at the Adelaide Assay Office, and found to consist of a valuable oxide of tin. Grains of a similar nature are said to have been frequently found in this colony, particularly at the Echunga gold fields.

ENGINEERING WORKS AT HOLYHEAD HARBOR.

In the October number of the *Architect's Journal* we find some facts in regard to the extent of the works now in prosecution for the protection and improvement of the Holyhead Harbor at the western terminus of the Chester and Holyhead link of the great London and Dublin railway.

The undertaking was commenced in 1849, and is intended to secure a total area of 316 acres for the purpose of a harbor, two-thirds of that space having a minimum depth of seven fathoms at low water. Accommodation will be thus provided for about 400 vessels of all classes, including 70 men-of-war, as large as the *Duke of Wellington*. The north or great breakwater will be 5,000 feet long and 170 feet wide, and of this immense work 4,000 feet have already been completed to low water mark—3,500 feet of it being from 14 to 15 feet above high water. The depth at low water thus filled up is from 45 to 48 feet, and some idea may be formed of the magnitude of this mole from the fact that the stonework which surmounts it is about 80 feet above the foundation. The smaller, or eastern breakwater, which protects the harbor on the landward side, will be 2,100 feet long, and 1,000 feet of it have already been formed, in a depth of 30 feet at low water, and to a width of 110 feet.

The method that has been adopted by Mr. Rendel for carrying out the breakwater, and which is under the immediate superintendence of the resident engineer, Mr. C. Dobson, is by means of a timber staging of five roads, 40 feet above the water, and 150 feet wide, supported on piles 80 feet long, which piles remain buried in the bank of stone as the work advances. The loaded stone wagons are taken down these five roads by locomotive engines, then tilted, discharging their contents, each of them eight to ten tons of stone, through the staging into the sea, forming a bank of rubble stone, from the bottom upon which the piles rest to above the surface of the water. Whole trains of wagons can thus be made to deposit simultaneously, and with a rapidity and certainty that no other system would admit of; 5,000 tons of the rock obtained in the quarries are thus with ease deposited in the day in the breakwater, at the spot indicated, and, by this means, about 3,000,000 tons of stone have been brought down, run out, and tipped into the sea. The staging is constantly kept in advance of the work by means of cranes upon the stage itself, which lift the piles (80 feet in length) from the water till they become upright; they are then properly adjusted in their place by the aid of a lilliputian screw steamer 60 feet long, when the framing and roads are then placed upon them, and rails laid to receive the wagons; the discharged wagons are again drawn up to the quarries for a fresh supply of stone, and the movement from the quarries to the end of the staging goes on continually. This five-road timber stage of the north pier, above described, has now advanced 4,000 feet to sea out of the 5,000 required to complete it, and this length of breakwater already formed has afforded shelter to hundreds of vessels for the last three winters, and 50 to 80 sail at a time of wind-bound vessels may now occasionally be seen anchored within the area of the new harbor.

In order to obtain so large and unprecedented a supply of rock as 5,000 tons a day, blasting with gunpowder upon a large scale has been introduced, and at the foot of the mountain called Holyhead Mountain (which is of a hard schistus quartz rock) quarries have been opened and formed, which, for extent, height of face (about 200 feet), and yield of stone, are certainly unparalleled. Fifty-nine to sixty shafts and galleries are sunk or driven into the rock, which is of so hard and impenetrable a nature that only one foot upon an average can be driven in twenty-four hours by the three relays of miners, who continually go on driving day and night. After the chambers or galleries are completed, two or three of them are sometimes discharged simultaneously with charges of gunpowder varying from 3,000 lbs. to 10,000 lbs., the instantaneous ignition of the charges is brought about by means of the galvanic battery, and the results are as great as from 30,000 to 50,000 tons of rock at once. We witnessed upon this occasion the effect of four of these large explosions, in which about 8,000 lbs. of gunpowder was discharged, displacing and throwing out several thousand tons of stone. About 20,000 lbs. of gunpowder, or 10 tons, are thus expended weekly, in large and small blasts.

In the quarries appears the largest amount of activity of any part of this great work—fifty moveable cranes (some with steam power) for raising the stone, from two hundred to three hundred wrought-iron wagons for conveying it, eight locomotives, and about fifty horses for the movement of it; these, together with a staff of men on the work of about 1,400, are daily employed by the contractors, Messrs. J. and C. Rigby, in pressing forward to its completion this great national undertaking.

MINERALS IN NEW BRUNSWICK.

We have been shown some specimens of iron ore obtained from this quarter, and in the possession of Thos. R. Gordon of this city. We are informed that the location of the deposit from which the samples were taken is well adapted for manufacturing purposes, being situated on the Bay of Fundy, in a country thickly timbered, particularly with the white birch, which has long been a favorite with iron smelters—the ore itself is of a rich quality, existing in an inexhaustible quantity, and coal being also obtainable at a moderate rate. The same gentleman has also specimens of plumbago, or black lead, from the same region, which seems of good quality. This is a mineral easily worked, and though neglected here, has given large returns to the operators in other countries. Few mines have yielded more to their owners than the black lead mines of Cumberland, G. B.

TIN.

Tin belongs almost exclusively to primitive mountains, and is found in veins traversing granite, gneiss, and mica slate. On the European continent it is met with abundantly on both the Bohemian and Saxon sides of the Erzgeberge, particularly at Zinwald and Schlackenwold, where it frequently occurs in maried crystals of considerable magnitude, weighing several pounds. It is also found in Galicia, in Spain; in the granite hills of Puy les Vignes, Haut Vienne, in France; in Greenland, Sweden, and the United States, in Asia, on the east coast of Sumatra, in the island of Banca, and on the peninsula of Malacca, in Mexico, among alluvial deposits in Chili, etc. The chief repository of this ore is, however, in Cornwall, where it occurs in veins traversing granite and schist, accompanied by chlorite, apatite, schorl, wolfram, and blende; also disseminated in granite, as in that of St. Michael's Mount. Generally speaking, the Cornish varieties are not of large size, though extremely perfect in form and symmetry, nor do they so often occur maried as those of Bohemia.

VENTILATING MINES.

Mr G Jones, engineer, of Birmingham, has patented several methods and arrangements for ventilating mines by means of exhausters or blowers in connection with pipes and branches for withdrawing the foul or vitiated air from such parts as may be desirable, or where it may be present, and thus causing a constant stream of fresh air to flow into such parts, to supply the place of that so exhausted; also, certain arrangements for forcing or blowing a stream of fresh air into places where foul or vitiated may be present, by means of blowers and arrangements of pipes and branches, as described.

THE MINER'S SAFETY LAMP.

In a recent discussion before the Society of Arts in London, a paper was read describing the early history of the safety lamp, and calling attention to the circumstance that an individual seldom succeeds in carrying his primitive ideas to perfection, but it is usually allotted to his successors to render them thoroughly effective. The first safety lamp was invented by Dr. Clanney, and although cumbrous was quite safe. His plan was to insulate the light by means of water, and to supply the flame with air by means of a bellows. Sir Humphrey Davy subsequently proposed four other lamps, all modifications of this one. At last his attention was drawn to the researches of Tennant on flame, who it seems had discovered that flame would pass through tubes in a ratio compounded of their breadth and length, the smaller their calibre the shorter distance would the flame traverse. Davy improved on this idea, and came to the conclusion that wire gauze furnished tubes of the shortest possible length and the narrowest diameter.—Hence arose his invention of *the* safety lamp.

But the safety lamp of Davy is by no means perfect. Among its faults may be enumerated a want of sufficient light, and danger of explosion in "blowers," or currents of gas.

Another lamp has been recently patented in England which is destined to remedy these defects. In this lamp the flame is surrounded by a double glass cylinder, the top of which only is covered with gauze. The air passes to the flame through the wire gauze at the top of the lamp, down the space between the cylinders, and is thence conducted, after combustion, through a double plate of gauze at the top. Even should one cylinder break, the lamp still remains a safe one until it can be exchanged for another. A tin cone also is so arranged in the upper portion of the cylinder as to regulate the inward current of air, and compel the lamp to become self-extinguishing in an explosive atmosphere. Various other safety lamps have been invented, one of which has also a double cylinder of glass, the annular space of which is filled with water, arranged with a trigger in such a manner that in case of accident it is instantly poured upon the light, which is thus extinguished.

RECENT PUBLICATIONS.

Historical Collections of Georgia. Containing the most interesting facts, traditions, biographical sketches, anecdotes, etc., relating to its history and antiquities, from its earliest settlement to the present time. Compiled from official documents, illustrated by nearly one hundred engravings. By GEORGE WHITE, M. A. 8vo, pp. 688. New York. Pudney and Russell.

This extensive volume is the result of ten years of labor and travel throughout the State of Georgia to collect the materials of which it is composed. It possesses both a local and general interest. The local interest arises from the vast amount of information relating to the early history of the state, its eminent citizens and its noted localities. But there are large portions of the work important to every reader of history; such as relate to the progress of the state as a member of the Confederacy and the Union. Above all, the work is valuable as a specimen of what such a volume should be, such as we hope yet to see prepared respecting every state of this Union.

It is printed in a very handsome style, and with the embellishments makes a very attractive volume.

The American Mining Chronicle, Iron Manufacturer's and Railway Journal. ROBERT F. BROWER, Editor. No. 1. Weekly, $3 per annum.

This is the *Iron Manufacturer's Journal* of this city enlarged and improved, so as to embrace mining subjects and information—its contents are both original and selected. We are gratified to see this enterprising effort on the part of the editor, and wish him that success to which he is so justly entitled.

The Wall Street Journal and Real Estate Gazette, of this city, is devoted to a field of intelligence which is strictly occupied by no other journal. It is published weekly, and is well stored with interesting and valuable information, and is likewise one of the most spirited and entertaining of our city journals.

THE

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EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

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THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c. &c.

VOL. II.—MARCH, 1854.—No. III.

Art. I.—THE REDUCTION OF AURIFEROUS ORES.*—By Charles P. Stansbury.

Before proceeding to discuss the more prominent means now in use for extracting the noble metal from the substances with which it is found associated, it will be well (very briefly) to consider the conditions in which gold presents itself in the various localities where it is found.

It has often been remarked, as an evidence of the wise care of Providence, that while gold, which possessed a comparatively artificial value, existed but in small quantities and in few localities, iron, the most useful of metals, was distributed in vast quantities in every quarter of the globe, and was everywhere accessible to man. The present appearance of things would seem to throw some doubt over the truth of this remark, which would appear to be more pious than just. The fact is that gold is found in every quarter of the world, and every day's research opens new fields to the enterprise of the gold-seeker. The authority of a year on this subject is already out of date. California, whose gold fields were opened only six years ago, had hardly successfully asserted its claim to the title of the El Dorado, before she found a powerful rival in your own Australia; and even this seems destined to share attractions with Devonshire and Wales.

The most ancient source of the precious metal mentioned in the sacred writings is "the land of Havilah, where there is gold," and of which it is said, "the gold of that land is good." Of Ophir, we are told that "they fetched from thence gold, and brought it to Solomon," and that "Jehosophat made ships to go to Ophir for gold;" but we know not with certainty the situation of Ophir; nor have we the means of ascertaining in what form the metal presented itself, or whether the diggers of those ancient days reduced it by means of crushers, cradles, or long-toms.

In later times, Africa was long a noted source of gold, which gave a name, indeed, to a large portion of its coast. The metal

* From the Proceedings of the Society of Arts, London.

was found in small particles, known in commerce as "gold dust," collected, no doubt, by some rude process of washing, from the sands in the beds of the intermitting streams. The region on the south of the Sahara, as also Sofala and Kordofan, were prolific sources of the precious metal. Sofala has, indeed, by some been supposed to be the ancient Ophir, and was long the chief emporium of the gold brought from the interior. But Africa is now entirely eclipsed by our modern El Dorados. It is said to yield about 5,000 lbs. weight annually.

Asia has long been, and still continues to be, an important source of gold; indeed it was brought from the Indian Islands in remote times, and more recently, gold deposits have been extensively worked in the Siberian and Ural districts. In the Ural it is found in small pieces, embedded in coarse gravel, and in veins of quartz in hard rocks. It is sometimes found associated with platinum.

America, too, has made her full contribution to the stock of the noble metal. Brazil, Chili, Peru, Ecuador, New Granada, have all yielded rich supplies. The streams which run from the mountains bring down their precious freight in their pebbly beds. These were for a long time the chief sources of Brazilian gold, but it is also found in veins in the rock, which modern capital is making available and profitable.

The quantity yielded in Mexico is comparatively small, and is always found there associated with silver.

The Alpalachian chain of the United States sends down in some of its streams quantities of auriferous deposits, which have been worked with advantage in Virginia, the Carolinas, and Georgia.

But all the gold-fields of America sink into comparative insignificance before the immense yield of the single state of California, which, in six years, has transformed a wilderness into a populous and wealthy state, with agriculture, arts, and commerce. The gold discoveries here took the usual course. It originated in accident, got wind against the will of the first discoverers, was kept alive by rich findings in alluvial deposits, and at last subsided into something like a regular branch of industry, into which more perfect methods were introduced, as the eagerly-sought wealth began to demand for its attainment a more steady and laborious industry. Rich sands and nuggets gave place to quartz ore, which required to be mined with great labor, crushed by heavy machinery, and amalgamated by careful and expensive processes.

In Europe, gold is found in many localities, the principal of which are Hungary and Transylvania. But England and Wales seem, from recent events, to bid fair to take their place among the most important gold-producing countries of the world. The precious metal occurs here in a state of minute division in quartz rock. In Devonshire, the red and brown gossans contain a per centage which will amply repay the cost of reduction, by the best methods now known. The following statement of the results of eight recent experiments with some auriferous quartz from Merionethshire, Wales, will show the grounds of the opinion above expressed:—

Oct. 20.—362 lbs.	yielded	154 grs.,	at the rate per ton	1 oz.	19 dwt.	17 grs.
98 lbs.	"	66 grs.,	"	3	2	20
25.—320 lbs.	"	138 grs.,	"	2	0	6
75 lbs.	"	31 grs.,	"	1	18	14
Nov. 7.—166 lbs.	"	72 grs.,	"	1	18	0
196 lbs.	"	222 grs.,	"	5	5	17
11.—748 lbs.	(lead)	294 grs.,	"	1	16	18
748 lbs.	(pyrit.)	173 grs.,	"	1	1	15

The Britannia gossan, from Devonshire yielded by recent experiments:—1. ½ ton produced 7 dwts. –14 dwts. to the ton; 2. 1 ton produced 1 oz. 0 dwt. 20 grs.: and from the Arundell United Mines, 2 ozs. 2 dwts. 14 grs. to the ton. A specimen of Cornish ore yielded at the rate of 11 ozs. 13 dwts. 8 grs. to the ton. The Poltimore gossan has yielded from 17 to 32 dwts. to the ton, and other Devonshire ore 9 ozs. to the ton. These results have been obtained within the last month, and go to show that the long-cherished dream of finding gold in profitable quantities in England is about to be realised. The experiments just mentioned have all been made at an expense not exceeding 5s. the ton for the reduction. The same ores have formerly been smelted at a cost of 30s. per ton.

A word on the subject of England's great gold-producing colony will conclude these hasty preliminary observations.

Australia has only been known as a gold-producing country since 1851; for although shepherds and others were known to have picked up stray pieces of gold-bearing quartz for some years previously, it was not suspected to exist in quantities sufficient to repay the labor of collection, until Mr. Hargreaves, a practical miner, who had gained his experience in the California gold-fields, showed that the metal could be obtained in large quantities on the western slopes of the Blue Mountain Range. Subsequent researches have proved the metal to exist in larger or smaller quantities throughout the settled districts of South-Eastern Australia; and, from the character of the ranges to the north of New South Wales, it is suspected that they will prove equally prolific. Hitherto the metal has been obtained solely by the simple process of washing; for, although machinery has been introduced by public companies for the purpose of extracting it from the quartz rock, no important results have yet been attained. Indeed, in the first instance, the metal appears to have been sought for only in the alluvium, until the discovery of a monster nugget, consisting of nearly 1 cwt. of gold, in a quartz ridge near Bathurst, called attention to the parent rock; and the subsequent researches of the Government geologists brought to light veins of auriferous quartz, so extensively diffused that quartz mining must soon become one of the chief industrial employments of South-Eastern Australia.

Notwithstanding this extensive distribution of gold, and the great desire of man to become possessed of it, the methods which human invention has hitherto devised for the purpose of obtaining it have been but partially successful.

There is abundant evidence to show that, up to the present time, no method that has been applied has succeeded in extracting all the precious metal from auriferous ores. A friend of my own, who has travelled extensively in Russia, states that a very large proportion of the wealth of the Russian ores is lost —by confession of the mining men themselves—in the process of reduction now employed, and which has been cited, by an eminent geologist and mining engineer, as the most perfect process now in use.

We might add volumes of evidence on this subject, all of the same tenor, but the simple fact that there has been so much inventive ingenuity applied in the last few years to the production of machinery for extracting gold from its ores, is sufficient to show that a machine for the purpose of doing this work effectually remained a desideratum.

This leads us at once to the consideration of some of the methods hitherto employed for this purpose. The processes for securing gold may be divided mainly into washing, smelting, and amalgamation. Of washing, that of panning may be considered the type; in another apparatus the hide of animals, with the hair on, and turned against the course of the stream, is employed to secure the fine auriferous particles as they find their way to the bottom of the stream. The hides are occasionally withdrawn, and freed from their precious load by washing in proper vats. The process of smelting will not be alluded to in the present paper, inasmuch as it is evidently not applicable to the general wants of the gold-seekers of the present day, because it requires means and appliances not within their reach. Next in order we come to consider the method of amalgamation, which is the one most relied on by practical men for securing the desired product. The process of amalgamation involves, of course, the previous reduction of the ore to a finely divided state, in which alone the mercury can seize upon the gold and secure it. The question between the machines hitherto invented is simply one of the quantity of work done with a given amount of power. In California, the principal ones in use have hitherto been the Mexican arrastra and the Chilian mill. Rollers are sometimes used for crushing and reducing to a powder; the objection is that they do not crush the ore sufficiently fine. All machines which come short of producing an impalpable powder, may safely be considered as failing in the most essential pre-requisite for securing all the gold from the ore: the qualities which a perfect gold ore-reducing apparatus it is thought should possess are—1. It should grind the ore to an impalpable powder, in order to which it should have a combined rolling and rubbing action.—2. It should amalgamate at the instant of crushing.—3. It should amalgamate at the point of crushing, or below the surface of the mercury, which must be kept constantly at the crushing point.—4. It should heighten the affinity of the mercury for the gold by the application of heat.—5. It should lose no mercury in the process.

The only method which seems hitherto to have answered all the five conditions necessary to amalgamating apparatus, is what is called at the diggings the miner's assay. In this process the mortar and pestle are employed: mercury is put in the mortar, the ore to be tested is thrown in and covered with hot water, when the operation begins. On a large scale, the cost of heating sufficient water to attain the result here indicated would of course be a great practical difficulty. Those who have seen Mr. Berdan's machine, will at once perceive that it embraces every principle of the miner's assay, while it avoids the expensive process of heating water in large quantities.

Prof. TENNANT said there was an impression upon the public mind for which he thought there was no positive foundation. It was said by some enthusiasts that we are to have a California in England. Such statements, however, were in his opinion fallacious, no instance of auriferous ore ever having been productive of profit in this country. In every case which had been attempted to procure the precious metal, it had cost 30*s.* to 40*s.* to get 1*l.* worth of gold, and, in every instance in which he had gone fully into, it had been a very unproductive speculation. Undoubtedly, gold existed in this country, and also in Ireland, Scotland, and Wales, but under very different circumstances to those in which it was found in California and Australia; there they had nothing more to do than to crush the ground; but even in that country he knew of no company that was paying a dividend from the production of gold obtained from quartz. Under these circumstances, the opinions of those who entertained a belief that gold could be produced in this country at a large profit ought, he thought, to be received with caution.

Mr. CALVERT said that since his return from Australia he had turned his attention to this important subject. He had found the geological positions favorable for gold in England, and had tested upwards of 300 specimens. He had not found richer specimens in other parts of the world than he had in this country. But a skepticism prevailed: parties were against the opinion that it was to be met with in large quantities here, because they live here. He was, however, of opinion that the gold ores of England were far more important than the gold of Australia. The specimens before the meeting were equal in quality, and, in fact, precisely the same, as those found in other parts of the world. In a very short time he hoped to see the gold mines of England fully developed; and, however skeptical parties might be as to the result, he had no doubt that ores would be produced that would yield from 5 to 6 ozs. to the ton. It was an astonishing fact that we had been blundering on for so many years without the aid of proper machinery; but he had great hopes that with the machinery coming before the public it would be seen that his opinions would be confirmed. Time would show. It had been the study of his lifetime, and he only asked them to wait for a very short time, and they would see what he had stated developed.

Art. II.—MANUFACTURE OF IRON BLOOMS.—By Prof. James T. Hodge.

The manufacture of wrought iron direct from the ore is a more ancient process than that of smelting, and is, to this day, rudely conducted by barbarous nations who have never learned our modern improvements. In some localities of rich magnetic and specular ores, where hard wood charcoal is furnished in abundance, the business, except in times of great depression in the iron market, is still successfully prosecuted. Not requiring the heavy capital which is involved in the building of a blast furnace, blooming fires may be established on a small scale by men of moderate means, and the region where the ores and fuel suitable to them are found, being generally mountainous and well watered with swiftly flowing brooks, small establishments of three or four fires each may be seen scattered here and there between the hills throughout extensive districts, which, but for these resources, would have been left in their original wildness. Essex and Clinton counties in Northern New York, and the highland country about the Ramapo, and thence extending past the other branches of the Passaic towards the Delaware, owe their prosperity—their settlement indeed—to numerous veins of rich iron ore found near frequent water-falls, and surrounded by mountain lands fit only for the growth of wood. These resources, each one of which is essential to the value of the others, might still be worthless, were not the region and climate both peculiarly adapted for that persevering and hardy toil, upon which this business, like that of lumbering, also belonging to the same region, is especially dependent.

The ores being reduced at a temperature much below that of the blast furnace, the earthy impurities they contain are not fused, by which the iron produced is stronger and of better quality than the same ores would make by first smelting, and then converting the pig metal into bars by the puddling furnace. The comparative economy of the two processes depends upon a variety of circumstances, and as two of the most important of these are, first, the peculiar qualities of the ores, and, secondly, of the merchantable products required, no general principles applicable to all localities can be laid down, by which one process is proved more advantageous than the other. The bars, hammered out, form the blooms in demand for the manufacture of nails and for most of the uses to which bar iron is put. Being finished at the forges into those shapes required for particular purposes, its increased value admits of transportation from remote points in the interior, while pig iron made at such localities would not pay to send to market.

In the two northern counties of New York, bordering on Lake Champlain, the number of forge-fires were not less than 200 five years ago. Each fire is capable of making a ton of refined iron every twenty-four hours. The expenses of the manufacture do not vary much from the following estimate:—

Two and a quarter tons of ore, etc., etc. . .	$9	
250 bushels of charcoal	15	
Bloomers' wages per ton	11	— $35

In working these bloomeries, it is generally found that from good magnetic ores, well prepared by crushing and washing, (unless, as in some cases, the ores are rich enough and coarsely granular at the same time to render their preparation unnecessary,) a hundred pounds of iron are produced every hour, or twenty-four hundred pounds every twenty-four hours. Two and a quarter tons of prepared ore are used, and about 240 bushels of charcoal to the ton of iron. This shows a considerable loss of ore in the process,—much more than in making pig iron in a well conducted blast furnace,—for this prepared ore must average not far from 65 per cent. of iron.

It is found most economical to use the air for the blast at a temperature estimated at about 600°; the fire being properly burdened with ore, less charcoal is consumed to the ton of blooms than when the blast is kept at a lower temperature.

The heating oven connected with some of the blooming fires requires more than one of these to keep it at a sufficient temperature for re-heating the blooms. The fires are so arranged that two supply the escape gases to each oven. Small blow-pipes are more effectual in causing a thorough mixture of the hot air and the gases, and consequently a more complete combustion, than large ones; but the smaller the blow-pipes the greater number must be employed. The pressure of the blast is estimated at from two to three pounds to the inch.

The simplest form of the bloomery fire is represented in the sections, Figs. 1, 2, 3, and 4. The same letter indicates the same part in the different figures.

Fig. 1

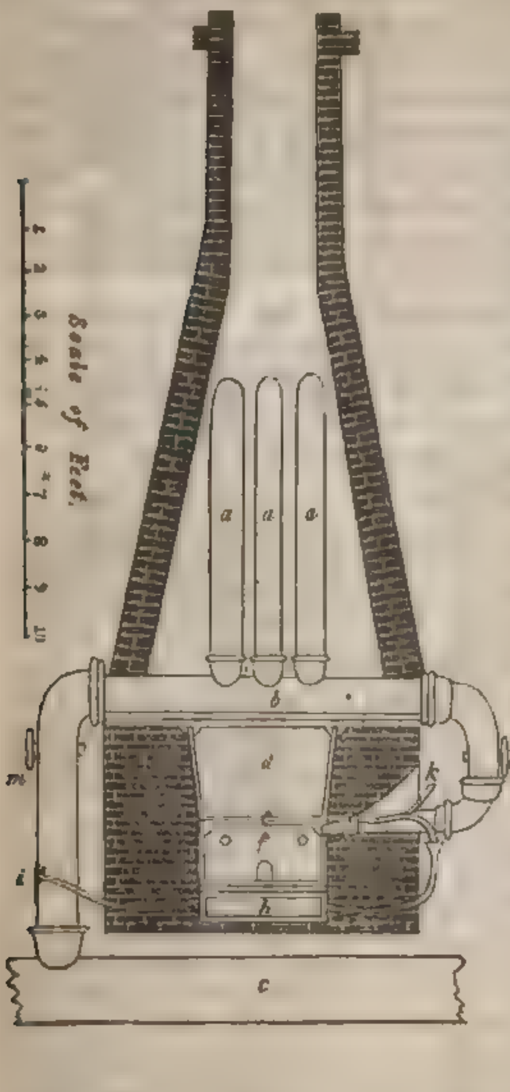


Fig. 1 is the front elevation.

a a a, hot air pipes, for heating the blast by the waste heat that passes through the heating oven.

b, one of the two bed pipes; one placed across the front, the other across the back of the oven.

c, main blast pipe from the blowing cylinder, placed under the fire.

d, back plate of the fire.

e, fire-plate.

f, plate through which the cinders are drained off.

g, bottom plate of the fire.

h, water-box placed under the fire.

i, small pipe for letting the waste water out of the box.

k, water-tuyere.

k, pipe for supplying cold water to the tuyere.

l, valve for shutting off the hot blast.

m, throttle valve for regulating the supply of cool air to the hot blast pipes.

Fig. 2 is a horizontal section of the same on the level of the tuyere.

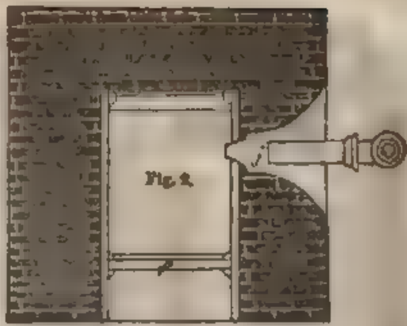


Fig. 3 is a side elevation of the same.

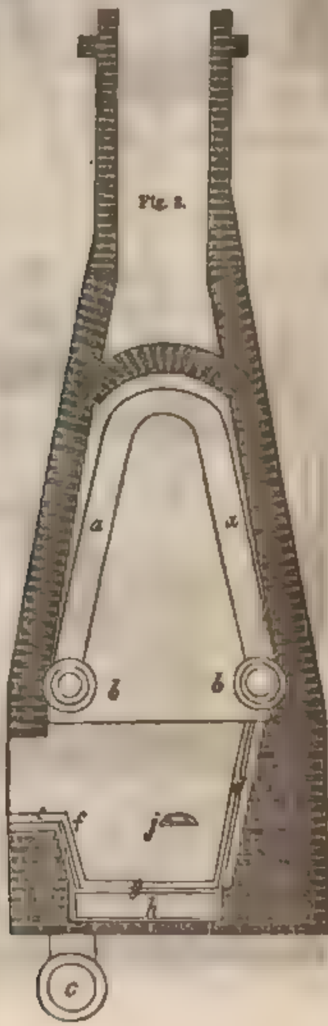


Fig. 4.

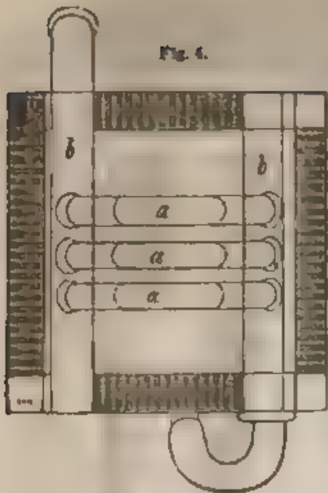


Fig. 4 horizontal section on level of bed-plate pipes.

The three remaining figures are representations of the bloomery fire with the recent improvement of an oven, in which the blooms are reheated by combustion of the gases of the escape heat, which here meet a current of heated atmospheric air. By this arrangement the blooms are prepared for hammering or rolling into bars without consumption of extra fuel.

Fig. 5.

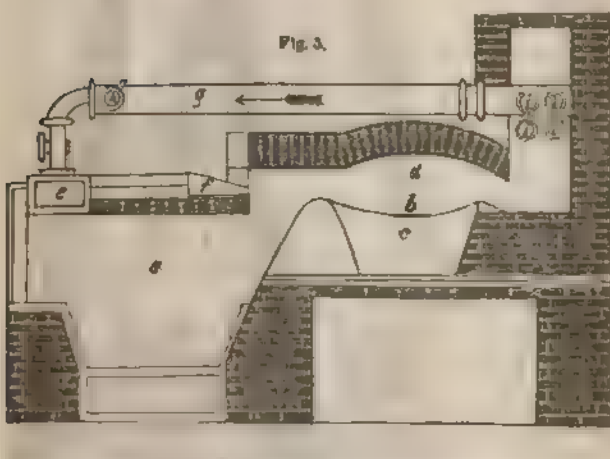


Fig. 5 is a side elevation of one of these fires and ovens.

Fig. 6.

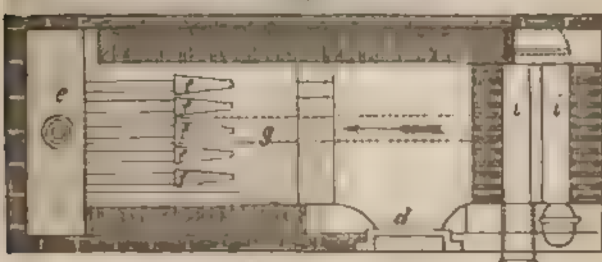
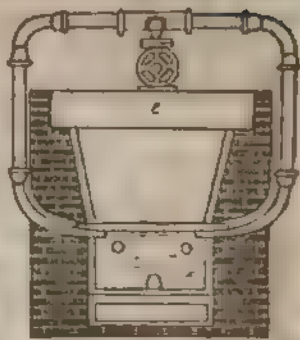


Fig. 6 is a horizontal section of the same on the level of the blow-pipes and oven.

Fig. 7 is a front elevation of the same.

Fig. 7.



In these figures the letters represent as follows:—

a, the bloomery fire.

b, bottom of heating furnace, on which the cold iron is charged.

c, sand hearth.

d, charging-door.

e, wind box.

f, wrought iron blow pipe.

g, pipes for conveying hot air to the wind-chest.

h, pipe through which the hot air passes to feed the bloomery fire below.

i i i, hot-blast pipes lying horizontally in the chimney.

j, cast iron door lined with fire-brick; lets up and down, and can close the front fire, so as to keep out the cold air.

Art. III.—THE LAKE SUPERIOR COPPER MINES.*—By John A. Callender, C. E.

The mineral regions of Lake Superior having become a subject of much interest to geologists, mineralogists, and mining men in this country, as well as in America, a few particulars respecting them may not prove unacceptable to the public. The district to which I am about to refer is in the State of Michigan, extending along that portion of the south side of the lake embracing a promontory, called "Keweenaw Point," through which the mineral-bearing range extends in a westerly and southwesterly direction, but little explored beyond a lake called Agogebec, which was the limit of my own observations during last summer, when I made a general tour through the region, inspecting every mine of importance, and numerous locations where veins had just been discovered, and on which operations were about to be commenced. The formation of this mineral country exhibits the result of frequent volcanic eruptions and disturbances, which, causing upheavals, have exposed alternate systems—plutonic and aqueous: the former presenting the amygdaloidal trap, crystalline greenstone, and porphyry; the latter as a conglomerate is found in belts, varying in thickness from fifteen feet and upwards, bearing with the range from east to west, and forming with the adjoining sandstone the base of the Silurian system. The character of country which there has proved so metalliferous is the amygdaloidal variety of trap—

* *London Journal.*

being traversed by veins from one inch to ten or twelve feet wide, and composed of quartz, felspar, epidote, lamonite, prehnite, carbonate of lime, and chlorite, etc., through which native copper is shot in small particles, or in leaf copper, where the matrix is of more compact texture, yielding in stamp-work from two to ten or twelve per cent. The most remarkable feature of these mines is the enormous masses of pure copper which occasionally form the whole lode between the walls to the thickness of two or three feet, and extending in length and breath for several fathoms. When I visited the North American or South Cliff Mine, a huge mass in the twelve-fathom level, measuring forty-two feet long, twenty feet wide, and averaging two feet thick, was being cut in pieces, such as might be conveniently raised through the shaft. This mass was estimated by the captain to weigh about 150 tons, which I consider was a moderate calculation, making liberal allowance for veinous matter attached to it, as one cubic foot would, I believe, weigh 550 lbs. Out of this mass was cut one solid piece, measuring two feet three inches cube, and weighing 6,300 lbs., which was sent for exhibition to the Crystal Palace at New York. In the stopes of this mine, and of the "Cliff," which lies north of it on the same vein, were to be seen many fine masses of copper clinging to the walls: but it is not in these only where such are to be expected. The whole region is evidently rich in copper; and I should not be surprised to hear of even larger masses occurring in the Copper Falls, Minnesota, National, or Norwich Mines, and many others, which are exceedingly promising. At the Copper Falls, where a shaft was being sunk on the "Hill vein," about fifteen tons of mass copper was raised from a depth of only six fathoms; it is, however, more profitable when these masses are found of such dimensions as will admit of being raised without cutting, which is a tedious and expensive operation. An opinion is entertained by many in the region that the deeper these mines are worked, the richer they will become. I cannot, myself, concur in such a theory. My belief is that the vein may prove as rich in copper near the surface, where it has not been shattered at the outcrop, nor suffered from decomposing agencies after the upheaval, as it may do in the deep; but a variety of impressions exist among geologists who have visited the regions as to the manner or law by which these masses have been accumulated—a subject which I cannot enter upon in this letter.

From the eastern division of the range, for about fifty miles west, the main veins run across the formation, bearing about north and south; and they gradually bear round in going west till the leading veins of the Ontonagan division bear nearly east and west with the formation. Those which have their strike across the formation, are generally well delineated on the surface by a natural depression, or valley, no doubt formed by the great current of water, which at one time prevailed from the north, acting upon the more destructible veinstone at its outcrop, and thereby forming a channel, which gradually became wider as it increased in depth.

The explorers are now much aided by these guiding features, also by pits, which indicate where an ancient race—probably the Aztecs or Toltecs—have carried on their superficial operations on the veins. Some of those I saw were twenty or thirty feet deep, which must have been the result of much labor, considering their tools—the only trace of which we find in the shape of ovi-formed stones, with a groove round the centre for the purpose of securing a handle, then to be used as a hammer to shatter the veinstone after it probably had been reduced by the action of fire and water on the calcareous matter entering into its composition. In favor of this conjecture, quantities of charcoal have been found in the bottom of some of these pits, which are almost effaced by the accumulation of timber decayed and foliage of ages past.

In tracing the veins across the range, it is interesting to observe the change which takes place as they pass through different formations. Beginning with the conglomerate on the Lake shore, the vein presents little native copper, but is charged with black oxide and green carbonate. Passing south into the amygdaloidal trap, the copper is found most abundantly in the native form, as before described; then into the crystalline trap, or greenstone, where the vein exhibits little or no copper in any shape; again, in the amygdaloidal trap, it appears as before; and, lastly, in the porphyry it assumes the form of a sulphuret.

I observed, in a recent number of your *Journal*, an interesting extract from the report of the Hon. Truman Smith, Senator in the United States Congress, who was visiting the mines during summer. It would appear, from his experiments in the reduction of mass copper from the North-West, Cliff, and Isle Royale Mines, that it contained a large quantity of silver per ton. I would not have supposed such to be the case in any specimens which I examined with the naked eye; but where silver was visible, it was generally in solid pieces, sometimes crystallized, adhering to the mass copper—several fine specimens of which I saw at the Minnesota Mine. Should the startling results of Mr. Smith's analysis prove to be but half correct, these mines must be rich indeed.

It is only within the last two or three years that mining pursuits in this interesting region have been carried on with spirit; for mining there is still in its infancy. But some estimate may be formed of this vast field for enterprise when it is known that, with all the disadvantage attending such operations in a new country, from the opening of the navigation up the Lakes last spring to the close of this winter, about 3,000 tons of copper will have been sent to market. What may be the amount of shipment next season no one can calculate; but there is much encouragement to expect that from so many mines recently opened, and by the erection of efficient machinery at those more fully developed, a large increase in the amount raised must follow, and at much less cost per ton as labor becomes less expensive. Good roads are formed to the different points for shipment, and better management is introduced.

The increase of population during the last two years is a convincing proof of the prosperity of the first adventurers. The little towns are rapidly extending: and at the mouth of the Ontonagan River, where, three years ago, there were only two log-houses, a complete plan for a town had been laid out. When I was there in August, about fifty houses were in process of erection. The population amounted to between 400 and 500 inhabitants. There were two comfortable hotels; and I believe a third will be opened in spring. Moreover, there are large stores, where every necessary can be obtained, though at high prices, from an easy-chair or a dress-coat to a frying-pan! And there is an incredible demand for preserved fruits, sardines, and such luxuries for the table—the miners requiring these dainties to coax them to remain in their backwood retirement. The Minnesota, National, Norwich, Ohio, Trap Rock, Forest, Toltec, and Douglass Haughton, are all within a reasonable distance of Ontonagan, and must contribute largely to the trade of that town. Eagle River, Eagle Harbor, and Copper Harbor, are also becoming points of considerable import, in consequence of natural advantages as harbors or their proximity to mines. The fortunate pre-emptors of the land throughout the region are growing in wealth; and what will tend much to populate the country, and enhance the value of property—mineral, agricultural, or for building purposes—is the construction of a canal at the Saut Ste. Maria, between Lake Superior and Lake Huron, which promises to be so far completed next autumn as to admit of the passage of vessels, and thereby establish uninterrupted sailing from Lake Superior to the Atlantic. The great expense at present attending freight to and from the Lake will thus be materially lessened by saving the unshipment and reshipment of all goods passing from one lake to the other. The monopoly at present enjoyed and taken advantage of by the steam-packet companies, will also be done away with, and a superior class of vessels will meet the wants of the people, and tempt the Southerners during summer to seek the exquisite climate and cool breezes to be enjoyed on these expansive seas of fresh water. The extraordinary success which has been attending the development of so many of the Lake Superior mines, offers great inducement to capitalists in this country, as well as in America; but I would caution against any speculation in these regions without the most authentic information derived from competent and reliable parties, either resident on the spot, or sent from this country to inspect and report on any location offered for sale in the English market. I believe that one company has already been organized by influential men in England and America. It is to be hoped their operations will meet with success, and be the means of directing both capital and skill to those pursuits which, properly conducted, in a country of such mineral wealth, cannot fail to be followed by ample reward.

Art. IV.—THE COAL LANDS OF EGYPT, BELMONT, EVANS, PALMER, AND WILCOX PLANTATIONS, ON DEEP RIVER, NORTH CAROLINA.—Report of Dr. Chas. T. Jackson.

Sir:—In accordance with the instructions which I received from you, on the 13th ultimo, I proceeded to examine the coal land on Deep River, North Carolina, which I had partially and cursorily explored with you in April last.

Having now spent a month in examination of the coal lands in question, I am prepared to give a pretty full account of their probable value for coal mining. In this survey I was most ably assisted by your agent, William McClane, Esq., to whom I would present my thanks. I shall also call your attention to the large deposits of valuable iron ores that occur on the same territory, and make some suggestions as to the use that may be made of your small coals, in the manufacture of iron from these ores.

North Carolina has been, perhaps unjustly, reproached for want of enterprise in allowing her vast mineral resources to remain for so long time idle, and the public generally have not, to this day, become fully aware of the fact, that this state may justly claim* the very highest rank as a mineralliferous country.

The former want of railways and of canals, and of good and

* North Carolina was the first state that caused a geological survey to be made under order of her Legislature—Professor Olmstead having been commisioned by the Governor to explore the gold regions of the state. Partial explorations were also made subsequently by Professor Mitchel, who prepared a geological map of the state, representing particularly the great bed of sandstone belonging to the coal series of rocks. At the present time, Professor E. Emmons is commissioned, as State Geologist, to make a geological survey of the entire state. It would, therefore, appear that North Carolina has taken adequate measures for a full exposure of her mineral wealth. The fact that few of the citizens of the state have engaged in mining enterprises, is owing, probably, to their attention being devoted mostly to agriculture, and that they were unwilling to enter upon business which they are generally but little acquainted with.

deep harbors for large shipping, prevented the due development of the internal wealth of the state; and her exports finding an outlet mostly from the ports of Charleston, South Carolina, and Norfolk, Virginia, led foreigners, and many of our own people, to undervalue the commerce of North Carolina.

Recently, a new spirit of enterprise has manifested itself in this state. Railways and plank-roads are now laid, and are rapidly extending.

The slack-water navigation of Deep River is to be completed by next spring, so that barges may run to Fayetteville with their loads of coal. A new port is rapidly growing up at Beaufort, where the largest class of ships may enter, and from whence they may go to sea, let the wind blow which way it listeth.

These are among the few improvements that have accompanied the new developments of her mineral resources, and will tend to excite still further to develop the vast mineral and agricultural produce of the state.

Copper, gold, lead, silver, iron, and coal, are among the most valuable of the minerals that will be largely exported, and quarries of excellent soapstone and of gray sandstone will also be opened, when ready means of exportation are provided.

The agricultural produce of the state is well known to be equal to that of any other state of equal area in the Union. I have premised these remarks, because I am aware how little is generally known at the North of the resources of North Carolina.

The immediate object of this report, is to bring distinctly into view the importance of the coal mines of Deep River, which are destined to furnish no inconsiderable amount of fuel for steam navigation, and for various manufacturing establishments.

The existence of large beds of good bituminous coal, in a region accessible to boat navigation, is a matter of universal congratulation; and no one can at first fully appreciate the advantages that will ultimately arise from a discovery of this kind. North Carolina is therefore peculiarly fortunate in possessing such mines, so conveniently situated.

GEOLOGY OF THE COAL DISTRICT.

The Deep River coal formation is believed to belong to the new red sandstone series of rocks, such an opinion having been formed by most of the geologists who have visited it, and examined the fossils which occur in the strata. By some it has been supposed that this coal was of the same age with that at Richmond, Virginia, which has been described as belonging to the oolitic or lias group.

This opinion has in its favor the geographical position of the two deposits; while the former view is maintained, by reference to the peculiar fossils that have been found in the Deep River shales, and sandstones. However this mooted question may ultimately be decided, it is certain that, whether the rocks are of the new red, or oolitic groups, the occurrence of workable beds of coal, in such comparatively modern rocks, is a most curious and interesting exception to conclusions arrived at in England; for no workable coal has ever been found in either of those formations in Europe. The Richmond coal mines have been wrought for more than a century, in rocks regarded as oolitic, and now we are able to show more extensive beds of coal in rocks which are either the new red, or oolitic, in the neighboring state of North Carolina.

It was regarded a marvellous exception to the order of superposition of rocks, that the Richmond coal should be found to rest in a granite basin. Not less remarkable is it, that the independent coal formation of North Carolina rests directly and unconformably upon the auriferous talcose slates of that state.

It would be very interesting to science, and of no small practical utility, to institute a rigid comparison of the strata and of the fossils which occur at the two above-named coal mines of North Carolina and Virginia; but my present duties will not allow me time to do this, nor would the discussion seem to be fitly placed in a report on a purely practical question. The merchant leaves all such matters to be disposed of by scientific men, and looks chiefly to the practical bearings of the results of their deliberations.

A simple and plain description of the rocks which contain the coal will of course be expected in this report, and such I shall endeavor to give, so as to enable others to know the true position of the coal.

DESCRIPTION OF THE COAL-BEARING ROCKS OF DEEP RIVER.

The bottom rock of the coal basin, which rests unconformably directly upon the auriferous talcose slates, is a coarse conglomerate, made up of pebbles of pre-existent rocks, which have been worn round and smooth by the action of the ocean's waves causing attrition among the fragments of rock at the bottom and on the ancient shores. These pebbles are now consolidated into a hard rock, by cementing of the pebbles and fine detritus, so that they are firmly imbedded, and the rock is suitable for mill-stones. Upon this coarse conglomerate or mill-stone, rests a finer-grained gray sandstone, made up of smaller particles of the same materials. This rock is known as grindstone grit, and is used for grindstones. Intercalated with this grit, we find beds of clay slate, which was originally fine blue clay, but is now a fissile and tolerably hard rock. Beds of this slate also overlie the gray grit. Over the slates we find a finer-grained sandstone, generally colored red by peroxide of iron. Then comes, over this, a bed of hardened clay, called fire-clay, or under-clay of the coal. It is supposed to have constituted the bottom of the lake or estuary into which the coal plants sunk in the formation of coal, or it may have been the soil in which many of the coal plants grew.

In the fire-clay, bands of clay-iron stone, carbonate of iron, and strata or bands of iron ore, occur, and this finds its analogue in deposits of iron ores in modern peat bogs.

Directly upon the fire-clay lie the first beds of coal, with a covering of thin-splitting slates, charged with bituminous matter, and called coal shales. Several alternations of coal, fire-clay and of shales occur in these coal fields.

It is obvious, both from the structure and mineral composition of coal, that it was derived from plants, and has resulted from a peculiar change in vegetable fibre, called bituminization, which resulted from a kind of fermentation of vegetable matter under water, analogous to the bituminization known to take place in vegetable matter at the bottom of peat bogs.

There are five beds of coal in the Deep River series; but the two upper ones are too thin to be worthy of exploration by themselves. The aggregate thickness of the two workable beds, which are parted by a thin seam of shale, is not less than six feet, and in some places it appears to be eight feet in thickness, according to Professor Johnson's report on the Farmersville mines. It has been observed that the beds widen as they descend under cover of the rocks, the parting shale gradually becoming thinner. This is generally the case in coal-beds so divided, and the coal becomes more pure as it departs from the exposed outcrop, and goes deeper under its roof.

The indications of coal in this basin, are the occurence of thin-splitting shingle of shale in clayey soil. This generally is a guide in finding the outcrop of a coal-bed.

Fossil plants, common to the usual coal formation, are not found in this shale, but small diamond-shaped shining black specks are seen in great abundance, both in the shales and under-clays. These are the scales of ganoid fishes, either the catopterus of Redfield, or some species of palæoniscus. No entire fish has yet been discovered in these rocks, though the scales and the teeth are very abundant, as are also the teeth of sauroid fishes and their coprolites.

It would seem that the fishes all underwent putrefaction before they were inclosed in the mud, now constituting the shales and fire-clay, since they would have been preserved entire, had they been enveloped before decomposition.

On working the coal mines, it is not improbable that perfect fishes will yet be disentombed, and then we may be able to describe them more accurately.

Fossil plants are found in the slates and gray grits that form the lower series of the basin, but they cannot be here described so as to convey a distinct idea of them, without lithographic plates, which I presume will not be prepared for this report. Lignites also occur in the gray grit, and some of them are fine jet suitable for ornaments.

LIMITS OF THE COAL FIELD.

On the west we find the limits of the coal at John Murchison's and George Wilcox's mines; on the east, a little above Rocky River, when the coal crosses Deep River, a little to the eastward of George's Creek. It is possible that after crossing the river to its southern side, that it may extend a little to the south of Hayward; but no mines have been opened so far to the eastward.

The whole length of the line of outcrop of the coal, following its curves, is not less than sixteen miles, and its direct length is not far from twelve miles. This outcrop appears to be exclusively the northern margin of the basin, as will be seen on inspection of the accompanying map.

It is obvious that such an extensive outcrop of coal, dipping southwardly at various angles of from ten to thirty degrees, indicates a most powerful bed of coal, and the dips all go to prove that the coal lies beneath Egypt and Belmont plantations.

We cannot, until the borings reach the coal, give the depth to which it extends beneath the soil of those plantations, because we do not know where the strata turn to become nearly horizontal, as the auger indicates the strata are in Egypt, where they have been bored into in several places.

When the Farmersville slope is worked to the turning point, we shall know the spot where we can reach the same bed, on the opposite side of the river in Egypt; but it is probable that the auger will settle this question before long, by penetrating the bed of coal itself, for the last borings indicate the proximity of a coal-bed.

IS THE COAL IN A BASIN OR TROUGH?

This question has been raised by those who doubt the fact of the existence of the bed of coal south of the outcrop, and therefore I shall devote a few lines in exposing my views on the subject.

We find one margin of a coal deposit, extending not less than twelve miles, parallel with the line of strike of the strata, and the coal is found to be regularly included between the strata, of shale and fire-clay, and to dip with them to the southward. Following this line we find it to converge towards the ends, or the north-eastern and north-western extremities, so that the arrows we put on the map, representing the true direction of the dip, point towards the centre of a long narrow or trough-shaped basin. Now, although no southern edge of this basin has yet been discovered, we may safely assume that the coal deposit has a basin, or trough-like shape, for such a form is indicated by one of its sides, already well known. Again, we know that this trough-like form is the usual shape of a coal field, and although we may never see the other rim of the basin, we have a right to assume that it will have another side, symmetrical with the one we have discovered, as much so as we have the right to assume the existence of symmetrical planes in a crystal one-half only of which is exposed out of its gangue.

In many working coal mines only a small portion of the basin is known, but still the coal is regarded as in a basin, or trough, such being the general law of deposits of the kind. Professor Silliman has well described the anthracite coal-beds as being "like a series of canoes set one in the other." Such, we feel confident, will ultimately prove to be the form of the Deep River coal deposits.

It is sufficient for practical purposes, to know that there is an adequate supply of coal; enough to warrant the opening of regular mines, with the requisite machinery for pumping out the water and hoisting up the coal, and such I am satisfied we have proved on Deep River. The coal certainly descends with the strata, and there is no instance known of such thick beds of coal giving out at a small depth. The linear extent of outcrop is, as before observed, from twelve to sixteen miles; hence there must be an abundant supply attainable, even if it extends only a mile in width.

To what depth beneath the surface soil on Egypt plantation we must descend to find the coal-bed, is, as before mentioned, yet unknown; but since we see the coal, not more than half a mile distant, dipping down beneath that plain, it is obvious enough that the coal must be there, and we can easily reach it by mining nearer to the outcrop, if it should be found to be too deep at the point where the auger is now penetrating.

On the Belmont estate the coal must be near the surface, if it continues to follow the slight inclination shown at Laurence Haughton's upper pit, where the coal-bed is nearly horizontal. There are flexures in the coal strata, without doubt, and hence it is impossible to predict the exact depth of the bed from a given point, though we may, after proper sounding with the auger in numerous places, form a probable estimate of its depth for a limited distance, especially if there are no protruded trap dikes near, which would be likely to have disturbed the coal-beds at the epoch of their eruption. In many places it is obvious that the eruption of trap dikes has broken the continuity of the coal strata, and produced shifts or faults. These are common in most coal districts, and the effect of such dikes is well understood by miners, as well as by geologists.

The dikes of trap on Deep River are numerous; but they are generally very narrow, and hence they have exerted but little mechanical or chemical power over the coal-bed. The conversion of some of the coals into semi-bituminous and anthracite, is commonly attributed to the heat of the trap rocks, given out during their eruption, and the displacement of the strata is supposed to have been effected by the uplift that took place during the eruption of these igneous trap rocks.

Owing to the smallness of the dikes of trap, their chemical effect on the coal is quite limited. Good and highly bituminous coal-beds are found quite near to the semi-bituminous, and anthracite coals, as seen at Murchison's, Bingham's and Evans' coal mines.

At the Gulf the most bituminous variety of coal is found at Haughton's mines, and the same kind is also found at the Farmersville mine, opposite to the Egypt plantation.

PETER G. EVANS' COAL MINE, AND WILCOX ANTHRACITE.

On the plantation of Peter G. Evans, a fine exhibition of the outcrop of the coal is seen on the borders of Indian Creek, where it is exposed in the natural embankment of the stream for a considerable distance. The coal dips, with its accompanying shales and fire-clay, twenty degrees south-eastward. This coal, near the surface, is not so bituminous as that got out at Haughton's mines at the Gulf, some of the beds being anthracite, but it is a solid and good coal, capable of bearing transportation, without breaking more than usual into small coals. It is proposed to open these mines in season to send coal to market when the slack-water navigation is completed.

After examining some dikes of trap rock which intersect the strata, in an east and west direction, on the road between P. G. Evans' and Wilcox's, we went to Wilcox's anthracite mine, a little beyond the trap rocks seen on the road.

The anthracite dips at an angle of twenty-five degrees to the south eastward. This coal is supposed to have become debitumenized by the action of the heat from the trap dikes near at hand; but it is remarkable that on Bingham's estate, a little to the north of this anthracite, a coal-bed, with the usual proportion of bitumen, is seen dipping *below* the anthracite. Whatever may have been the cause of the formation of anthracite at Wilcox's mines, it is certain that the influence of it was quite local.

There is some sulphuret of iron mixed with the anthracite, which, if it continues to occur throughout the bed, will injure the value of the coal for smelting of iron ores.

PALMER ESTATE.

Palmer's estate contains the same bed of coal that is exposed at Peter G. Evans' mines, as is obvious from the line of the outcrop of the bed; but no sufficient openings have yet been made to explore it, though the coal shales are seen in the soil. Iron ore is abundant on this location, and is of good quality. Some of the coal obtained near the surface is a true anthracite, and much of it is dry coal.

By aid of the map, it is easy to see exactly the relations of the coal to each plantation delineated, and therefore it will be unnecessary for me to enter into a repetition of remarks at each locality, that are generally applicable to all of them.

I have the impression, that when mining operations extend excavations into the debitumenized or anthracite coal-bed, that it will be found, when the coal reaches a certain depth, it will contain bituminous matter, as in other parts of the field. If not, I should attach but little value to that kind of coal, since better varieties of anthracite are readily procured from Pennsylvania.

The excellent bituminous coals of Deep River will always command the highest prices in the market, and I should advise that the best coals only should be sent to a distant market, and the poorer qualities be kept on the ground, to be used for driving the steam-engines of the works, and for local uses at steam saw-mills and forges, there being a large local demand for cheap coals.

COAL MINE AT FARMERSVILLE.

Within an oxbow of Deep River, nearly a mile from the Egypt plantation, a regular sloping shaft has been sunk into the coal-bed, and the working of this mine is now about to be recommenced; a steam-engine having been provided for pumping out the water, and for raising the coals.

Since this coal-bed descends beneath the river, and passes beneath the plain of Egypt plantation, it is important to your Company to know what can be learned about it. The slope was filled with water while I was there, so that I was able to see only the outcrop of the coal, and the shales and fire-clay that had been got out in working the mine. This slope now has reached the extent of eighteen yards, on a dip of twenty degrees, and consequently reaches a perpendicular depth of $16\frac{8}{10}$ feet. The coal-beds at that point are stated in Professor Johnson's report to have the following dimensions:—

1st.	Bottom Coal,	2 feet 8 inches.
2d.	Intermediate Slate,	1 " 6 "
3d.	Top Coal,	4 " 6 "
		8 feet 8 inches.

Showing an aggregate of 7 feet 2 inches of coal.

In the upper part of the slope, the thickness of the coal was as follows:—

1st.	Bottom Coal,	2 feet 6 inches.
2d.	Intermediate Slate,	2 "
3d.	Top Coal,	3 "
		7 feet 6 inches.

Or, 5 feet 6 inches of coal.

These measurements prove that the coal-beds widen as they descend, by the diminution of the thickness of the shales, and the substitution of coal in place of them.

Most coal-beds are thin and poor at the immediate outcrop, and become thicker and more solid as they enter under cover of the rocks.

It is obvious that when the coal-bed reaches beneath the plain of Egypt, it will be more compact and of better quality than it is at Farmersville, near the surface.

If the distance from the line of the Farmersville outcrop is one-fourth of a mile, or four hundred and forty yards, if the coal continues to dip at an angle of twenty degrees, the depth of the bed at the borings in Egypt, would be two hundred and thirty yards nearly, or six hundred and ninety feet; but it is not probable that the coal continues to dip at such a bold angle, for the successive borings in Egypt, in a line toward the outcrop, indicated nearly horizontal strata of shales below Egypt. The present depth of the borings is two hundred and eighty-two feet, and several seams of "bone coal," or a mixture of coal with shales, have already been penetrated, and the last perforated strata consisted of a highly carbonaceous black shale, like that over the coal-bed. We may therefore expect soon to hear that coal has been reached.

At Belmont the coal is probably still nearer the surface, for the outcrop at Haughton's shows the coal plunging beneath Belmont estate, at angles varying from ten to thirty degrees. If the angle of the dip should prove to be ten degrees, then at four hundred and forty yards south, twenty degrees east from the outcrop, the coal would be eighty yards, or two hundred and forty feet, from the surface, and at one mile, or one thousand seven hundred and sixty yards distance, it would be three hundred and twenty yards, or nine hundred and sixty feet deep; while if the angle was twenty degrees in one mile, the depth would be six hundred and fifty yards, or one thousand nine hundred and fifty feet.

It is not probable, however, that the coal will continue to dip at a high angle far from the outcrop, for we find in other American coal fields, as in that of Wyoming Valley, that although the coal begins at the outcrop with a bold dip of twenty-five degrees, it assumes an early horizontal line when it has reached a depth of sixty or seventy feet below the surface. This seems also to be a general law in the formation of most coal basins, and we have good reason to believe it will be found to be the law in the formation of the deposit of coal in Deep River.

It is obvious that if a bold dip was long continued beneath the strata, that our coals would soon pass beyond the reach of the miner, and the coal would only be attainable near the outcrop.

It is a curious and providential arrangement, that coal is always found in shallow trough-shaped basins, and that it is very rare for it to sink to inaccessible depths.

Professor Walter R. Johnson, in his admirable report on Farmersville coal-mine, says:—

> The thickness of even six feet two inches of coal, worked in a chamber seven feet nine inches in height, or at the point where I last measured the bed, is abundantly sufficient for very profitable workings.
>
> The whole coal will not of course be removed, but with careful mining it would not be necessary to leave more than one-fourth in the ground. The gradual inclination of the beds does not lead to the supposition, that you will ever have to descend to an excessive depth, and be thereby compelled to leave a large proportion of coal for pillars.

In working coal mines it is generally found to be most economical to sink shafts, and to drive levels, and then to cut out chambers in working the coal. The advantages of this method, over that of working by slopes, is obvious. Drainage and ventilation are more easy, and a larger extent of ground can be opened by the miners.

It would be most desirable to have at least one hundred feet of rock overhead in working these mines; and therefore, when we have ascertained the exact position of the coal by the auger, shafts will be sunk in such places as will insure that thickness of roof rocks to the mine. Considerable time and labor will yet have to be expended in explorations with the auger, before the mines can be advantageously opened.

I beg leave to refer to the late Professor Walter R. Johnson's report, for a series of chemical analyses and researches on the value of Deep River coals, and would recommend them to your careful consideration as models of correct analytic work on coals.*

I would respectfully call your attention to the large deposits of excellent iron ores that are found in the coal districts of Deep River.

They are, the "blackband" iron ore, carbonate of iron, clay iron balls, and brown hematite.

These ores occur in sufficient quantities to warrant the erection of a blast furnace, for the manufacture of cast iron.

Large quantities of iron ore, shales, and strata of carbonate of iron will be thrown out in working your coal mines; and in addition to this supply you can obtain readily, from various plantations in the vicinity, a large amount of iron ores obtained

* See Mining Magazine, Vol. I., pp. 357–361.

from the surface soil. In working a coal mine large quantities of small coal are produced,—at least one-third of the coal raised from the mine being broken too small to send to market.

This coal should be made into coke, and may be economically employed in smelting iron ore.

All the pig iron that can be produced from one blast furnace can readily be sold on the spot, at prices that will be profitable to the Company.

Re-melting furnaces will employ this pig iron for castings, and forges will consume a large amount of the pig iron in the manufacture of bar iron, all of which may be sold on the spot where it is made; for it will be cheaper than imported iron, that would require so much expense to be paid for transportation from the seaboard.

Limestone suitable for flux is found in the western margin of your coal field, and the red sandstone will make a good stack for the furnace; and the excellent soapstone found at Wamble's and Clark's quarries will make the best hearthstones, tymps and lining for it, as the fire-clay of the coal mines will make fire bricks for the interior of the furnace.

I am satisfied that iron can be manufactured profitably on Deep River. If the limestone found there does not answer the purpose for flux, your boats returning from Cape Fear River, after discharging their loads of coal, could bring back loads of shell marl, which is nearly pure carbonate of lime, and will make a better flux than any limestone, since it is more divided, and will therefore act more promptly.

There need be no fear entertained with regard to the practicability of manufacturing iron on Deep River, and if the present prices are maintained, the iron could be made at a very high percentage profit.

I have, at the suggestion of Mr. McClane, called your attention to a branch of business not mentioned in your letter of instructions to me, and am informed by him that there will be no difficulty in finding capital in the neighborhood to carry on the works, if it should be decided to erect them.

With regard to the value of coal land per acre, I beg leave to refer you to the excellent State report of Professor Emmons, pages 132–3, in which you have an estimate applied to the Deep River coal that is obviously correct:—

> If the thickest seam of coal is worked, which has a thickness of six feet, exclusive of a thin band of slate, it will give for every square yard of surface, two square yards of coal. A square acre has 4,900 superficial yards; hence, there will be 9,800 square yards of coal in each acre, and as a square yard of coal weighs a ton, there will be for every acre, 9,800 tons of coal. A thousand acres will give 9,800,000 tons of coal, or a square mile, 6,272,000 tons.

Trusting that your enterprise in opening the coal mines of

North Carolina will be duly rewarded, I have the honor to be your obedient servant,

CHARLES T. JACKSON.

T. ANDREWS, Esq.

P. S.—Since the above report was set up in type, Mr. McClane has discovered a bed of coal, four feet ten inches in thickness, in Egypt, on the south side of the river, where he perforated the coal at a depth of 361 feet from the surface. Our predictions are therefore fulfilled, and the coal has been found at a convenient place for mining. C. T. J.

ART. V. — THE MANUFACTURE OF THE SLAGS OF REDUCING FURNACES.—REPORT OF THE AMERICAN LAVA COMPANY.

IN the utilization of the mineral products of reducing furnaces, a new channel of productive industry is created, equal in extent, interest and importance, to any that has previously afforded employment to the capital and labor of civilized nations.

A company, called the American Lava Company, has been formed, the object of which is to utilize the slags of reducing furnaces, by manufacturing them into ware; and also to sell rights under the patent already granted to Dr. Wm. H Smith, in the United States and in Europe, and has secured for itself full possession of the entire right and interest in said patents.

The manufacture of iron and other metals has progressed so rapidly within the last century, as to render it an object of primary importance to capitalists interested in this department of industry, to avail themselves of every possible means of economizing the processes and utilizing the products of a business which requires an investment in buildings and machinery of a greater capital than is employed for the development of the resources of any other manufacturing or commercial enterprise.

In metallurgic operations considerable improvements have been made during the last sixty years, both as regards the construction of furnaces, the economizing of heat by the use of hot air in the blast, the use of anthracite coal, and the employment of suitable fluxes.

It has not yet, however, been deemed safe or wise to invest capital in the reclaiming from waste of that vast amount of *mineral material* which constitutes by far the largest product of the smelting operation. In America, and in all parts of Europe, a vast source of wealth has in this respect been almost entirely overlooked. Material has accumulated as a waste product, which, if economized, might have enhanced the value of metallurgic operations to a far greater extent than has been effected by all the other improvements that have been adopted during the last century.

To utilize these vitrifiable mineral products of reducing furnaces, by their manufacture into various kinds of useful and ornamental mineral ware, is the object contemplated by the American and Foreign Lava Company.

The term *lava* has been applied to this class of products, because this term aptly designates the very peculiar property of these products, viz., their remarkable *fluidity*, and consequently their superiority over all other mineral preparations for the processes of casting, rolling, pressing, etc. This remarkable fluidity is owing to the elevated temperature of the hot-blast furnace, which not only insures a perfect fusion of the mineral ingredients contained in and furnished by the ore, fuel and flux, but presents the resulting mineral compound in a state of liquidity the most favorable for subsequent treatment in manufacturing it into ware.

Had the experiment never been tried, of refining, coloring, moulding, casting, annealing and polishing refuse slags, it would be hazarding but little to attempt to demonstrate the practicability of the undertaking upon purely philosophical principles. All the accumulated facts and established principles of modern science that shed light upon the mineral deposits and formations of our globe clearly agree upon this fundamental truth, that there has been from the earliest ages, and must still exist, some *modus operandi* by which igneously fused mineral compounds can be moulded into shape, and so annealed as to result in desirable building material.

The lava of the volcano has, by some agency exerted in the laboratory of Nature, been moulded and annealed so as to form some of the most durable and beautiful rocks of our globe. Chemistry, geology and electricity all harmonize in bringing to light the agencies concerned in determining the form and general properties, as to hardness, flexibility, etc., of mineral formations. To the mineralogist who is acquainted with the valuable properties of the large class of the rocks of our globe known to be of igneous origin—to the chemist who knows that the mineral ingredients of a reducing furnace, when melted together, must unite in definite atomic proportions, determined by invariable and fixed laws of affinity—to the electrician who is acquainted with the power and influence of electricity in modifying and regulating the crystalline tendencies of rocks, whether formed by aqueous solution or igneous fusion—the molten slags of iron furnaces afford an inviting field of research that must prove both fertile in scientific discovery and of immense practical utility, enhancing the profits of metallurgy.

But aside from all theoretical considerations, the American and Foreign Lava Company are prepared to present to the public satisfactory facts, the result of protracted and careful experiment, which convincingly attest the value of the molten mineral product of reducing furnaces. According to the analysis of M. Berthier, the slag or cinder of the Dowlais furnaces consists of silica, 40.4; lime, 38.4; magnesia, 5.2; alumina, 11.2; protoxide of iron, 3.8; and a trace of sulphur. Slags from the Dudley furnace, and others from Saint Etienne, in France, presented similar analytical results, varying slightly as to the relative quantities of manganese and sulphur.

The slags of the anthracite furnaces of America generally consist of silex, 51; lime, 21; alumina, 15; magnesia, 4; iron, 5; with traces of sulphur, carbon, manganese, potash and sulphur.*

Now, it is known to every mineralogist that the above ingredients form the most desirable mineral compound that could be desired for the artificial formation of a durable material, to be used for architectural purposes. These are the very elementary ingredients out of which, in the vast laboratory of Nature, are moulded and annealed nearly all the solid rocks of our globe.

"The rocks of our globe," says Professor Dana, in his standard work on Mineralogy, "are made up of about thirteen of the fifty-nine elementary substances found in nature. These are the gases, *oxygen, hydrogen, nitrogen, chlorine;* the non-metallic elements,

* Composition of Cinder.—Taken from the Report on the Manufacture of Iron, by Mr. J. H. Alexander, Baltimore, Md.:

	Charcoal Furnaces.							Coke Furnaces.		
	Peroxide.			Sparry Carbonate Ores.				Carbonates of the Coal Formations.		
	1	2	3	4	5	6	7	8	9	10
Silica . . .	51.84	65.6	31.1	52.0	71.0	37.5	49.6	60.6	68.2	55.4
Lime . . .	21.8	24.0	14.1	30.2	7.2			12.2	13.3	18.4
Magnesia . . .	4.52	1.2	34.2	5.2	5.2	8.6	13.2		4.0	1.5
Aluminum . .	15.21	3.3	8.9	5.0	2.5	2.1	9.0	16.4	12.0	16.2
Prot. of Iron . .	3.73	1.7	1.0	1.6	5.0	21.5	0.4	10.4	4.2	1.2
Prot. of Manganese .	1.16	3.9	4.4	4.7	6.5	29.2	25.8			2.6
Oxide of Titanium .			9.0							
Sulphur . . .			trac's			trac's				1.4
Phosphoric Acid . .		trac's								

COMPOSITION OF THE ANTHRACITE CINDER OF PENNSYLVANIA.

	No. 1.	No. 2.	No. 3.
Silex	50	58	51
Alumina	17	[illegible]	15
Protoxide of Iron . . .	3	2	5
Manganese		2	Traces.
Magnesia		10	4
Lime	30	22	21
Sulphur		Traces.	
Carbon	Traces.	Traces.	
Potash			Traces.

carbon, sulphur, silicon; the metals, *calcium, sodium, potassium, magnesium, aluminum.* The element, *silicon*, combined with oxygen, forms silica; combined with lime, it forms nearly all the other mineral ingredients of *granite, mica-slates, volcanic rocks, shales, sandstones*, and *various soils*. No element is therefore more important than this in the constitution of the earth's strata; and it is especially fitted for this pre-eminence by its superior hardness," (see specimens of *lava ware*,) "a character which it communicates to the rocks in which it prevails. Next to silica rank *lime* and *carbon*, for carbon with oxygen constitutes *carbonic acid*, and this combined with lime produces *carbonate of lime*, the ingredient which, when occurring in extended beds, we call *limestone* and *marble*."

Professor Phillips, in his treatise upon Mineralogy, remarks: —"But if we look more narrowly into the composition of the crust of the globe, as consisting chiefly of the earths and earthy minerals, we shall find that only three of the earths which have been discovered, viz., *silex, alumina* and *lime*, are found to constitute its great bulk."

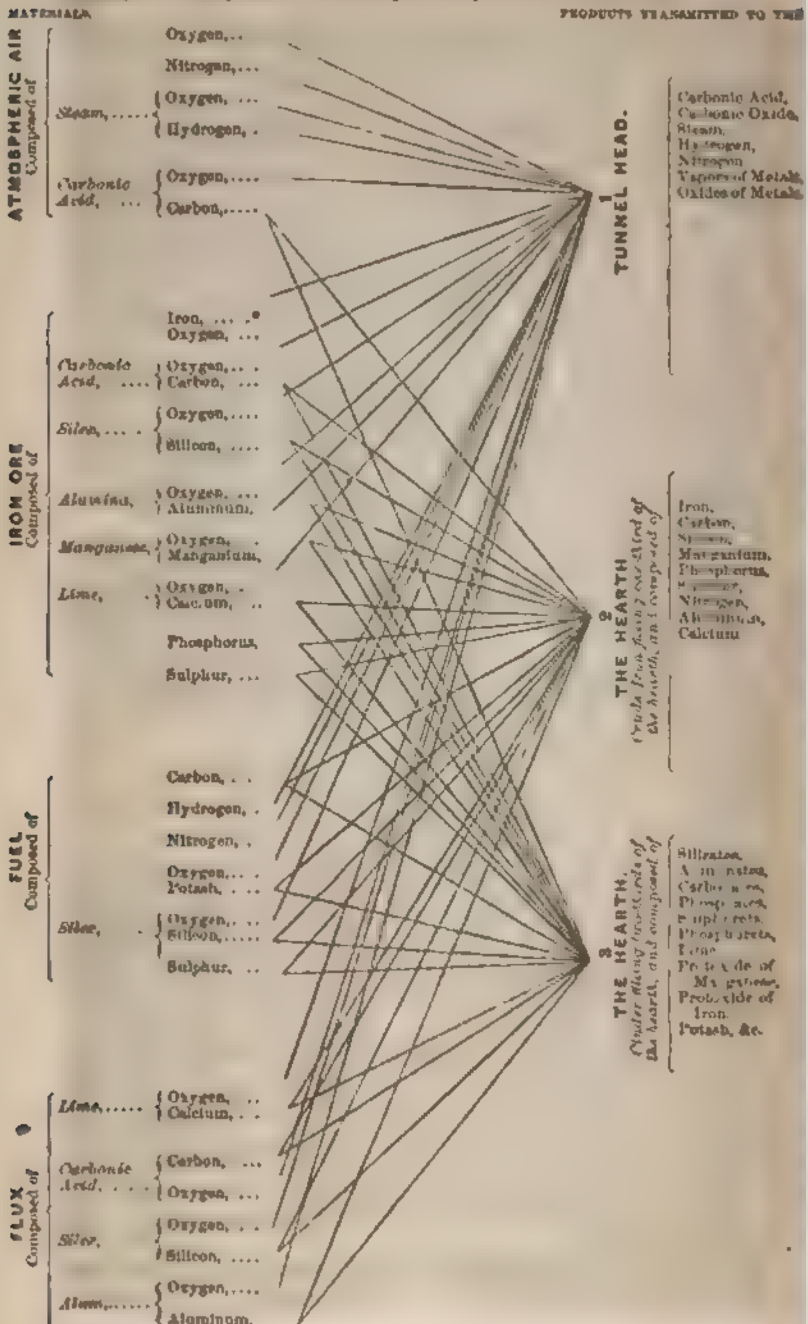
A simple reference to the ably compiled anagraph, page 268, (extracted from "Overman on the Manufacture of Iron") is all that is needed to convince the most skeptical, that each reducing furnace for the smelting of ores is a complete laboratory, furnished with all the ingredients, and in just suitable proportions, for the composition of artificial stone, corresponding in all essential features and properties with the most valuable natural rocks of the globe.

But the most powerful argument that could be advanced in advocating the expediency of utilizing slags, is afforded by the economical considerations presented by the facilities afforded for working these mineral products. Under the present improved forms of smelting, these ingredients are reduced to a state of fusion which allows of their formation into solid and hollow ware, with comparatively little additional labor, and but a trifling cost. Let it be remembered that the iron manufacturer who now expends $100,000 per annum in reducing 6,000 tons of metal from its ore, fuses from 12 to 15,000 tons of mineral ingredients in order to obtain the pure metal. The melting or fusion of the mineral compound, then, when connected with the reduction of metals, costs nothing, and if regarded as waste material, subjects the iron manufacturer to a cost of from $1,000 to $3,000 per year for its removal. Here, then, is afforded annually 15,000 tons of mineral material, fused at a cost of $100,000, and not only thrown away, but accompanied with a premium of from $1,000 to $3,000 to any one who will remove it from the smelting furnace.

Now, in order to compute the value that may be realized from these mineral ingredients, let us briefly present a few statistics

ANAGRAPH

Exhibiting the Decomposition and Recomposition of Materials in the Blast Furnace.



* The lines from 2 and 3 to the (*) were omitted by the engraver.

connected with the reduction of but one class of metals, viz., the smelting of iron ore. It is estimated that an iron furnace that yields 5,000 tons of pig metal, annually yields three times this amount, or 15,000 tons of slag and scoriæ. At least one-third this amount, or 5,000 tons of slag, is available for being cast whilst in its molten state, as ejected from the reducing furnace, into ware. By the simple process used in manufacturing, lava ware is at once cast, without re-melting, into suitable moulds, and afterwards annealed. The result of experiments made upon an extended scale, shows that the cheaper and simpler articles of lava ware, viz., tiles for paving and building purposes, can be manufactured at a cost that need not exceed from 2 to 4 cents per square foot, if a capital be invested in the manufacture of from $20,000 to $50,000, varying according to the size and yield of the reducing furnace. These tiles, when manufactured, are worth from 10 to 20 cents per square foot, according to the purposes to which they may be applied.

Estimated according to weight, 5,000 tons of slag will cost about $5 per ton when manufactured into ware, and will be worth for building purposes about $20 per ton.

Now if we estimate the annual produce of pig iron in the United States at 600,000 tons, the production of slag suitable for manufacturing purposes will at least equal in amount 600,000 tons. Valuing the slag when manufactured into ware at $20 per ton, it realizes twelve million dollars a year for the United States alone. If even an approximation to this amount of wealth be realized from the utilization of slags, its effect upon the iron manufacture, both in augmenting profits and diminishing the cost of the manufacture of iron, must be such as to render the manufacture of lava ware an object of primary importance. For, if the cost of 600,000 tons of pig iron is twelve million dollars, and the profits upon 600,000 tons of available slag are nine million dollars, there will remain only an expense of three million dollars upon the production of 600,000 tons of iron, worth, at $30 per ton, the sum of $18,000,000. Deducting three millions from eighteen, and a clear profit of twelve million dollars (equal to the whole cost of the iron at $20 per ton) will remain to the iron manufacturers.

Even upon the supposition that the amount of slags has been over-estimated in the above statistics, and that but one-fourth of the value assigned them be realized in the practical result, the profit accruing from their utilization must prove of immense importance to the iron interest of the world, according to reliable statistics, which show the extent and increase of the iron manufacture.

The following tables show the most recent estimates of the number of tons of iron annually manufactured in the United States and Great Britain:—

TABULAR STATISTICS OF THE PRODUCTION OF IRON.

UNITED STATES.

In 1810,	annual yield of iron furnaces,	54,000 tons of pig metal.
" 1828,	" "	130,000 "
" 1830,	" "	165,000 "
" 1832,	" "	200,000 "
" 1840,	" "	35,000 "
" 1846,	" "	765,000 "
" 1847,	" "	800,000 "
" 1854,	" "	1,000,000 "

GREAT BRITAIN.

1740,	annual produce.	17,350 tons.
1788,	"	61,900 "
1796,	"	124,879 "
1802,	"	170,000 "
1806,	"	258,206 "
1818,	"	360,000 "
1820,	"	400,000 "
1823,	"	452,066 "
1825,	"	581,367 "
1830,	"	678,417 "
1836,	"	1,000,000 "
1839,	"	1,248,781 "
1840,	"	1,396,400 "
1845,	"	1,512,500 "
1848,	"	1,998,568 "
1849,	"	2,000,000 "
1854,	"	2,250,000 "

At least 6,000,000 tons of slag will result from the reduction of 3,250,000 tons of metal. Regarding one half this entire amount available for casting and annealing, there will remain 3,000,000 tons of mineral product suitable for being manufactured into ware.

From the above tables it will readily appear evident that the amount of lava ware that can be realized in Great Britain and the United States (without taking into consideration the large manufactures of Sweden, France, Belgium, Russia and the German States,) will be sufficiently ample to constitute a branch of industry that will profitably employ at least 100,000 laborers, and yield an annual profit of at least thirty millions of dollars.

In utilizing slags, the American and Foreign Lava Company proposes to restrict its first operations to the manufacture of the cheaper kinds of ware, so as to hasten the consumption of the immense amount of slags that now encumbers the iron manufactories.

As time and opportunity will allow, the lava will be applied to other uses, such, for example, as the manufacturing of mantles, table-tops, architectural ornaments, bath-tubs, sarcophagi and coffins, basins, counter slabs, columns, slabs for lining cisterns, registers for furnaces, refrigerators, plates for electrical machines, galvanic battery cups and troughs, etc.

ART. VI.—THE SLATE QUARRIES OF VERMONT.—BY CHARLES S. RICHARDSON, CIVIL AND MINING ENGINEER.

PERSONS unacquainted with slate and the slate trade, will probably feel interested with the following brief description of its general features, and more particularly so, when they are informed that there is in this country sufficient of that valuable article, not only to supply their own wants, but to meet the requirements of one half the civilized world. Slate, for the purpose of covering roofs of houses to a small extent, has been used in England for the last five hundred years. It was not, however, until the early part of the last century that its durable properties became generally known, or, at all events, appreciated. At this period, a quarry in Cornwall, and a few in North Wales and Westmoreland, were opened on a small scale. Like all other incipient works, they had to struggle with the difficulties consequent on inexperience in the nature of its development; but what retarded its progress more than any thing, was the want of capital, and the ready and cheap means of transit. The quarries were situated on the stormy, iron-bound coast of the northwest side of the island, lashed by the tempestuous billows of the broad Atlantic. Vessels in those days could not always be obtained to embark in so hazardous a carrying trade, and even those which did venture, were only coasters (small sloops), of seventy to ninety tons burden, and then only for about six months of the year; consequently, the expenses of freight, delays and losses, made the article become very expensive. It is, therefore, not in any way surprising, that we find slate used only on the mansions of the nobility, or buildings belonging to the government, excepting in the locality of the quarries, or sufficiently near to places where a direct internal communication was to be obtained without much labor. But such an important commodity as slate was not long destined to remain in obscurity, for we find that about the years 1780–1790, Lord Penrhyn, who owned extensive estates in the county of Carnarvon, North Wales, opened a quarry in a fine vein of slate rock on his domain at Cae Braich-y-Cefn, near Bangor, constructed roads to the water, and erected jetties for loading the vessels, and his operations, although beset with many trying difficulties, eventually proved very successful; and having once set the example, other landowners in the principality followed. In 1815, there were more than twenty quarries at work, some of them extensively. About this time, that celebrated military road from Shrewsbury to Holyhead was commenced under the direction of the eminent civil engineer, Thomas Telford.

In 1826, the Bangor Suspension Bridge over the Menai Straits, connecting the Island of Anglesea with the main land—

a structure that was considered one of the wonders of the world, and which now stands a lasting monument of the skill of that great man—was opened to the public. This bridge, under which vessels of a thousand tons burden can sail without striking their top-gallant masts, became an object of such universal interest, that persons from nearly every part of the globe came to visit it. This circumstance, I think, contributed very largely to draw public attention to the quarries, as most of the visitors, going on a tour up the mountains, were shown the great Penrhyn and other quarries, which, at this period, were becoming works of importance. On the demise of Lord Penrhyn, the property fell into the hands of his son-in-law, Colonel Pennant. This gentleman, aided by a large capital and a determined spirit of perseverance, combined with skill, has made the Penrhyn quarry of such magnitude, that at the present time it gives employment to 2,600 working people, and, at the same time, renders to its indefatigable proprietor, a yearly profit of £90,000, or $450,000.

About thirty years since, the Delabole quarries in Cornwall, which had been worked at periods on a small scale, for nearly one hundred and fifty years, were opened by Mr. Avery, a merchant of Boscastle, in that county. These quarries are of a different kind from the Bangor quarries. They are what is technically called "sinking quarries," which implies a large open pit, sunk by means of machinery below the level of the sea, and which is much more expensive to work than those quarries which are cut into the side of a mountain. With a like creditable perseverance, Mr. Avery brought his works to a high state of perfection. They are now above three hundred feet deep, and give employment to about one thousand persons. I cannot say what may be the annual profit derived from these works, but it may suffice to say, their proprietor has retired from business with an ample fortune. The quarries are now in the hands of a public company.

Slate-veins present themselves in three different positions of stratification, and three different colors. The vein is sometimes horizontal, often vertical, but generally oblique; in color it is blue, purple, and green. Their relative values depend on the taste and requirements of the consumer; in quality, I consider there is but little appreciable difference.

Quarries are of two kinds; the tally, or roofing-slate quarries, and the rock, or slab-slate quarries. Roofing-slate quarries are those where the vein is finely laminated, which property in the slate admits of its being split into plates of any required thickness. The rock-slate quarries are of a more compact or granular character, the vein is cleaveable, but with an uneven course, and rough surface. It will not generally split thin; therefore it is only fit for slabs, which are seldom required less than one inch thick. The great Delabole quarries have a nearly horizontal vein: the slate is of a somewhat coarse nature, but excessively durable. I know of an instance, where a tombstone that has been standing in an open churchyard, exposed to the atmosphere for two hundred and thirty years, the engraved letters on which are as plain as the first day they left the mason's chisel, and the surface of the stone has scarcely a trace of corrosion upon it. In the town of Camelford, North Cornwall, there was, until a few years ago, a roof covered with this gray-green slate, that had been up for one hundred and fifty years, and the slates were apparently quite sound when taken down. The color of the slates from these quarries is of a grayish green, faintly approaching to a blue tint. They produce both slates and slab, and have a ready sale for all produced.

The Carnarvon quarries, North Wales, in the neighborhood of Bangor, have a vertical vein. It is many miles in length, and varies both in quality and color. The produce is mostly roofing-slates of a blue and purple color, alternating in shade, lighter or darker, very finely laminated, metallic, and durable. The principal quarries in Carnarvon, are:—the Penrhyn, worked by Colonel Pennant; the Llanberis, which produce an annual profit of £48,000, or $240,000, by Ashton Smith, Esq.; and the Royal Bangor, by a London Company, under Mr. Dixon. The Mantlle Vale quarries are on either side of Nant-Mantlle Lake, nine miles from the ancient town of Carnarvon. Here there are a great many works going on: some of them are becoming extensive, employing many hundred families; a few are worked by private individuals, but most of them by companies. Those which have got into full successful operation, are making annual profits of thirty per cent. on their working capital; others are young and barely paying costs; but, taking an average, I should think they pay annually about fifteen per cent. The principal quarries in the valley are the old and new Cylgwyn, under the management of one of the directors, Mr. Hayward, assisted by Mr. Seed, junior; the Taly-Sarn, by Mr. Bonns; the Dorothea, by Messrs. Jones and Company; the Tyn-y-Worglodd, by a London Company, Mr. Jenkins, resident agent; Pen-y-Bryn, Mr. Hughes, the Pen-y-Orsedd, private property, under Mr. John Williams; and the Ty-Maur, a London Company, under the management of Mr. John Horn. There are many others in this section of the country, but with the above I am most intimately acquainted. The last named quarry is one of a very unusual character. The vein is good up to the very surface, the foot-joints are perfectly straight and horizontal, and the heading joints only four to five feet apart. This enables the works to be prosecuted with a small amount of labor, and as there is but little waste, very large profits are the result. One vein in the quarry adjoining the country, called the "Silky Vein," is so finely laminated, that slates can be split as thin as a coarse piece of paper, a property I never saw in any other quarry.

The next large quarries are in Merionethshire, the adjoining county. In the Vale of Festiniog, are some very large works: one, called "Lord Palmerston's Quarry," where a large capital has been expended, gives a fair return. Messrs. Casson and Turner's quarries are extensive. This firm have made a large fortune by quarrying. The vein is of a beautiful light blue color, splits free, and is very elastic; it dips into the mountain at an angle of forty-five degrees. These quarries cannot be so profitable as those before named, for to follow down the vein, a very heavy overburden has to be removed, which increases as the works proceed in depth. To remove such an immense amount of deads becomes so serious an item in the working costs, that eventually the expenses must over-balance the profits, and the quarries be abandoned. Higher up the valley are others now opening. The Cromorthin is one, and promises good returns: some roofing-slates are made, but it is principally a slab quarry: it is owned by a London Company, and is under the management of Mr. Serril, a gentleman who has recently patented some improved slate-sawing machinery. The shipment of the produce from these quarries is at Port Madoc, distant thirteen miles, which is connected by a railroad; every facility for shipping has been made, the vessels lie perfectly safe, and a large trade is carried on.

In the ravine, or mountain gorge, on the eastern slope of a lofty mountain, called "Cadir idris," near Tal-llyn Lake, between the towns of Dalgelly and Machynlleth, are the quarries Aberthevelly and Gwywen, the property of Mr. Rowland, and Messrs. Jones and Company. The former is a slab quarry, and is very productive; the latter produces roofing-slates of a most excellent quality; it has an oblique vein. An experiment has been made to mine for the slate, that is, without taking down the top, but I am of opinion it cannot eventually pay. The shipping-place is at Derwenlass, on the river Dovey; the slate is carted there, a distance of ten miles, which much increases the cost, but a railroad is projected, which, when constructed, will much increase the value of the quarries. There are others opening higher up the mountain, some of which are looking very well. About ten miles north-east of these, in the parish of Mallyrod, near Dinas Mowddy on the side of Moel, Dinas mountain, are three slab quarries. They are are of a coarse natured stone, but are very large, strong, and durable; the color is a light blue. At present they are suspended, the cost of transit being too expensive to enable them to be wrought at a remunerative profit. Of the Westmoreland quarries I know but little. The slate is green, coarse, and very heavy: it was formerly much used in the midland counties, but at the present time Welsh slate has the precedence. In Ireland there are a few quarries; I am only acquainted with two of them—the Ross quarry, in Waterford, and Kilpatrick quarry, in Tipperary. The slates from the former were quite equal to Welsh; both works are now stopped, nothing seems to flourish, however good, in this beautiful, though ill-fated country.

VERMONT SLATE QUARRIES.

Thus far have I sketched the history of the English slate quarrying trade. There may probably be some errors as to dates, etc., which must be excused, as I have no notes to assist my memory. I will now enter into a brief description of the American quarries in Vermont, the details of which must be deferred until I can have time to make myself more generally acquainted with them.

About twelve miles from Rutland, in the township of Poultency, is situated the Eagle Slate Quarry, the property of Messrs. Hollins & Co., of New York. It has been opened in a valley about the centre of a most splendid vein which is dipping 70° northeast, at an angle of about 13° with the horizon. The width of the vein has not as yet been ascertained, but I have traced it over a quarter of a mile. It is of great magnitude, and runs many miles in length visible at the surface; its stratification is very regular, and the stone is of a fine quality, even up to the very surface. The color is green, purple and blue alternating; not by gradation, as in some of the Welsh quarries, but with the several beds. It splits well and makes large-sized slates, which are parallel in their cleavage, straight, not contorted or winding, full of metal, and nearly free from spots. They are quite equal to the generality of Welsh slates, and, I am of opinion, as durable. As a matter of course, at so shallow a depth, they cannot be expected to have arrived at a state of perfection, for slate, like mineral veins, increase in quality as they increase in depth. It is a well authenticated fact that the greater weight there is on a bed of pure slate, so is its properties and value increased. This quarry was commenced about the middle of last summer, and slates were made from even the surface rock. It is at present about twenty-five feet deep. At the dip side of the quarry, at which point the slate is of a most excellent quality, there has been several hundred tons of roofing slates made, which have been favorably received in the Boston and New York markets, and extensive orders are now on hand. The works are looking very well. There are at present about fifty men employed, and, from the nature of the stone, if the works are properly conducted, they will prove very profitable to the proprietors. I am informed it is their intention to open the quarry on a much larger scale in the ensuing spring, and set on one hundred extra men. Some of the stone comes up large, a good deal of which is top rock, and although but little used for roofing slate, would make excellent slab. The present mode of working is by the common derrick, a machine very useful for working a small pit, but totally unfit to meet the wants of a slate quarry, where the speedy removal of the slate rock, and waste, and deads, is a matter of serious importance to the successful prosecution of the works. Like all other young works of the kind, they have difficulties to contend with, and those are augmented through the absence of practical experience; nevertheless, in a quarry where there is such an abundance of good working rock, with scarcely any overburden to remove, and very little waste in the stone, the undertaking cannot very well fail of being a successful one. I am told that the works have already made sufficient profit to enable the proprietors to declare a dividend of ten per cent. on the eight months work. This certainly is as much as any shareholder could reasonably desire, and argues well for the future; in fact very few works ever do so much as this. Should the owners resolve to open the quarry large enough to employ five hundred men, erect the necessary machinery, and place the workings under a proper system of management, I have not the least doubt but that a yearly dividend of 25 per cent. on the working capital would be realized.

THE HYDEVILLE QUARRY,

Working by a New York company, is situated in the township of Castleton, on the edge of that charming piece of water known as Bombazine Lake. The quarry is beautifully located for working; the drivings are with the side of a hill, and all the tip can be run into the water, thus keeping the vein clear of rubble by means of a tram road, although I saw no such appendage here. There seems, at nearly all the quarries I have visited in this country, a determined predilection for horse or ox power—a process many years extinct in England and Wales, as being found by our forefathers to be exceedingly tedious, slow, and expensive. There is a considerable cap of sparry waste on the outcrop, but below the vein is of good quality and of a very pleasing color. The slate is somewhat thick at present, and splits rather rough, but this defect will wear out in depth. I was somewhat surprised they should have made, from an outcropping vein, exposed with its flank to the surface, any slate at all fit for the market, at so shallow a working, although a large quantity of second quality slab might have been returned. The proprietors may consider themselves very fortunate, and it goes to prove the vein must be a good one. The quarry requires to be sunk below water level; if it is done, there is every reason to anticipate the works will assume a profitable character. In quantity there is enough rock to employ a thousand men for as many years.

WEST CASTLETON QUARRIES,

Locally called the Screw-drivers, are worked by a Boston company. They are situated at the head of the same lake, down which their produce is transmitted by boats. The quarries are the most extensive I have seen: they consist of three or four openings. The first is a slate quarry, although not essentially a rock slate; it is of a light pink color, and comes away in large blocks. I saw some slabs one and a quarter inch thick, split to eighteen feet in length very true and clean. In the quarry were some blocks that would make from thirty to forty-five feet superficial in a slab. They are also of a good width to make slabs in their proper proportion. I should think they would work well under the plane; and, from the absence of water splits, I have reason to think they will stand the weather very well. There was so much snow on the ground and it being very slippery, I could not very well ascend the rock to examine the line of heading-joints, but from the appearance of the blocks lying loose, I should think they were at a working distance apart. If they do not exceed ten or twelve feet, then this quarry will some day be one of great value, as the stone is dense, fine in grain, and sufficiently laminated to admit of being split into any kind of slab. There is no regular slab-quarrying machinery on the works, but a sand sawing mill has been erected where blocks are cut for the purpose of making school slates. The upper quarries are for roofing slates, and they have certainly a fine vein to work upon. A very moderate amount of capital would suffice to place those works in a good and profitable state.

HUGHES' QUARRY—

So called—is a small opening made on the edge of a small lake above the West Castleton quarries. It is sunk already below the water level. The slates are of excellent quality, being true, parallel, free from spots, full of metal and of a most beautiful color. The rock possesses all the requisites for making the best kind of roofing slates. The quarry was full of water, therefore I could not form any judgment of the nature of the vein below. A whim is erected and a tram-road run down on an incline into the quarry. This is the first quarry I had seen that had any thing like a workmanlike appearance about it; and although I did not see the manager, I rather guess he has been in slate quarries before he came to Castleton. There is a difference in the appearance of this slate from that which is worked above water, and I am of opinion that eventually all the best part of the vein in this run will be found below the bed of the lake. Next to the slate from the Eagle Quarry this is the best I have found in the district. The quarry is being worked, I am informed, by a private individual.

THE SCOTCH HILL QUARRIES.

Here are a string of five or six quarries close together. They are worked on the side of a hill on the outcrop of the vein, or, as it is called there, the ledge. They all possess excellent working advantages, there being a valley to take all the refuse, and the tip may be almost close to the quarries. They are owned by various parties, but all are working on a very limited scale. I apprehend it is from the want of capital they are not more extensively opened, for there is an abundance of fine rock, and very easy to be obtained; the overburden is trifling. The vein lies at an angle of twenty degrees and produces green, purple, and blue slates, of a very fine quality. I saw no slab made, although there was plenty of curve rock fit for the purpose. Some of the quarries are more than twenty feet in depth in the hill: they are all worked on a level; some have a tram-road, but generally horse and cart power seems the favorite way of taking away the rubbish and rock. From the very small quantity of stock on hand I should think the quarrymen find a ready sale for all the slates their quarries produce.

ROOT'S QUARRY.

This quarry is close to the railway in Poultney, and is the property of Messrs. Root and Company, a local firm. There is here some most excellent slate, as well as blocks for working slab. They are yet shallow, but the quarry looks very promising. Here we find some geological phenomena that are interesting, and which will prove the subject matter of an article expressly devoted to the slate formation and other secondary rocks of the same series, as directly or otherwise bearing upon slate veins or quarries, and which space will not admit of at this time. The works are let by contract to some Welsh quarrymen, at a price per thousand which, after paying themselves, the opening cost, the wear and tear of machinery, interest of capital, etc., leaves to the proprietors, I am told, something like a net profit of thirty per cent. on the capital.

THE NEW PENRHYN QUARRY, OR QUARRY SETT.

Adjoining Messrs. Root's quarry is an estate of about one hundred acres that has been recently purchased by some gentlemen in New York, for the purpose of opening a quarry on an extensive scale. It is proposed to have it bear the significant appellation of Penrhyn, after the monarch quarry of North Wales. I hope it will be half as successful as that to its promoters. I am informed by one of the interested parties that, in the spring of the year, a company is to be organized with a "real capital" commensurate with the requirements of the undertaking, that the works are to be carried out on the most scientific and improved system of modern English quarrying; every description of machinery useful to such a work is to be provided, and, consistent with economy, no amount of money is to be spared to render the undertaking not only one of the largest, but the best in North America. This is the proper and only true way in which quarrying should be carried out, and if it should be conducted as proposed, capitalists may embark in such an enterprise with advantage, or those who have money to spare may invest it with a perfect degree of safety, for I am positively certain there is no kind of property which generally admits of paying so large a bona fide profit as well-conducted slate quarries. There are two or three other quarries in this section of country, which I had not time to visit. They are the Allens Quarry at Fairhaven, and the Granville Quarries in New York State, both worked by private firms. They are well spoken of, and, like all the others, command greater orders for their produce than they can supply.

Slate quarrying may be said to be a very simple and easy business. So it is, in the hands of those who understand it; for, like the lancet in the hands of the surgeon, the mallet in the mason's, the pick and gad to the miner, or the helm to the mariner, so is a quarry in the hands of a quarryman: every man to his trade. If we were to make an analysis of the failures common to works of this or a similar kind, we should find more than one half of them attributable to persons dabbling in things they do not understand.

"Advice gratis has no weight," is a saying in England. Nevertheless, as I am now upon the subject, I must for once volunteer, and my advice to companies or private individuals about to embark in such undertakings as mines or quarries is, on the most reliable data, first to estimate the cost of the proposed works, to lay down a systematic plan of operations, to provide twenty-five per cent. more capital than is supposed to be wanted, to intrust the works to none but the most experienced managers, and to see the end of the works before they commence. By adopting these simple rules a great deal of care, anxiety, trouble, and probably ultimate loss, may be avoided.

In the English trade, slates are sold by the thousand of 1,200 slates, and at the quarries 60 slates extra are allowed by the quarryman to the merchant to cover breakage. The American system, as far as I have seen, is to sell by the square of 100 feet; this is a slater's business, not a quarryman's. I consider it a very bad plan for the quarries to adopt such a system, it leaves a gap open for unfair dealing. The number of slates required to cover a square of roofing is according to the gauge or lap of the slate one over the other; some slates would be better with one and a half inch dead lap than others with three inches. Again, a roof covered with Duchess slate, viz., 24 by 12, is worth 20 per cent. more in value than one covered with Doubles, viz., 14 by 7. Again, slates should be classified into three kinds—best, seconds, and inferiors. A square of inferior slates will take a great many more in number than a square of best slates—the one, being true, can be laid on with scarcely any breakage, while the other being winding, crooked, rough, unequal, and often stripy and knotty, will not bed solid, consequently there is a great waste from breakage. I do not think the slaters themselves approve of the mode the quarry owners have adopted for selling slate. It has been introduced, I apprehend, in consequence of roofs being covered with tin, which is known by every body, at a fixed price—good, bad, or indifferent—so that it is at so much per square the public are satisfied. Slates should be sold from the quarries by the thousand, either net or long tale, and the price regulated by the quality. The following table will give an approximate estimate of the superficial area covered by 1,200 slates of different dimensions, allowing the ordinary gauge, also the usual weight, and last year's prices. Those of our readers unaccustomed to the slate trade may feel an inclination to smile at the aristocratic names given the different sizes of slate, but they are very ancient appellations, and, for want of better, are still universally used in the English slate trade:—

PRICE LIST AT THE QUARRIES.

Description.	Number per thousand	Size.	Will cover in Roofing.	Weight per ton of 2 240 lbs.	English quarry price £. s. d.	American quarry price.
Kings . . .	1,200	36×18	24 squares	11½	22 5 0	$120 00*
Queens. . .	"	32×16	19½ "	8½	16 10 0	100 00
Princesses . .	"	28×14	14½ "	5	11 0 0	80 00
Duchesses . .	"	24×12	11 "	3½	7 15 0	52 00
Marchionesses .	"	22×11	9 "	3	6 10 0	40 00
Countesses . .	"	20×10	7½ "	2½	5 0 0	32 00
Viscountess .	"	18×9	5½ "	1¾	3 17 6	23 00
Ladies . . .	"	16×8	4½ "	1½	2 0 0	15 00
Doubles . .	"	14×7	2½ "	1¼	1 5 0	8 50
Singles . . .	"	12×6	1½ "	$1\frac{1}{10}$	0 17 6	5 00
†Moss Slates .	average	15×8	3 "	2½	0 17 6	none.
‡Scantle . .	average	10×7½	1½ "	2½	0 8 6	none.
§Rags . . .	220	various	2½ "	1¼	1 7 6	none.

* The prices here quoted for American slate are reduced from slaters' trade lists in New York and Boston, which lists include the carriage, wharfage, etc. I have adjusted them to their respective values at the quarry, at what I consider a fair valuation.

† Rough slates, cut fair on three sides, made from waste rock, much used in Scotland.

‡ Small pieces made from the trimmings of slate, not dressed, used in Cornwall.

§ Coarse slate from two to five feet long, various widths, not dressed. They are very strong, and have the advantage of not requiring any battens on the roof; if bedded in mortar they make an excellent covering; are used to a very great extent in the West of England.

SLAB PRICES AT THE QUARRY—AVERAGE SIZES.

	English per foot super. d.	d.	Per ton English. £	s.	d.	Proposed per foot American.
Slabs 1 in. thick rough . .	2 to	2½	1	5	0	$0 6
" " " sawn edges .		3	1	[illegible]	0	0 [illegible]
" 1¼ " rough . .	2½ to	3½	1	5	0	0 12
" " " sawn edges .		4	2	0	0	0 16
" 1½ " rough . .	3 to	4	1	2	6	0 16
" " " sawn edges .		5½	2	[illegible]	0	0 20
" 2 " rough . .	4 to	5	1	0	0	0 20
" " " sawn edges .		6	2	10	0	0 25
Planing slabs on one face . .		1½				0 6
" " both sides .		2½				0 10
Slabs rough sanded . . .		3				0 12
" rubbed clean and polished .		5				0 20

LIST OF MANUFACTURED ARTICLES IN SLAB SLATE.

	English. £	s.	d.	American.
Cistern, any size, . . . per foot super. .	0	1	2	$0 40
Sinks trapped with brass grates " . .	0	1	6	0 50
Staircases, patent, ready for fixing " . .	0	1	9	0 60
Foundation covers " . .	0	0	1½	0 05
Street paving planed out of winde " . .	0	0	3½	0 10
Garden edgings, per 100 feet run . . .	0	4	0	1 50
Window sills, rough, 2½×8, per foot run . .	0	0	3	0 10
" " planed and throated " . .	0	0	6	0 18
Chimney pieces, plain mantle and jambs, each .	0	5	6	2 50
" " plain boxed, with nine inch mantle .	0	10	6	4 00
" " moulded pilasters . . .	0	12	6	5 00
Chimney slips, per set	0	2	6	1 00
Copings, planed and throated, 2½×14, per foot run .	0	0	6	0 20
Hip and ridge rolls, patent	0	1	6	0 60
Drain bottoms and covers 12 inches wide . .	0	0	1½	0 05
Effluvia traps, each	0	7	6	3 50
Filters, according to size, from	0	17	6	7 50

One hundred and fifty feet of one-inch slab is usually estimated as a ton.

A cubic foot of good slate will weigh 165 lbs.

The above articles are manufactured at the quarries, for the building business, and sold wholesale.

Such is a general outline of the slate quarries and the slate trade. The different modes of working quarries—as known by the Gear Chain system, the Perpendicular Lift, the Water Balance, the Inclined Plane, and the Crescent Form—I shall treat on in some future chapter devoted expressly to the subject. Quarrying machinery, in its various forms and applications, will also form another article. But, for the present, I must conclude by informing the reader, that twenty-five years' experience in mines and quarries, and some of them under every conceivable difficulty, has taught me at least one very important fact—that quarries, however promising they may appear at surface, or even when partially opened, seldom realize what mining engineers make of them on paper; as a member of that body myself, my sentiments may perhaps appear somewhat incongruous, but what I wish to infer is, that often, in making an estimate of expenditure and returns, casualties are not taken into account. It is not a very difficult matter to calculate what it will cost to raise a hundred yards of slate rock from a hundred feet in depth; but to tell the number of tons of slate fit for the market that will be produced from that hundred yards of rock, is quite another thing. The more practical information in earthworks a person by experience obtains, so much the more does he know he has got to learn. Well-conducted quarries are worked by bargains—contracts to gangs of men. If you look over the cost sheets, you will find the labor account gives on a good vein a profit of over cent. per cent.; yet the manager finds the greatest difficulty in maintaining a regular annual twenty-five per cent. dividend. Where the discrepancy exists can very easily be shown if we go into the minutiæ of a mine or quarry. Such, however, is inadmissible in this article. Quarries, to become profitable, must be wrought on a large scale, and consequently are only suitable for public companies, where a large amount of capital can be raised with convenience. The risk is then borne by a number of persons, and should any delay occur in making profits, or the undertaking terminate unsuccessfully, the loss is not materially felt by any single individual. I therefore do most earnestly advise those who are sanguine enough to expect to make a fortune out of a quarry or mine, with a small capital, to pause and well consider the end before they go too far to return, for it is nine chances out of ten but the reward of their labors will be disappointment and loss.

Art. VII.—THE BRITISH GOLD FIELDS.

That gold has been found in England from a very early period, is a fact well known; but that there should exist, at the present time in that country, an excitement akin to those produced by the discoveries of gold in Australia and California, and scarcely less intense, created by recent developments, is surprising and novel. English miners, and English mining journals, must look well after the reverence which experience and success has attached to them in the eye of the public, or such discoveries at such a late hour will tarnish their laurels. With us, the subject is one of interest, not only in so far as relates to the fact itself, but more particularly as the investigation of it gives good promise of furnishing many valuable hints relating to the united efforts of capital, skill, and labor, in obtaining the gold.

It is only within a year and a half, that public attention has been turned to the investigation of the extent at which gold existed in England. At that time, the first modern company for working a gold mine at home—the Britannia—was established, and in October, 1852, six tons of gossan were forwarded to London —portions of which, when assayed, produced an average yield and promised handsome returns. At this period the Poltimore Company appeared in the field, and set about the task of bringing the question whether English auriferous ores afforded adequate profits to a convincing test. A cargo of fifty tons was sent to St. Helens, in Lancashire, to be reduced in a reverberatory furnace. The result was a yield of 1 oz. 7 dwts. of gold per ton of red gossan. This was followed up by experiments on a freight of seventy-two tons, and finally by others—the total amount tested having been upwards of one hundred and eighty tons. Some time before the formation of the Britannia and Poltimore companies, the geological probability of British gold fields had engaged the attention and study of an experienced Australian explorer, Mr. John Calvert, between whom and the promoters of these undertakings nothing of concert or mutual understanding existed—a fact worthy of observation: and when this gentleman proceeded to the practical prosecution of his researches, he found, besides his own important discoveries, two English gold mines considerably advanced in their preparations and works to afford tangible confirmation of his views. The result of his investigations was laid before the British Association for the Advancement of Science, at Hull, and has since been published in an octavo volume on the *Gold Rocks of Great Britain and Ireland*, and he may be said to be the originator of the movement now so general, and which has been so much assisted and promoted by Berdan's crushing and amalgamating machine.

Mr. Calvert imagined that gold would be found in most of the rocks of England, in consequence of their similarity of structure and position to the rocks of Australia, and says that when he first engaged in his inquiries in England, he found nearly every one against him, and little to encourage him.

The work of Mr. Calvert we have not seen, but from extracts and notices of the English press, we are extensively informed of its contents. In regard to the association of gold with copper and iron, which are the two great mineral productions of England, he shows, that in former centuries it was found in the copper wrought from the mines: he gives a list of mines in which it is unquestionably to be found in combination with copper, asserting, "that so far as the evidence of practical men goes, a great deal of copper is produced and sent into consumption, containing gold largely." He also states, that "copper, in its original direction, is not a favorable medium for gold, but sometimes becomes so in its subsequent deviation. Gold may be extracted from certain copper ores very profitably."

With respect to the presence of gold in combination with iron, his observations and his testimony are very distinct. He states that he had examined nearly two hundred specimens of the sulphuret of iron from different localities, and found that by far the greater part contained gold, varying of course considerably in quantity. In an appendix, he gives a list of ores, in which gold was not visible by the microscope, but which, when treated by two processes, chemical analysis and electrical analysis, clearly exhibited it. In that return, there are some sulphurets of iron, proved by both species of analysis to contain gold exceeding six, seven, and even eight, ozs. to the ton; also, oxides of iron which, when subjected to similar processes, were found to contain three, four, five, and even seven, ozs. to the ton; also, ferruginous quartz, exhibiting upwards of four ozs., and decomposed granite at least four, to the same quantity. Mr. Calvert very justly remarks, that geology, as a science, is the creation of the last half-century, and that it is a branch of human progress in which finality has no place. Attention was attracted to these statements, and much anxiety began to be raised in the public mind to ascertain the auriferous value of different strata, when Mr. Berdan presented to the public his crushing and amalgamating machine. Various mining companies soon forwarded samples to be tested by the machine. At first the experiments were made during a part of one day in each week; the patentee on the one hand being desirous to exhibit his machine, and the proprietors of mines on the other, to test their samples. Now the demand has become so great, that, at the last accounts, it was necessary to run the machine night and day. More than seventy of these machines have been ordered by different mining companies, and rumor reports that the patent has been sold for a large sum. We state the facts as an illustration of the excitement in England relative to the existence of gold. The experiments with Berdan's machines have been made by scientific professors, committees of learned societies, select parties of private individuals, and on every occasion gold has been produced. Sixty-three experiments were made in one week upon quartz, gossan, mundic, etc., and the result, as published, shows, that if a ton had been crushed at each experiment, the gross product would have been forty-two ozs., sixteen dwts., two grs. In one instance, some Cornish ore gave an equivalent to ten ozs., twelve dwts., two grs. per ton, and another parcel from the same mine gave at the rate of one lb., four ozs., six dwts., sixteen grs. troy, per ton. This was "the greatest yield obtained from English ore where the precious metal was not visible."

It would scarcely be possible in human affairs, that a machine which reported such results, should be long without a competitor. Accordingly we find one announced in the following style, the conclusion of which must extort a smile:—"We have inspected the arrangements making by Mr. Perkes for testing auriferous rocks on a large scale, and they will prove of a most efficient character. One machine, with cones weighing 1,000 lbs. each, and which will reduce ten tons a day, is already completed; and the larger one, the cones of which weigh about 6,000 lbs. each, and will be complete in a fortnight, will crush 1,000 tons per month; and it is intended to keep it working, when practicable, for such period without drawing off the amalgam, when it is expected masses of gold will be produced which will give a tolerably correct idea of the extraordinary importance of the 'gold discoveries of Great Britain.'"

We are not disposed to discredit the general results of these experiments from any cause whatever. The great variety of circumstances under which they have been made, entitles them to this respect. They show an extensive diffusion of the precious metal in the British isles: whether it can be extracted with profit remains to be proved. To meet this question properly, requires the solution of three or four points, the investigation of either of which cannot fail to be both instructive and profitable: viz., what is the cost of extracting it, the probable supply of the material, and what improvements can be made in the treatment of gold ores and minerals. These questions, we hope, will receive an interesting investigation in the discussion already commenced. One very respectable writer gives the following view of the supply of materials:—"Hitherto a 'keenly gossan' has been the pride of miners, as generally indicating good ores beneath: but as it is now about to create a revolution in the annals of mining, and engender a rage for gold speculation at home, as fierce as we have for some time had it abroad, it may be as well to examine a little more into its history. Gossan (oxide of iron mixed with quartz) varies in appearance and substance according to the metals beneath it; for instance, the gossan of copper lodes differs very much from the gossan of lead or tin, and the gossans containing most mundic (iron pyrites) appear, from the experiments hitherto made, to be most productive of gold. In general, the gossan in lodes does not continue very deep, though instances have been known where it has held to fifty or sixty fathoms. The average depth is about twenty to thirty fathoms; then comes capel and spar, and next copper, tin, or lead, as the case may be. This having generally proved to be the case in most of the mines in Cornwall, I do not see how any *large* supply can be calculated upon, unless from a regular gossan lode, and should hesitate much before going to the expense of costly machinery for trying experiments on any one mine, until sufficient quantities had been actually raised to put the supply beyond question."

In relation to improvements in the treatment of the ores, something is to be expected. Gold itself furnishes an instance of a combination of metals, each of which may be individually poor, and yet the aggregate result of the production may be valuable. There are different classes of gold ores of very dissimilar chemical constitutions, affording a wide field for the experience of scientific skill.

Art. VIII.—THE VENTILATION OF MINES.*—By J. Kenyon Blackwell, Government Inspector.

LOSS OF LIFE FROM EXPLOSIONS.

In considering the loss of life arising from explosions, the circumstances under which so much larger numbers of the persons involved usually perish by the after-damp, than by either the burning or concussions occasioned by the blast, demand the most careful attention.

Explosions are of two classes—partial, that is, confined to a particular district, or general, extending through the whole of the mine. If the first explosion be heavy, it is frequently followed by others, caused, either by the action of the flame on the surfaces of coal exposed, liberating by decomposition large quantities of carburetted hydrogen, or from the shock and rush of air which occurs, disturbing accumulations of inflammable gas in some other part of the workings, which again explode as soon as they become mixed with the air currents of the mine.

If the stoppings which divide the different districts and air currents in a colliery are weak, they are all overthrown by an explosion; at the same time the rush of air, and the inflammable gas formed or set in motion, spreads the action of the fire everywhere. The extent of excavations which stand open in some mines contributes greatly to this violence. The imperfect separation which is so often allowed to exist between the various districts and currents, arises from the fact, that the arrangement and means adopted have been devised with reference only to the management of the air, under the ordinary circumstances of its motion. The consequence is, that weak stoppings, or even doors, are employed to separate and guide the most important currents, such as the main ingoing and outcoming columns of air, the absolute division and permanent security of which involves the lives of all who are in the mine.

The greatest modern improvement in ventilation consists in the division of the works into districts; not only in order to afford purer air in each section, by a larger aggregate volume and a shorter run in the air currents, but for the purpose of isolation,

* The concluding pages, "On the Ventilation of Mines, etc.," were omitted in the last number of the Mining Magazine, and we now complete the paper as presented to both Houses of Parliament.—[Ed. M. Mag.

in case of accident. To attain the latter object, the barriers separating these districts, and their system of air ways, must be of a nature not liable to derangement, which may, without difficulty, be effected.

The loss of life from after-damp is generally found to occur, to the largest extent, in the roads which the men have to traverse on their way to the shafts by which the mine is entered. This fact points out the necessity of making these roads the main intake air courses, and of securing these intake columns of air, both from the contact of fire damp, and also from their being disturbed by the shock of an explosion, until they reach those points in the mine where they enter the workings in which the men are engaged. It is only in case of the permanence of the arrangements made to establish this division, and to conduct columns of pure air to the extreme districts at all times, that the men can escape after an explosion, or that help can be speedily conveyed to the survivors, who may be suffering from it, but unable to effect their own escape. The system of using the main roads for return air ways, in which the currents, after they have received all the explosive gases yielded in the mine, are brought or kept in contact with lights (and thus both propagating an explosion and cutting off every avenue of escape, since these roads are sure, under such circumstances, to be swept by the fire or speedily filled with after-damp), ought not to be adopted except in small collieries, in which inflammable gas is never seen.

The foregoing considerations also point out the strong necessity for two independent shafts in all coal mines; and of providing for the accessibility of the downcast shaft to all the men engaged. Subsequently to an explosion, it is generally impossible to descend or ascend in an upcast shaft, until after the lapse of some time, on account of its being filled with the after-damp.

If there be only a single shaft, and the division of the downcast and upcast currents be of a slight nature, such as by a brattice partition or pipes fixed in the shaft, the damage which is produced by an explosion generally prevents either escape or the rendering of assistance to the survivors. The number of bratticed shafts is fortunately diminishing. Where they are still continued to be used, it ought not to be permitted that any other light than the Davy lamp should be taken below the surface. The employment of a furnace for ventilation is objectionable in such cases.

OTHER INJURIES AND ACCIDENTS TO WHICH MINERS ARE LIABLE.

There is another class of injuries resulting from defective ventilation to which miners are exposed. The circumstances producing these injuries are slow in operation, and from their effects being disease, and not immediate and sudden death, their existence has been little considered. A careful examination of the state of mines leads to the conclusion, that the ultimate loss of life is greater from this cause than even from explosions.

VITIATED AND FOUL AIR.

These effects are the result of an inadequate supply of air, which thus becomes vitiated and unfit for breathing, on account of its having lost its due proportion of oxygen, which is replaced by the formation of carbonic acid. This gas has its sources from respiration, the lights of the mine, the decomposition of small coal in the goaves, and of timber in the workings. Air in this state is also usually found to be loaded with carburetted hydrogen, yielded from the whole coal or in the goaves. Sulphuretted hydrogen, arising from the decomposition of pyrites, is sometimes found to be present, especially in coal seams liable to spontaneous ignition. The gases formed by blasting are also allowed to load the air of mines to a very injurious extent.

This state in the atmosphere of mines arises from the want of the necessary air ways, and other arrangements to discharge such portions of the air in circulation, as may have acquired this condition, and to afford a fresh and pure supply, at any part of the workings.

The air in the leading drifts, and in the extreme workings of mines, is often found to be in an injurious and dangerous state, from the carburetted hydrogen and carbonic acid yielded or formed at those points, not being diluted and removed by a proper circulation. This may be caused by defective ventilation generally, or only locally. The latter case is of frequent occurrence, and arises from the main air currents returning to the shafts by leakage, without reaching the distant parts of the mine, or from a want of the requisite means to carry the circulation fully up to the face of the drifts and works.

Those districts and seams of coal least affected by inflammable gas, are generally those in which the ventilation is allowed to be in this imperfect and injurious state, on account of attention not having been called so imperiously to the subject, as it is by the violent catastrophes resulting from explosions.

Asthmatic diseases, at an unusually early period of life, are the unfailing results of ventilation which is deficient in quantity.

SPECIAL CASES OF DEPARTURE FROM CORRECT PRINCIPLES WHICH HAVE RESULTED IN EXPLOSIONS.

In reviewing the cases of explosions in mines, of which the attendant circumstances can be ascertained, it must be admitted that the greater part have been the result of a clearly defective system of working and ventilation.

The larger part of these cases show defects, arising either from a want of a proper system in the management of the ventilation, or that of the necessary volume in the quantity of air supplied.

JOURNAL OF MINING LAWS AND REGULATIONS.

MINING DIVISIONS OF FRANCE.

France, for mining purposes, is divided into eight districts, each of which has an inspector-general—these are the north, north-east, east, centre, south-east, south west, west, and north-west; in each of the several arrondissements in these districts there is besides an engineer-in-chief, in addition to a number of ordinary inspectors, according to the extent and importance of the arrondissement.

RIGGING THE MARKET.

In the Court of Queen's Bench, an action was brought to recover the sum of 173*l.* 11*s.* 6*d* for commission on the purchase and sale of shares in the Ceylon Land Company. Sir J. Milley Doyle, Archibald Douglas, John Witham, and William White (the defendants) were directors of the Company, which was established upon the cost book principle, with a capital of 200,000*l.*, in shares of 1*l.* each. It appeared that the shares did not go off well, and recourse was had to what is called "rigging the market." A resolution was passed by the directors in the month of March last, instructing Messrs. Linthorne & Tripp to make purchases of the shares of the Company according to their discretion, not exceeding 200 shares, at a premium of ¾, and to sell the same again upon such terms as they might think fit. The defendants, Doyle, Douglas, and Witham, signed the resolution, and Whithorne signed it on behalf of White, who was abroad. Mr. Robson (the plaintiff) was employed by Messrs. Linthorne & Tripp to carry out this resolution, and now sought to recover the amount of his commission, and the money expended by him. Lord Campbell inquired whether the shares bought by the plaintiff were the Company's own shares, and was answered in the affirmative, and that the object was to raise the value of the shares in the market. It was explained that this was called "rigging the market"—a proceeding which Lord Campbell said was clearly illegal Mr. Wood then applied to be allowed to amend the pleadings by adding a plea of illegality. Mr Crowder said it was the defendant's own illegal conduct which was complained of, and, of course, they could not be allowed to take advantage of it. Lord Campbell said he would not allow such an amendment. The jury then gave a verdict for the plaintiff for the amount claimed against all the defendants, except White, who was abroad, and had not signed the resolution. Lord Campbell, at the close of the case, expressed his hope that, after the exposure which had taken place on this trial, the practice of "rigging the market" would never be attempted again.

COMMERCIAL ASPECT OF THE MINING INTEREST.

NEW YORK, Feb. 20, 1854.

We have again to record quite an active market in mining stocks, but not at an advance in rates. *North Carolina* stands at about $4, at which figure considerable amounts could at present be sold. *Pennsylvania and Lehigh Zinc* has been dealt in largely at about $3 per share cash, with considerable advance on this figure for time purchasers. It is said that large lots of this stock have been bought for Philadelphia account. *Ulster* stock is dull and stationary. There is little disposition to invest in it; and, taking all things together, the price at which it is now selling, say 1¼, is full as much as it will bear. The accounts from *McCullough* and *Lindsay* are exceedingly favorable. Some gentlemen connected with these mines have just returned from a visit to them, and report everything conducted to their satisfaction. The ore from the McCullough, they say, is abundant in quantity, and very rich in quality. The Lindsay, though but partially developed, promises to be as rich as the McCullough; and the stock has risen rapidly from 75 cts. to $1, at which latter figure large amounts have changed hands. It is now about 95 cts., and is a cheap purchase at that figure. *Gold Hill* is stationary at about 3 to 3¼. The products of the mine continue richer than ever, and from the present appearance of the property, there can be few better investments than Gold Hill at the present figure. The only reason we can give for its present low figure is, that the public appear to us to be afraid that it is too good to be true. In *Phœnix Gold* a change has been made in the direction, by the resignation of the President and the election of a new one, who can give more time and attention to the affairs of the Company. Two additional directors have also been chosen, and all the reserved stock taken. All this, it is supposed, will give additional energy to the management of the Company, and develop its resources more speedily. The stock of the Company, however, is still at about 75 cts. cash, and is not very active at that figure. Higher prices are, however, confidently looked for before long. *Deep River* continues steady at about 30 cts., but we have no transactions to record in it. In *Parker Vein* there has been great activity, and the stock reached 8½, a higher point than it has touched for months. At present, however, it is about 7¾ to 7⅞. *Hiwassee Copper* has also been active, and the price has risen to $5, at which figure it is in considerable demand. This, from all accounts, is destined to turn out an excellent dividend—paying more, and that before long. It is managed by men of commercial character and ability, who direct its affairs with system and economy. In *Potomac Copper*, both old and new, there has been great activity.

The transactions in the Lake Superior mining stocks have been quite large, particularly in Toltec, Algomah, and Ripley. The former stock touched 12⅞ some twenty days since, but now stands at about 12¼, 12½. *Algomah* is in demand at 4¼, and from the demand for the stock, we think it is certain to rise. *Ripley* is heavy at $4, at which figure some few lots were sold a short time since; but much could not be sold at over 3⅞, cash. In *Douglas Houghton* there have been several transactions, and the stock is in demand. We have thus noticed all the mining stocks most generally dealt in here, and must leave them by saying that, on the whole, there is no great change in prices, and no news of importance to communicate in relation to them.

We find that the views expressed in our last with regard to the advantages to be derived from organizing with a moderate bona fide capital, instead of the nominal millions we constantly hear of, are fully participated in by our more experienced mining men who have tried both systems, their experience having led them to conclude that the principle of starting with a capital just sufficient to defray the prospective working expenses (which by competent men can be very accurately estimated), and to allow a reasonable margin for unforeseen expenses, etc., etc., would, if generally adopted, serve perhaps more than anything else to place mining property as it should be, in its proper place, at the head of all investments.

As a suitable conclusion to our observations on this subject, we append for reference the dividends on some of the British mines since 1845, premising that, with two or three exceptions, the capitals of all these are not over $200,000, while by far the larger number of them are much under that sum:

Year ending 1845, in 18 mines	$1,084,160
" 1846, in 23 "	762,494
" 1847, in 30 "	745,826
" 1848, in 22 "	619,315
" 1849, in 38 "	891,556
" 1850, in 42 "	1,025,186
" 1851, in 45 "	1,089,182
" 1852, in 60 "	1,254,082
" 1853, in 60 "	1,828,000

The dividends declared since our last, have been the *Pennsylvania Coal Company*, which pays 5 per cent. in stock. This Company have published their statement of the business for the past year, which shows a profit of $359,198, being over 11½ per cent. on the capital stock; large sums having been expended in securing the means for doing the additional business of last year, in the shape of extra cars, canal-boats, etc., etc., they have deemed it advisable to make their dividend in stock.

The *Union Iron Company*, of St. Louis, have made a dividend of 40 per cent. profit on their business for the last year.

The *Old Potomac Copper Company*, as it is termed, has attached to it a dividend in the stock of the Isabella Mine, adjoining the Hiwassee in Tennessee, and said to be equally as good. It will also soon receive a dividend of the Davis Mine, another of the rich Tennessee mines. The new *Potomac* is a later issue, and is entitled only to the dividend of the Davis Mine. The former is selling at 3½, and the latter at 1¾.

The *Albion Mining Company* have called an assessment of 75 cents per share on the subscription stock, payable 24th of March.

The *American Mining Company* have called for an assessment of $3 per share, payable the 10th March next.

The *Cumberland Coal Company*, in winding up its affairs for the half year ending 31st December, sets down the value of its property at $1,069,043, and its liabilities at $682,674, leaving a surplus of $386,369. The available property consists of:—

Cash bills receivable, and outstanding coal accounts collectable, and stock of coal, amounting to	$505,000 00
Steamers, vessels, and barges	355,000 00
Lumber and other property at Baltimore, Cumberland, Alexandria, etc.	210,000 00
Total	$1,070,000 00

The principal liability of the Company is the funded debt of $537,000, payable in two years. The other liabilities of the Company, outstanding at the close of the year, have since been liquidated, leaving the Company free from all floating debt.

The long-protracted strikes of the miners have operated very much to the injury of the prospects of this Company. These difficulties, at present, give every prospect of a favorable termination.

Fluctuations for February 20th, 1854, in the different Mining Stocks sold at the New York Stock Exchange and Mining Boards, showing their Highest and Lowest Points, and the Date, with the Market Value on February 20th, Gain or Loss from January 20th, and number of Shares sold in each.

Name of Stock.	Shares.	Par.	Highest Sales.	Day Mo.	Lowest Sales.	Day Mo.	Value Feb. 20.	From Jan. 20 Gain	From Jan. 20 Loss	Shares Sold.
Algomah	20,000	25	4½	2	4¼	22	4½	½	—	473
American White Zinc	—	—	3½	7	3	19	3½	—	¼	1,150
Brockingham	100,000	3	1½	14	¾	1	1½	½	—	1,170
Caseland	—		4½	3	4	24	4½	½	—	2,440
Chatham Cobalt	100,000	2	3	11	—	—	3	—	—	100
Charlotte Copper	—	—	—	—	—	—		—	—	—
Conrad Hill	—	—	¾	20	½	28	½	—	—	3,800
Copper Falls	10,000	20	—	—	—	—	59	5	—	No sale.
Cumberland Coal	50,000	100	34	21	28½	6	31½	—	2½	37,400
Dauphin and Susquehanna	24,000	50	25	16		—	25	1		15
Do. 7 per cent. Bonds	—	—	45	11	—	—	45	1½	—	5,000
Dolly Hyde	—	—	5½	7	5	1	5¼	¼	—	500
Douglass Houghton	—	—	6	14	—	—	6	—	—	100
Fulton Copper	100,000	5	1½	16	1¼	24	1½	—	¼	2,550
Gardiner Crusher		-	1	23	¾	15	¾	-	¼	750
Gold Hill	200,000	5	3½	23	3	20	3	—	½	6,685
Hiwassee Copper	—	—	5	20	4	27	5½	1½		300
Isle Royale	12,000	10	—	—	—	-	—	-	—	No sale.
Lindsay	100,000	10	30	16	30	28	31½	½	—	1,150
McCulloch Gold	200,000	5	—	-	—		¾	—	—	No sale.
Manston	50,000	5	¾	17	—	—	¾		¼	800
Middletown Silver-Lead			2	20	1½	17	2		—	3,450
National	10,000	25	—	—	—	—	—	—	—	No sale.
Newton	—	—	—				2	-	—	No sale.
New Creek Coal	200,000	10	2½	17	2¼	21	2½	¼	—	[illegible]
New Jersey Zinc	28,000	12½	9½	11	8¾	27	9¼	-	—	6,[illegible]
North American	16,000		70	17			70	8	—	6
North Carolina Copper	100,000	5	5¼	21	3¾	11	4		1½	22,300
Ohio Land and Mining	—	—	¾	11	—		2		1	50
Parker Vein	80,000	100	8½	20	6	23	7½	1½	—	53,100
Passaic Mining and Manuf.	—	—	4½	21	4½	21	4½	—	—	300
Pennsylvania Coal	60,000	50	109½	31	102*	2	103½	—	—	5,100
Pennsylvania & Lehigh Zinc	100,000	10	3½	14	2½	24	3	¼	-	25,600
Phoenix Mining and Manuf.	20,000	100	10½	24	8½	13	10	—	1	850
Parrott Gold	—	—	¾	17	¾	7	¾	—	¼	14,200
Potomac†	100,000	10	8½	20	8½	17	8½			7,200
Potosi Lead	200,000	5	5½	8	5	3	5	—	½	[illegible]
Randolph	-	—	1	14	-	-	1	—		100
Ripley	40,000	12½	4½	27	4	20	4	—	—	800
Rockland	—	—	12	1	—	—	1	—	—	50
Rover Bar	—	-	5	20	—	—	—	—	—	100
Rutherford	—	-	¾	24	—	—	¾	—	—	500
Toltec	20,000	25	13	22	12½	7	12¾	¼	—	250
Ulster	100,000	5	1½	29	1½	17	1½	—	¼	5,800
Vandeleburg	—	-	¾	11	—		¾	—	—	500
Winthrop	20,000	25	—	—	—	—	8	½	—	No sale.

* Ex-dividend.
† Carrying the Davis and Isabella dividends; without them the stocks sells at 1¼.

BOSTON MINING SHARE MARKET.

Boston, Feb. 20, 1854.

Since our last several mails have been received from Lake Superior, bringing advices of the most cheering nature, and fully confirming the anticipations of friends of the mining interests. The market is generally firm for all the stocks, and no amount of shares in any of them could be obtained at the present current rates. Every day strengthens the hold this class of stocks is obtaining on the good favor of the public; and more inquiry into their merits is being made by those who are seeking them as investments. We will venture to predict, that an investment judiciously made in the mining stocks of the Lake Superior region will give a threefold better interest within five years, than any other security that can be obtained in this country. This belief is based upon facts, and not from any temporary excitement, caused by speculative activity. The results of a year past are sufficient to satisfy any who are willing to be convinced, that the success of copper mining is no longer a matter of uncertainty. It speaks for itself, and the copper literally "sticks out."

Copper Falls has improved from 56 to 59, and if one quarter that we hear of it is true, the mine bids fair to be pre-eminently successful. There seems to be hardly room for a doubt as to the immense richness of the veins, and new discoveries are continually being made to strengthen past successes. Work was first commenced on this mine in June, 1851, and the whole amount expended to Jan., 1854, is $167,000; of which, $130,000 has been assessed on 10,000 shares, at $13 per share, and $37,000 realized from the sales of copper. In 1853, the net proceeds of copper sold was $27,700. It is anticipated that the Company will ship 500 tons of mineral during 1854, the average percentage of pure copper being about 70 per cent. There will be an assessment, during the coming spring, of probably $5 per share, which, it is expected, will be the last required by the Company; and the managers hope to make a dividend in the spring of 1855. *North American* is in better demand, and the stock has improved from 70 to 80, although no sales have been made higher than the first-named price; but 80 would be paid now if any shares could be obtained at that figure. The latest accounts from this mine are even more encouraging than when the agent stated, some months since, that "the results were such as to place the Company beyond the necessity of calling further assessments, and to insure large and speedy dividends." It will be recollected that this Company found a mass of not less than *one hundred and fifty tons* in the first level, only about forty feet from the surface of rock. *Toltec* is firm, with but few transactions, holders of stock little inclined to sell at ruling prices; and there is at present no disposition to put the price up, although recent accounts from the mine are of so favorable a nature as to warrant an advance of $5 per share, at which point the stock would be one of the cheapest in this market, taking its true merits into view. Within a short time the Company took out a "mass" of over 1,200 lbs., and the stopes are yielding a great deal of barrel and stamp copper. The mine has improved wonderfully of late, and its sure success is on a firm basis. It ranks as first class among the new mines.

National is also making a splendid show, and the stock is scarce at 81 bid. The shares come into the market but little, and a demand for a few hundred could not be met without a material advance in price. *Norwich* is looking up, and bids fair to be a mine of great promise. The Company have just called in an assessment of 50 cents per share, and there is no stock for sale at $11½ per share, for $4 50 paid. *Forest* is firm at 11 bid for small lots, and no stock pressing upon the market. The mine is said to look better now than ever before, and with the present judicious management there is a fair prospect of a successful result. *Isle Royale* is firm at 20½ bid, for large lots, although an assessment of $1 per share will be due March 6. With the present favorable accounts from the mine, however, there is no probability of any serious decline in the market value of the stock. The mine has thus far been proved, to an extent which leaves little if any doubt of success, and the stock bids fair to pay dividends as soon as any other non-paying company, if we except, perhaps, the Copper Falls and North American.

North Western has been more inquired for of late, and 17 is now offered. The mine is looking remarkably well at all points, and is rich in stamp and barrel work. They have a mass in sight, estimated to weigh 2,500 lbs. *Phœnix* is improving, and the mine shows much better than formerly. *Star* is in good demand at 6½ bid, with very few sales. Accounts from the mine are favorable, and their vein is considered a valuable one.

Among the low-priced stocks, *Algomah* is the most active, and in demand at 4¾ bid. This Company has the Toltec vein, and promises exceedingly well. The friends of the stock think it will largely advance within a few months. *Ripley* is firm at 8¾; and although the Company have not as yet discovered the Isle Royale vein, there is little doubt but they will eventually strike it. *Winthrop* has declined to 2¼, but the demand is not supplied at that figure. *Webster* is firm at 2 bid, and accounts from the mine are promising. *Bay State* is in better demand at 1¾ bid, having been heavy at 1½ for several months. *Dana* is in fair demand at 2, assessment paid. Late letters from this mine speak more favorably than for some time past. *Fulton* is steady at 1½ bid, 1¾ asked. The large number of shares (100,000) operates against the stock of this Company; and, although the advices from the mine are favorable, it is hard to get up the market value of the shares. Accounts from the *Glen* are very favorable. At a meeting of the Directors, held Feb. 13, it was

"*Voted*, That six thousand shares of the reserved stock of this Company be issued to the stockholders of record of this date—in proportion to their respective shares—being one share for every two now held by them, at the price of $2 per share, to be paid at the Treasurer's office on or before the 20th day of March next, and that all of said stock not then taken shall be forthwith disposed of by the directors, as they shall deem best, a preference being given to such of the present stockholders as may have taken their proportion of such new issue, and who may have made application for and be then ready to take a portion of such residue."

The Glen was originally a part of the Forest territory, and is composed of 20,000 shares, of which 10,000 are issued to and held by the Forest Company, in payment for the land, to be eventually distributed among the stockholders of the latter as a dividend: 2,000 shares of Glen have been previously issued, the holders of which are entitled to 1,000 shares of the new issue (at $2), and the stockholders of the Forest 5,000 shares, in the proportion of one share for every two now held by them. Two thousand shares are still to be issued, at the discretion of the directors.

Shawmut is firm at 1¾, which includes the assessment of 50 cts. per share, due Feb. 10. The prospects of this mine are looking better, and the work is being pushed forward with great vigor. Accounts from the *Summit* are very promising, but the stock has not yet been introduced into this market. The vein is about 1½ feet in width, carrying a fair amount of stamp and barrel work. *Native* is heavy, with nothing particularly favorable from the mine. *Manitou* is seldom offered in this market; but 50 cts. per share was bid to-day. *Manassas* we hear but little said about, and its market-value is very low.

DIVIDENDS.—The Pittsburg and Boston (Cliff) Mining Company have declared a *semi-annual* dividend of $10 per share, payable Feb. 27. This Company has been very successful, and paid the following regular dividends since commencing to pay in 1849:—

May, 1849	$10	per share.
February, 1850	7	"
August, 1850	7	"
February, 1851	5	"
August, 1851	5	"
February, 1852	5	"
August, 1852	5	"
February, 1853	7½	"
August, 1853	7½	"
February, 1854	10	"
Total, since May, 1849	$69	

Which is a very fair equivalent for $18.50 per share paid in on the stock, and should certainly give satisfaction to those who are looking for profits in the copper mining business.

BOSTON MINING SHARE LIST.

Fluctuations for February 1854, in thirty-one different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their Highest and Lowest Points, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

[illegible], Boston	Nominal Capital	Shares	Par	Paid in Feb. 28	Highest Sales	Day Mo.	Lowest Sales	Day Mo.	Value Dec. 31	From Jan. 31 Gain	From Jan. 31 Loss	Shares sold in January	Value Feb. 28
Adventure, *Copper*	$250,000	10,000	25	$11.00	—	—	—	—	4	0	0	No sale	6
Algomah	500,000	20,000	25	1.62½	4½	21	3½	2	4½	½		3,769	4½
Bay State	500,000	20,000	25	†2.00	—	—	—	—	1½	½	–	No sale.	2
Bohemian		10,000	—	6.50	4½	30	4½	28	4¾	½	—	400	5½
Boston	500,000	20,000	25	†2.00	—	—	—	—	1	0	0	No sale.	1½
Copper Falls	300,000	10,000	50	18.00	58½	27	52	5	56	5	—	103	59½
Dana	500,000	20,000	25	1.62½	2	3	1½	26	1½		½	1,408	2¼
Forest	200,000	10,000	20	10.00	11½	26	9	11	11	2½		1,365	11
Fulton	500,000	100,000	5	†2.00	1½	2	1½	15	1½	0	0	2,650	1½
[illegible]	500,000	20,000	25	†2.00	2½	4	2	4	2½	½	—	25	2½
Isle Royale	120,000	12,000	10	6.00	21	28	17	7	19½	2½	—	972	21
[illegible] *Sandstone*	450,000	45,000	10	†3.00	60	27	56½	3	62½	0	0	800	½
[illegible], *Mining*	1,000,000	100,000	10	†1.00	—	—	—	—	½	0	0	No sale.	½
[illegible] *Copper*	150,000	20,000	5	1.25	—	—	—	—	1	0	0	No sale.	1
Minnesota	200,000	8,000	100	22.00	125	11	125	11	*165	5	—	1	170
National	250,000	10,000	25	2.00	31½	24	25	3	31½	6½	—	161	31½
Native	250,000	10,000	25	1.25	1	14	1	14	1	—	½	25	1½
North American	800,000	10,000	80	30.00	70	31	70	31	70	5	—	2	75
Norwich	100,000	20,000	5	4.50	—	—	—	—	10½	0	0	No sale.	‡11½
North Western		8,000		12.00	—	—	—	—	16	0	0	No sale.	17
Phoenix	500,000	10,000	50	6.00	10½	26	7½	19	9	2½	—	935	9
Pittsburg, (*Cliff*)		6,000	—	18.50	150	2	147½	24	*142½	2½	—	41	145
[illegible]		10,000	—	8.50		—			5½	½	—	No sale.	5½
Ripley	500,000	40,000	12½	†2.50	4½	26	3½	7	4½	½	—	7,371	3½
Shawmut	500,000	20,000	25	2.50	1	28	½	9	1	0	0	1,190	‡2
Star	500,000	20,000	25	8.50	—	—	—	—	‡6½	1	—	No sale.	6½
Summit	500,000	40,000	12½	†1.00	—	—	—	—	4	0	0	No sale.	0
Toltec	500,000	20,000	25	4.00	12½	28	11	8	12	1	—	1,835	12½
Winthrop	500,000	20,000	25	.75	2½	27	2½	5	2½	½	—	2,470	2½
Webster	200,000	40,000	5	†2.00	2	23	1½	20	2	½	—	2,720	2½
W. Castleton, *Slate*	1,000,000	50,000	20	†6.00	3½	25	2½	27	3½	0	0	250	3

* Ex-dividend of $30 per share on the Minnesota, and $10 per share on the Pittsburg.
† These are fully paid stock, not assessable.
‡ Assessment paid.

NEW YORK METAL MARKET.

COPPER.

South American	per lb.	29c	a –
U. S. Soft Ingot		32	a
Sheathing		31½	a 32
Braziers'		35	a —
Yellow metal		28	a
Ingot		32	a –
Tubing		45	a –

IRON.

Iron ores, magnetic and hematite	per ton	$3	a 6
Iron Bars, American hammered		75	a 85
Do. American refined		85	a 90
Do. Superior brands		–	a 95
Do. English common		72½	a 75
Do. do. best		—	a [illegible]
Do. Swedes refined		—	a 92½
Do. Norway bars, fork & NIFK brands		102½	a 104
Russian		86	a 94
Do. Sheet American	per lb.	6c	a —
Do. do. English, No. 1 to 20		5	a –
do.	21 to 24	5½	a —
do.	25 to 28	6	a —
Do. do. Russian		12	a 12½

New York, *February 21st*, 1854.

Iron Sheet, English, Damaged	3½	a 4
Do. Galvanized	$10½	a 14
Do. R R bars by contract p ton		a 60
Do. Pig American, red short	38	a 40
Do. White Charcoal for found.	28	a 45
Do. do. do for mal cast	45	a 50
Do. for car wheels	45	a 50
Do. Scotch, for cash	55	a

LEAD.

Galena Pig, as per quantity	6½c	a 7
Spanish	7½	a 6¾
Sheet	7½	a —
Pipe	7½	a
Old Scrap	6	a

SPELTER.

Spelter, as per quantity	6½	a 7
Do. in slabs	4	a 4½
Do. Sheet	8½	a 9½

TIN.

Block Banca	—	a 32½
Do. Straits	—	a 31½
Do. Spanish	—	a 28
Do. Bars	—	a 35

LONDON METAL MARKET.

JANUARY 20, 1854.

The *London Mining Journal* gives the following quotations, to which we add the duty *ad valorem*, United States Currency, rate of freights, and Foreign Exchange.

ENGLISH IRON.

Duty 30 per cent. ad valorem.

		£	s.	d.	$	c.
Bar and bolt *a*	per ton.	£9	10	0	$45	98
* In Wales *a*		8	10	0	41	14
* In Liverpool *a*		9	10	0	45	98
* In Staffordshire *a*		10	10	0	50	82
Sheets, single *a*		12	10	0	60	50
" double *a*		14	0	0	67	76
Hoop *a*		11	15	0	56	87
Nail rod, round *a*		11	0	0	53	24
" square *a*		10	10	0	50	82
Rails { Wales *b*		8	0	0	38	72
" { Staffordshire *b*		8	10	0	41	14
Railway Chairs Clyde *b*		5	17	6	28	44
Pig, No. 1, Clyde *b*		3	15	0	18	08
3-5ths No. 1, and 2-5ths No. 3		3	15	0	18	08
No. 1 in Wales *c*		4	10	0	21	78
Scotch Pig No. 1 in London		5	0	0	24	20
Stirling's No. 1 toughened or Hardened Surface Rails	£9 to	9	2	0	43 56 / 44 05	
Cold blast, No. 1 Foundry	£5 17s. to	6	10	0	28 62 / 31 46	
Charcoal bars		14	10	0	70	18
Stirling's Patent Toughened Pigs } Glasgow		3	12	6	17	50
Ditto. Wales £4		4	5	0	20	57

FOREIGN IRON *c*

Duty 30 per cent. ad valorem.

		£	s.	d.	$	c.
Swedish	per ton.	£12	0	0	$58	08
Russian CCND		17	0	0	82	28
Indian Charcoal Pigs in London		6	0	0	29	04

FOREIGN STEEL *a.*

Duty 15 per cent. ad valorem.

Swedish keg, nominal	per ton.	£16	0	0	$77	44
Ditto faggot		—	—		—	—

SPELTER *c.*

Duty, in pigs, bars, and plates, 5; sheets, 15 per cent. ad valorem.

On the spot in bars	per ton.	£00 0 to 24	4	0	$116	88
To arrive		$00 0 to 25	10	0	$123	42

ZINC.

Duty 15 per cent. ad valorem.

In sheets *d*	per ton.	£32	0	0	$154	05

ENGLISH COPPER.

Duty: bolt and braziers', 20; pig, bar, and old, 5 per cent. ad valorem; Sheathing free.

Tile 14 to 28 lbs, *a*	per ton.	£126	0	0	$609	84
Tough cake *a*		126	0	0	609	84
Sheathing for ships 14 by 48, and bolts *a*	per lb.	0	1	2		28½
Sheet *a*	"	0	1	2		28½
Bottoms *a*	"	0	1	3		30¼
Old *a*	"	—	—			—
Yellow Metal *a*	"	0	1	0		24
Wetterstedt's Pat. Met.	per cwt.	2	0	0	9	68

ENGLISH LEAD *a.*

Duty 20 per cent. ad valorem.

Pig	per ton.	£23	0	0	$111	32
Sheets		24	0	0	116	16

FOREIGN LEAD *a.*

Duty 20 per cent. ad valorem.

Spanish in bond	per ton.	£22	0	0	$106	48

ENGLISH TIN *c.*

Duty 5 per cent. ad valorem.

Block	per cwt.	£6	10	0	$31	46
Ingots	"					
Bar	"	6	11	0	31	70
Refined	"					

[redacted]

Duty 5 per cent. ad valorem.

Banca	per cwt.	£6	10	0	$31	46
Straits (uncertified)	"	6	7	0	30	73

TIN PLATES.

Duty 15 per cent. ad valorem.

IC Charcoal	per box.	£1	14	0	$8	23
IX Ditto	"	2	0	0	9	68
IC Coke	"	1	7	6	6	66
IX Ditto	"	1	13	6	8	07
Canada Plates *a* ton	"	16	0	0	43	60
Quicksilver *f*	per lb.	0	2	4		57

TERMS.—*a* 2½ per cent. 3ds.; *b*, net; *c*, 3 ditto; *d*, 1½ per cent. 2ds.; *e*, 2 ditto; *f*, 1½ ditto; delivered in Liverpool 10s. per ton less.—† Discount 5 per cent.

* Delivered in Liverpool 10s. ($2 42) per ton less.

EXCHANGE, New York, Feb. 6, 1854. Rates are ranging from 8¾c to 9c. premium in favor of London.

FREIGHTS at Liverpool are about 20s. 0d. ($4.84) per ton for iron in pig or bars.

visit to them, and report everything conducted to their satisfaction. The ore from the McCullough, they say, is abundant in quantity, and very rich in quality. The Lindsay, though but partially developed, promises to be as rich as the McCullough; and the stock has risen rapidly from 75 cts. to $1, at which latter figure large amounts have changed hands. It is now about 95 cts., and is a cheap purchase at that figure. *Gold Hill* is stationary at about 8 to 8½. The products of the mine continue richer than ever, and from the present appearance of the property, there can be few better investments than Gold Hill at the present figure. The only reason we can give for its present low figure is, that the public appear to us to be afraid that it is too good to be true. In *Phœnix Gold* a change has been made in the direction, by the resignation of the President and the election of a new one, who can give more time and attention to the affairs of the Company. Two additional directors have also been chosen, and all the reserved stock taken. All this, it is supposed, will give additional energy to the management of the Company, and develop its resources more speedily. The stock of the Company, however, is still at about 75 cts. cash, and is not very active at that figure. Higher prices are, however, confidently looked for before long. *Deep River* continues steady at about 30 cts., but we have no transactions to record in it. In *Parker Vein* there has been great activity, and the stock reached 8½, a higher point than it has touched for months. At present, however, it is about 7¾ to 7½. *Hiwassee Copper* has also been active, and the price has risen to $5, at which figure it is in considerable demand. This, from all accounts, is destined to turn out an excellent dividend—paying more, and that before long. It is managed by men of commercial character and ability, who direct its affairs with system and economy. In *Potomac Copper*, both old and new, there has been great activity.

The transactions in the Lake Superior mining stocks have been quite large, particularly in Toltec, Algomah, and Ripley. The former stock touched 12¾ some twenty days since, but now stands at about 12¼, 12½. *Algomah* is in demand at 4½, and from the demand for the stock, we think it is certain to rise. *Ripley* is heavy at $4, at which figure some few lots were sold a short time since; but much could not be sold at over 3¾, cash. In *Douglas Houghton* there have been several transactions, and the stock is in demand. We have thus noticed all the mining stocks most generally dealt in here, and must leave them by saying that, on the whole, there is no great change in prices, and no news of importance to communicate in relation to them.

We find that the views expressed in our last with regard to the advantages to be derived from organizing with a moderate bona fide capital, instead of the nominal millions we constantly hear of, are fully participated in by our more experienced mining men who have tried both systems, their experience having led them to conclude that the principle of starting with a capital just sufficient to defray the prospective working expenses (which by competent men can be very accurately estimated), and to allow a reasonable margin for unforeseen expenses, etc., etc., would, if generally adopted, serve perhaps more than anything else to place mining property as it should be, in its proper place, at the head of all investments.

STATEMENT OF COIN MANIFESTED AND SHIPPED FROM THE PORT OF SAN FRANCISCO DURING THE YEAR ENDING DECEMBER 31, 1853.

For Central America	$35,000
Callao	214,994
Valparaiso	5,550
Rio Janeiro	500
Sandwich Islands	60,251
China	227,748
Singapore	5,926
Manilla	158,250
Calcutta	19,575
Pondicherry	14,525
Australia	86,556
Vancouver's Island	1,000
Padang	5,000
Total	$750,175

An examination will show a decided improvement in the shipments of 1853, over those of any previous year.

Shipment of dust for 1851	$34,492,000
Shipment of dust for 1852	45,779,000
Shipment of dust for 1853	54,907,000

About ten millions increase each year, of dust, manifested.

YIELD OF GOLD IN RUSSIA.

In Russia, the mines belonging to the State, in 1853, furnished to the Mint, 1457 poods and 28 pounds of gold, representing a value of 19,902,338 roubles (79,609,352f.), and 1367 poods of silver (4,979,524f.), or in all 21,147,219 roubles (84,588,876f.).

CALIFORNIA GOLD FIELDS.

The progress of operations during the first part of the winter was successful in the mineral districts. More rain seems to have fallen along the coast than in the interior—that which has fallen in the mines having been in a great degree absorbed by the parched ground, leaving little or none to flow through the dry gulches, where the miners had made preparations to wash the dirt which had been previously thrown up. The want of water was, to some extent, supplied by the different water companies, whose works spread in many directions.

The *Press* mentions the discovery of quartz veins in Calaveras county, and one paper makes the following statement:—

We have been presented by Messrs. Langdon and Wheeler with a sample of gold-bearing quartz, taken from their newly discovered lead in Calaveras county, on the ridge between Amadore Creek and Rancheria, near the Jackson stage road. The lead is from two to two and a half feet wide, of an unknown length, and has been prospected to the depth of thirty feet, all of which pays well. The specimen before us is very rich. The proprietors have on exhibition at the Crescent City Hotel a single lump of this quartz, weighing 257 ozs., and which is estimated to contain three lbs. of gold. The section of the country from which this was taken is proving to be rich in quartz leads, and is now second only to Grass Valley. There are seven quartz mills in successful operation in the vicinity of Amadore; three of these are driven by water, and the others by steam power.

Fluctuations for February 20th, 1854, in the different Mining Stocks sold at the New York Stock Exchange and Mining Boards, showing their Highest and Lowest Points, and the Date, with the Market Value on February 20th, Gain or Loss from January 20th, and number of Shares sold in each.

Name of Board.	Shares.	Par	Highest Sales.	Day Mo.	Lowest Sales.	D. Mon	Value Feb. 20.	From Jan. 20. Gain.	From Jan. 20. Loss.	Shares Sold.
Algomah	23,000	25	4½	7	4¼	29	4½	½	—	475
American White Zinc	—	—	8½	7	8	19	8½	—	½	1,150
Buckingham	100,000	5	1½	14	¾	1	1½	½	—	2,100
[illegible]	—		4½	4	4	24	4½	½	—	2,400
Chatham Cobalt	100,000	5	3	11	—		3	—	—	500
Charlotte Copper	—	—	—	—	—		—	—		—
Conrad Hill	—	—	½	20	¼	26	¼	—	—	5,800
Copper Falls	10,000	50	—		—		60	5	—	No sale.
Cumberland Coal	50,000	100	34	21	25¾	8	31½	—	2½	37,100
Dauphin and Susquehanna	22,000	50	26	16			29	1	—	15
Do. 7 per cent. Bonds	—	—	45	11	—	—	45	1½	—	5,000
Daly Hyde	—	—	5½	7	5	1	5½	½		900
Douglass Houghton	—	—	6	14	—		6	—	—	100
[illegible] Copper	100,000	5	2½	16	1½	24	1½	—	½	[illegible]
Gardiner Crusher	—		1	29	½	15	¾		½	[illegible]
Gold Hill	200,000	5	3½	23	3	20	3	—	½	[illegible]
Hiwassee Copper	—	—	5	20	4	27	5½	1½	—	[illegible]
Isle Royale	12,000	10	—	—	—	—	—	—	—	No sale.
[illegible]	100,000	10	20	20	[illegible]	23	[illegible]	½	—	[illegible]
McCulloch Gold	200,000	5	—	—	—		6½	—	—	[illegible]
Manhattan	20,000	5	½	17	—	—	½	—	½	[illegible]
Middletown Silver-Lead			2	20	1½	17	2	—		3,450
National	10,000	25	—	—	—	—	—	—	—	No sale.
[illegible]	—				—		?			No sale
New Creek Coal	200,000	10	2½	17	2½	21	2½	¼	—	8,800
New Jersey Zinc	36,000	12½	9½	11	5½	23	9½	½	—	[illegible]
North American	10,000		70	17	—		70	5	—	4
North Carolina Copper	100,000	5	5½	21	2½	11	4	—	1½	[illegible]
Ohio Land and Marble	—		½	11			[illegible]		[illegible]	[illegible]
Parker Vein	50,000	100	8½	30	4	27	7½	1½	—	53,100
[illegible] Mining and Manuf	—		4½	21	4½	21	4½		—	[illegible]
Pennsylvania Coal	60,000	50	109½	31	102*	2	[illegible]	—	—	[illegible]
Pennsylvania & Lehigh Zinc	100,000	10	5½	14	2½	24	3	½		[illegible]
Phoenix Mining and Manuf	20,000	100	10½	21	8½	15	10	—	1	[illegible]
Phoenix Gold	—	—	½	17	½	7	½	—	½	[illegible]
Potomac*	100,000	10	8½	20	8½	17	8½	—		7,500
Potosi Lead	200,000	5	6½	4	6	6	6	—	½	[illegible]
Randolph	—	—	1	14	—		1	—	—	100
Ripley	60,000	12½	4½	27	4	20	4	—	—	[illegible]
Rockland	—	—	12	1	—	—	1	—		50
[illegible]	—	—	5	20		—	—	—	—	100
Rutherford	—		½	24	—	—	½	—	—	500
[illegible]	20,000	25	18	22	12½	7	12½	½	—	250
Ulster	100,000	5	1½	20	1½	17	1½	—	½	3,300
Vanderburg	—	—	½	11	-		¼	—		[illegible]
Winthrop	20,000	25	—	—	—	—	8	½	—	No sale.

* Ex-dividend.

† Carrying the Davis and Isabella dividends: without them the stocks sells at 1½.

BOSTON MINING SHARE MARKET.

BOSTON, Feb. 20, 1853.

Since our last several mails have been received from Lake Superior, bringing advices of the most cheering nature, and fully confirming the anticipations of friends of the mining interests. The market is generally firm for all the stocks, and no amount of shares in any of them could be obtained at the present current rates. Every day strengthens the hold this class of stocks is obtaining on the good favor of the public; and more inquiry into their merits is being made by those who are seeking them as investments. We will venture to predict, that an investment judiciously made in the mining stocks of the Lake Superior region will give a threefold better interest within five years, than any other security that can be obtained in this country. This belief is based upon facts, and not from any temporary excitement, caused by speculative activity. The results of a year past are sufficient to satisfy any who are willing to be convinced, that the success of copper mining is no longer a matter of uncertainty. It speaks for itself, and the copper literally "sticks out."

Copper Falls has improved from 56 to 59, and if one quarter that we hear of it is true, the mine bids fair to be pre-eminently successful. There seems to be hardly room for a doubt as to the immense richness of the veins, and new discoveries are continually being made to strengthen past successes. Work was first commenced on this mine in June, 1851, and the whole amount expended to Jan., 1854, is $167,000; of which, $130,000 has been assessed on 10,000 shares, at $13 per share, and $37,000 realized from the sales of copper. In 1853, the net proceeds of copper sold was $27,700. It is anticipated that the Company will ship 500 tons of mineral during 1854, the average percentage of pure copper being about 70 per cent. There will be an assessment, during the coming spring, of probably $5 per share, which, it is expected, will be the last required by the Company; and the managers hope to make a dividend in the spring of 1855. *North American* is in better demand, and the stock has improved from 70 to 80, although no sales have been made higher than the first-named price; but 80 would be paid now if any shares could be obtained at that figure. The latest accounts from this mine are even more encouraging than when the agent stated, some months since, that "the results were such as to place the Company beyond the necessity of calling further assessments, and to insure large and speedy dividends." It will be recollected that this Company found a mass of not less than *one hundred and fifty tons* in the first level, only about forty feet from the surface of rock. *Toltec* is firm, with but few transactions, holders of stock little inclined to sell at ruling prices; and there is at present no disposition to put the price up, although recent accounts from the mine are of so favorable a nature as to warrant an advance of $5 per share, at which point the stock would be one of the cheapest in this market, taking its true merits into view. Within a short time the Company took out a "mass" of over 1,200 lbs., and the stopes are yielding a great deal of barrel and stamp copper. The mine has improved wonderfully of late, and its sure success is on a firm basis. It ranks as first class among the new mines.

National is also making a splendid show, and the stock is scarce at 31 bid. The shares come into the market but little, and a demand for a few hundred could not be met without a material advance in price. *Norwich* is looking up, and bids fair to be a mine of great promise. The Company have just called in an assessment of 50 cents per share, and there is no stock for sale at $11½ per share, for $4.50 paid. *Forest* is firm at 11 bid for small lots, and no stock pressing upon the market. The mine is said to look better now than ever before, and with the present judicious management there is a fair prospect of a successful result. *Isle Royale* is firm at 20½ bid, for large lots, although an assessment of $1 per share will be due March 6. With the present favorable accounts from the mine, however, there is no probability of any serious decline in the market value of the stock. The mine has thus far been proved, to an extent which leaves little if any doubt of success, and the stock

£1, for one month.
£2, for three months.
£3, for six months.
£5, for twelve months.

From the success which has attended the present temporary measure, your Committee have been induced to adopt it as the basis of the scale of payments to be proposed for permanent enactment. It will be observed that the fee for three months is identical with that now established; the rate for one month being somewhat in excess, and that for the longer period being proportionately diminished.

The uncertainty attending the ordinary avocations of the working miner has induced your Committee to fix a scale so low as can scarcely be felt oppressive even by the unsuccessful.

Your Committee would recommend that several advantages should be granted to those who may become annual licensees. They consider it reasonable that the elective franchise should be extended to this class. But as any bill passed by your honorable House for this purpose must, previously to its becoming law, be laid before both Houses of Parliament for thirty days prior to receiving the royal assent, and as no time would be gained by introducing a separate measure for this object, your Committee would recommend that the necessary provision should be made in the new Constitution, the preparation of which now engages the attention of your honorable House. At the same time your Committee are of opinion that those who will not, by obtaining a yearly license, afford a guarantee for their settlement in, and attachment to, the colony, are not entitled to be intrusted with so important a privilege; and that a migratory population, many thousands of whom are not resident for more than a few months in the country, should not have power to interfere in permanent legislation for its internal government.

They would further suggest that a right should be conceded, without additional charge to annual licensees, to cultivate ground for gardening, subject to such regulations as may be necessary to prevent any interference with the sale of agricultural, or the working of auriferous lands.

By granting such advantages, and by making the proposed reduction to those who take licenses for the longer period, your Committee trust that ere long the evils hitherto attendant upon the wandering and unsettled habits of the miner may be removed.

It has been stated to your Committee, that it would be regarded as a hardship by the working miner, if he alone of all the residents on the gold fields were called upon to pay towards the exigencies of the State, whilst others, who in truth derive more benefit from his labor were not required to contribute their fair proportion. Your Committee assent to the justice of this view, and would recommend the imposition of an annual charge upon all persons engaged in trade on the gold fields.

They also advise that, with a view of further developing the resources of the colony, every encouragement not detrimental to, or antagonistic with, the pursuits of the individual miner, should be held out to companies to work such portions of land as would not repay private enterprise. A vast amount of wealth, otherwise unavailable, would by these means be procured, and a large field for employment insured to many who may not have succeeded in their uncombined efforts. Land, heretofore imperfectly worked, or too poor for rude and unscientific labor, would be rendered a prolific source of prosperity, and thus it is conceived that the operations of companies, so far from being prejudicial, would be generally advantageous to the industrial class. Companies, or associated miners, ought also, in the opinion of your Committee, to receive every legitimate encouragement in working quartz veins. Land suitable for both these purposes might be let on lease, or even in some instances sold, subject to proper regulations. In no case, however, does it seem desirable to disturb the operations of the individual miner.

But, as the most certain mode of identifying a people with the country, and binding them to support the law, is to give them a vested interest in the soil, your Committee would recommend that a large amount of land immediately contiguous to the gold fields should be offered for sale in allotments of various sizes, and that if the accomplishment of this object should be found to interfere with existing rights, compensation should be awarded rather than that the claims of the occupant should be permitted to impede the permanent settlement of these districts.

Your Committee, in thus viewing the settlement of the gold fields as a matter of the utmost moment, have considered the expediency of farther facilitating the occupation of land; but regarding the propositions on this point already alluded to as sufficient, if carried out with energy, to meet existing wants, do not propose to offer any further suggestions, or at this period to advise legislation, avowedly imperfect, on a subject which your Committee trusts will at no distant day be brought fully under the consideration of the country.

Encroachments upon mining claims, which cannot practically be redressed by the ordinary legal means, and disputes between partners in mining, the law respecting which, even were the tribunals more accessible, is too cumbrous for ready application, appear to your Committee to require special legislation; they would therefore recommend generally that a simple and expeditious mode of determining such cases should be introduced.

They would also suggest, that encouragement should be given to those who may be disposed to "prospect," with the view of discovering new gold fields. Some inducement appears necessary, as the miners are naturally reluctant to sacrifice certain gain, by undertaking a task which, whatever benefits it may promise to the public, is too often unprofitable to themselves.

Your Committee entertain the belief that all reasonable demands have been fairly met by this Report, and they are confident that the liberal policy they recommend to your honorable House will be productive of the best effect. That any legislation can be looked upon as permanent in a state of things changing so rapidly from day to day, is, perhaps, more than can be expected; but the present proposals seem to remove all the chief grounds of complaint, and provide, as far as possible, for the future development and settlement of this country, and for the encouragement of the great source of her prosperity.

In conclusion, they would advise that the bill submitted to them should be remodelled, with a view of embodying the suggestions contained in this Report.

A summary of the progress at the diggings may be found in the following paragraphs:—

The intelligence from the different digging localities continues good, although on the Ballarat side they complain of the late heavy rains having greatly impeded operations. The late discoveries there have been at a much less depth than hitherto; in fact, extensive surfacing has been met with, thus holding out some encouragement for the digger of small means. The line of the last discoveries is towards Buningyong. That which has been long since predicted is now pretty well established, that all the ground between Golden Point and Buningyong is one continuous field. In the week ending October 8, there had arrived by escort at Geelong, 43,552 ozs. from Castlemain Mount, M'Ivor, the Ovens, and Ballarat diggings.

The *Melbourne Argus*, of October 10, says:—"During the week business has been dull, but very extensive trade has nevertheless been done, especially for the diggings and the country generally, and should the weather prove moderately dry, there will be a considerable reaction. Numbers are now beginning to move, both from the neighboring colonies and from town, for the summer diggings campaign, and this movement has caused an increased demand particularly; but there appears no chance and no expectation that the excitement, speculation, and high prices of former years will be again experienced. The labor market was very active, there being a great demand for all kinds of labor, at increased wages. Seamen for the coast abundant, but for home few."

THE LIBERTY MINING COMPANY.

This is an English Company whose mines are located in Virginia. They were noticed at page 413, Vol. I., Mining Magazine. We make the following extracts from the proceedings of the first meeting of the stockholders:—

The notice convening the meeting having been read, the Secretary submitted the subjoined statement of accounts, from the 2d April to the 30th September:—

Issue of 60,000 shares	£60,000	0	0				
Loan in lieu of 3,000 shares	3,000	0	0	—	£63,000	0	0
Purchase money for Vaucluse and Grymes Mines	50,000	0	0				
Remittances to America	10,648	10	0				
Preliminary, travelling, and engineer's expenses	1,068	6	8				
Printing and stationery, and advertising	249	18	6				
Salaries and rent	[illegible]	4	[illegible]				
Office furniture	18	7	6				
Incidental charges	79	3	1	—	62,537	10	2
Leaving balance in favor of Company, Nov. 26					£ 462	9	10

To which is to be added a remittance of £1700 to the local management, and not charged in the above account.

The Secretary then read the Directors' report, of which the following is a summary:—The Vaucluse Mine has long borne a high reputation in the north of Virginia, and the purchase of the adjoining Grymes Mine has enabled the Company to realize the idea of uniting the two properties, and working them as one concern. The average yield of the ore at these mines, after being stamped, was ascertained to be 8 dollars, or 32s. per ton. The yield of the sulphurate, taken separately, and subjected to a decomposing process, averaged £80 per ton. By doing away with the Chilian mills, and erecting 60 heads of stamps, 120 tons of ore might be crushed in a day of twenty two hours. Estimating the net yield of this quantity to be £120 a day, the clear product would realize from £36,000 to £38,000 a year, which, on a capital of £63,000, would pay 60 per cent. per annum. Our resident director at Vaucluse has had to encounter many serious difficulties, which have contributed to retard operations from the outset. On taking possession there were only two English miners on the property; at Christmas the whole of the hands, white and colored, amounted to forty five only. With so inadequate a force, mining operations on the scale we had contemplated, could not be entered upon, and were, therefore, postponed till the commencement of the new year, by which time, after great exertions, a very efficient corps had been got together. From this period the works, both above and below ground, have been pushed forward as rapidly as possible. By the end of March fully 800 feet had been driven in tunnels and cross-cuts, and upwards of 100 feet sunk in different shafts. A great number of good veins had been cut through, and there was one in almost every tunnel. At the beginning of April, the resident director wrote as follows:—"I think our prospects are very good. Another large vein cut into to-day. We have mine enough here to last 100 years. There is abundance of ore here, and a good lead in it, and, if the mine were opened properly, I believe sincerely that we should pay heavy dividends. The more I see, the stronger becomes my impression of this." In May, the resident director wrote:—"I am sanguine of a splendid success. Captain Phillips and I feel confidence in stating, that in three months hence we shall be able to raise from 120 to 130 tons of ore a day from the levels driven and driving." The total amount of gold produced during the year from shoots and veins, met with in driving and sinking, has been 536 ozs. 6 dwts. The gold produced during the first year has been certified by the United States Mint to be 948¼ degrees, or more than 22¾ carats fine. The value would thus be somewhat over £4 per ounce. In November last, the directors instructed Mr. Macdaniel to inform himself of the capabilities of the new inventions submitted to the mining public, with the view of superseding stamps, and he had entered most cordially into the views of the board, examined the machines, gave them ample trials with ore brought from our own mines, and reported on the operation of the different crushers, separators, and amalgamators. Acting on his advice, the directors decided on erecting one of Cochran's large-sized pulverising machines, which reduces or grinds the ore to an impalpable powder. This machine, in conjunction with a new apparatus for catching the free gold and separating the sulphurets (the invention of their resident manager), promises to realize results which will render the shares of this Company one of the most valuable investments of the day. On the 8th of October, Mr. Macdaniel writes:—"I do think the yield of the ores may be fairly set down at £2 per ton, and with this yield the mine will make a fortune for the shareholders." The proprietors are aware that the capital was originally fixed at £100,000, in £1 shares, of which not more than 65,000 were then to be issued. The number issued was 60,000, and in December last, the board decided on reducing the capital temporarily to that amount, at the same time reserving the power of issuing the remaining 5,000 shares, should it become necessary to do so, but providing no farther increase should take place without the sanction of a general meeting. The necessity of issuing a limited number of fresh shares has arisen, in order to enable the resident director at the mines to meet the extra expenses which have been occasioned by the delays already mentioned. Those delays have subjected the Company to the payment of three months' extra wages, added to which are bills not yet rendered for founders' work, fixings, etc., required in the erection of the new machinery. The board has, therefore, been compelled to issue 3,000 additional shares, and, as it may be necessary to issue the balance of 2,000 shares, they recommend that the capital be increased to its original amount of £65,000.

LONDON AND VIRGINIA GOLD COMPANY.

This is an English Company owning mines in Virginia. Their property is known as the Garnett and Mosely Mines, noticed on pages 164 and 514, Vol. 1., Mining Magazine. From the proceedings at the meeting of the stockholders, we extract so much as will inform the reader of their system of operations.

The following is the Report of the Directors:—

As this is the first meeting of the stockholders, it will be proper to state shortly the Constitution of the Company, and the steps which have been provisionally taken, in order that the object and proceedings of the present meeting may be rendered intelligible to all. The Company was established in Virginia under an Act of Incorporation, obtained from the Legislature of the State, on the 24th day of March, 1853. The Act confers upon the stockholders the usual powers and incidents of a corporation (most important as limiting individual liability), including power to make by-laws and regulations for its own government, and to hold lands to the extent of 5,000 acres in the county of Buckingham, in Virginia, and four adjoining counties. The only corporator named in the Act is Mr. W. M. Mosely, and he is authorized to associate with him the other parties holding stock in the Company. Although the Company is incorporated for general mining purposes, the principal object contemplated by the promoters of the Act was the working of the Eldridge Mine by an efficient joint-stock company. With reference to such part of the capital as was to be subscribed here, it was obviously necessary that some provisional steps should be taken, for the English subscribers could not be incorporated until their names were ascertained, and it was essential that their interests should be clearly defined and secured before they gave in their adhesion to the Act of Incorporation. Accordingly the directors named in the prospectus were associated as a provisional board, and in August last they reported to the shareholders their proceedings, including the contract for the purchase of the mine, and the survey and report of Captain Jehu Hitchins. At the date of that report, the deposit of 5*s.* per share had been paid upon all the 30,000 shares issued to the public. The shareholders were then invited to accept the Act of Incorporation, and the assentients were requested to pay a further sum of 5*s.* per share. The result has been as under:—

	Shareholders.	No. of Shares.
Assentient	140	28,620
Dissentient	7	475
Not declared	20	1,890

The second instalment of 5*s.* has been paid on 26,125 shares. The dissentient shareholders have received back their deposits, less 1*s.* per share, which amounts in the whole to 95*l.* The assenting shareholders have been associated by Mr. Mosely with himself, as stockholders under the Act of Incorporation, and a power of attorney has been given by that gentleman to the directors, authorizing them to exercise for him, in this country, his powers under the Act. The title to the property has been investigated by an English lawyer, and found unexceptionable. An abstract of the receipts and payments is subjoined. It will be seen that, after paying for the mine, and all expenses up to this time, the balance in hand will be 7981*l.* 3*s.* 9*d.* This balance will be somewhat increased by further receipts, on account of that part of the second instalment, which is at present unpaid. Estimates of the cost of machinery and working have been obtained by the directors, and they confidently hope—founding their expectations upon these estimates—that without any further call, they shall be enabled to carry on the works at the mine until returns are obtained. Proposals have been received and entertained by the directors, for the engagement of Mr. John F. Miller, a gentleman very highly recommended for his science and experience in gold mining, to take the charge of the works at the Eldridge Mine. The proceedings of the present meeting will consist of the election of president and directors, and the passing of the by-laws and regulations, which will be proposed in detail, and the provisional proceedings up to this time will be submitted for confirmation. It was stated in the last report that some amendments were considered desirable in the Act of Incorporation. Instructions to procure these and other useful amendments have been sent to the United States. It may also become necessary by the law of Virginia, that the proceedings of the present meeting should be confirmed by a meeting to be held there. In conclusion, the directors beg to repeat to the stockholders their unabated confidence in the soundness of the undertaking. They hold themselves, and their friends hold also, a large portion of the shares, and they have embarked in the undertaking not with a view of realizing accidental profits, but because, in their opinion at least, the Company may fairly hope that the operations at the mine, when properly developed, will produce remunerative profits as a commercial enterprise.

The statement of accounts, of which the subjoined is a copy, was then submitted:—

RECEIPTS.

Deposit of 5*s.* per share on 30,000 shares	£7500 0 0			
Call of 5*s.* per share, on 26,125 shares	6531 5 0			
1*s.* per share on 475 shares, the deposits on which were returned, and the shares afterwards re-allotted	23 15 0			
Interest on money in bank	73 1 7	— £14,128	1	7

PAYMENTS.

Capt. Jehu Hitchins, survey and report of the mine	£ 330	0	0	
Expense in America of investigating title	128	17	0	
Expense of assays	26	17	0	
Brokers' commission	150	0	0	
Reports about machinery and establishment	41	15	0	
Office furniture	81	6	0	
Rent of office (two quarters), and coals	13	10	0	
Advertising, printing, and stationery	60	8	0	
Expense of scrip	18	13	8	
Secretary's office	152	17	6	
Solicitors	177	5	6	
Freight and charges	8	9	7	
Miscellaneous accounts and petty disbursements	28	1	0	
Balance— In bank	12,978	4	9	
Petty cash	2	19	0	— £14,128 1 7
Balance brought down	£12,981 3 9			
Deduct payment to be made to the vendors	5,000 0 0			— £7,981 3 9

The Chairman said, it now became his duty to render an account of the past proceedings of the undertaking, and in so doing he had only to state facts as they had occurred; and, for the future management of the Company, to submit certain rules and by-laws to the consideration of the meeting. In the month of May last a prospectus was published, which stated, in rather glowing terms he must confess, the prospects of the undertaking. The opinions set forth in that prospectus were those of the gentlemen who were formerly in possession of the property; and the statements were placed before the public as they came before the promoters of the Company. It then became the duty of the directors to verify the representations of the vendors; and Mr. Thomas, an eminent broker, was consulted as to the best person to send to America in behalf of the Company, and upon his recommendation the directors engaged the services of Mr Jehu Hitchins, and in August last the report of the survey made by that gentleman was printed and circulated amongst the shareholders. In comparing that report with what had been formerly received, the directors found considerable discrepancy, and it became a question whether they should rescind the original contract—in fact, they called upon the vendors to do so. The directors had carried on this negotiation upon a very independent footing and he thought the shareholders would agree with the board, that they had not made a very disadvantageous arrangement. The bargain they entered into with the vendors was for the payment of 5,000*l* in cash for the purchase of the estate, 5,000*l*. in shares, with certain contingencies. The vendors were perfectly satisfied with the bargain, and having a large interest in the undertaking, they would, no doubt, themselves derive considerable advantages. With regard to assays which had been lately made, he might fairly state that the average produce was from 2¼ to 1¼ ozs. of gold to the ton; although, in some instances, it had been double that amount.

MECKLENBURG GOLD AND COPPER COMPANY.

The mines of this Company are located in Mecklenburg county, North Carolina. They are known as the Rhea and Catha Mines, and consist of two tracts of land, containing respectively five hundred and seventy-five, and one hundred and twenty-five acres. The officers of the Company are J. D. Sparkman, President; Paul Groot, Vice President; and S. W. Armstrong, Secretary.

The following is the Report of Professor Emmons, the State geologist of North Carolina, upon these mines:—

SIR:—In pursuance of my duties as geologist of North Carolina, I have made a survey of the Rhea property, situate in the county of Mecklenburg. This property consists of five hundred and seventy-five acres of land, with veins of minerals carrying both copper and gold, and the necessary buildings for the accommodation of a plantation. The land is well located on a travelled route, and is pleasantly situated as to scenery, beauty and health.

The vein of the metals occurs in three clusters. The first and most westerly cluster is made up of four veins parallel, taken in pairs thus—1 and 2 parallel to each other; 3 and 4 also parallel, or nearly so.

The course of *one* and *two* is N. 70° E. No 1 has been worked to the depth of seventy feet. It has furnished several pockets stated to have been worth from \$6 to \$7 per bushel. Its average yield, taking the whole vein, has exceeded one dollar per bushel. The width of the vein, which is now from nine to twelve inches, has increased, etc; with its increase in width, it has also increased very perceptibly in the amount of copper pyrites. This accounts for an important fact, for the yield of gold has apparently diminished with the depth. Not because the vein carries less gold, but because the ore has passed from the brown oxide above to the copper pyrites below. This is now a well-known change. It would be an unfair representation of the value of the vein if we omitted to mention the fact, that the only method pursued at this time for obtaining the gold has been by the drag mill, a mode which, while it answers a very good and useful purpose for amalgamation where the quartz is already pulverized, is not at all adapted to the work of reducing it to a powder. We have, therefore, sufficient ground for believing that considerable gold still remains in the sand which has passed through said.

This vein is well formed, and traverses a hard rock, with regular and distinct walls, and so far the facts go to prove that it will continue in its present course.

As this vein has changed its condition materially from the depth of fifty feet to seventy, by an increase of copper pyrites, which is scarcely mixed at all with iron pyrites, it is highly probable it will still continue to change, and finally to become a good copper vein. This may be expected at the depth of one hundred feet.

The third vein runs in an oblique course to the first, and for a distance of several hundred feet lies to the west of No. 1, which it intersects as represented in the diagram. This vein upon the hill has been worked one hundred feet deep. Portions of this vein were found to yield \$6 to \$7 per bushel, veinstone resembles the former. At the bottom of the hill at the branch, it is worked only to the depth of six feet, and the vein is still all standing south of the branch.

Southward these veins may be traced about one mile, and north of the branch one fourth of a mile.

These two veins constitute a mine in themselves, and will warrant the erection of a steam-engine for working them, when, if the mining works are properly conducted, they will pay a handsome profit to the owners.

The second cluster is about one third of a mile eastward. There is, however, only one vein which has been worked. It is three fourths of a mile long. Shafts have been sunk upon it at various places, and much gold obtained, but the value of this vein is not yet fully tested; its length and regular course show that it is a strong vein. It has been worked only to the depth of thirty-five feet at one shaft, portions of the vein yielding here three to four pennyweights to the bushel. It has been worked in the same rude, imperfect way as those already noticed.

The third cluster of veins is south-westerly from the latter. The vein here is narrow, being only from four to six inches wide. It is worked thirty feet deep, and has yielded three dollars to the bushel. The walls of this vein are hard, and not so easily drilled as the former. It is like the others, however, sinking down vertically. Without placing an undue value upon this last vein, there is scarcely a doubt respecting the permanence and value of the two first, which I have briefly noticed. The first is like the others, a decided indication that the vein will be permanent. Persons, therefore, who feel disposed to engage in mining, may safely make an investment in the Rhea property.

The capabilities of the soil are not to be overlooked; for, with a tillage adapted to the nature of the soil, the plantation itself will furnish a source of gain. Its agricultural and mining capacities, therefore, are recommendations not always connected together, or not met with upon one plantation.

THE DORN MINE.

To the particulars of this mine, last mentioned at page 518, Vol. I., Mining Magazine, we now add a few further facts.

A vein has been opened in the Talbot shaft, in which the ore is reported by the Superintendent as rich and easily worked. There are now eight separate openings, or shafts, on the vein, all yielding ore. The mine worked by Mr. Dorn adjoins the Company's tract, and is now yielding more gold than before. The Dorn Company has recently completed its organization by the selection of the following board of trustees and officers: Lowell Holbrook, President; Jacob Berlin, Secretary and Treasurer; Samuel J. Tilden, William H. Appleton, William B. Lewis, Trustees. The capital of the Company is $600,000—of which the large amount of nearly one fourth is reserved as working capital.

THE LAWHORN GOLD MINE.

This mine, located in Georgia, has not been before mentioned in our pages. It is situated in the extreme southern part of Union county, at the base of the Blue Ridge on the N. W. side, in the Valley of "Shalome,"—so named by General Lawhorn, after he discovered the rich veins. The mine consists of two veins, running nearly parallel with each other, but of quite different characteristics. One is a quartz vein, traversing mica schist; range, N. E. and S. W.; dip, S. E. some twenty degrees; thickness varying from one to one and a half feet; and in length the vein has been traced for more than a mile, and is quite distinctly marked and uniform on the surface throughout the whole distance. Nor is the gold confined to the vein proper, it is found also in large quantities in the adjacent slate, which pays largely for working. The vein itself is easily pulverized, being a sort of rotten quartz.

The other vein is found some two hundred yards to the east of the quartz vein. It is imbedded in the same formation, but is nearly perpendicular, if anything pitching a little towards the other vein, and would, at considerable depth, converge to the same point. This is a talco quartzose vein, the talc generally predominating, and at the line of junction is generally found the most gold. This vein is about two feet in its widest part, and is richer in spots than the regular quartz vein; though I apprehend the latter, on account of its uniform richness, its great length and regular formation, will be found the most productive.

The great resemblance between the geological features of the country in the vicinity of these veins, and in California in the neighborhood of some of the richest places there, struck my mind most forcibly; the gold in both sections being found in the mica schist series, either in veins of quartz or talc imbedded in it, or in detritus resulting from their disintegration.

REMARKS ON THE GOLD IN THE VANDERBURG MINE, NORTH CAROLINA.

Mr. C. Ludwig Richter, a practical metallurgist, in some remarks on the gold of the Vanderburg Mine, alludes to one or two points in relation to pyrites found there which are worthy of attention:—

The occurrence of gold in this mine is widely different from that in the diggings of California, and the processes sufficient to extract the gold of the

California sands and quartz are insufficient for the extraction of the greatest part of the auriferous ores.

It is easy to the practical metallurgist to show that a very great quantity of gold necessarily escapes in the rough processes of working which are now in use, and that by other processes, and better constructed apparatus, adapted to these ores, far greater profits could be obtained, without raising the expenses in the same ratio.

The rocks through which the veins run in the Vanderburg mine, are talcose slate, as the hanging wall, greenstone slate, as the foot wall, often with sharp separation of the veins from the rock, almost throughout the whole mass of the rocks. Iron pyrites are disseminated in small brass yellow crystals, aggregating in greater number where quartz veins occur, and at the borders of the metalic veins.

The ores of the veins are generally copper pyrites (sulphuret of copper and iron, kupferkies), intimately mixed with iron pyrites and copper glance, of the most beautiful peacock colors, and frequently in well-formed crystals. Some specimens show the valuable red copper ore, but only in small quantities. I obtained specimens of brown sparry and clayey iron ore (carbonate of copper, grunkupfererz), as well as malachite in nests.

Iron occurs as pyrites in masses and single crystals, as carbonate and aluminite. The latter show very frequently a great degree of decomposition, great friability, a cellular, sometimes lava-like, structure, with nests of fine crystallized quartz and other minerals. Some specimens, which contain iron oxides and felspar together, illustrate a matter of the highest mineralogical interest; the iron oxides are in the shape of very thin lamellæ, inclosing an empty rhombic cell of exactly the same angles as the crystalline fissures of the grayish spar, which latter shows a very advanced state of decomposition. The simplest explanation of this very interesting fact is, that the iron oxide in solution filtered into the crystalline fissures of the spar, and combining with its constituents, formed these lamellæ, completing at the same time its decomposition.

Wherever the iron oxides occur in that friable, porous state, lining the holes of the quartz or pyrites (what the miners call honey-combs), they are highly auriferous, and yield a great quantity to simple washing and amalgamating process.

Another form in which the iron occurs, is a black, heavy powder, disseminated through the iron ores and auriferous sands; it is magnetic iron, and occurs so generally along with the gold, that the diggers of the Ural, in Russia, Bohemia, Austria, and other countries, consider it an indicator of the gold itself.

The quartz of the mine shows very frequently beautiful particles of gold, mostly in fissures colored by ferruginous infiltrations, and near the junction with the adjacent rocks, seldom in the middle of the siliceous mass.

Wherever the quartz occurs in a cleft, rugged and broken state, intermixed and lined with earthy iron oxides (honey-combs), there the richest harvest of gold can be expected.

The gold itself, disseminated through all the rocks of a wide district, is for the greatest part invisible, and held in close combinations with the pyrites of iron and copper, and is found in immense quantities at this locality. It is among the gold miners of Europe long ago well understood, that even the richest of the auriferous pyrites yield only a comparatively small quantity of their gold to direct amalgamation. Other processes are needed to develop the golden treasures from the pyrites, and these processes are neither complicated nor expensive compared with their certain results.

GOLD IN ENGLAND.

The existence of gold in England, in large quantities, is a subject which has agitated the public mind there for some months. The astonishing results ascribed to the operation of some of the new crushers and amalgamators upon the gossan of some of the mines, seems to have convinced even the most skeptical. Among others who have written upon the subject, Prof. Calvert has published a work on the "Gold Rocks of Great Britain and Ireland," in which he maintains the following positions: —

1. That we have gold in this country in large quantities, and spread over a great extent of surface.
2. That machinery is now produced, capable of extracting gold at an inconsiderable cost.
3. That the results of the machinery during the last few weeks have been most extraordinary and satisfactory.
4. These facts are at present reputed fables.

Another writer upon the subject presents the following points in relation to amalgamators and crushers: —

The thing to be tried is, how many tons of hard quartz or friable gossan will any of these patent mills grind to a powder of a given degree of fineness, with an engine of a given size, with a given quantity of coal, and in what time? And what will a stamping mill do, supplied with similar material, pounding it as fine, and worked by an engine of the same size, with the same quantity of fuel, and for the same time? A stamping mill is cheaper, lighter, more easily transported, and more easy of repair.

For producing a large quantity of dry powder, however, a crushing mill, driven by an engine of equal power, will, I believe, far exceed any of these patent mills or stamps, but a great degree of fineness is not readily obtained, and the great desideratum, at present, is an improved dry grinding mill, something simpler or cheaper than stone runners or conical mills, and something which will do larger quantities.

As to grinding and amalgamating simultaneously with any advantage or economy, I am most skeptical, the process having been tried over and over again in various parts of the world, and found to be a bad and wasteful one, as I am assured.

Several of the mills will probably be found useful for grinding the ore to an impalpable powder, after having been crushed to a moderate degree of fineness in a preparatory machine, and they must therefore be looked upon as valuable additions to this class of implements.

GOLD ASSAYING IN SOUTH AMERICA.

The process of gold assaying amongst the native miners of South America is very simple. A fragment of quartz is pounded, and rubbed to powder between two pieces of granite. A bullock's horn, of a black color, is the only assay instrument. It is cut longitudinally into two equal pieces, partly on the curve, so that one half forms a kind of long spoon, the inside being polished. The powder being placed in the spoon, water is poured in it and shaken, and then poured off. A second and a third water being applied, nothing is left but the coarser particles at the bottom, and at one edge of them, conspicuous on the black horn, is seen a fringe of gold powder, if gold be present. With a keg of water at his back, and his spoon in his wallet, and a little parched meal, the treasure hunter wanders amongst the barren rocks in search of a treasure, which he sells when discovered, and seeks another; the claims of labor being practically regulated by natural aptitudes, just as the North American squatter sells his "betterments," and moves into another locality, not too "crowdy," with a neighbor only five miles off.

The man who buys the mine, digs the ore, breaks it up into the size of walnuts, loads it into his hide sacks borne on mules, and sells it to the *beneficiador*, or benefitter, in the valley below, who passes it through his mill. Considering the ways and means at his disposal, his mill is more of a marvel than Mr Berdan's machine

Having settled upon a small stream, with a fall of from four to five feet, he builds up two walls to inclose it on each side, and a back wall to form a small reservoir, with a spout and plug to let out the water at his pleasure. Over the side walls, with considerable labor, he contrives to lay a flat circular granite stone, some five feet in diameter, with a hole of fifteen inches through the middle The middle of the stone is hooped round with staves, which stand up eighteen inches in the form of a tube. The outside is surrounded with similar staves, so that a water tight circular trench is formed, with a granite bottom. Through the central hole is passed the straight stem of a tree, shod with an iron pivot, standing in an iron shoe, fast to a block below. The upper part of the tree is steadied in a beam above, supported by two upright posts. Through the middle of the vertical shaft is a horizontal hole, with a horizontal shaft projecting on each side. In this horizontal shaft, at nearly the level of the foot below, are affixed in a circle, like the spokes of a wheel, a number of wooden spoons, about three feet in length To the horizontal arms above are tied, by raw hide cordage, a sort of large flag paving stones, with their faces bearing on the flat granite below. The water being turned on the spoons, the paving stones are drawn round by the motion of the shaft, and grind the quartz.

An improvement on this is to use two vertical rolling stones, eighteen inches thick and five feet in diameter, with a circular hole in the centre, through which the horizontal shaft or arm passes, and forces them round As the stones vary in their speed on the inner and outer edges, there is a grinding as well as a crushing process.

When the machine is at work, a quantity of quicksilver is thrown into the trench, and the quartz with it A small stream of water runs in, and at one portion of the rim there is a hole for it to run over, which it does, carrying the floating mud with it. As it runs over, it falls into a goat-skin, with quicksilver at the bottom. Out of this goat-skin it falls into a second, with more quicksilver, and so on from one to another, according to the amount of fall.

When the quicksilver is supposed to be saturated, the mill is stopped, the quicksilver is taken out of all the receptacles, and poured into a linen bag of fine texture, and three or four thicknesses. The quicksilver is squeezed through this bag, and the thickening amalgam is finally rammed down with a sort of rolling pin.—*Journal of the Society of Arts.*

AN IMPROVED GOLD SEPARATOR.

Patented by M. C. Gritzner, *Washington, Dist. of Columbia.*

The nature of my invention consists in the arrangement of two or more screens, one having oblong and the other square meshes, the square meshes to be of the same size of the short diameter of the oblong meshes, for the purpose of separating and retaining the leaf or flake of gold, and permitting the balance of the material to be subjected to a blast in uniform or nearly uniform sizes, so as to be differently operated upon by their different specific gravities; also, in the interposition of guide rollers, or their equivalents, between the shaking hopper and the blast, for the purpose of guiding or bringing the material in a proper manner to the blast.

Claim.—What I claim is, the arrangement of the screens (two or more), one having oblong and the other square meshes, the square meshes being of the same size of the short diameter of the oblong meshes, for the purpose of separating and retaining the leaf or flake gold, and permitting the balance of the material to be subjected to the blast in uniform or nearly uniform sizes, so as to be differently operated upon by their different specific gravities, substantially as described. I also claim the interposition of the guide rollers, or their equivalents, between the shaking hopper and the blast, for the purpose of guiding or bringing the material in a proper manner to the blast, substantially as described.

JOURNAL OF COPPER MINING OPERATIONS.

LAKE SUPERIOR COPPER REGION.

The rare opportunities for information from the Lake region during the winter, confine attention chiefly to the results of the operations of different companies during the preceding mining season.

Isle Royale Copper Mine.—This mine was noticed on pages 293, Vol. I., and 198, Vol II., of the Mining Magazine. We find a very full statement of operations there during the last year in the *Boston Journal*, which, both on account of the quarter whence it appears and its origin, we regard as entitled to consideration. The President of the Company is Truman Smith, and the mining agent, C. C. Douglass.

The mining operations of this Company were first commenced on Isle Royale, where they were engaged for several years with but little success. In 1852 the Company purchased lands on the south side of Portage Lake, and began work at this new location in August of that year, where they have since been actively and successfully employed. The Company own within the Portage Lake district three tracts of land, comprising 501 acres. On one of them, the northwest quarter of section 1, township 54 north, range 34 west, containing 160 acres, they are now mining. There are three large veins running obliquely across this tract, about 200 feet apart. On the middle vein, usually called the Isle Royale vein, the mining work is now progressing. This vein, which extends through the tract a distance of between 3,200 and 3,300 feet, is by far the largest which has ever been opened on Lake Superior, being from twelve to fifteen feet wide, with regular walls, and well charged with copper.

They are now sinking five shafts on this vein. On the 1st of January, Nos. 1 and 2 shafts were down to the ten-fathom level; Nos. 3 and 4 to the twenty fathom level, and No. 5 down to near the ten. A drift had been extended on the ten fathom level from No. 3 to No. 4 shaft 200 feet, north of No. 3 about 150 feet, and south of No. 4 about 200, making in all about 550 feet on that level. In addition to this, they have drifted each way on their twenty-fathom level from No. 4 shaft about 25 feet. The whole amount of work done is: in drifting, 600 feet, shafting, 420 feet.

The amount of copper sent forward during the last year was 31,783 lbs., or about 16 tons, which yielded 18,738 lbs. of ingot copper, and realized $4,334 13, after deducting the price of smelting. This, according to the statement of the principal of the smelting works at Detroit, is fully the average yield of the barrel ore received from the Lake, being 62½ per cent. They have now upon the surface at the mine, not less than 1,500 tons of copper rock, at least one half of which is rich stamp-work, and the residue will pay a good profit on stamping. The agent is confident of being able to ship $25,000 worth of copper next season.

Thirty six miners and forty five surface men were employed, at the last advices, and it is stated that the mine will soon be sufficiently advanced to employ twenty four additional miners. On completion of the stamps the mine will probably employ two hundred men.

They have erected at the mine one large and four small boarding-houses, one framed barn, thirty by forty feet, two change houses, a blacksmith shop, and several other small dwelling houses and buildings. A lot on Portage Lake has been contracted for, where a boarding house and office have been erected, and where the stamps are to be put up during next season. A contract has been made in Detroit for an engine capable of driving forty-eight heads of stamps, and this is to be completed by the 1st of April. It is in contemplation also to build a wharf, store and warehouse at the Lake during the next season, and also several dwelling-houses for the accommodation of those who will be employed at the stamps.

The Isle Royale mine has been proved to an extent which leaves but little, if any, doubt of success. The unusual width of vein at first induced many who had been long familiar with the copper mines in the Ontonagon and Keweenaw districts, to raise doubts as to the continuance and regularity of the vein; but further developments have satisfied the most skeptical, and it is now believed to be as true and regular a vein as can be found in the copper region.

The Company is organized under a special charter from the State of Michigan. The whole number of shares is 12,000, and the amount paid in $48,000, or $4 on each share. Another assessment of $1 per share has just been levied, and other assessments will doubtless be called for during the season, as it is intended by the managers to push the enterprise to a dividend paying condition as speedily as possible. The present market value of the stock is $20 per share, and it is held with great confidence.

The North American Mine.—This mine has been previously mentioned on pages 637, Vol. I., and 75, and 198, Vol. II., Mining Magazine. From the same source as the preceding, we have the following particulars respecting it during the last year:—

The vein now worked by the North American Mining Company is an extension of the famous "Cliff," and the same from which such remarkable results have been obtained by the Boston and Pittsburg Mining Company. It is known as the "South Cliff Mine." The Company commenced operations at this mine in 1852, and have thus far met with brilliant success. According to the annual report of the Superintendent, recently issued, the entire amount of sinking done up to July 1, 1853, in shafts, is 166 feet; drifting, 296 feet; winzes, 166 feet; cross-cutting, 58 feet; and in stoping there has been only 70 fathoms opened, from which have been taken out and blasted down ready for cutting into pieces over 300 tons of copper, less 33 per cent. for adhering rock, which gives 200 tons of pure copper, valued at over one hundred thousand dollars at the mine. "The results of mining at these works," says the Superintendent, "are such as to place the Company beyond the necessity of calling for further assessments upon the stock, and to insure them large and speedy dividends upon the money invested. The mine north of shaft No. 1 is nothing but a bed of masses. The vein will be opened as far north as the possessions of the Company extend, which will probably reach nearly, if not quite, through the strata of rock which is found to carry this copper."

At the date of this Report there were about 145 men employed by the Company. Stamps are to be erected during the next spring, and the agent calculates upon sending 500 tons of copper to market during the present year.

The number of shares in the capital stock is 10,000; amount paid in, $17 per share; present market value of the stock, $65 a 70. The Company is organized under a special act of incorporation from the State of Michigan.

The assets and liabilities of the Company, November 29, 1853, were as follows:—

ASSETS.

Bills receivable	$2,094 45	
Copper unsold	35,000 00	
Balance in Treasurer's hands . .	3,110 44	—$40,204 89

LIABILITIES.

Indebtedness for merchandise, etc. . .	$11,834 05	
Mine drafts yet out	5,361 77	—$17,195 82
Balance		$23,009 07

The mining operations of the North American Company are much less extensive than those of the Copper Falls, but the developments of the mine have been extraordinary for the amount of work performed, and there can be little if any doubt of its proving one of the most productive mines on Lake Superior. The managers are mostly Pittsburg men, in which place the stock is principally owned.

The Minnesota Mine.—This mine has been previously noticed on pages 196 and 636, Vol. I. Later accounts furnish the following additional facts:—

At the beginning of 1853, four shafts had been sunk upon the vein, one of which had reached a depth of 267 feet, and the other three but little less. The longest adit level was 1,138 feet, and the total length of drifts 3,545 feet. In the year 1848, with 20 men employed, the mineral produced was 6¼ tons, valued at $1,700, with an expenditure of $14,000. In 1849, with 60 men, the mine yielded 52 tons, valued at $14,000, at an expenditure of $28,000. In 1850, 90 men, 103 tons, valued at $29,000, expenditure $58,000; 1851, 175 men, 307½ tons, valued at $90,000, expenditure $88,000; 1852, 212 men, 523 tons, valued at $196,000, expenditure $108,000. The result of five years working was a yield of 992 tons, valued at $330,700, at an expenditure of $293,000. The product of 1853 was estimated at 750 tons; and from the accounts received at various times, it is probable that this is not far from the actual result. Upwards of 70 buildings have been erected by the Company, including 33 dwelling houses, and a comfortable building designed and occupied as a church and school-house. One hundred acres of land have been under cultivation, producing hay, turnips, etc., in great abundance. At the landing on the river, they have a good dock and warehouse, with a road of two miles length to the mines, and are from the latter to the Lake a distance of twelve miles. They have also 1,200 feet of surface, and 1,100 feet of underground railroad connecting the different shafts. The resident population at this mining village, in the autumn of 1852, was 312, of which 212 were men and boys employed at the mine, and 100 women and children. The vein now worked by this Company is one of the richest opened in the mineral district of Lake Superior, and the yield bids fair to equal, if not exceed, that of the Cliff in a few years. The whole number of shares issued is 3,000, and the first dividend of $30 per share was declared in January.

Besides the dividend of $30 per share, the stockholders have received stock dividends in mines, set off from the parent mine, with some $7,500 for each original share.

Toltec Mine.—This mine was last mentioned at page 198, Vol. II. The subjoined facts in relation to the mine and Company are added to those already inserted in our pages:—

The great metalliferous range which embraces the mining districts of Lake Superior, commences at the extremity of Keweenaw Point, and continues south-westerly, crossing Portage Lake, and thence turns in a more southerly direction across the Ontonagon River, where it is fourteen miles from the shore of the Lake. The range is divided into three districts, known among mining men as Keweenaw Point, Portage Lake, and the Ontonagon. Of the mines to which we have alluded in previous articles, the Pittsburg, Copper Falls, and North American are located on Keweenaw Point, while the Minnesota is within the Ontonagon district. The veins worked upon the Keweenaw Point and Ontonagon districts are of much the same character, but those of Portage Lake, brought more recently into notice by the success of the Isle Royale Company, are in many respects entirely different.

The Toltec Consolidated Mining Company has its location within the Ontonagon district. The mineral land owned by this Company was formerly the property of the Toltec and Farm Mining Companies, which in the spring of 1853 were merged into one company, under the title of the Toltec Consolidated Mining Company. The two companies had been working upon the same vein, with locations adjoining, and the measure of uniting was doubtless a very judicious one, as a large expenditure for separate buildings and machinery was thereby avoided, and the expenses of the two companies in general management much reduced. The tract comprises about 1,000 acres. Mining was commenced in 1851, and has since been prosecuted with a view of developing the mine extensively, upon the model of the Copper Falls Mine.

The vein is considered one of the most promising of the new mines upon the Ontonagan, and improves as the work of sinking shafts and driving levels progresses. It varies from one to three feet in width, and at several points swells to three and a half or four feet, well charged with masses of 2,000 lbs. downward, to barrel and rich stamp copper. The vein crosses the territory in a south-westerly direction, and has been traced for a distance of three quarters of a mile through the Company's land.

The Company has not yet made any shipment of copper worth mentioning, nor has it been so much the aim of the managers to raise mineral at present, as to prove the mine thoroughly, and to prepare it for working advantageously, in readiness for the machinery which will be erected during the next summer.

An examination of the extent of shafting and driving levels shows that the mine is considerably developed, and the managers are confident, from the excellent character of the vein and the results already obtained, that the Toltec will prove a very profitable concern.

PERCENTAGE OF LAKE SUPERIOR COPPER.

The present average yield of pure metal to the ton of metalliferous product in the English mines is but 6½ per cent. The average yield of the Cliff Mine last year was 45 per cent. The average of the seventy tons sent to market by the Copper Falls was 70 per cent. of pure metal; while the yield of the National Mine shipment of last season was 75 per cent. The yield of the Isle Royale, with a vein from 20 to 30 feet wide, of barrel-work and small masses, is 15 to 20 per cent. of all the rock and copper extracted—the Isle Royale having no large masses involving a heavy expense in cutting up, and no stamp-work yielding a small percentage.

AMERICAN MINING COMPANY.

This Company has under its direction numerous mines, located at Lake Superior, Maryland, North Carolina, Cuba, and elsewhere. Some of them have already been described in these pages. We continue a report of the progress of their operations.

The Norwich Mine. This mine, located in the Lake Superior region, was noticed at pages 518 and 654, Vol. I. We gather the following facts from the reports of the Agent, A. C. Davis:—

Sept. 6, 1853. We have a number of fine masses out, and more in the ground to come out. We are extending second level west from shaft B, and stoping between first and second levels west of shaft B—have as fine a lode as was ever seen of mass, barrel, and stamp-work. We have a number of tons of copper that we could ship this fall if the roads were passable. At present we have eighty-five men at work.

Sept. 17.—The adit is completed and in good working order, and contracts let to drive both east and west on the vein.

Sept. 25. The drifts from the adit level are started. The vein is large and rich. No mass copper shows itself yet, but good indications.

Sept. 30. We have the drifts in eight feet east and west from adit level, with a good vein, and a good show for mass copper soon. The stopes in second level west are turning out finely. The west shaft, or shaft D, is looking well—no heavy copper, but good barrel work. We are burning kilns and getting a fine lot of copper ready to be sent forward.

Oct. 3.—We have just got our bottom levels fairly started. The lode is large, and rich in stamp and barrel work—we do not look for masses under twenty-five feet from the crossing. We have a mass in the bottom of first level west that I cannot estimate; I think it considerably larger than any mass ever raised. Shaft D looks well. We now shoot all copper and rock to the bottom, load it into a car, and run it out of the mine. We have the roof on the mill; have commenced framing the stamp-house. The engine has arrived at the landing.

Windsor Mine.—This mine is referred to on page 173, Vol. I. The following are later and more full particulars from the reports of the Agents:—

Sept. 1, 1853. The drift from shaft No. 3, west, was driven eighteen feet, and most of that distance the vein looks very well—good stamp-work and a little barrel-work. The stopes east of shaft No. 3 have not been very productive, but are now looking much better, and will probably turn out some very good copper this month. Shaft No. 2 is planked and ready for the whim. Shaft No. 1 I have sunk three feet—it is now down 140 feet—and I am now cross-cutting south to cut the main vein.

Sept. 12.—I am making preparations to work the mine this winter with vigor, and I trust we shall have some copper to ship in the spring.

Oct. 5.—The mine has improved somewhat. The west drift was driven nineteen feet eight inches, with a good vein the whole distance, considerable barrel-work, and very good stamp-work. There are now in it two small masses, which will be taken out in a few days. To-morrow I shall start the second level west from shaft No. 2. Shaft No. 1 is planked. The vein east from shaft No. 1, at the depth of 149 feet, looks very promising, being about one foot wide, of good stamp-work.

Sharon Mine, Oct. 3, 1853.—The shaft is but ten feet deep. The regularity of the vein is unquestionable. It is exposed 800 feet in length. Have commenced shaft No. 1, so that three shafts will open the vein for the 800 feet.

Warwick Mine, Pennsylvania, Oct. 14, 1853.—The engine shaft is 145 feet 4 inches deep, in hard blasting rock. Have sunk 4 inches in twenty-four hours. The rock has a regular dip west, and lies in shelly floors, but is compact and solid.

New London Mine, Maryland, Sept. 25, 1853.—Have taken out some very nice copper from the second and third levels on the east side of the main shaft. I am still costeaning for the vein west—and I am opening a new shaft a little north-west of the first shaft. Have had 30 men at work three last days.

Sept. 28.—We are taking out some very good copper—the best that has been broke here. The best vein is in third level, west of main shaft.

Oct. 16.—There are about twenty tons of ore cobbed ready for market—and we judge there have been 350 tons taken out, of pretty good copper, since I commenced here.

Cabarrus Mine, North Carolina, Oct. 10, 1853.—The Agent reports:—We have commenced operations. Our first object was to discover the lode west of Messrs. Fisks' lease. The first pit we sunk about 80 yards to the west, where we discovered a vein 7 inches thick, composed of quartz-producing gold. This pit is 7 feet deep. The next pit, 12 yards further west, is 8 feet deep, where we discovered a vein 8 inches thick, composed of quartz, sulphur, and gold. The third pit is 8 feet deep and 30 yards further west, where we discovered a vein 8 inches thick, composed of quartz gold, yellow sulphuret of copper, and sulphuret of iron. The fourth pit is about 40 yards further west. The vein here is 4 inches or 5 inches thick, composed of quartz. The next pit is about 40 yards further west.

San Augustin Mine, Cuba, Sept. 12.—The mine at present is looking very promising. The southern side of the eastern end is proving quite the thing. We have driven in some $2\frac{1}{2}$ fathoms, all the way through good copper spar, breaking some days as much as a ton of yield a day. Both sides of the drift are looking as well as where we have been through. The last of the week I shall begin to drive southerly from the winze down 4 fathoms. The lode is so enormous that something must make below, for it is impossible for more than 10 fathoms of a vein in width (through the whole of which we have raised more or less of copper) to diminish in goodness, when the spar and lode stuff continues so rich as it does here.

Sept. 17.—We are raising ore; it is quite good at the 15 fathoms, and extremely promising. We are now driving from the winzes.

THE PLYMOUTH COPPER MINE.

This mine is located in the State of Connecticut, and is a very promising one. We insert at full length the Report of Mr. C. S. Richardson respecting it, as it presents all the points worthy of particular notice:—

This mine is situated in the township of Plymouth, in Connecticut, and embraces in the sett enough land to make a very extensive mine, having a run of three quarters of a mile on the lode. The strata is principally gneiss rock, of a nature congenial for the production of yellow and gray copper ore, evidences of which may be seen wherever regular lodes have been opened on, in the same formation. It has little or no inclination; the cleavage joints are nearly north and south, slightly dipping to west; and, although it is a close, compact stone, yet in working it gives freely to the drill. This is an important feature, as it will enable the miners to d'zeu the lode in sink ng the trial shaft.

The lode is one of a very promising character. It carries a black gossan at surface, and at ten feet deep is impregnated throughout with mundic and yellow ore in finely-disseminated particles. The leader part consists of a compact quartz, tolerably well stratified, although nothing can be expected to be regular at this shallow depth. Its dip is inclined a little to the north; its bearing apparently is 75° north-west, and may be classified as an east and west lode. It traverses the entire length of the sett, which, as before described, is three-fourths of a mile long. The width of the lode has not yet been perfectly defined, neither wall having been cut into; or, if it has, the country carries as much ore as the lode. But I can see nothing to show like the walls of a lode.

A shaft has been sunk about twenty feet deep, at which depth the lode is much more strongly mineralized, and certainly looks very promising. Shode pits have been put down to the eastward, in several places, to prove the continuity of the lode. At the present stage of its development, but little more can be said of its properties.

Those unacquainted with mining will be apt to say, there are no rich specimens of ore yet discovered, and would infer that it must necessarily be a poor lode. In this country, such is a very commonly received opinion, but nothing is more erroneous. Productive mines very seldom throw up rich specimens of ore in their lodes to the surface. The fact, in the present instance, of the ore being found impregnated in finely divisible particles, through the matrix of the lode, is, in my opinion, a much better index of its future riches or productiveness than any other feature it could possibly possess.

At the place where the present explorations have been made, which is nearly on the top of the hill, and which is 367 feet above the bed of the Naugatuck river, an adit level could very easily be driven in from the eastern valley, on the course of the lode; but such a mode of working would not be advisable. I apprehend no profitable working backs will be found under twenty fathoms below the valley, on the eastern side of present shaft. I should recommend the erection of a steam engine in this valley, at the place where the engine shaft is to be sunk; but this cannot be ascertained before the trial-shaft on the hill is run down some ten or fifteen fathoms deeper. Then the underlay of the lode will be proved, and the proper site for the permanent engine-shaft accurately ascertained. For the speedy sinking of the trial shaft, I would recommend the use of a three-horse portable engine, and a lift of six inch pumps. There will not be much water to contend with in consequence of its elevation, and this small power will keep the shaft in fork. The expense of this simple machinery will be very trifling, as no buildings or other permanent fixtures are requisite. I have not the least doubt but that twenty fathoms may be run down this way, which would prove the lode, and set all further doubts at rest.

In setting out your plan of machinery, let me caution you against the introduction of non-condensing engines. The first cost of them is much less than the proper engine, but the consumption of fuel to drive them is wasteful in the extreme, and becomes very expensive in the end. The Cornish engine, with the internal flue fire-place boilers are now brought to such a state of perfection, that the enormous weight of eighty-five million pounds of water can be raised with the consumption of one hundredweight of good Welsh coal. Small high pressure engines are very valuable for proving lodes, but must not be used for working mines.

The local position of this mine is everything that is desirable. The Naugatuck Railway runs through the sett, and the depot is within 500 yards of its north-western boundary; thus affording every facility for the ready and cheap transportation of mining materials, etc., and the produce from the mine. It is held on a lease for a long term of years, without rent or royalty, and taking everything into consideration, the development of the mine must be regarded as a fair speculation.

AN EXAMPLE OF LEGITIMATE MINING.

In our last we briefly alluded to the important discovery which had taken place in the Hayle district, and we feel great satisfaction at again alluding to it; inasmuch as it shows that when mining is conducted as an enterprise, and not as a speculation, in nearly every instance satisfactory results are arrived at. In former years this district was known as one of the most productive in the country; the great Wheal Alfred has given to its proprietors upwards of 260,000*l* profit; next to this is West Alfred Consols, an improving mine, which, if sunk deeper, according to the country, and the run of the lodes, must be a profitable mine. The mine adjoining this is West Wheal Alfred, which at a shallow depth has already produced a large quantity of ore, and gives every indication of a prosperous development. The mine next to this is Trelowith; this has now been worked for upwards of four and a half years, with a shallow adit in the first place, and afterwards drained by means of a water wheel, when but little ore was produced; subsequently an engine was erected, and the works prosecuted with vigor; the returns were but small, but the adventurers continued the workings with great skill and indomitable perseverance, the shaft has now been sunk to 80 fathoms, and there large rocks of ore have been met with of a high percentage. The stones which we have seen from there give every indication that this is a continuous lode, and will increase in productiveness and richness as it gets deeper. The mine is situated within a mile of the shipping port, and the carriage of ores and coal does not amount to more than one shilling per ton. From the facility of shipping, and other advantages, there can be but little question that this mine, if carried on in the same persevering manner in which it has been done by the present adventurers, will become one of the most profitable in the county. we do not infer by this that it shall be a Devon Great Consols; such instances are but few and far between; but judging from the character of the district, and the quality of the ore, if the present proprietors continue their efforts, there is every prospect that their enterprise will be crowned with more than remunerative results.—*London Journal.*

SMELTING WORKS OF FAHUN, SWEDEN.

In Sweden, at the smelting-works of Fahun, the assay is always taken by an iron bar. About 200 tons of copper are produced there annually: the mines are the most ancient in Europe, having been worked over 1,000 years. It was here that Gustavus Vasa was concealed while under the ban of Christian II. of Denmark. Attached to the mines is a laboratory and school for students in practical mining and mineralogy.

MINERAL PRODUCE OF SOUTH AUSTRALIA.

The following is a comparative statement of the export of mineral produce from South Australia, for the years ending June 25, 1852 and 1858:—

	Quantity.	Value.		
1852—Copper	48,704 cwts.	£179,442	0	0
Regulus	653 tons	17,090	0	0
Copper ore	10,974 tons	161,346	0	0
Lead ore	49 tons	320	0	0
[illegible]		£362,189	0	0
1858—Copper	28,144 cwts.	£113,593	8	0
Regulus	84 tons	1,260	0	0
Copper ore	4,793¾ tons	95,147	0	0
Lead ore	20½ tons	291	0	0
Total		£210,291	8	0

This return shows a great falling off in the exports of copper, owing to the disturbance of the labor-market caused by the gold discoveries.

ENGLISH SALES OF COPPER ORE.

The following are the particulars of the copper ore sales at the Cornwall Ticketings during the quarter ending 31st December, 1853:—

1853.	Av. Stand.	Prod.	Price.	Ore.	Fine cop.	Amount.
Oct. 6	£1[illegible] 15	6½	£[illegible] 17 0	4,654	291 4	£27,[illegible] 12 0
" 13	136 8	6¾	6 13 0	4,365	302 8	29,114 6 0
" 20	134 19	6½	6 10 0	4,494	320 19	[illegible] 14 6
" 27	141 13	6	5 14 0	3,[illegible]4	179 14	17,270 15 0
Nov. 3	129 8	6⅞	6 12 0	[illegible]	156 14	15,601 18 6
" 10	148 1	6¾	7 1 6	3,[illegible]	271 0	27,918 2 6
" 17	141 16	7¾	7 13 6	3,818	282 7	2[illegible],531 15 6
" 24	147 0	7⅞	8 1 0	2,464	180 18	19,[illegible] 14 0
Dec. 1	153 19	6¾	7 2 0	4,394	282 11	31,424 7 6
" 8	150 18	6¾	7 0 6	4,[illegible]	227 19	32,889 2 6
" 22	148 14	6¾	6 13 0	4,6[illegible]	300 9	31,[illegible] 2 6
" 29	152 14	6⅛	6 12 0	2,951	180 8	19,429 2 6
Total for the quarter				45,722	2,948 4	£[illegible]12,771 4 0
For the quarter ending September				4[illegible],736	2,[illegible] 0	2[illegible],160 18 0
Ditto June				[illegible]	3,174 15	289,082 10 0
Ditto March				43,156	2,771 14	318,543 4 6
Total for the year				181,[illegible]	[illegible] 13	£1,1[illegible] 3 6
Average per quarter				45,4[illegible]	2,[illegible] 5	288,791 15 10

By the foregoing, it will be seen that the fluctuations during the past twelve or fifteen months have been very considerable; for instance, during the first quarter, ending March last, there were sold at the Cornish Ticketings 43,156 tons, containing 2,771 tons 14 cwt. of fine copper, which yielded the sum of 318,543*l.* 4*s.* 6*d.* A serious fall took place immediately, and the result of the quarter ending June, although showing an increased quantity of ore, and 400 tons additional in fine copper, realized only 269,082*l.* 10*s.*, a difference in money equal to 49,460*l.* 14*s.* 6*d.* Owing to a diminished quantity coming forward, the September quarter showed a much better result, since when the price of metal and standard has been advancing to its present highly satisfactory condition; for, on the 29th of December the produce of 6¾ sold at 152*l.* 14*s.* standard, or an average of 6*l.* 12*s.* per ton of ore. The average standard for the year being higher than at any period since 1800, and the amount realized for copper ore beyond any year upon record. The difference in the first and last quarter of the year is.—

	Ore.	Fine cop.	Amount.
Quarter ending March, 1853 .	43,156	2771 14	£318,543 4 6
Quarter ending Dec. 1853 .	45,722	3048 4	312,371 11 0
Increase . . .	2,566	276 10	Decrease £6,171 13 6

Labor supplies of every description and provisions have in this period risen to a very considerable extent. Emigration of a vast number of our best mining population to the "gold diggings" naturally created a vacuum in many of the largest districts, and the consequence has been that a vast number of pitches have been left unwrought. On the other hand, a considerable number of unproductive speculations, foisted into public notice during the last three or four years, most of them at high premiums, have sunk into oblivion, and the "tools, tackle, and materials" being sold and removed, the laboring men that were employed therein are now obtaining work in others of a more lasting character. It is to such mines that we call the attention of our readers, and we entreat them to watch the monthly and quarterly returns, rather than run after every new scheme that is daily set forth in dazzling, but imaginary, if not delusive, colors.—*London Journal.*

A VISIT TO THE GAP MINE OF LANCASTER COUNTY, PENNSYLVANIA.

This mine is situated about four and a half miles from Christiana, in the county of Lancaster. It was first worked in the year 1732, and subsequently wrought again by a company in the year 1797. The only particulars now known relating to those operations may be seen in a pamphlet in the Philadelphia Library, No. 9,125, from which it appears that the produce at that time was copperas and precipitate of copper, from the vitriolic water which issued from the veins. At that period the veins were not explored to any considerable extent, and the work chiefly consisted of surface explorations, although they succeeded by the aid of the imperfect machinery they then had, in sinking a shaft to the depth of from sixty to eighty feet, but the water was such an impediment, that the veins could not be pursued at that depth. Latterly these mines have been purchased by a company of gentlemen of the city of Philadelphia, who have a charter from the Legislature, under the title of the Gap Mining Company. They have erected a steam-engine on the works, and sunk the original shaft to the depth of 100 feet, from which a gallery is extended some 200 or 300 feet. They have also extended the old works at a depth of sixty feet, and sunk several shafts to determine the extent of the veins, for there appears to be several veins running parallel to one another, and one vein running transverse to these parallel veins. These veins are all from ten to fifteen feet wide, producing copper and other ores; but as they sink deeper, it changes into nickel and cobalt ores, of which there appears to be an inexhaustible supply. These ores contain by analysis:—

Sulphur	27·67
Iron	43·41
Nickel	6·67
Alumina	1·40
Silica	16·85
	100·00

They are now being taken to Philadelphia to be smelted. There are some hundreds of tons now lying on the surface, and some thousands of tons discovered in the mine, and extensive preparations are being made for working the mine on a large scale.—*Journal of Franklin Institute.*

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

SHIPMENTS OF LEAD FROM THE NORTH-WEST.

The tables heretofore published contain the shipments of lead from Wisconsin, Illinois, and Iowa, subsequent to 1842. The following furnishes all the statistics which exist previous to that period:—

	Pounds.
1823	335,130
1824	175,220
1825	664,530
1826	958,842
1827	5,182,180
1828	11,105,810
1829	13,343,150

Here follows an interval of eleven years for which no statistics exist, owing to a change of mining regulations.

LEAD VEINS OF THE NORTH-WEST.

Professor Daniels, State Geologist of Wisconsin, has made a report to the Legislature upon the "Geology of Wisconsin," which is soon to be published. From a notice of it in the *Madison Journal,* we find the following facts stated as established in the Report:—

Mining, until quite recently, has been confined to the "upper magnesian limestone," of Owen. This is known as the "lead rock;" immediately underlying which is the blue fossiliferous limestone, differing from it entirely in composition, texture, etc. Now it has been generally supposed that the metallic veins would be lost when the blue limestone was reached, with no hope of finding them beneath. The survey has established the fact that extensive veins are now being worked below the blue; in a buff-colored limestone is a layer of sandstone, above the lower magnesian, and the question has long anxiously been asked by miners, whether the interposed sandstone was not an effectual bar to all hope of finding mineral below. The survey has established the fact, not only that the lower magnesian is lead bearing, but that at one locality alone over 200,000 lbs. of mineral have been raised within a year or two, the miners themselves not being aware of the deposit they were working in. Thus there are three instead of one lead bearing deposit, as formerly supposed. They may be thus arranged or classified:—

Metalliferous.		Non-metalliferous.	
Upper magnesian	400 feet	Blue limestone	50 feet.
Buff-colored limestone	40 "	Upper sandstone	40 "
Lower magnesian	250 "		

In a practical view, this discovery more than doubles the mineral ground, so to speak. In other words, it holds out definite inducements to deep mining, rendering a profitable return safely probable. At present the deepest shafts scarcely exceed 150 feet.

THE LEAD MINES OF CHESTER COUNTY, PENNSYLVANIA.

A correspondent of the *Journal of the Franklin Institute*, Dr. Turnbull, describes, in brief terms, the operations at these mines at the present time. He gives us later information respecting some of them than that of our last notice on page 375, Vol. I., Mining Magazine:—

Within a mile of each other, in the vicinity of the beautiful stream called Pickering Creek, these lead mines are situated; but I was sorry to find that they added nothing to the comfort of the farmer in whose region they were placed, for upon inquiry I was informed that every spring in their vicinity was entirely dried up, and that even the railroad company's supply has entirely failed. This should always be provided for by a special agreement by the farmer on whose land they operate, for it is a very serious evil to find that his spring-house is no longer fitted for the storing of milk, cream, and butter.

CHARLESTOWN MINE.

The first mine which I visited is called the Charlestown Mine, and is situated on the farm of Capt. Davis; it has been in operation about fifteen months, and the product is exclusively lead ore, the salts of lead are the sulphuret or galena carbonate and phosphates of lead. They have sunk a shaft of 180 feet. The vein is about two feet wide, but is apt to be filled up in many places with inferior deposit, containing very little true lead ore. The mine is owned by a company of capitalists of Philadelphia, under the superintendence of Mr. Charles Wheatley; the chief miner, or captain of the mine, is Mr. W. Perry. To keep the mine free from water, they have in operation a beautiful Cornish whim or low-pressure condensing engine, of sixty horse power, built by Mr. John West, of Norristown. In this form of engine there is a great saving of fuel; it is arranged so as to set a crushing machine in operation. They have also a horse whim and capstan, and out house containing two giggin machines. The price given to the miner is from thirty to thirty five dollars a month. Above ground, they had a man and a boy; in the mine, they had eight or ten miners at work. This mine has yielded but a few tons of ore.

MONTGOMERY MINE.

After crossing the creek a second time, and ascending the hill about a quarter of a mile, at the corner of the wood I came to the Montgomery Company's Mine, which, before entering, presented an active spirit of industry, very different from the quiet of the Charlestown Mine, there being some four or five men, with several boys, at work above ground; the puff of the steam also causing it to be seen at a considerable distance. Upon inquiring for the captain, I found him to be an agreeable, intelligent man, whose name was McGierk.

This mine has only been in operation for about twelve months, and has sunk a shaft some 120 feet. The encouragement to progress has been very good, the ore is abundant; but they have been considerably annoyed with the large quantity of zinc ore, which has to be separated by washing; they had some four or five tons on hand. They have a small horizontal high pressure engine at work, and the horse whim was in active operation, dragging up ore, which is principally galena and phosphate of lead. They had some fifteen miners at work, and one of them was complaining of the want of proper ventilation in the mine, so that their lamp or candle would not burn, and they had to come up after each blast to get rid of the smoke; this I have found a great defect in most of the mines that I have visited, and some endeavor should be made to obviate it.

SHERWOOD'S MINE.

The third mine visited, being about half a mile from the Montgomery Mine, is called Sherwood's, but everything about the mine looks desolate; as all operations have been stopped for several months, the iron work is rusting; the only miner at work was a Cornish man, who, with a little boy, was washing carefully with a buddle the refuse washings of former operations; he was making about a ton of ore, with much care, in about two weeks, yielding sixty per cent.; this, he said, was poor work, as they only gave him fifteen dollars a ton for it. He had been a washer of ores in Cornwall, and his father before him, commencing at the age of eight years, but he was very desirous of getting to Mineral Point, where he had two uncles; he said he should then feel as if he were at home in one sense.

I then passed over into Mr. Sherwood's smelting-house, where he produces about fifty to fifty five of lead from every 100 pounds of rich ore, and if the ore is galena they then can extract from twenty five to thirty seven ounces of silver from the ton of metallic lead by cupellation. They, I find, are erecting the brick work for a series of boilers, so as to go into operation and extract the silver by the new process of Pattenson, by taking advantage of the crystalization of the lead, so as to remove it, and leave the lead which remains with a large quantity of silver, and by cupellation there is less of lead oxidized, and fewer of the cupels employed. The chemist's name is Mr. W. Johnston.

The fourth mine is situated on Funks' place, their shaft has been sunk some ninety feet, and they are about increasing the depth, there being some little encouragement to do so; they have also a steam engine in active operation; this mine has only been open within the year 1852.

THE WHEATLEY MINE.

Across a single field is situated the Wheatley Mine, the deepest lead mine in this region, being some 200 feet, with levels run in several directions. The old or first shaft is employed for raising refuse matter, but at the shaft back of the blacksmith's shop they are raising ore. There are some four shafts at different points, and the ore is the same as that found at the Charlestown Mine. In Mr. Wheatley's collection of ores of lead from this mine, there are two varieties of galenas, fibrous and steel grained, the latter being richer in silver than the former; there are also phosphates, chromo-molybdunate, with beautiful crystals of sulphate in the centre of geodes of galena; also, fine specimens of carbonate. They have a large bucket-wheel driven by water, which, driving two large iron wheels, crushes the ore; the number of men and boys employed in washing and sorting being greater than at any other of the mines in that region. They are also digging all over the fields in the immediate vicinity for ore; their steam engine is high pressure, and the prospects of this mine are stated to be good; but of the amount of ore raised, cost of raising, etc., I could not find any account, although I desired the information. Having spent some time at this mine, I started for the copper mine on Judge Morris' beautiful farm, which is situated about two miles from Wheatley's Mine, and a quarter of a mile south of Phœnixville, a square off from the State road, in a grove of trees. The mine is owned by a New York company, who commenced working last summer (1853), and brought out a good deal of ore, but found that the steam engine employed by them was too small, the water having increased so much; they are now erecting one of 180-horse power, with a fly wheel twenty five feet in diameter, in a very substantial manner. The vein of sulphuret and carbonate of copper runs in an easterly direction, directly under the Judge's house, and varies from eighteen inches to four feet; they have upon the ground some twenty or thirty tons of ore, which, as far as I could judge, was not very rich, but still, if they have an abundance of it, there will be no doubt it will pay, at the present prices of copper ore in the market. The owners, workmen, and the persons around the works, speak in the highest terms of the encouraging prospect of the mine; still I do not consider the ore as rich as that of the Perkiomen Mining Company, but the expense of raising the ore will be much less.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE FOR 1854.

Amount shipped from Richmond to close of week ending Feb. 11th .	71,878 tons.
Same time last year	77,565 "
Amount sent by Reading Railroad to close of week ending Feb. 8th .	287,556 "
Same time last year	206,431 "
Increase	81,125

The *Pottsville Register* makes the following remarks on the prospects of the trade: —

The shipments from this region since Dec. 1st, the beginning of railway year, have maintained a good figure; being 31,125 tons in excess of shipments last year, during same time.

In the Shamokin district, we are advised the Big Mountain Coal Company have leased one of their collieries to Messrs. Black & Sheaff, at thirty-five cents per ton, the lessees binding themselves to mine not less than 75,000 tons during the year. Responsible parties offer the same price per ton for the collieries of the Susquehanna Coal and Coal Mountain Company. This company is being organized under a very favorable act of incorporation, the larger portion of the stock being subscribed by Baltimore capitalists.

The Pennsylvania Coal Company, at Pittston, are preparing new openings, in addition to those worked last season. They estimate their production for the present year at 750,000 tons, which is an increase of 257,000 tons on their last season's business.

In the Cumberland district, the "strike" among miners still continues; and, as a consequence, almost total suspension of business. The miners still demand forty cents per ton; and, in the mean time, a meeting has been held by those representing all the coal companies of Alleghany county, and the action of the Superintendents' Association considered and endorsed, declaring that the prices for mining should be those fixed by them until changed by the superintendents themselves. They also agreed upon the following prices of coal: fine coal, \$3.75; run of the mine, \$4; lump coal, \$4.50. A correspondent of the Cumberland *Journal*, in referring to this difficulty, says: —

There is a wide difference between what a miner can do, and what he has an opportunity of doing.

The estimate of what a miner ought to do, as a fair day's work, has been variously stated at four, five, and six tons. Five tons may be considered a fair average, when there is no interruption, by a failure of the cars to arrive, or suspension of canal navigation.

My estimate of the actual work by the miner is: —

For six months	5 tons per day.
" " "	2½ " "
This gives an average of 3¾ tons, which amounts, at 33 cents, to .	\$1.24
Deduct for sharpening tools, pick-handles, oil, etc. . . .	.12
And there is left for each day's work	\$1.12

* * * * * * * *

The whole difficulty lies in there being nothing to bind either party. Suppose the coal companies would contract with the miner at thirty-seven cents per ton, for the year 1854, and have a forfeiture for non-compliance of, say the price of a month's pay by each party. Would not the certainty of steady work more than compensate for the sacrifice each would make?

It has become a settled, fixed fact, that North Carolina contains almost inexhaustible supplies of bituminous coal. Three years ago the Legislature made a small appropriation for a geological survey of that state. The discoveries of the first year developed the existence of copper and gold ores, drew to them the attention of capitalists, and have already increased the revenues of the state to five times the cost of the whole survey. In the second year, seams of the purest bituminous coal, some of them fifteen feet in thickness, extending through a region of some forty five square miles, rewarded their investigations. It is estimated that every thousand acres of these seams will yield thirty millions of tons of bituminous coal of the best quality.

SHIPMENTS OF COAL FROM PICTOU TO THE UNITED STATES TO AUGUST 25, 1853.

Prepared by W. H. Shock, U. S. N. :—

Years.	British Ships. Tons.	American Ships. Tons.	To Brazils in American Ships. Tons.
1846 . .	28,000	30,008	
1847 . .	49,135	41,343	
1848 . .	48,225	58,338	740
1849 . .	43,350	25,385	
1850 . .	49,450	21,903	
1851 . .	35,174	8,368	
1852 . .	52,277	18,525	1,070
1853 to date .	83,000	9,000	
Total . .	388,611	188,800	1,810

PROSPECTS OF THE SCHUYLKILL REGION IN 1854

We notice a correspondence between a member of the Pennsylvania Legislature and the editor of the Schuylkill *Miner's Journal*, in which the probable yield of coal during 1854 is touched upon. The reasons urged in favor of or against the increased supply are worthy of attention, as showing the circumstances likely to operate upon the results of the year. Mr. Henry Strong of the Legislature thus writes:—

The county of Schuylkill will not send one more ton to tide-water in 1854 than it has in 1853. Mark the prediction. Several new collieries, it is true, will come into operation, but then several old ones will have levels worked out. One hundred thousand tons may positively be sent to market, but the seven new anthracite furnaces that have this year been erected in the valley of the Schuylkill will require 125,000 tons of coal to supply them. Five hundred thousand tons of coal will be required in 1854, on the line in the valley of the Schuylkill. Where, then, will the supply come from to supply the demand for 5,800,000 tons of anthracite, which is an increase of 600,000 tons? Not from Schuylkill, not from the Lehigh, the increase there cannot reach 75,000 tons. Not from the Lackawanna, the Pennsylvania Coal Company and Lebanon and Hudson Canal Company have nearly reached the maximum of their capacity; not from the Wyoming Valley, as all the increase, and more, will be sent northward to a new market upon the opening in the spring of the North Branch Canal, to Western New York. The collieries upon the Mahanoy and Shamokin are new, and will do very little the present year.

The great supply of anthracite coal is in Schuylkill county. The whole space between the Sharp and the Broad Mountains, is underlaid with the great white ash seams that crop out on the northern rim of the basin. That portion of the country called barren land, and where the small red ash seams have been worked out and the tracts abandoned, are the richest coal lands in Pennsylvania. Here, as in England, great collieries will be established. Here great perpendicular shafts will be sunk, some of which will be more than 1,000 feet deep, to the great seams which underlie the coal-field. Some of these great collieries will annually send *half a million* of tons of coal to market, and before it can be done, the consumption of coal in this great country will demand it.

To this, the reply is as follows:—

We agree with Mr. Strong, that an increase of 500,000 tons of anthracite will be required this year, but the assertion, that "Schuylkill county will not send one ton more to tide water in 1854 than she did in 1853," shows that he is totally unacquainted with the capabilities of this region, and has been misled by the few advocates of coal corporations among us, whom we have heard make use of similar assertions here. *The ability of our collieries to produce coal is now, and has been for the last fifteen years, ahead of the demand;* and we can assure Mr. S. that we have collieries prepared and under preparation, which could be made ready during this year, to increase the supply not less than half a million of tons, provided we had the working power to mine that additional quantity, and the facilities to transport it to market. All the principal regions are at present in a similar condition. It is not the want of colliery capacity, but the deficiency in working and transporting power that will limit the supply this year. This is well known to the trade, and they know that these difficulties can only be partially overcome the present year, and consequently the supply will be within the demand, which will keep the trade healthy through the whole year.

BROAD TOP MOUNTAIN RAILROAD AND COAL COMPANY.

This Company, of which Lewis T. Watson is President, are constructing their works in order to deliver coal at Huntington, Pennsylvania, whence it will reach a market by the State Canal, or perhaps the Pennsylvania Railroad. The Directors, in their Report, thus describe the character of their coal lands:—

These lands have been examined by two of the most eminent geologists in the state, J. K. Strong and W. F. Roberts, who conclude their report in these words. "The superiority of the Broad Top semi-anthracite coal for manufacturing iron, for generating steam, and for domestic uses; its abundance in five large seams, above the water level; its proximity to market, its purity, and its exemption from pyrites, all unite in establishing the fact, that the lands of the Huntington and Broad Top Mountain Railroad and Coal Company will, if properly managed, yield a princely revenue, annually and continuous."

The quantity of coal in our lands is estimated by them at 20,000 tons per acre, so that from the Company's lands alone we might safely calculate upon taking 46,000,000 tons, an amount sufficient to employ the capacity of the road for one generation, at least. When it is stated that the coal basin contains eighty square miles, we may fairly cease all inquiry about the quantity of coal. Upon the subject of its quality, the test of experiment has been added to, and has sustained the scientific opinions of Messrs. Strong and Roberts. M. W. Baldwin, the eminent engineer of Philadelphia, has used it for the purpose of generating steam, and pronounces it of the best quality for that purpose. It has also been used in the engines upon the Pennsylvania Railroad, and the engineers unite in declaring it the best coal for that purpose they have ever tried.

HAMPSHIRE COAL AND IRON COMPANY

The possessions of this Company consist of 800 acres of land, containing the great vein on George's Creek, immediately opposite the valuable coal estate of Aspinwall, Cunard, and others. This is already opened, and the proximity of the George's Creek Railroad gives the Company the means of immediate operation. The residue of their lands are in Virginia, and consist, first, of 2,000 acres of coal land at Piedmont, all of which is underlaid by the six-foot and other veins, and several hundred acres hold the great vein, which, at this end of the basin, is thicker, and of better quality than at the Frostburg end. This is the only portion of the large vein that lies immediately upon the Baltimore and Ohio Railroad, and thus possesses facilities and advantages which no other company can claim.

Col. Hughes, the President of the Company, and Gen. Tyson, and other directors, are now in the field, devising the best mode of an early opening of this portion of its mines.

The Company own an immense reserve of coal land in Hardy county, which awaits the completion of the Alexandria, Louden, and Hampshire Railroad, to contribute from its inexhaustible resources to the coal markets of the country. This body of land in Hardy county, the existence of which has hitherto been almost unknown, consisting of some 8,000 acres, has recently been carefully and accurately surveyed by competent engineers, who report that these lands lie on the north branch of the Potomac; that from the location of the Manassas Gap Railroad, and the Alexandria, Loudon and Hampshire Railroad, now in progress, as well as the position of the Baltimore and Ohio Railroad, the mineral and other products of these lands may be carried to market, by the former to Alexandria, and by the latter to Baltimore; and that at present a road of twenty miles extent, with a descending grade from the mines of less than sixty feet to the mile, would connect with these works, and place these mines fifty or sixty miles nearer tide-water than those of the George's Creek end of the coal field.

THE WINIFREDE MINING COMPANY.

From the Report of the President of this Company, we take the annexed particulars relative to the location of their property, facilities for sending coal to market, and the quality of the coal:—

The property of the Winifrede Mining and Manufacturing Company lies partly in Kanawha and partly in Boon counties, Western Virginia, running from near the west bank of the Great Kanawha River to the east bank of Coal River, covering an area of some 10,000 acres.

There are four seams of coal upon the estate that are worthy of remark, all of which are horizontal and parallel. The first, a vein of three feet, which dips under the waters of Fields Creek, three and a half miles from the Kanawha River, is entirely free from slate, and an excellent article of coal. The second is the cannel vein, which, with eight inches of bituminous coal, measures from top to bottom rock three feet eight inches; and in position, lies fifty feet above the first. The coal in the entry is not of good quality, and I apprehend will not be worked, at least for the present; its position for mining is very advantageous, and farther under the mountain the coal will no doubt be found in better condition. The third or principal seam, and the one upon which you must rely for the great yield of the estate, in position, is 200 feet above the cannel vein. This seam measures from four feet six inches to five feet two inches in our present openings. The bottom "bench" is "splint coal," and measures eighteen inches; the remainder is bituminous. The qualities of this coal will be a subject of particular description hereafter.

About 200 feet above the main seam we discovered in July last, a vein of cannel and splint coal—eighteen inches of cannel, and sixteen inches of splint, the cannel being the bottom "bench." This seam is entirely free from slate. The cannel coal is the best that I have seen in the region, and the splint coal unexceptionable. As soon as the works are extended higher up the creek, this seam will be made available.

Three permanent openings have been made into the main seam: No. 1 having been driven 662 feet; No. 2, 745 feet, and No. 3, 280 feet. These entries are driven upon what is termed the "end of the coal," which is the guide of the miner; and to show the remarkable regularity of the strata, the three entries were found upon a plot of the workings (though driven with spaces of 300 feet) to be parallel.

This seam has been opened at eight different points upon the property, some of them three and four miles apart, and the same undisturbed condition of the strata is discoverable. It presents a degree of regularity that, in my experience, I have never met with elsewhere—a condition of the strata that is nowhere found upon the borders of the Kanawha River, and hence it is that the coal enterprises in this region involve the necessity of building railroads four and five miles in length to reach the undisturbed districts.

I have stated that the Winifrede Mining and Manufacturing Company's possessions covered an area of 16,000 acres. Two-thirds of this area is underlaid with this seam of coal which presents such remarkable features of regularity, and it is everywhere accessible—a circumstance that must determine any question as to the mining capacity of the estate.

The Kanawha River, at the terminus of the railroad, offers a fine basin of deep water at the lowest stage. Here our fixtures for loading are erected. A daily train is now being sent from the mines; and within the last few days, three large barges and one flat-boat have been loaded, containing some 32,000 bushels.

The terminus of the railroad is 263 miles above Cincinnati, seventy-three miles above the mouth of the Kanawha, thirteen miles above Charleston, and two miles above the upper Salt Furnace.

The Kanawha salt furnaces are scattered along on either bank of the Kanawha River, and all lie between the terminus of our railroad and Charleston. The Virginia Central Railroad intersects our railroad on the bank of the Kanawha, within a few hundred feet of the basin.

Having thus described the localities, as also the capabilities of the estate, and the works erected thereon, I proceed to a description of the qualities of the coal, which I present, first, in the shape of a comparative analysis, made by Professor Locke of the Medical College of Cincinnati, whose celebrity as a chemist is a sufficient guarantee for the truth of the results presented. The Ohio River markets take almost exclusively Pomeroy and Pittsburg coal. I have, therefore, taken specimens from these points for comparison. I have not taken the Pittsburg coal proper, but the Youghiougheny, which has the highest character in the market.

ANALYSIS.

	Youghiougheny.	Pomeroy.	Winifrede.
Of water	1.77	3.49	1.24
Of volatile matter . . .	28.10	35.80	27.01
Of ashes	3.44	12.99	3.23
Of fixed carbon . .	66.69	47.72	68.53
	100.00	100.00	100.00

THE INTERIOR OF A COAL MINE.

A very pleasant account of a visit to the interior of a coal mine is given by a correspondent of the *Journal of Commerce*, who writes from the Wyoming Valley. As it contains some facts of importance relative to colliery operations, and may be gratifying to some of our readers but little acquainted with the manner in which this valuable article is obtained, we annex the following extracts:—

We formed a party to visit a coal mine, and selecting those at Wilkesbarre as most desirable on account of cleanliness, we filled two carriages with our party, and drove down the valley road through Kingston, and across the Susquehanna of Wilkesbarre. Here we rested only long enough to determine which mine to enter, and having chosen that of Mr Hillard and Captain Bowman, about half a mile from town, we presented ourselves to Mr. McCullough, their energetic head miner, who immediately provided us with the means of entering.

There were three ladies, four gentlemen, and one boy in the party, just enough to fill a car, which, being emptied of its load of coal, had two benches placed lengthwise in it, on which we sat, four and four, facing each other, each gentleman carrying a lamp, and the ladies covering their heads with every available protection from dripping water.

This mine is one of the finest in the valley; that is to say, it penetrates the richest vein ever found, being the same vein with that worked by the Baltimore Company, and between twenty and thirty feet in thickness. The entrance was usually expensive; and probably had the proprietors anticipated the difficulty they experienced, they would never have attempted the opening. The vein of coal was reached only after penetrating solid rock for one thousand and forty feet.

Through the tunnel thus constructed our car was drawn by a mule, driven by an imp-like boy who carried the never-missing lamp on his cap, and yelled and tormented the mule with truly diabolical spirit and success. Curious exclamations of wonder, terror, laughter, fright, and fun escaped from the ladies, who began to wish themselves out before the sunlight disappeared; but their courage increased as we advanced, and was up at full height when the guide, stopping the car, informed us we were at the coal. It looked very much as if we were. Profound blackness was all around us, and he might have told us that we were at the coal a hundred feet back, and it would probably have looked as much like it. But as our eyes became accustomed to the lamp-light, we could see an occasional gleam from the walls of the cavern, which had now greatly enlarged, and at length we approached the sides and admired the glowing ebony walls and shining points. We now walked on, with rather damp footing, in a confusion of mules, and cars, and miners, out of which chaos it seemed impossible for any one to extract order. But a brief view showed that all was going on regularly, and we began to understand ourselves.

The vein lay on an inclination of perhaps thirty degrees with the horizon, and of course part of the mine was on a higher level. From this higher gangway, or mine, the shutes were constantly pouring down their masses into the cars below, and these as fast as filled were arranged in trains of five or seven and sent out to daylight through the tunnel by which we had entered. A large furnace glowed in the upper level, kept constantly burning for the purposes of ventilation, while the intense blackness was relieved by the glaring lights in the caps of the miners.

The roof was supported by enormous pillars of coal, left standing as they worked around them, and the floors were everywhere intersected with tracks for the cars. Pursuing one of the gangways to its extremity, we found the men working at the actual labor of getting out the coal. Some were picking at it with heavy picks, others drilling for blasts, and others loading cars with the scattered masses that lay around. Satisfied with viewing everything, we returned to our car, remounted, and again, under the guidance of the same black and yelling imp, who now urged his mule into a gallop, were drawn out into the sunshine.

There are a great many matters of interest connected with the coal business in the Valley, which I have amused and instructed myself by collecting, but which, I fear, will prove too dull and statistical for a letter of this sort; but I will venture to add a few facts that will interest some readers, and which those who think them stupid may pass over.

One general fact of interest is, that the coal mines are seldom worked by their owners. They are opened at more or less expense, and after the vein is reached and proves good and plentiful, the owner lets the mine to a contractor, who agrees to work it, paying so much per ton to the owner for every ton he takes out. The value of coal lands may be estimated, when you learn that one gentleman receives fifty cents per ton for every ton taken out of his mine, and the yield is a great many thousand tons per annum. But this is an unusually large payment, the major portion of owners receiving from ten to thirty cents per ton.

The effect of the coal deposit is, of course, great on the value of land in the valley, and sales are not unfrequently made of large tracts, with a reservation of all rights of mining, as well as sales of the right of mining, without selling the surface of the soil. Produce of all kinds commands the highest prices, even higher than in the city markets, and although the Valley is one of the richest grain growing regions in the state, as you might judge from its broad fields of gold and green, yet all that it produces is consumed here, and nearly as much again. It is probable that nearly the whole Valley is underlaid with coal strata, and in many places the upper vein, which is very thin and poor, crops out on the surface. The owner of the soil bores for coal in the usual way, driving a bar down into the rock, drilling deeper and deeper until the bar is entirely down, when a joint is added, and the bar is lifted and let drop in the hands of a man until joint after joint has been added. The dust is taken out of the hole from time to time, and the boring continued until the dust is either coal or conglomerate rock. If the latter be the result the work is abandoned. Coal is never found below this formation. (I am particular in giving the minutiæ of this process, for the benefit of those who are as ignorant as I was a few years ago.) Large tracts of land are owned by companies, such as the Pennsylvania Coal Company, which are not worked, nor intended to be for years, but which will in time yield millions of tons of coal to the market.

You cannot fail to notice the immense heaps of coal lying around the openings of mines, and by the sides of the railroads leading from them to the canals and elsewhere. These are the accumulation of winter work, when the canals are closed, and are very important to the proprietors as a means of preventing strikes among laborers. If there be a sudden demand for coal in the market, and an unusual anxiety to fulfil orders, the miners are ready to seize the opportunity for a strike, and demand higher wages. The result, however, is only to throw the proprietors back on their reserved heaps, from which, with a half-dozen men, they can load boats as fast as they come, and supply a demand for hundreds of thousands of tons. The check is, as you perceive, a very useful one, and costs nothing.

It may be interesting, before I finish my letter on coal, to mention the various routes by which the article reaches the market. The Wilkesbarre coal goes south by the North Branch Canal to the various Pennsylvania markets. The Pittston coal follows the same route to some extent, but the principal portion of it, as well as that taken out of the mines at Port Griffith, is brought over the Pennsylvania Coal Company's railroad to Hawley, where it takes the Delaware and Hudson Canal, and then via the Hudson River reaches New York. This railroad is a curious structure, being laid up and down the mountains, crossing sometimes by high trestle-work over the tops of lofty trees, carrying nothing but coal. The propelling power consists of stationary engines, which draw the cars up inclined planes to high points, whence they go down long grades, sometimes for miles, by their own impetus, and when they reach the lowest part of the grades are drawn up by other engines and again started down hill. By this expensive route the price in the market is kept up; and Carbondale, using the same sort of conveyance to Honesdale, and thence via Delaware and Hudson Canal and Hudson River to New York, is of course unable to supply the market at any cheaper rate

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ANTHRACITE FOR STEAMERS.

The use of anthracite coal, not only as a fuel for stationary steam engines on land, and marine steam navigation, but even for domestic purposes, is at the present moment exciting very considerable attention, attributable in a great measure to numerous local Acts which have recently come into operation for preventing the nuisance of the ejection of vast volumes of smoke into the atmosphere. The question as to its capabilities and value as a furnace fuel, and particularly for steam navigation purposes, may be considered as decided, the *Great Britain* having taken 1,000 tons in her last voyage, which, from the report of Capt. Matthews, appears to have answered the most sanguine expectations, quickly getting up steam, burning cleanly, and promoting no injurious action on the fire-bars. It is in its use for domestic and culinary purposes that the prejudices of the public require combating, and correct information is required. It must be acknowledged that anthracite is more difficult to kindle than bituminous coal, but a very little experience would prevent any inconvenience on this account, and when once burning and left to itself, it is undoubtedly the most superior fuel of the two. A well-selected anthracite far surpasses for culinary purposes every other description of fuel, being cleanly, smokeless, economical, and giving great heat, and it is highly necessary that the public should be undeceived as to some erroneous statements, published by M'Culloch, and others, as to the inapplicability of anthracite coal as a domestic fuel. The great deposits of anthracite in Pembrokeshire and Carmarthenshire will, we have no doubt, very shortly prove of great national importance, and so convincing have been recent experiments as to its value, that the West India Royal Mail Steam-packet Company have been induced to take a colliery in Pembrokeshire, for the purpose of supplying continuously their large steamers with anthracite coal, and thus avoid any delays which might occur should they be dependent on others. Even at the port of Llanelly, large steamers are now continually taking in cargoes of anthracite coal.

Although anthracite coal is found in other parts of Britain and in Ireland, the best deposit, quite equal to the finer qualities of Pennsylvanian, crops out from the Pembrokeshire basin, within four miles of the north shore of the harbor of Milford Haven.—*London Journal.*

COAL FOR BURNING BRICK.

Recent experiments made with Cumberland and anthracite coal in the burning of brick have shown that this fuel is peculiarly adapted for this purpose, and that it can be used advantageously and economically, as compared with pine wood. Three several experiments were made in Baltimore and Philadelphia by persons engaged in the manufacture of bricks, and the results were the saving of three days' time in the burning of such kiln, and one dollar and ten cents per thousand on each thousand burned.

REMARKS ON THE WORKING OF COAL MINES.

In working a colliery the owner is anxious to raise the greatest proportion of round or large description of coal, at the lowest cost, consistently with the proper management of the mine. Large coal realizes a better price than the small kind of the same quality. The labor of the miner, and the method of working a mine, have an important bearing on the yield of large or round coal, and to this consideration I would here direct the attention of underground managers

There is in all coal districts, it must be admitted, a great want of improvement in the skill and labor of the miner, entailing a considerable yearly loss in regard to the yield of large coal, and which might be avoided by care and diligence on the part of underground managers. In the course of my experience I have had occasion to observe that this loss has generally been prevented where the men have been properly trained. It is to be regretted that underground managers do not bestow more attention to the training of their pit men, so as to increase the number of good workmen.

The conditions in which seams are placed, with regard to the roof, floor, and natural formation, and the distance of workable seams above or below, are so various, that it is impossible for all to be profitably worked after the same plan. The method of working should, therefore, be adapted to circumstances; and it has to a great extent, with reference to the quality of the coal, a direct influence on its commercial value, one system of working producing from thirty to forty per cent., or about one third more of round coal than another, the round coal having the preference in the market. One seam will be worked to the greatest advantage by the bord and pillar; another by long work; another by narrow bords and by long work; another by narrow ends, and the pillars got in jenkings, ribs or faces, six to eight yards wide, and having one end loose to the goaf, or where the coal is entirely excavated.

The older explored coal fields have each their peculiar modes of working, modified to suit the circumstances and conditions of the roofs and floors of the seams. In the more recently explored coal fields modifications of the methods of working mines practised in the old working coal fields are commonly adopted.

"Bord and pillar" or "post and stall" workings are peculiar to the Newcastle or Northern Coal Field, and in that district the arrangement of the workings, the principle of ventilation, and the good discipline established in the well regulated collieries should be more generally imitated by the collieries in other coal fields.

The "long wall" or "long work" mode of working is peculiar to the Derbyshire and some of the Southern Coal Fields. By this method the whole of the coal is got at one operation, by working in banks of various widths towards the rise from the shaft, and maintaining roads through the goaf, or broken by building strong stone continuous pillars with the fallen roof; also by driving narrow bords to the extremity, and working the coal towards the shaft or homewards by long work, leaving the goaf behind. In this latter case no roads are maintained through the goaf.

"Wide work" is a mode of working peculiar to the Yorkshire Coal Field; a series of bords from seven to ten yards wide, separated by a pillar of coal one yard thick, and not got out, form a bank, which is worked towards the rise of the mine or from home, pillars of coal twenty to forty yards wide being left between two such banks, and worked towards the shaft or homewards, after the banks on each side are driven the determined distance.

It has been, and is still, the practice in many mining districts, in working seams by the bord and pillar, to leave large areas of pillars standing until a considerable portion of the royalty is excavated in bords or drifts. Long standing pillars do not yield so great a proportion of large coal as those which are more expeditiously worked, and in many instances I have known pillars of long standing to be entirely lost. The exposure of some roofs to the atmosphere for a length of time in the excavated bords, causes a general settling of the roof on the pillars, and crushes them. The loss by crushed pillars is great, and is well known to be so by those who have experienced it.

A greatly improved method of working mines has now for some time been practised by the viewers in the Newcastle Coal Field. The coal is got in districts, panels or divisions, and whole coal and pillars are worked simultaneously in the same district or division. This arrangement of the workings is adapted to a flat seam, and reduces to as great an extent as possible, consistently with the proper working of the mine, the area standing in pillars—

these pillars remaining ungot from two to four months, according to the length between the bord or drift faces and the faces of the working pillars.

Seams with an inclination cannot have whole coal and pillars worked simultaneously in the same district as cheaply as flat seams: the increased cost conveying the coal up bank, or up the rise of the mine from the faces of the pillars to the head-ways or end, along which it is taken to the main-roads, would be considerable, and the conveyance would be impracticable in steep seams.

The operation of removing the pillars begins at the rise part of a district or division. Advantage is taken of the inclination of the seam, in working both bords and pillars, to convey the coal by mechanical means from the panel to the main-road. When incline or engine planes are used in a mine, a sufficient width for a travelling-road should be left clear of the passing wagons or tubs.

In the course of my experience, I have worked mines by the various modes treated upon in this work, and I have invariably found that the produce of large or round coal has been the greatest by working long work wherever circumstances were favorable. Many are of the opinion that deep seams cannot be worked with advantage by long work. *The deep seam at Monkwearmouth Colliery, Durham*, 1800 *feet below the surface*, is however now successfully worked by this plan, and is producing a considerably greater yield of large or round coal, than is obtained by working bord and pillar. A moderately strong seam, at any depth from the surface, may be got by long work, if the roof is suitable for building the necessary packs or walls through the goaf, and less injury is done to upper seams than by other methods of working, as the packs or walls through the goaf cause large areas of the roof to settle gradually. This method of working is not favorable for a tender seam having a heavy roof, as the weight on the bank face in such cases crushes the coal.

If a mine is first cut out to the boundaries, and then worked towards the shaft, leaving the goaf entirely behind, less coal will be crushed, and a smaller cost incurred in maintaining roads than by getting the coal from the shaft towards the boundaries. This method of working a mine may be pursued in a colliery of limited extent, as only a short period will thus be required to open the mine; but in an extensive royalty, where a mine has to be got with a pair of shafts, the necessary preparations will obstruct the vigorous working of it for some years, involve a large outlay, loss of interest on capital, and for the time delay a return of profits on the mine. If the getting of an extensive royalty is begun at the shaft and continued towards the extremities, the necessary workings to open out the mine to the boundaries can be pushed forward at the same time. By working the mine after this method, under judicious management, whatever loss may be sustained by the coal being crushed, and by the extra cost of maintaining the roads, will be more than compensated for by an earlier return on the outlay.

When the mode of working a seam is determined upon, a plan of operation should be laid down, with an arrangement of the workings, suited to carrying out the best system of ventilation. The shafts should be well supported by leaving sufficient solid coal around them. The roads of the mine should also be protected by strong pillars of coal, proportioned to the depth of the seam below the surface. When these pillars are left of insufficient strength, and the coal is got around them, the sinking of the roof crushes them, and also damages the roads, whereby a considerable addition is made to the expenses of the mine. When at length the pillars are got, they yield but a small proportion of round coal, and much beside of the coal is lost in the mine through the broken state of the roof, which requires a considerably increased quantity of timber to support it during the working of the pillars.

The workings should be systematically carried forward, and the workmen, under no circumstances, allowed to drive places in the mine without proper directions being given; order and regularity being no less essential to the safety of a mine, than to the economical and profitable working of it.

That haste, which is common among inexperienced adventurers in the coal trade, to raise large quantities of coal, in an incredibly short time after the shafts are sunk, cannot be too strongly condemned: such persons cannot see why they should not at once commence raising large quantities, and think that others are supine who do not, as soon as the shafts are sunk, begin a wholesale raising of coal. The experienced coal owner or manager is however aware that there is some preparation absolutely necessary before this can be done with propriety. This hasty wholesale raising of coal before the necessary preparations are made, is frequently attended with disastrous results.

There is no difficulty in working a seam systematically, and ventilating it on the best principles, when it is uninterrupted with dikes, throws or faults; and it is obvious that any seam may be worked in the manner here described with much less anxiety and care, than one worked without plan, order, or system. Where dikes, throws, or faults are numerous in a seam, they offer great obstacles to the carrying out a good system of ventilation, and the resources of a manager may be frequently taxed in working such seams; but let him be assured that extraordinary difficulties may be overcome by a plan concerted with care, aided by such means as practical experience and sound judgment may suggest.

IRON AND ZINC.

THE MANUFACTURE OF IRONSTONE SLAG.

The effort to convert to useful purposes the vast heaps of slag produced at iron furnaces, is already attracting considerable attention in England, as well as in this country. In the former country we find a no less distinguished name than that of Mushet writing to the public press upon the subject. Here Dr. Wm. H. Smith has a patent, upon the basis of which a company has been organized, and is known as the American Lava Company, for the manufacture of slags. The officers of this company are Christopher Morgan, President; Wm. S. De Zung, Vice President; Jerome Lott, Secretary; C. Y. Wemple, Treasurer; and Wm. H. Smith, Superintendent of Manufactures.

In previous pages of this Magazine their views will be found. In England, the patent of Mr. W. G. Elliott is the one at present under consideration. With regard to its nature, we find the patentee writing in the following style respecting it in one of the public journals:—

There being now several companies forming for smelting Northamptonshire ironstone on the spot, notwithstanding the high price of fuel and labor, and the destruction of the land, as in Staffordshire, by throwing the slag away, will you allow me to put the following questions to your readers and correspondents, in the hope that something may be elicited to induce some one in the business to come forward and assist me in practically proving what it is admitted I have statistically shown to be of so much national value, particularly at the present time, as there is an unlimited demand for sanitary pipes, and all underground building material, which the slag is so well calculated to supply in any form or shape, plain or ornamental.

1. Is it not fair to presume that in the manufacturing of every ton of pig iron, at least one ton of earthy material, commonly called slag, may be cast

direct from the furnace in a liquid state, so as to partly fill an iron brick, or pipe mould, of any form or shape, which only requires to be pressed and gradually cooled to be fit for use?

2. Are there not many million tons annually thrown away?

3. Have not bricks or large lumps been made, or run into moulds, many years since, direct from the furnace; but being full of gases, as the air when cold, greatly reduced in bulk, permits the atmospheric pressure to bear against the outer surface, were they not generally found to be cracked in cooling?

4. Will not my patented system of piercing and pressing the fluid slag, when in the mould, remedy this, by giving vent to the confined air, rendering the whole mass more solid and uniform, and lessening the contraction and expansion of the parts at different heats when cooling?

5. And if so, is not the piercing and pressing a great improvement on the old system, as it not only lightens the article nearly one half, but makes it much stronger; by thus manufacturing bricks, pipes, tiles, etc., in combination with pig iron, a much better and cheaper article may be produced for the London market than by any other system, and the material which is now thrown away, at a great expense in labor and destruction of land, may be manufactured into articles of unlimited demand for all sanitary and building purposes, being particularly adapted for all under-ground and water-works, such as the banks of the Thames?

On this article, Mr. Mushet subsequently writes in the following intelligent manner:—

I am glad to see my friend, Mr. Elliot, calling attention to his patent process for converting into an article of commercial value the enormous waste of the slags of our iron smelting furnaces. I have not been able to acquaint myself so thoroughly as I could wish with the practical details of his operation. It is very probable considerable perseverance and experiment may be required with the heterogeneous and variable compounds resulting from a blast furnace in ordinary work, before the casting of the slag can be brought under the same certain control as the casting of the iron. The quality of slag is constantly varying: sometimes tenacious in cooling, and, with care, to be as easily managed as the ordinary products of the glass-house; sometimes liable to rapid decomposition in the atmosphere. But I cannot see but that the extensive provisions of Mr. Elliot's patent are, or may be made, adequate to the treatment of all varieties, especially with the attention which will be given to avoid any great irregularity of product, when the charging of the furnace for slag shall become a matter of nearly, if not equal importance as the charging for iron. I intend, when a little at liberty, to look very closely into this matter, for it is not easy to overrate the importance of converting into drainage and sewerage pipes, tiles, absolutely water-proof bricks, and other architectural objects, 6,000,000 or 7,000,000 tons of vitreous matter, now thrown to waste at some cost to the manufacturer, instead of adding to the profit of his operations. To impart a value of 10,000,000*l.* to 20,000,000*l.* sterling yearly to a worthless and inconvenient material is no slight proposal, but, on the contrary, demands the best efforts of perseverance and ingenuity to realize a fair and conclusive trial. It may ultimately produce extraordinary economical changes, and develop in a striking manner the reaction of resources. The ultimate effect of establishing this process would be, by adding another source of profit to the manufacturer, to throw down the cost and market price of iron, and proportionally increase its already vastly increasing application through the whole range of its commercial utility. And this would be actually accomplished by the very necessities of a thickly peopled country having created an enormous demand for the article produced, in crowded towns, and in the exigencies of agricultural improvement. Domestic wants would thus perpetuate and enhance our position as ironmakers to the world. The high prices of labor and commodities, ensuing on the discovery of the gold-fields, would find some counterpoise in the accession of an enormous yearly value called into existence at home. I trust the iron companies now on foot in Northamptonshire will see and appreciate the advantage of availing themselves of this patent process. Though ironstone, I understand, of 33 to 35 per cent. can be put into blast furnaces on the spot at the unparalleled price of 2s. per ton, and they seem able to obtain good iron making coke at a cost not exceeding 30s. per ton of pig iron, yet they must still be at great disadvantages in the absence of this cheap coal, without carriage, for all the minor operations. And in the absence of cheap fuel for bar-iron making on a large scale, they will hardly be able to carry out the smelting branch to that extent which perfects and secures the resources of established districts. The theoretical figures of iron-making are always found to fall far below the practical figures, in which contingencies and waste constitute formidable items. It is, therefore, impossible for these new undertakings, with a view to permanent prosperity, to bestow too much attention on Mr. Elliot's process, which will enable them, besides its immediate product, to make the most of their fuel in the iron department. A light burden, with materials proportioned for the finest foundry iron, will yield the most regular and perfect product in the slag; and I conceive foundry iron for the London market will command the best opening for the manufacture of the county.

IRON MANUFACTURES OF OHIO.

The extent to which the manufacture of iron is carried on in Ohio, will surprise those who have not watched its progress. From the latest and most careful returns, the following summary has been compiled by the *Railway Record* of Cincinnati:—

We shall not exaggerate, when we say that in Cincinnati, and its suburbs, there are not less than sixty iron factories of the largest sort, which, with their dependent work shops, give employment to full 5,000 operatives.

This immense development of the iron manufacture has arisen chiefly from the nearness and excellence of the Ohio iron mines.

The iron ore of Ohio is found almost entirely east of the Scioto; and occasionally, in the form of bog ore, in the north. The principal depositories are in the counties of Adams, Scioto, Lawrence, Jackson, Vinton, Hocking, Gallia, Athens, Muskingum, Licking, and in the same geological section continued to the Lake. The furnaces are found almost entirely in Adams, Scioto, Lawrence, Jackson, and Gallia. One has recently been built in Hocking, and one on the edge of Athens.

The iron works and iron produce of Ohio are:—

PIG IRON.

Furnaces	35
Tons of iron ore used	140,610
" pig iron made	52,658
Bushels of coal consumed	605,000
" coke and charcoal	[illegible]
Operatives employed	[illegible]
Capital invested	[illegible]
Value of products in 1853	[illegible]

In the production of pig iron, Ohio is the second state in the Union, being next to Pennsylvania. Pennsylvania produces half the pig iron of the United States, and Ohio about one tenth.

IRON CASTINGS.

Factories		188
Pig metal, iron, and ore used	tons,	41,050
Castings made	"	[illegible]
Coal consumed	bush.	[illegible]
Coke and charcoal	"	[illegible]
Operatives employed		[illegible]
Capital employed		$2,000,000
Value of products		$3,200,000

WROUGHT IRON.

Factories		11
Pig metal used	tons.	13,676
Blooms	"	2,000
Coal consumed	bush.	600,000
Coke and charcoal	"	466,000
Operatives employed		708
Wrought iron produced	tons.	14,416
Capital invested		[illegible]
Value of products		$1,500,000

In the manufacture of castings, Ohio is the third state; and in wrought iron the sixth. The establishments for the manufacture of castings are one-seventh in number of those in the Union. The following general view will give the relative standing of the principal states in the manufacture of iron:—

	Iron Works.	Value of Products.
Pennsylvania	681	[illegible]
New York	401	[illegible]
Ohio	229	[illegible]
Virginia	122	[illegible]
New Jersey	108	[illegible]
Tennessee	81	[illegible]

These states produce more than two-thirds the iron ore and iron manufactures of the United States. Both Tennessee and Kentucky are destined to produce and manufacture an immense amount of iron; but, at present, Ohio is much ahead in that department of industry, and has raw material to supply her manufactures for generations to come. It is destined to enter very largely into the business and construction of railroads. It is a very extraordinary thing, in view of the very great superiority of American iron rails in wear, that our railroad companies have not obtained more at home. The system of buying iron for bonds will prove a very bad one, if it diverts the support which ought to have been given to American industry into foreign channels. We undertake to say, that if the English did not sell their iron for bonds, on a very long credit, they would not have been able to sell one-fifth the amount which has been brought to this country.

Having given an aggregate view of Ohio iron manufactures, it may be well to note its growth. This is quite extraordinary. The comparisons of results, under the censuses of 1840 and 1850, were:—

	1840.	1850.
Iron works	92	229
Operatives	[illegible]	[illegible]
Value of products	[illegible]	[illegible]

This comparison shows that, in the aggregate, the iron business of Ohio increased 100 per cent. in ten years. From the aspects of business in the last three years, we may safely anticipate that it will increase yet more rapidly in time to come.

Looking specially to Cincinnati, we find here an immense and rapidly increasing iron manufacture. As the pig metal and bloom brought to Cincinnati, with much of the iron bar, is used in various manufactures, the annual imports of iron from the iron region is a fair test of the progress of iron manufacture and consumption. Here we extract the following return of iron imports into Cincinnati, from the *Price Current*:

	1848-49.	1852-53.
Iron, tons	[illegible]	14,124
" pieces	[illegible]	[illegible]
" bundles	[illegible]	[illegible]
" pigs, tons	15,602	[illegible]

We then find that, in the short space of four years, the import and manufacture of iron in Cincinnati has increased at least 150 per cent. We discover further, that while, at the present time, about 55,000 tons of iron are produced in Ohio, 44,000 tons are imported into Cincinnati. A part of this import comes from Kentucky, Pennsylvania, and Tennessee; but much the larger part from Ohio. It is, therefore, very evident that Cincinnati is the great market and manufacture for Ohio iron; and, indeed, for that of upper Kentucky.

IRON MANUFACTURES OF THE WORLD.

The following statistics, so far as they relate to Great Britain, are compiled from the returns of 1850, and from the recent trade and navigation returns:

In 1850 there were 459 furnaces in the United Kingdom, and the annual yield of iron was 2,380,000 tons. The following figures are said to represent the produce of the respective countries named:—

	Tons.
Produced in the United Kingdom	2,380,000
Produced in the United States	400,000
Produced in France	348,000
Produced in Russia	1[illegible]
Produced in Austria	14[illegible],800
Produced in Sweden	133,500
Produced in Prussia	112,000
Total	3,723,800

In 1850, therefore, while Great Britain produced 2,380,000 tons, and imported 28,000 tons, her total export of iron and hardware amounted to 809,100 tons. She, therefore had left for home markets, over 1,500,000 tons. In 1796, the quantity of British iron made was 125,000 tons. The quantity of foreign iron retained for home consumption was 45,000 tons. The total exports of iron and hardware amounted to 408 tons. The total home consumption to 170,100 tons. The contrast in 1850 is striking indeed, as calculated to show the progress of this manufacture. The figures stand thus:—

	Tons.
British iron made	2,380,000
Foreign iron retained	28,000
Iron and hardware exported	809,100
Iron consumed at home	1,598,900

In connection with the foregoing, the following table will show not only the rate of increase in the exports of iron, steel and machinery, but also the gradually increasing proportion which, in the periods given below, the value of these exports bore to the total exports of the country. In 1814 they amounted only to 4.08 per cent. of the whole, whereas in the present year they will probably exceed 20 per cent., amounting as they do to 18.85 per cent. on the first ten months of the year.

Years.	Total value of exports.	Total value of iron and steel hardware and machinery.	Proportion per cent. to total revenue.
1814	£4[illegible]	£1,7[illegible]	4.08
1821	[illegible]	2,[illegible],000	5.01
1831	37,[illegible],000	3,514,000	9.46
1841	51,6[illegible]	5,0[illegible],000	9.79
1850	71,367,000	9,0[illegible],000	12.65
Ten months ending Nov. 5, 1853.	73,156,000	13,[illegible],000	18.85

In 1825, the United Kingdom exported as follows:—

Iron and steel, wrought and unwrought	£1,048,000
Hardware and cutlery	1,392,000
Machinery and mill works	212,000
Total	£2,652,000

The increase since that period may be inferred from the following figures, which allude to the ten months ending Nov. 5, 1858:—

Iron and steel, wrought and unwrought . .	£9,281,000
Hardware and cutlery	[illegible]
Machinery and mill works	[illegible]
Total	£18,790,700

Of countries which received the largest portions of this enormous mass of exports, the United States took not only by far the largest quantity of iron and steel, wrought and unwrought, but also the largest quantity of pig iron—the quantity exported in 1850 being 57,600 tons. Next to the United States stands Holland, 15,100, France, 11,710, Prussia, 10,950, Canada, 10,890, Denmark, 7570; Italy, 7400, and the Hanseatic towns, 7370 tons. Russia takes only 812, and Turkey 930 tons of pig iron. Of bar, bolt, and rod iron, the United States is also the largest customer—taking in 1851 253,530 tons. Next in order stands Canada, 46,540, East Indies, 45,200, Italy, 26,770; Turkey, 14,820; Hanseatic towns, 10,840, Holland, 9850, and Portugal, 6890 tons; Russia taking only 706 tons.

The following table gives the total values of these three branches of iron manufactures exported to each country:

Countries.	Value of iron and steel, wrought and unwrought.	Value of hardware and cutlery.	Value of machinery.	Total.
United States	£2,355,410	£1,004,800	[illegible]	£[illegible],462,420
British N. America	479,220	139,550	8,170	[illegible]
East Indies .	[illegible]	[illegible]	49,[illegible]	[illegible]
Hanseatic Towns	237,170	151,[illegible]	84,[illegible]	472,470
Italy . .	222,170	37,960	59,210	[illegible]
Holland . .	199,500	52,810	18,[illegible]	27[illegible]
Australia .	144,280	115,580	[illegible],290	[illegible]
Turkey . .	112,050	40,870	14,[illegible]	167,102
West Indies .	86,400	52,180	36,[illegible]	175,9[illegible]
Brazil .	78,[illegible]	80,070	29,000	188,[illegible]
Spain . .	77,270	43,[illegible]	78,[illegible]	1[illegible],100
France . .	69,790	98,480	30,108	227,470
Prussia . .	67,140	9,540	[illegible]	[illegible]
Portugal . .	65,140	17,960	13,770	96,[illegible]
Belgium . .	59,570	41,900	22,530	[illegible]
Russia . .	36,050	58,[illegible]	1[illegible]	2[illegible]
Denmark .	22,580	18,570	20,610	56,[illegible]

ON THE MANUFACTURE OF CAST STEEL.—BY DR. KARSTEN.

In the processes employed for decarbonizing pig iron and converting it into steel, it has not hitherto been possible to obtain a product of perfectly homogeneous nature. It is always necessary to sort the steel, in order to separate the harder parts containing more carbon from the softer, and these again from the steel-like iron. This absence of homogeneity, in the product, resulting from the imperfection of the processes, led to an attempt to give the steel great uniformity of texture by melting. The so-called cast steel is really a much more homogeneous and trustworthy product than the raw steel, or that obtained by cementation, although its characters likewise depend upon the proper and careful selection of the material from which it is made. In consequence of the fact, that steel may be prepared by fusion, which, together with a large percentage of carbon and consequent hardness, possesses homogeneity whatever may be the degree of hardness desired, cast steel has acquired such a well-merited reputation, that it is now always employed for articles in which great hardness is indispensable. However perfect the process for making cast steel may appear to be, it is still open to the disadvantage, that the selection of the suitable material must be intrusted to the judgment of the workman, and consequently that however homogeneous the product, the per centage of carbon, the hardness and solubility of the steel cannot be determined with precision beforehand. Such imperfections in the practice of metallurgical operations are in every case unavoidable, when determinations of weight must be replaced by the practised eye of the workman. The per centage of carbon in the material employed in making cast steel—cementation steel—is different in every part of the section of the bars, so that the average per centage of carbon in the charge of a crucible and the product of the casting cannot be determined with precision. Although the hardness of the English and good German cast steel correspond tolerably well with that which is required, this result is solely attributable to the perfect acquaintance of the workmen with their materials, and their careful selection of it for this practical purpose. There would be no uncertainty as to the result, if we possessed a material applicable to the preparation of cast steel, in which the per centage of carbon could be calculated. The white pig iron made from pure spathic and brown iron ores free from disseminated copper pyrites, and the per centage of carbon in which may, without any considerable error, be assumed as 5·4, is a material of this description. The per centage of carbon in the best kinds of Swedish bar iron and the iron which is made in Germany from the pure spathic and brown iron ores, may very safely be assumed as 0·25 on the average. The above pig iron and this bar iron are the purest kinds known, containing only traces of silicon, from which likewise the cementation steel used for making cast steel is never free. Both these kinds of iron are, therefore, of such a nature as to enable the operator to determine beforehand with precision the per centage of carbon in a crucible charge, and to produce cast steel of any desired degree of hardness by means of a simple calculation of the requisite proportion of the two kinds of raw material. If the per centage of carbon in the melted product obtained in this way, and the characters dependent upon that per centage, should be found to agree perfectly with calculation—a question to be determined only by experiments on a large scale—it might be expected that the production of cast steel from these materials would constitute a new phase of this branch of industry in Germany; for besides the trustworthiness of the operation, by which cast steel could be made of any degree of hardness and tenacity, it possesses economical advantages in the cheapness of the raw material.

But the production of cast steel by melting together white iron and pure bar iron appeared to be liable to an objection far greater than that founded upon the impurity of the raw material, and this arose from the doubt as to whether the product of the fusion would be homogeneous. However, the question of practicability could only be decided by direct experiment. Such experiments were made in the years 1846 and 1847.

The melting crucibles employed were of such capacity that from thirty to thirty-five pounds could be melted at a time. The melted metal was as usual run off into cast-iron moulds. The following is a brief statement of the results obtained in a great number of meltings, and the subsequent treatment of the cast steel:

1. In the selection of the pig iron, it is of great importance to employ such as presents perfect lamellar structure, and not such as is partly fibrous or compact. The use of lamellar iron is necessary, and not only in order that the per centage of carbon in the charge may be calculated with accuracy, which cannot be done with fibrous or compact iron, in which the per centage of carbon varies greatly, but likewise and especially because the lamellar iron exercises the greatest solvent action upon the bar iron, so that even a comparatively much larger quantity of those kinds is but an imperfect substitute for the lamellar iron. Consequently, good cast steel cannot be produced in this way without lamellar pig iron.

2. The extremely high temperature which bar iron requires for fusion appeared to render it necessary that it should be added to the charge in small

fragments. On this account the first fusions were made with bar iron, which had been rolled into moderately thick sheets, and then cut into pieces. However, it was subsequently ascertained, that the solution of the bar iron in the liquid pig iron takes place without any difficulty, and that the product is equally good when thick pieces are used, so that finally masses of a cubic inch in dimension were employed. By this means the expense of cutting the bar iron is obviated; at the same time the iron is less oxidized, and less room is taken up in the crucible than when it is in small fragments.

3. In order to produce a homogeneous cast steel, the highest possible temperature is necessary for the fusion. Consequently very infusible crucibles, which are not liable to crack, are a much greater desideratum in the production of cast steel from pig and bar iron, than even in the melting of steel itself. Of course the greater the number of meltings which can be made in one crucible, the greater is the economical advantage gained.

4. The melted metal must be run off into the cast iron moulds as rapidly as possible, in order that the whole mass may cool uniformly. At the same time care must be taken that none of the slag is allowed to pass from the crucible into the moulds, for there is not time for the slag to separate from the metal; it solidifies in the midst of the steel, and renders the casting defective, and causes the bar to rend in rolling. This may be most advantageously obviated by taking the cover from the crucible while it is still in the furnace, and skimming off the slag with a ladle-shaped iron. The small quantity which then remains may easily be kept back in the ordinary way during the casting.

5. The cast steel, when allowed to cool slowly in the crucible, loses all coherence, and breaks down under the hammer or rollers. The cause of this appears to lie in the formation of carburets of iron, which do not remain combined with the rest of the steel containing less carbon.

6. The cast bars must, after they have cooled, be freed from all adhering granules of metal by means of a chisel. If this is neglected, the edges of the bars become broken in rolling.

7. In heating the cleaned bars for the purpose of further working, a bright red heat must be employed. This cannot be effected in a satisfactory manner before a blast, because the temperature is not sufficiently uniform, and a uniform heat is indispensably necessary for the favorable result of the rolling or hammering. This can only be effected in a well constructed reverberatory furnace, and most advantageously in one fed with gas, a slight excess of which is present.

8. It is preferable to roll the heated bars rather than to hammer them; but if a hammer is used it must be of considerable weight.

9. The cast bars presented a perfectly homogeneous appearance, even after rolling. The bars were first rolled out square to a length of four feet, and then, after reheating, brought into the desired form. They admitted of being rolled into the thinnest sheets without cracking at the edges.

10. Even in making soft steel, for which purpose the crucible was charged with twenty-five pounds of bar iron and two pounds of pig iron, a perfect solution of the bar iron was effected by means of a strong heat. The product was a homogeneous steel, although, according to calculation, it could not contain more than 0.6 per cent. of carbon. The best, hardest, and most tenacious steel was obtained by fusing mixtures in which the calculated per centage of carbon was 1.5 or 1.6. For this purpose the crucible was charged with twenty-four or twenty-five pounds of bar iron, and eight pounds of pig iron.

11. The cast steel, even that which is soft, and in which the per centage of carbon is only 0.6, differs essentially from the raw or melted steel, from the circumstance that it cannot be welded without great difficulty. With a higher per centage of carbon it can only be welded under a coating of borax. With a per centage of 1.25, it can no longer be welded at all. Although, on the one hand, this behavior of the cast steel obtained in this way indicates its homoge-

neity, still it is a defect, one, indeed, which is likewise possessed by the English cast steel in a somewhat less degree.

12. The cast steel bears only low tempering heat, and acquires a very high degree of hardness, although at the cost of its tenacity. The proper mode of tempering it still remains to be ascertained.

13. The steel may be used for making the finest kinds of cutlery for files and chisels. For all purposes in which it is submitted to sudden and violent blows, it has proved destitute of the requisite tenacity. While very hard, it possesses considerable brittleness.

14. The last-mentioned character of the steel affords a ground for doubting its certainly apparent homogeneity, and this conjecture is confirmed by the fact, that its tenacity and capability of being welded are considerably increased by remelting. If, however, it should prove to be impossible to produce a good cast steel in one melting, the economical advantages of this process would probably be altogether lost.—*Scientific American.*

IRON TRADE OF SCOTLAND.

Notwithstanding the existence of legitimate causes for simulating production, the average price of the year being 26s. per ton higher than the average price of the last five years, the make is 50,000 tons less than in the years 1852, 1851, owing to the scarcity of labor and the raw material.

Scotland possessed, fifty years ago, only 13 furnaces, the small produce of which realized 10*l.* to 13*l.* per ton; 114 furnaces are now in blast, the value of the production of which at the price amounts to the large sum of 2,800,000*l.* per annum, about one-half of which is expended in wages. These facts, taken in connection with the annual tabular statement annexed to the make, stocks, prices, &c., will give an idea of the extraordinary growth of the iron trade of Scotland to its present gigantic dimensions, and of its great national importance.

	Tons.
Stock on hand 31st of December, 1852	46,000
Stock in warehouse keepers' and makers' stores on the 31st December, 1853.	210,000
Decrease of stock	240,000
Exported foreign and coastwise from Glasgow, Firth of Forth, Ayrshire ports, and per railway	650,000
Consumed in local foundries and malleable iron works here	300,000
Total deliveries	950,000
Deduct decrease in stock	240,000
	710,000
Computed make in 1853.	710,000

Make in	Tons.	Stock Dec. 18	Tons.
1845	475,000	1845	345,000
1846	870,000	1846	149,000
1847	810,000	1847	80,000
1848	580,000	1848	98,000
1849	690,000	1849	210,000
1850	597,000	1850	270,000
1851	760,000	1851	350,000
1852	775,000	1852	450,000
1853	710,000	1853	210,000

IMPROVEMENTS IN THE MANUFACTURE OF WHITE OXIDE OF ZINC. PATENTED BY O. K. YEVELIN, OF MIDDLESEX, ENGLAND.

These improvements relate;

1. To a novel form of retort used in the process of sublimation.
2. To a particular arrangement of retorts in which they are placed in con

tact, so that the heat cannot pass up between them but must first move along their under, and then over their upper, surfaces before it passes away to the flue.

3. To a method of admitting jets of steam or vapor into the retorts, to facilitate oxidation.

4. To certain means of feeding the furnaces, in which the fuel is heated on a charge plate before it enters the furnace.

IMPROVEMENTS IN TREATING WASTE PRODUCTS OBTAINED IN SMELTING.—PATENTED BY W. & J. [illegible], ENGLAND.

This invention refers to the treating of slags and other waste products in such manner as to produce a hard tough slag, which, when formed into suitable shapes, may be applied as pavement in roads and streets, and for other such purposes; and the [illegible] consists in fusing such slags and products and then mixing them with fluxes when necessary.

IMPROVEMENT IN MACHINE HAMMERS.—PATENTED BY DANIEL NOYES, ABINGTON, MASS.

The essential features of this improvement consist in a novel arrangement of mechanical devices for hammering or forging iron, whereby it can be brought into any desired shape or form much more expeditiously and with much greater regularity than by any of the means commonly practised in trip hammers for the purpose. This result is effected by means of hammers, which are so placed and actuated as to strike the iron to be shaped both on the top and on the two sides, the upper hammer having motion imparted to it from a crank on the main driving shaft, and the two side hammers moving horizontally, so as to strike the sides of the piece to be forged.

Claim.—"What I claim is: 1st. A machine for hammering iron, etc., having the distinguishing features herein above enumerated, viz., a hammer for giving the blow upon the upper surface of the iron, acting in connection with two hammers which simultaneously strike the sides of the iron, substantially as above set forth; and I further claim, in a machine for hammering iron, the use of these two side hammers operating as specified, whether used in connection with the upper hammer or without it. 2d. I claim so arranging the relative position of the fulcra of the hammer beams, and the ends of the connecting rods attached to said beams, and to the crank shaft and gears from which they derive their motion, as to bring the said fulcra and connecting rods in nearly a straight line at the time of giving the blow for the purpose above specified, the opposite ends of the connecting rods, just before giving the blow, moving in opposite directions, so as to give a rapid and powerful blow. 3d. I claim causing the anvil to descend from the iron just before the blow of the side hammers, and to ascend just before the blow of the upper hammer, by means of a rod attached at one end to the under side of the upper hammer beam, and at the other end to a lifting arm, which embraces the anvil, substantially as above described."

THE UNION IRON COMPANY.

The officers of this Company are—Leonard Hunt, President; J. T. Harris, Secretary; J. W. Smith, Treasurer; J. W. Smith, J. A. Warner, Leonard Hunt, Joseph T. Harris, and Edward F. De Lancey, Trustees.

Their property, consisting of the [illegible] vein of coarse-grained black ore, is located about four miles from Lake Champlain, forty miles north of Whitehall, and about one hundred [illegible] miles from Albany. The ore is conveyed over a plank road to Port Henry, distant about four miles, from whence it can be shipped to any part of the United States.

The ore is mined and delivered at Port Henry at a cost not exceeding $1 80 per ton. The prices of the ordinary ores of this county, delivered on the lake shore for transportation, range from $3 50 to $4 50 per ton. It is in contemplation to establish forges in New York for the manufacture, from this ore, of eight tons of bloom iron per day, at a cost which will not exceed $30 per ton. The price of good bloom iron, from the ordinary ores of this country, ranges from $50 to $55 per ton.

Of the characteristics of the ore found on the property of this Company, Professor Emmons thus speaks, in his Geological Report of the State of New York:—

Chemically considered, the ore is a mixture of the protoxide and peroxide, in the proportion of one atom of the former to two of the latter; it is, consequently, less disposed to pass to a state of peroxidation than any other ore of this county. It presents a high degree of uniformity in texture, in mode of working, and in the quality of the resulting metal—a highly important fact. A large proportion of the vein is situated above the waters of the Lake, and under circumstances as favorable for drainage as can be desired; so that water will form no obstacle to mining or quarrying the ore. In conducting the ore to the Lake, the surface is such, that a gradual descent is obtained. The ore, also, being unmixed with rock, no labor is lost in removing worthless stone. The ore being bedded in character, or naturally separated into layers, masses are readily detached by aid of the bar alone.

That no injurious substance exists in the coarse-grained black ore, is fully shown by the quality of the iron produced from it. This is evidence of the best kind, and supersedes the necessity of making any further remarks on this point. The vein is more than 700 feet wide; and by measurement, on a line running nearly north and south in the direction of its strike, it is found to extend 3,168 feet, furnishing material for the manufacture of iron for centuries to come.

Experience establishes the fact, in relation to the magnetic oxide, that ore from which the stony matter has been separated, produces iron possessed of different properties from that which has been made from the unwashed or unseparated ore. An instance of this kind is furnished in the iron formerly made of this ore.* When first used, it was wrought without separation. The iron then made was remarkable for its hardness and tenacity: it, in fact, produced steel of the best quality; and the bars which were at that period made, and left in rather a damp place, preserved their smooth appearance, without any disposition to rust or oxidate. This, perhaps, may be accounted for by supposing the formation of an alloy of iron and silicium. Whether the explanation is correct or not, the fact is important and interesting, and worthy of being preserved.

Leaving considerations of this kind, I have only to remark, that probably no ore in this country has produced iron of a better quality than the vein now under consideration; or, perhaps, it would be better to say, is capable of producing better iron.

In concluding his observations, Prof. Emmons says:—

In many instances, in the manufactures of this Adirondack iron, bars have been made which would temper or harden, and which, made into hammers or chisels, etc., were remarkable for their goodness, and the ability with which they withstood the severest usage.

Such, at any rate, I conceive to be the qualities of this iron, that it is a matter of national importance that the operations of its manufacture should be conducted in the best possible mode. There are some particular uses to which this can be applied, and for which there is nothing equal to it made in

* This ore has been partially opened for nearly half a century.

this country, viz.: where there is much wear, or friction, and at the same time great tenacity required; as the axles of locomotive-engines, railroad cars, or chain cables for ships of war, large spikes, nails, etc.

QUARRIES AND CLAYS.

CLAY IN WISCONSIN.

In a notice of a Report of Professor Daniels, on the Geology of Wisconsin, in the *Madison Journal*, we meet with some facts relative to the clay beds of that state:—

Perhaps the most interesting deposit, geologically considered, and which, as yet, has been but little studied, is the clay. It attains its maximum thickness in the south-western portion of the district, where it assumes the form of pipe-clay, presenting several distinct beds. The included fossils, which are often found in great abundance, proves this to be of fresh water origin. But the fossils of greatest interest, peculiar to this deposit, are the gigantic bones which have at several places been found imbedded in it. Those found at Fairplay belonged to an elephant and mastodon, and similar ones were dug up at Potosi. The remains of an elephant have also been discovered at Sextonville, Richland county. These discoveries prove that in ages immeasurably remote the elephant and mastodon roamed over Wisconsin, and found favorite places of refreshment and repose on our hills and valleys, and even upon the sites of our populous towns. The antiquity of their era may be imagined when, to quote the language of the Report, "the lakes and rivers from which they drank are now dry; and the forests amid which they wandered, and upon whose luxuriant vegetation their colossal forms were fed, have disappeared forever."

The clay seems to have been formed by the decomposition of the rock whose place it occupies. Its peculiar characteristic is its fresh water origin; and renders it quite certain that a lake once covered a large portion of the district, whose bottom was two or three hundred feet higher than the present level of the Mississippi. There is no "drift," properly—that is, sand, gravel, bowlders, etc.—in any part of the district; nor any evidence of diluvial action, so manifest over a large portion of the state. Had such depositions covered the mining country, the discovery of mineral had, possibly, never been made. It is, indeed, probable, that at the drift period the mining region was an extensive island, upon whose shores impinging icebergs dropped their loads of igneous debris, judging from the present appearance of that deposit along its eastern margin.

RARE MARBLES.

To the Editor of the Mining Magazine:—

A singular quarry of rare marble has recently been opened, on the shores of Lake Champlain, that deserves much attention, not only from its great beauty when polished, which gives it an intrinsic value in the fabrication of choice marble, fire-places, vases, etc., but also in a scientific point of view, arising from the presence in this marble of the remains of the coral insect, in the form of detached pieces of coral, showing to the geologist that the Lake Champlain district was at some former period the bed of an ocean of salt water.

The quarry referred to, is situated in the town of Chazy, Clinton county, New York, about four miles distant from the lake, and is known as "Stoughton's Quarry." The locality was examined in June, 1853, by Mr. Henry Wertz, who named it *Coralline Marble*, as it is composed of innumerable fragments of fossil encrinites, coral formation and other marine shells. It lays, generally, about four feet below the surface, and can be quarried from the strata in blocks of any size desirable. The marble has been sold to a number of manufacturers in the city of New York. The color, when polished, is a grayish mosaic, mottled with red of the coral. It is worthy of remark, that the workers in marble who have used it are unanimous in the opinion that it is the best colored marble to work ever introduced into the New York market.

The chemical composition of this marble is as follows, in 100 parts:—

ANALYSIS.

Carbonate of lime	95.45
Carbonate of magnesia	1.55
Silica	1.90
Peroxide of iron	1.07

One block, on exhibition at the Crystal Palace, elicited from the *Journal of Commerce* the following remarks, under date of the 14th of November last:—

"In materials for building and ornamental rocks, the resources of this country are hardly so well illustrated as in our public streets, and it seems unnecessary to recapitulate the list of familiar objects. A new aspirant for public favor appears in some very pretty reddish-brown, spotted marble, from the town of Chazy, on Lake Champlain. It is composed of innumerable fragments of fossil encrinites, and resembles in its appearance the variegated marble of Lockport. The locality is about four miles distant from the Lake shore; and it has been considered an entirely new discovery, both in an economical and geological point of view. We will state, from a personal inspection, that it appears to rest upon the stratum commonly called or known as the fucoidal layers of the calciferous sand-rock, and is referred to in Prof. Emmons' Final Report, page 310."

In the late award of prizes, by the committees on the Crystal Palace Exhibition, it appears that the exhibitor of this marble, Mr. A. C. Stoughton, received a silver medal. H. A. H.

THE MARBLE QUARRIES OF RUTLAND, VT.

These quarries of marble were mentioned on page 91, Vol. I. We now present some additional facts relative to the number of men employed, the produce obtained, and the expenses of their operation, for which we are indebted to the *New York Tribune*:—

West of the Green Mountains and within the state of Vermont, there are at this time numerous companies and individuals actively engaged in mining marble, from an extensive deposit, which underlies the mountain and shows itself about four miles from its western base, mostly in the valley of Otter Creek. The most extensive and systematically worked quarries are in the western part of Rutland, the shire town of Rutland county. The marble of this section has proved of better quality than any other American marble, and throughout the whole range is deposited in strata of from eighteen inches to eight feet in thickness, with a dip to the east of about forty-five degrees, being overlaid by an immense body of limestone. The whole thickness of white marble lying together in the mines which are now worked is about thirty feet, resting upon a body of mixed limestone and colored marbles, which to appearance is of great thickness, extending many feet beneath the white marble, and coming to the surface in many places. These mixed marbles are quarried extensively, and in great demand for building purposes.

The edges of the layers, in the deposit of white marble, come to the surface on the slope of a small elevation, which rises rather abruptly, facing the west, and extending north and south about three-fourths of a mile. At the base of this hill commences an extensive swamp, which is now undergoing the process of improvement, and, when cleared and ditched, making lands of the utmost fertility and productiveness. Across the swamp is now run the main line of the Rutland and Washington Railroad, and also a connecting branch leading to all the different mines located upon this range, thus giving the owners of these mines great facilities for the shipment of their products to all parts of the country. The extent of these products can only be known by a detailed statement of facts and statistics connected with the marble business which is here carried on.

We will commence at the south mine upon this deposit, in the town of Rutland, which is about as extensively worked as any; producing annually fifty thousand cubic feet of excellent marble, about three thousand feet of which is sawn into two-inch slabs, producing one hundred and fifty thousand superficial feet, which is readily sold at prices varying from thirty-four to fifty-five cents per foot. The remainder, or two thousand cubic feet, finds its market in blocks, or is sawn into shape for monuments, or other heavy uses, selling at from two dollars to four dollars and fifty cents per cubic foot. This mine has been in productive operation for about six years; steadily increasing in its productiveness and in the quality of marble produced.

The proprietors of this mine are Messrs. Sheldon, Morgan and Slason, who have now in successful operation an extensive mill for sawing marble, situated within fifty feet of the mouth of their mine, containing twenty gangs of saws, besides whip-saws, for slitting out and sliding down monument stuff, and other slabs, all driven by a powerful steam engine. There are employed in the mill and upon the yard about sixty men, at from ninety cents to one dollar per day each, and on the yard is a gang of men constantly at work loading the marble upon the cars, which are driven up alongside by the locomotive. A long train of loaded cars is taken away almost daily at the season of the year when the trade is most brisk. The mill at this place is kept running night and day for eight months in the year, consuming, in shaping the marble to sell, about twenty tons of coal and one thousand and two hundred cords of wood annually, together with two thousand and five hundred loads of sand, and ten tons of saws.

The mine from which the above marble is taken is now worked about one hundred feet below the surface of the rock, the main drift being about one hundred and sixty feet broad, and a horizontal chamber extending fifty feet further south, making the whole length now uncovered about two hundred feet. The inclined drift has been cut over the top of the marble and under the limestone, leaving the rock, of which the hill is composed, projecting over at an angle of forty-five degrees, and presenting an opening at the surface of but few feet more in width than the thickness of the white marble deposit, thus freeing and laying bare a vast amount of marble, without the delay, trouble and expense of removing the superincumbent mass. The marble is raised to the surface by means of powerful cranes or derricks, connected with horse-power appliances to move them, and the water which filters through the rocks, or falls into the pit from rains, is lifted and thrown out by means of a chain-pump, driven by a steam-engine. The marble is raised from the mine in blocks, varying in weight from five to ten tons. From the cranes it is taken to the mill, where it undergoes the process of being sawn.

This mine gives employment, both summer and winter, to about one hundred and ten men, at wages varying from eighty cents to one dollar and twenty-five cents per day. This Company pay annually for labor twenty-five thousand dollars, and notwithstanding the large outlay and the absorption of immense capital, are now realizing a handsome remuneration for their former expenditures and perseverance. Their works are carried on systematically and constantly, and although producing yearly an immense quantity of marble, which mostly finds consumers at the South and in the Great West, they are unable fully to supply the steadily increasing demand. From this mine is obtained the deservedly celebrated American statuary marble, specimens of which have already been wrought and placed on exhibition. The marble at this mine was, to appearance, thrown into its inclined position by some internal convulsion of nature, and has some marks of volcanic action.

The other more extensive mines, north of the one already described, are owned and carried on by Mr. Wm. F. Barnes, who commenced business upon what is now called the "old ledge," some twelve or thirteen years since. For several years he labored under many disadvantages on account of the scarcity of mills for sawing the marble produced, and from other circumstances. There are now laboring upon the mines, under the control of Mr. Barnes, about two hundred men, at an average of one dollar per day, producing in the various shops in which marble is used, about seventy-five thousand cubic feet annually. There is paid for labor to the men employed upon this mine, in cutting it out and preparing it for sale, some thirty thousand dollars; they also consume large quantities of powder, steel, coal, iron, and other things.

There are several other mines in operation upon this deposit, scattered along the hill-side, which are worked more or less extensively, producing in all about seventy thousand cubic feet of marble, and giving employment to one hundred men at one dollar per day, and distributing to the working men of this district a further sum of twenty thousand dollars a year. The business is one of considerable magnitude and importance, since upon this small ledge of but little more than half a mile in length nearly five hundred laborers are employed, receiving annually from seventy-five to eighty thousand dollars, and producing marble to the value of many thousands more than is expended. Upon these deep and extensive works labor is in constant and increasing demand, with a sure and steady increase of remuneration. The men who are now employed there at this branch of industry are mostly Irish, who have emigrated to this country within the last few years, and many of them arrived even the past year. The character of the labor in the production of marble is the most severe, calling into full play muscular strength, activity and power of endurance.

The hours of labor upon these mines are graduated according to the length of the day at different seasons of the year. The employers have no general rule established by common consent for the regulation of all, but each employer makes regulations for the government of his own work. This is not as it should be, as upon this plan the regulations differ upon the various mines according to the varying magnanimity of employers. Time, however, will remedy this evil and introduce one general rule of labor. But, notwithstanding the urgent want of reform, the relations now existing between the employers and the employed is of the most friendly and harmonious kind.

TALBOT'S ROCK-BORER.

A notice of the patent for this invention was made in a former number of the Mining Magazine. Subjoined is a description of the invention, and its mode of operation.

The machine is, in effect, a huge seventeen-feet auger, slowly turning at the rate of one revolution per hour, and advancing at the same time, from four to eight inches per hour, according to the solidity of the rock perforated. The common auger, as every one knows, is fitted with two fixed cutters, vertical to its centre, each cutting its way spirally into the wood. The cutters of this auger, four in number, are likewise fitted vertically to the centre, and cut their way spirally into the rock, with the combined revolution and advance of the machine. The only difference is in the construction of the cutters, which we shall presently attempt to explain.

The principal parts of the machine are as follows:—A carriage of massive iron resting on ways, and pushed forward at the rate above named, by means of a screw, turned by a simple contrivance similar to that which propels the carriage of a saw-mill, which is readily graduated to produce any desired speed, from two to twelve inches per hour. Upon this carriage rests all the machinery, engine included, and its total weight of 150,000 lbs. affords a sufficiently steady basis of operations to prevent the slightest perceptible tremor. 2. A great face-plate like that of a lathe, circular and vertical, resting and revolving on a hollow shaft large enough to admit the play of a horizontal beam, piston-like, through its cavity. 3. Four sectors (as if a wheel were divided into quarters), with their apexes hinged upon the face of the plate in such positions, equidistant, as to bring their segments of circumference at right angles to each other, meeting at the centre of the plate. The horizontal beam above mentioned connects by an arm with each of these segments, at their corners, which meet at the centre of the plate; and in playing back and forth, causes each to vibrate in a segment of a circle which passes through half the diameter of the tunnel, the four meeting at the centre. 4. The circumference of each sector is armed with three small wheels having teeth, not unlike circular saws, set obliquely, so as to strike the face of the rock in the same direction as a stone-cutter's chisel, and to act upon it in substantially the same manner, as they are rolled upon it back and forth by the vibratory swinging of the sectors. Each cutter in succession thus steadily carves away its proper thickness of rock, as it swings back and forth from the centre to the circumference of the tunnel, urged against the rock by the slow advance of the carriage, and borne around by the revolution of the face-plate. The thickness of the shaving carved away by each cutter, varies from one to two inches, according to the hardness of the rock.

Four cutters, passing around once in an hour, and each cutting one and a half inches deep, make, of course, a progress of six inches per hour, which is the rate now made at Harlem. It is said that, after allowing for all necessary interruptions, the machine may be run steadily for twenty hours out of twenty-four; making a progress of ten feet per day. Sixty horse power of steam, two engineers, and two men to shovel out the broken rock, comprehend the expense of working the machine at this rate; to which, the expense of keeping up the cutting wheels, is the only additional item of importance which seems necessary to be added.

A ROCK DRILL.

Anthony Fraiser, Sault Ste. Marie, Mich., has invented certain improvements in machines for drilling rocks, on which he has applied for a patent. The invention consists in placing the drill bar in a short sliding box, having one loose and three fixed sides; the loose side being so arranged and operated by a crank movement through a pitman, rocking pawl, and cam, that its whole surface is caused to exert friction in a straight line upon the drill bar, which is thus firmly held between this and the remaining sides of the box, and is elevated until the upper end of the pawl, coming in contact with an inclined plate, releases the bar, and it descends by its own weight. The box holding the bar is slightly turned, during its upward movement, by an eye-pin loosely inserted in its side, and the drill is thus rotated.

ARTIFICIAL STONE.

Mr. B. Barrett, sculptor, of Ipswich, Eng., has patented some improvements in the treatment of natural and artificial stone, and of articles composed of porous cements or plaster, for the purpose of hardening and coloring the same. The inventor introduces the liquid indurating substance into an exhausted chamber containing the stone to be indurated, the liquid substance being previously heated to a temperature of about 50° or 60° Fah. When the stone requires to be colored, the color is laid on with a brush, and allowed to dry before the indurating process is commenced. The mixture employed by the inventor for indurating stone is composed of fifty-six parts, by weight, of sulphur, dissolved by the aid of steam or dry heat, and forty-four parts of dilute vinegar or acetic acid, containing seventeen parts of acid to eight of water. In preparing indurating mixtures to be applied to the exteriors and interiors of buildings, whether the surface be of brick, stone, cement, or plaster, he employs:—Mixtures 1. Fourteen parts, by weight, of shellac, fourteen parts of seed lac, one part of coarse turpentine, and forty parts of pyroligneous spirit. 2. Gutta percha dissolved in coal-tar, naphtha, or other suitable solvent, in the proportion of three parts, by weight, of gutta percha, and eight parts of the solvent. 3. One bushel of limestone or chalk, twelve gallons of water, twelve pounds of alum, half a gallon of beer grounds, and half a gallon of gall, well mixed together. These solutions, when heated, are to be laid on with a brush until the surface will absorb no more. *Claim.* The above means, or any mere modifications thereof, for hardening and coloring natural and artificial stone, and articles composed of porous cements or plaster.

MACHINES FOR DRESSING STONE.

E. G. Mathews, of Troy, N. Y., has patented an improvement in machines for dressing stone. His claim thus describes it:—

What I claim is:—1st. The driving apparatus for driving the cutters, said apparatus being formed and constructed of the driving wheel and friction wheel, arranged substantially as herein specified, in the frame attached to the driving rod, by means of which rod a reciprocating motion is given to the said frame, which causes the driving wheel to roll back and forth, on and over the heads of the cutter stocks, thereby causing the cutters to make the desired cut in the stone, the friction wheel meanwhile rolling on the periphery of the driving wheel, and also in a groove in the cross bar, as before described. I do not intend to confine or limit myself in this claim exclusively to the use of one friction wheel, but hold myself at liberty to use one or more, and to vary the arrangement of them, while the principle of driving the cutters as herein described and shown is substantially adhered to. 2d. I claim the rocking bar, with inclined planes at each end, in combination with the cutter stocks and the roller, or its mechanical equivalent, attached to the frame of the driving apparatus, for the purpose of rolling or striking on the inclined planes of the bar as the driving apparatus reaches the end of its stroke, so as to rock or tip the bar, thereby causing the upper edge of the bar to catch or strike under the shoulders in the cutter stocks, and raise them up in position for the driving wheel to act upon them in its return stroke, substantially as herein specified.

ARTIFICIAL SILICIFICATION OF LIMESTONE.

It is some years since M. Kuhlmann, of Lille, proposed to preserve pieces of sculpture, etc., by impregnating them with a solution of silicate of potash. This process has been used on a grand scale in certain parts of the cathedral Notre Dame. The architect of the cathedral reports as follows:—1. That the infiltration of silica has preserved the stone from the green moss that covers stones in moist places. 2. That the gutters and flagging of limestone subjected to this process present surfaces perfectly dry, covered with a siliceous crust. 3. That upon the stones so prepared, dust and spider webs are less common than upon the stone in the ordinary state. The report also states, that tender stones have been rendered hard; they have lost part of their porosity; and, after being washed, they dry more rapidly than stones not silicified. The process has succeeded completely on all calcareous blocks, whether isolated or forming part of the structure, new and old.

It is not yet known how this process will act on mortars; but if successful, the silicification of an entire monument may be accomplished, and its restoration when old. The old exterior might be thus covered with a thick bed of artificial silicate of lime, and a whole edifice be protected by this means from all atmospheric causes of destruction.—*Silliman's Journal.*

MISCELLANIES.

GEOLOGY OF RAINY LAKE, NORTH AMERICA

At a recent meeting of the London Geological Society, a paper was read by Dr. Bigsby on the Geology of Rainy Lake and the region north of Lake Superior.

Chloritic and greenstone slates, gneiss and mica slate, appear once to have occupied the lake basin, with an E. N. E. strike, and a N. N. W. dip, at a high angle. But subsequently, a very extensive outburst of granite and syenite has taken place, to the great disturbance of the slate rocks, and penetrating them both in intercalations and cross-veins. These intrusive rocks occupy a large portion of the lake, most of the western shore, nearly all the eastern trough or arm, and much of the eastern end. An Upper Silurian limestone occurs on the south shore of the lake, at the mouth of Rainy River, which resembles a similar limestone in the Lake of the Woods. The rocks of Rainy Lake are a continuation of those on the south, both towards the head waters of the Mississippi and the Fond du Lac of Lake Superior. Dr. Norwood considers the great chain north of Lake Superior, and running nearly parallel with its north shore, from N. E. to S. W., to be the main axis of dislocation for whole regions in this part of America. This opinion is strengthened by finding in Rainy Lake and along the chain of lakes (225 miles long) which lead to the Grand Portage of Lake Superior, that the dip of all the stratified rocks is almost invariably to the north, whilst that of kindred rocks in Wisconsin and Michigan, south of Lake Superior, is with great constancy to the south, and this over areas of many thousand square miles.

AMOUNT AND VALUE OF QUICKSILVER EXPORTED FROM SAN FRANCISCO DURING THE YEAR 1853

During the year 1853, the total exports of quicksilver from San Francisco amounted to 18,800 flasks, valued here at $683,189. All this, together with the large amount used in this state, was the product of the "New Almaden" mine in Santa Clara. The following shows to what points the quicksilver was exported:—

	Flasks	Value
Shipped to Hong Kong	5,642	$1[illegible]
" Shanghae	812	31,[illegible]
" Canton	866	7[illegible]
" Whampoa	300	11,500
" Calcutta	50	1,875
" Mazatlan	2,811	[illegible]
" Mazatlan and San Blas	255	[illegible]
" San Blas	1,912	[illegible]
" Callao	1,800	[illegible]
" Valparaiso	1,977	71,875
" New York	1,545	7[illegible]
" Philadelphia	1,000	50,000
Total exports	18,800	$683,189

ARTIFICIAL PRODUCTION OF DIAMOND POWDER

M. Despretz has made two communications to the Académie des Sciences, upon carbon. In these he states, that placing at one, the inferior pole of a voltaic battery, a cylinder of pure charcoal (its purity being secured by preparing it from crystalized white sugar candy), and at the superior pole a bundle of fine platinum wires, so arranged that the charcoal was in the red portion of the electric arc, and the platinum in the violet, he found the carbon volatilized and collected on the platinum wires in a changed state. In these experiments the current has been continued during a month in activity, and the powder collected on the wires has been found to be sufficiently hard to polish rubies with great rapidity, and when burnt it left no residue. M. Despretz asks himself,—Have I obtained crystals of carbon which I can separate and weigh, in which I can determine the index of refraction and the angle of polarization without doubt? No. I have simply produced, by the electric arc, and by weak voltaic currents, carbon crystallized in black octohedrons, in colorless and translucent octohedrons, in plates also colorless and translucent, which possess the hardness of the powder of the diamond, and which disappear in combustion without any sensible residue. A similar result has been obtained by decomposing a mixture of chloride of carbon and alcohol, by weak galvanic currents.—*Athenæum.*

SACOTINGA.

Sacotinga is a Brazilian term for a micaceous schist containing gold. Capel is a Cornish term, and means the lining strata of the walls of the lode, generally composed of quartz, schorl, and hornblende, and more frequently accompanying tin than copper lodes.

ASSAY AND ANALYSIS OF ORES AND MINERALS.

We are gratified to notice that the interest taken here in the assay and analysis of ores and minerals is such as to induce Dr. Chas. T. Jackson to establish an office for that object in this city. Dr. Jackson has been too long and too well known in this country and in Europe for his chemical and geological investigations, and high attainments in science, to need any compliments at our hands. The fact that such an office is established here under his supervision will be gratifying to all interested in scientific or mining pursuits.

APPLICATION OF MANUFACTURED PEAT TO THE ARTS.

Numerously and extensively distributed as are the mineral products of these islands, the use of which for ages has contributed to the wants, the comforts, and the progress of man, there is yet one production of the soil, which, although known for centuries as a domestic fuel, possesses many peculiar and rare qualities, which have yet to be fully developed, and which, we believe, at no very distant day, will be productive of many new sources of industry of the utmost value to manufactures and the arts. Peat, by destructive distillation, yields numerous valuable products, light and heavy oils, tar of a peculiar character, acetate of lime, ammonia, paraffine, or stearine of the purest kind, leaving behind a valuable residuum of pure charcoal. The chemical conditions attendant on each of these products are, however, extremely variable, and many as have been the patents taken out for peculiar modes of manipulation, it is still an open question whether the costs of the several processes, each requiring expensive means of refinement, will allow them to be rendered commercially valuable.

Among the several companies, which we have from time to time noticed, was the Great Peat Working Company of Ireland. Although the company may have been considered defunct for the want of support, and the difficulty of raising the necessary capital for carrying out the works on a large scale, operations have never been suspended, but have been carried on by private enterprise; the charter remains in full force, with all its privileges intact; the company is still in existence, and is now being again brought before the public; the processes of the patentees, Messrs. Gwynne & Co., greatly improved and perfected, and a market secured for any quantity of produce for which machinery may be erected to execute at highly remunerative prices. The products under these patents are peat coal, peat charcoal, peat tar, acetate of lime, and sulphate of ammonia in a crude state, produced entirely by mechanical operations; and although chemical changes occur, and affinities take place during these processes, it is not considered a chemically working company. In the manufacture of peat coal the turf in its wet state is put into a centrifugal machine, when by rapid motion, and hot air or steam, it is dried; or the turf having been dried in the usual manner in the open air, by which half its moisture is driven off, is placed in a mill, and ground to powder. An endless band, having attached to it a series of shelves or lifts, passes under the spout of the mill, and continually raises the ground turf to the necessary height, from whence it falls into the top one of a series of cylinders, rotating in a furnace chamber leading to a chimney. These cylinders are placed diagonally, each in an alternately different direction, and kept in rotation by cogwheel gearing; and as the powder falls through from one to the other, it leaves the lower one, in the hottest part of the furnace, entirely free from hygrometric moisture. In this heated state, and in full possession of all its bituminous matter, it passes to the pressing or brick-forming machine, where three volumes are compressed into one, and one machine producing 60 four-pound bricks per minute, forming a fuel equal in density to coal, entirely free from sulphur, forms no clinkers, stands the blast superior to coal, and holds many peculiar advantages over the latter fuel in the smelting of iron and other metals, from its chemical constituents and its behavior under combustion, promising some extensive and important changes in those important metallurgic operations. Large and continuous contracts can be immediately entered into as soon as the Company is sufficiently prepared to carry out the works on an adequately extensive scale.

The valuable qualities of peat charcoal or coke for various purposes, and for smelting iron ores, has long been recognized in Germany and France, and Sir R. Kane, in his *Industrial Resources of Ireland*, gives many interesting details of successful results. Under the Company's patents the charcoal is prepared from the compressed peat, or peat coal, forming a highly dense coke of great purity, giving out a powerful heat, and free from all noxious impurities or alloys. They do not profess to separate the steam or oily matters from the tar produced, but obtain the entire product in a highly refined condition, containing all the properties of wood tar, with many important ones additional, and is coming into extensive use for the preservation of timber by a new process, appertaining solely to the Company, and for the manufacture of a superior gas, having two and a half times greater illuminating power than coal gas. A lighter description of charcoal is also manufactured, easily pulverized for agricultural, deodorizing, and sanitary purposes.

In connection with this subject, we have to notice a singular geological discovery at Deptford, in Kent, a distance of only four miles from London, which, if it should prove of any extent, will form a question of considerable importance to the Geological Society, as well as to all those who identify themselves with this truly interesting science. Mr. Gwynne is the patentee of the Balanced Centrifugal Pump, which caused so much attention in the Great Exhibition in 1851, and having recently received orders for the erection of one at an establishment at Deptford, about half a mile from the banks of the Thames, the men, in commencing to sink through firm London clay, came at a depth of three feet from surface upon a bed of peat, apparently possessing every characteristic of the generality of peat bogs in different parts of the country, composed principally of the vegetable *sphagnum*, the true peat plant. From experiments made at Messrs. Gwynne, Son & Co.'s premises, Essex Wharf, the result has proved very satisfactory. Whether this should prove a bed resting on the chalk, or in a basin of the London clay again covered by that deposit, it gives rise to a question of singular import. How came a portion of geologically recent alluvial deposits beneath the upper stratum of the tertiary period?

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VOL. II.—APRIL, 1854.—No. IV.

ART. I.—NOTES ON THE GOLD REGION OF NORTH AND SOUTH CAROLINA. TAKEN DURING FOUR MONTHS' RESIDENCE.—No. 2.* By STEPHEN P. LEEDS, GEOLOGIST.

IN some instances the decomposed slate has resulted in a pure white silicious sand, free from all mineral impregnations chemically, but occasionally holding a mechanical admixture of granular gold; as if nature had conducted a simple assay by the humid process, and removed all the readily soluble metallic substances, and left only the gold, from its being insoluble in the menstruum employed, disseminated through the equally refractory silex. This pure white sand extends over tracts varying from a few feet in width, to a surface of country of some miles in transverse extent, and holds a depth from a mere surface film to beds of several feet in thickness, which frequently overlie the deep red ferruginous soil.

Where veins permeate this arenaceous soil, they can very frequently be distinguished at a distance by the iron-tinted character of their surface and the adjacent earth—the superabundance of oxide of iron always accompanying a vein ever producing the deeper color—and can frequently be traced near at hand by the outcrop of angular fragments of "honey-comb" quartz, which in numerous instances produce beautiful and valuable hand specimens of native gold, disseminated through the cellular mass, in immediate juxtaposition with the dark-brown oxide of iron. More frequently, however, these veins carry the gold disseminated in such minute particles, that they are invisible to the naked eye.

Where a trap dike, *a a*, has cut through a gold-bearing slate vein, it generally occurs that the vein on the lower side of the dike is excessively barren of gold, to the extent usually of some two or three feet, *b*; but beyond that point, the greater accumulation of gold in the vein produces an ample offset against the paucity nearer the dike. The number of instances in which

* Continued from Vol. II., No. 1, p. 34.

this fact manifests itself, are of too frequent occurrence to favor the impression that they may be merely accidental. Beyond, a

small distance, the vein regains its usual character, and generally maintains the average production of gold. Above the point of intersection, at *c*, the vein is always more rich than in any other immediate portion. This fact is so indubitably established, that the experienced miner is always aware of the character of the vein at such positions, and can predicate upon the comparative result of his labors with a full degree of certainty.

The quartz veins vary very materially in their construction, not only in their dimensions but also in mineralogical features. Their extent embraces a range of width from a mere thread to thirty or forty feet. Their dip is usually to the south, and assumes all angles from ten or fifteen degrees to a vertical position. Their strike is generally North 20° East, by South 20° West, which in fact is characteristic of the mineral veins in this section of country. The wall rocks are either the decomposed trappean granitic rocks, or the hornstone slate.

In some cases the vein consists of the pure milk-white quartz, holding but little of the gossan in the cavities, and carrying the gold disseminated in coarse grains through the body of the quartz: in many instances the gossan, or ferruginous oxide, is more abundant than the quartz, and in such veins it is this mineral that is the vehicle of the gold. The cavernous, cellular, or honey-comb appearance of the vein quartz, is due to the decomposition of the iron pyrites which is abundantly intermixed entirely through it. This decomposition is sometimes so complete that not a trace of the iron can be discovered, and the quartz appears clear, white, and free from tint; but frequently the dark brown oxide partially fills the cellular cavities with a ferruginous powder, or adheres to their sides in a stalactitical formation: and occasionally no trace of the pyrites remains except a small quantity of native flowers of sulphur. Where the iron maintains the peroxide or hematite character, the hand specimens are very frequently singularly beautiful; more particularly, those having the botryoidal and mammillated form, being brilliantly irridescent, and delicate in structure.

In all these varieties, the gold is irregularly disseminated in the vein, varying in value from five cents to ten or fifteen dollars per bushel of ore; while instances, though not often occurring, are still not uncommon, in which the yield has been equivalent to eighty or ninety dollars to the bushel; and, in some extraordinarily rich section of the veins, a single half-bushel of ore has afforded twenty-five hundred dollars' worth of the precious metal.

The quartz is often very broken, and angular fragments pervade the entire vein, the appearance resembling that of quartz which has undergone a sudden change of temperature, and experienced a series of fractures consequent upon the irregularity of contraction or of expansion.

In addition to the slate and the quartz veins that have been described, the gold is also found in deposit beds. These localities are most frequent upon the banks of the branches or streams, the erosive action of which having produced valleys of denudation, which have cut through some gold veins, the metal, by its greater specific gravity, has escaped the more extended removal that has fallen to the destiny of the common sand and gravel, and has remained at the depth of the valley through all its changes. Some of the richest and most valuable of the gold locations have been of this character. Over eighty dollars' worth of gold was washed from a quart of earth taken from a small deposit of this nature; and, although the ravine in which it was found bore but a limited extent, the vein which primarily yielded the gold has never been discovered. It most probably was a small pipe vein, which had been fully removed from its original position by the formation of the ravine. The accompanying sketch will illustrate this fact:

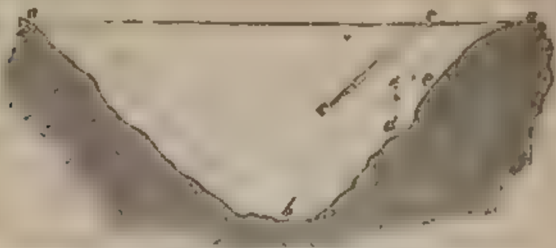
a. a. The original level of the surface.

a. b. Being the present form of the ravine, produced by the erosive action of a small water-course.

c. c. The probable position of a pipe vein, now entirely removed.

d. The cavity, or pocket, in which the gold was discovered.

a. b. The present position, which gives gold by panning.



A moderate quantity of gold has been found in all parts of the ravine, from about one-third of the way from the summit to the lowest point; and although at present unworked, it still contains no inconsiderable amount of this valuable material.

Other deposit beds are formed from the disintegration of the quartz veins. In these cases, the silica is in a state of the finest powder, so impalpable that its characteristic harshness or grit is scarcely discernible to the touch. It is free from ferruginous presence, and white as a bed of recent snow. Some fragments of partially disintegrated quartz are scattered irregularly through these beds, which not unfrequently are covered with a rich profusion of gold, making it difficult to decide which is the greater—their beauty, or their value. A single specimen, carried from a location of this description, was received at the Mint at a valuation of upwards of five thousand dollars.

Many of the true quartz veins appear, upon investigating their mineral qualifications, at depths varying from sixty to one hundred and fifty feet, to have a strong and determined tendency to eventuate in copper-bearing veins. The yellow sulphuret of copper, which is the predominant ore, first appears in small nodules, or minute threads, at various distances from the surface; and, as the examination progresses downward, the quantity of the ore increases rapidly; until, crowding out all other mineral traces, it becomes the leading ore of the vein. The surface rocks on the course of these veins are, many of them, indicative of the vicinity of copper; one particularly so, it being that peculiarly tinted class of fragments known to the experienced miner by the common appellation of "Copper blood." Even where the presence of copper has not previously been suspected, this sure indication tells plainly of its existence; and it is questionable if the absence of this trait from the surface of a copper vein does not in reality form the exception to the general law. Those veins which are productive of copper, possess some features peculiar to themselves. As a more prevalent rule, they embrace a stronger character as regards dimensions, and assume a nearer approximation to the vertical in their position. They also usually carry a greater quantity of the bright sulphuret of iron, the lode in frequent instances seemingly formed of this mineral solely; and where the pyrites of iron bear the strongest sway, the change to the copper pyrites is very often sudden and abrupt, much more so than where it is more sparsely scattered. Traces of the red oxide of copper are prevalent in many of the veins, accompanied by greater quantities of the green and blue carbonates, and some minute evidences of the black oxide. From the general features of the copper veins, the conviction cannot but be derived that this portion of the United States is destined ultimately to afford an unlimited supply of copper ore to the world.

Manganese ore, the black oxide, or pyrolusite variety, is very abundant in some portions of this region. One belt of country, which extends from North Carolina through the northern part of South Carolina into Georgia, holds large quantities of this mineral. Some locations afford a compact, lustrous and valuable variety, in ample quantities for working. On one portion of this range, the immediate vicinity of a belt of limestone points to the manufacturer a desirable position for the preparation of a desirable commercial product; and when this section of the country has awakened to a full sense of the necessity of home manufacture,—when the noise of the shuttle and the loom is heard throughout the land,—then such mineral positions will be eagerly sought after, and points like the one referred to shall be deemed of no small value.

The term "*ore*," applied to gold, is in reality a misnomer, as the gold is always found in a metallic or native state, with an accidental or mechanical intermixture, and not a chemical combination, with the gangue-stone; still, custom has sanctioned its application to gold mining, and it may therefore properly be used in this department of mining operations as a technical term. Thus far the process of separating the gold from the accompanying rock has been exceedingly primitive and simple; the hand-rocker, the stamps, the Chilian mill, the circular iron mill, and the araster mill, though far from meeting all the requisites on the score of economy and time, have proved of more practical utility than any of the more costly and complicated machines that have been placed upon the mining properties. It is to be hoped, that as the attention of practical machinists has been turned toward this branch of mining, that the skill and ingenuity that has heretofore been displayed by them, and has been productive of such practical and beneficial results, will, ere long, develop some course which will effectually supersede those means now in use, and place the mechanical part of gold mining upon an equality with that more advanced state to which other mining operations have attained.

A brief description of the simple machinery at present in use may not be out of place at this point.

PANNING.

A common frying-pan, divested of its handle, constitutes the simplest and most effectual machine for separating the gold upon a small scale. The earth in which the gold is disseminated, or the rock containing it, which has been crushed to a powder, is placed in this pan, and by a free use of water, either in some running stream or standing pool, the loose and lighter particles are washed away, the coarser pebbles taken out by hand, and by a peculiar lateral and gyratory motion combined—which must be seen but cannot well be described—the heavier particles of gold fall to the bottom of the pan, and the remaining sand can be fully removed.

When the panning is accurately and carefully conducted, a perfect separation of the metal from all foreign substances is produced. In the hands of an experienced operator, no better test of the value of any class of gold ore can be required or obtained.

STAMPING.

When the work is conducted upon a more extended scale, a set of stamps are used to reduce the vein-stone to a powder. These are formed of iron weights, varying from fifty to one hundred pounds each, attached to the lower end of an upright shaft of wood, which by a simple frame-work is retained in a vertical position; some six or eight of these weights thus attached are ranged side by side and constitute a set.

From each of these upright shafts an arm projects, which, coming in contact with a similar projection upon a horizontal shaft moved by machinery, generally by water-power, the stamp is raised to a moderate height, when the contact of the two arms having ceased the stamp falls, and by its weight crushes the quartz or other stone containing the gold. By the variation of the position of the arms upon the horizontal shaft, the stamps are raised and suffered to fall alternately, preventing the full strain of their combined weight from falling upon the shaft at one time, and producing a more effectual crushing than if suffered to fall in unison together.

The ore to be stamped is placed in an iron trough with a grated bottom, through which the fragments fall when broken sufficiently small by the stamps. Sometimes the ore is placed upon a platform of solid stone, and as it is crushed by the stamps, a small stream of water washes the fine particles of gold and rock over an inclined plane, which is covered with baize; this retains the gold upon its rough surface, and allows the dirt and sand to pass over it. When requisite, the baize is thoroughly rinsed in a vessel of water to remove the gold, and replaced upon the inclined plane to gain a new supply. The former plan is designated the dry stamping, and the latter the wet stamping.

THE CIRCULAR CAST-IRON MILL.

This mill consists of a circular gutter or trough made of cast-iron, in which some three or four solid cast-iron wheels are kept constantly moving forward by a revolving vertical shaft to which they are connected by an arm or axle to each wheel. In this iron gutter is placed the quicksilver, and as the fragments of ore from the stamps are thrown into it they are ground to fine powder, the gold liberated and amalgamated with the mercury; the earthy matter is washed away by a stream which is caused to flow into the trough over its rim on one side, and passes out of a hole a few inches below the rim on the opposite extreme. As the wheels pass on in their continued round, the mercury is kept in a constant state of agitation, the gold is brought into immediate contact with it, and the wave of the water keeping the finer particles of the crushed and broken rock suspended, they are borne away with the flowing stream.

THE ARASTER MILL.

This mill is different in form from the circular mill, being a stone bed, surrounded with a circular frame-work of staves, forming a large and shallow tub with a stone bottom. A revolving upright shaft with horizontal arms, drags forward constantly a large piece of flat stone, attached to each arm by chains, over the stone bed. The quicksilver is placed in this shallow tub, a stream of water made to flow through the tub, the crushed ore thrown in, and by the weight of the stones, being more finely crushed, the washing and amalgamation proceeds as in the circular mill.

THE CHILIAN MILL.

This is upon the same principal as the Circular Cast-iron Mill: the bed is formed of stone, and surrounded with a box-work like the Araster Mill, and it carries one large stone wheel instead of the three or four iron ones.

In all of the above-named mills, when the work has progressed for a sufficient length of time, the operations are suspended, the quicksilver removed and strained either through buckskin or a closely-woven piece of bed-ticking, which retains the amalgam; this is subsequently placed in an iron retort, and the mercury distilled off from the gold: the quicksilver can be repeatedly used until the gradual loss shall produce the necessity of a renewed supply.

Such are the simple appliances for extracting the gold from the earth and rock by which it is accompanied, and with the exception of the hand-rocker, a cradle-shaped box, or sometimes merely a hollowed log, with a covering of sheet-iron perforated with holes about half an inch in diameter, upon which the earth or pounded rock is thrown, and washed by a small stream of water caused to flow upon it; containing irregularities of surface at the bottom of the box or log into which the quicksilver is placed, and the gold amalgamated by falling through the perforations into the mercury—with this exception, no other machinery is in general use. The machinist has expended his ingenuity, and the inventor has theorized and labored thus far in vain; but with practical men, the hope still predominates, that the desideratum will ultimately be obtained, and a series of machinery be produced adequate to the requirements of the contingency.

In many of the mineral locations of this interesting section, frequent slides are discernible; some of them of sufficient extent to throw the veins from forty to sixty feet from their original position, and some of them of such meagre influence as to have produced a change of but a few inches, or even less than an inch. Where these changes have occurred, and the rock has subsequently undergone that decomposition before alluded to, the tracing of these slides is a matter, in many cases, of easy work—the soft and friable material of the crumbling rock rendering its removal an operation of perfect facility: the fault in these cases being easily perceptible by the black metallic lustre ever accompanying it. These faults are seldom in the line of stratification; most frequently they occur at an angle of from sixty degrees to eighty degrees to the horizon.

Nearly all the gold found in this auriferous region, has more or less silver associated with it. The quantity of the latter metal differs at various locations; in some places the gold bears a value of only seventy-three cents per pennyweight, while in others, it rises as high as one hundred and two cents; the difference in value arises generally from the intermixture of silver. I have not yet been able to establish the fact, that one terminus of the gold region is more highly argentiferous than the other, although a number of observations taken would apparently lead to such a conclusion. It is to be hoped that a connected series of examinations will ere long determine this important point.

The geologist who visits this region must not endeavor to condense the time requisite to produce the facts which at every step present themselves to his observation, into too brief a period. He must allow a long space of time, whose numerical representation shall count tens of thousands for the years necessary for the production of that sedimentary formation which now stands with its upturned edges beneath his feet; a transverse section of which costs forty miles of travel to follow from its commencement to its termination; and if a moderate upheaval, or a gradual subsidence, has changed the position of this vast belt from the horizontal to the vertical—and its unbroken character would speak loudly in favor of total absence of violent and sudden commotion—his notation must be extended perchance to another like period of time.

Nor must these same facts which meet his view be taken solely in regard to the evidence they now present; the previous changes which have occurred over the extent of this region must be carefully considered, and the facts before him taken in the secondary position which they should occupy, when justly examined as modifications of those previous mutations. Many valleys of erosion now exist, whose present aerial space was erst filled with compact solid matter; many dikes now rising above the surrounding surface, once reposed in quietude beneath the level of the adjacent soil, and valleys and depressions now exist where hills and elevations once arose. Without a due consideration of these changes, many seeming contradictions could not be made plain; without an allowance for these mutations, doubts and antagonistic views would continually arise to mislead and bewilder, instead of pointing the course to the clear broad light of truth.

The influences of denudation, which have heretofore, in ages long antecedent to the present time, been exerted, have placed this gold-bearing portion of the country in an almost seemingly anomalous condition. At the first glance, while making surface examinations of the numerous moderately rounded hills, the idea would be impressed upon the observer, that the inequalities of the surface level was the result of diluvial action. But a more close inspection would immediately evince the error of such a conclusion. The smoothly rounded surface of the hills is clearly proof that they have been produced during a long series of years, reaching, perchance, a period antecedent to the advent of the human race, by the surface washings caused by rains and springs. No better evidence of this fact can be needed than will meet the view at every step, of the same causes now in active operation; the smoothly rounded hills, the deepening ravines, the extending valleys, and the vast amount of earthy matter held in suspension by the streams and rivers, and continually carried forward by them, are incontestible facts that cannot be controverted, that point effectually to the conclusion above deduced. That denudation from such influences only has been exerted, is manifest from the fact, that rounded pebbles are found only near the larger water-courses, and then most frequently upon the summits and sides of the highest hills within a distance of half a mile from the present bed of such water-course; showing that the river has flowed in the same general direction in past ages as at the present day, but has during that time eroded to its present depth the channel it now occupies. It is also proved by the absence of rolled and rounded pebbles from any other position than that of the immediate neighborhood of the streams; the surface pebbles of other sections of the country being formed of fragments of rock of sharp and angular fractures, being the natural abrasures of existing veins, and showing that diluvial action could not have been exerted upon them, and had no agency in placing them in their present position.

The extent to which this denudation has been effected, almost staggers the belief by its magnitude. In ascending any of the highest points that are elevated above the general level of this vast area, the summits of the hills or mountains show the same rock that composes the bed of the broad plains below. Being more indurated, or having been free from the disintegrating causes so universally present in the adjacent rocks, they have withstood the action that has worn down the surrounding country, and stand as monuments or landmarks of what was once the level at their summits. It is not improbable that the original level was at an elevation far above their present extreme point of altitude. Rising abrupt as these hills do, from the broad level of thousands of square miles, they appear like upheavals of rocky materials that have been forced by volcanic agency above the contiguous strata; but the dip of the rock being the same in the hills and in the plain, the composition of the rock being also similar in both positions, the natural conclusion, and in fact, a self-evident one, is, that their present elevation is the result of denudation of the remainder of the region. Standing upon Crowder's, King's, Parson's, or any of the mountains, at an elevation of some five hundred to seven hundred feet, the whole country appears like one vast level plain, the minor irregularities being scarcely perceptible in the distance. With an extended view of about one hundred and twenty miles from north-east to south-west, by nearly eighty miles in a directly transverse course, a vast tract of country, covering nearly ten thousand square miles, is spread out like a chart before the gaze; and this is but a small portion of this vast mineral belt. It is here that the magnitude of denudation can be most clearly comprehended, when the mind becomes cognizant of the fact, that these thousands of square miles have been uncovered by slow and gradual operations, until their surface has been depressed to a point at least one thousand feet below the original level. Some slight approximation to the period requisite to produce such change can be derived from the fact, that in comparatively sheltered situations, the corn-hills are still plainly evident in many parts of this country in old fields that have been deserted for over thirty years: if that lapse of time, extending to one-third of a century, has not been adequate to the obliteration of these slight elevations, how long a period must have transpired during which the stupendous vicissitudes occurred that are so evident over this extensive territory. In less sheltered situations, the soil wears away more rapidly. An instance was observed, where the necessity arose to change the road from time to time, over a surface of a quarter of a mile, to avoid the deep gullies which in about forty years had rendered that extent unpassable, reaching in some portions a depth of over forty feet. The instances of the corn-hills, and the surface-washing of the roadside, may be considered as evincing the two extremes of time required for this denuding influence.

At scattered intervals over this vast extent, isolated hills or mountains rise, breaking the monotony of the universal level; from their summits can be seen wide forests waving in their native luxuriance, and spreading away into the far off distance with a wave-like appearance, resembling huge surges on an ocean of vegetation. The uniformity of the dense foliage is occasionally relieved by the lighter aspect of a cultivated plantation; and the rays of the sun glitter back, at times, from the countless panes, and whitened buildings of quiet villages, while wreaths of smoke curl gracefully upward, from the half-hidden and secluded log-cabin of the hardy and adventurous miner.

The people of this section of country are awaking to the subject of internal improvements in the ways and means of travel and transportation of freight. A system of railroad operations has already covered this hitherto seemingly inaccessible territory, with a net-work of railway, which has opened some of the richest and most valuable portions of it to a ready market for their surplus products, and by rendering the mode of travel easy and expeditious, has already brought an influx of strangers and capital into such portions as have held forth the most alluring and promising inducements for the operation of energetic and efficient plans. As this work progresses, as the influx of strangers among this people increases, as capital and energy are disseminated among them, and their true destiny becomes apparent to themselves, they will rise in their strength and power, and take their true position in the great progressive works of the age: but unless they arouse from their lethargy ere long, they will awaken too late to derive those immediate advantages which others are already commencing to obtain from the rich mineral positions which exist in their midst.

Already the treasures which are contained in their mines are being developed; the sturdy arm of the miner is wielding the pick, the sledge sends forth its dull and surging sound, as its heavy blows abrade the massive rock, hundreds of feet beneath the surface of the soil, and the wealth that for countless ages has lain buried in the earth, is being brought to the light of day, and made to perform its part in the amelioration of the condition of the human race.

The future operations in the mines, must, if they would be permanently productive, be carried to a far greater depth than has heretofore generally been reached. The most productive veins will ultimately be discovered to be those which penetrate to the greatest depth, and from their continuation, the fullest reliance can be placed upon the yield they may be caused to afford of an unfailing supply of metal. Those companies that work the deepest upon their veins, will learn to their own advantage, that their course has been the only true and judicious one; and the more bold, energetic, and fearless their movements, provided always that wild speculation is not understood by the term, the more favorable will be the appearance of their balance-sheet. Still, a due degree of caution, and a total avoidance of all undue haste, must ever be observed. A great error in the operations of mining companies, is the impatience they usually manifest in their desire to get out their first shipment of ore. No ore should ever be attempted to be raised for sale until the mine is in that advanced stage of maturity that a continuous supply can be uninterruptedly sent forward. Every ton raised, previous to the mine being in such good working condition, is so much of a retarding influence on its general welfare and prosperity, as the time and cost of raising that ton will amount to.

When the business men of the country who embark in mining enterprises, will display in their mining operations that same degree of good, sound common sense, which bears the appellation of shrewdness, which they ever manifest in their accustomed transactions; when they exercise their well-formed judgment, in all matters appertaining to mineral developments; when their expenditures are based upon a system of rigid and careful economy; then, and then only, can we look forward to finding the mineral character of our country assuming and maintaining that high and proud position which her true and actual mineral wealth so justly entitles it to claim.

Thus far, with a few exceptions, the mines of this valuable belt of territory have been worked but to a very limited depth and extent; in but a few instances to sufficient depth to develop their true character as mineral veins, or their capability of producing ore. Compared with the mines of some of the European districts, they have scarcely gone beyond surface examinations, and yet with a character upon, or near the surface, unequaled by any mineral region of the world, we have, to this time, remained indifferent to their inexhaustible treasures, and unprofitably passed over long years, simply satisfied with brief and desultory explorations.

Long and arduous toil awaits the friend of the American mining interests; hard struggles must be held with those whose acts, perhaps unintentionally, are retarding the advancement of this source of national enterprise and prosperity; but still, with the prospect of difficulties to come, and through the deep gloom of many desponding hours, he has no fear of the contest, no doubt of the ultimate calm, for he knows that his sensations of confidence are based upon no false foundation, but are fixed upon those vast and enduring treasures, whose magnitude bears a relative correspondence with the immense mountain elevations and extended plains of his farmed land, and that their future development is no longer a problem of fact, or expediency, but simply a question of time.

ART. II.—THE PROGRESS OF ENGLISH MINING OPERATIONS IN 1853.—BY J. Y. WATSON.*

To give a correct idea of the progress of mining adventures, becomes every year a more interesting, as well as a more difficult undertaking, as few commercial pursuits have grown into such importance in so short a time, or have been so universally taken up by the general public, as the "searching for mines for minerals." The spirit of speculation would appear to be infectious, and the most cautious, as well as the most speculative, embark in that which "fascinates more than it deters."† Besides, we all like the idea of making a good "hit" in a mine; and although it is rather too much to suppose that every one we take in hand must succeed, I do certainly believe, that with ordinary discrimination in the choice of mines, and the necessary means to carry them out, few speculations in general pay better, or in some cases, so enormously.

RESULTS OF COPPER MINING.

To show, moreover, that this increase in the spirit of speculation has had good practical results, in discovering and opening out the mineral resources of this country, I would remark that the first sale of copper ores in Cornwall on record was in 1729, when 2,216 tons, *being the produce of twelve months,* were sold. In 1732, the produce was only 1,714 tons of ore. In 1764, the quantity increased to 16,437 tons; in 1800, to 55,981 tons, yielding 5,187 tons of copper, and £550,925 in money. For some years after this the quantity varied from 60,000 to 78,000 tons of ore per annum. In 1822, it was 100,364 tons; in 1830, 141,263 tons; in 1840, 147,266 tons; in 1848, 155,616 tons, yielding in money £825,080 2s.; and in the year ending 30th of June, 1853, 180,095 tons of ore, of 21 cwts. each, yielding 11,839 tons 14 cwts. of fine copper, and in money £1,124,561

* *London Journal.*

† An old writer, in the time of Queen Elizabeth, says:—"A mineral man should be a hazard adventurer, not much esteeming whether he hit or miss. If he happen to win, he must esteem it as nothing: if he lose all, yet he must think he has got something. If he find a rich vein, let him not esteem it, for it is like a man stung with a nettle." Another says:—"When mines hit, it is the best got gear in the world, it is so profitable to all, and hurts none; and when they hit not, though it be lost for a time, God is hereby honored in searching his hidden treasures out of the depths of the earth."

2*s.* The sales in Wales during the same period (mostly of foreign ores brought to England) were 29,244 tons, yielding 4,362 tons 19 cwts. of fine copper, and in money £452,391 12*s.* The total amount of money, therefore, received for copper ores sold in England and Wales, during the twelve months ending in June last, was £1,576,952 14*s.* In 1764, the average produce of the ore sold (16,437 tons) was 11¾ per cent., and in tracing the sales through subsequent years, I find a gradual decline in the richness of the ores, from which it may be inferred, either that the miners of those days sold the rich ores only, leaving the poorer as halvans or refuse, or that the ores found near the surface were the richest, and as the mines became deeper, so their ores became poorer. I incline rather to the former opinion, inasmuch as, at Alfred Consols, the ores appear to be richest at the deepest levels.

SILVER AND LEAD.

The returns of lead and tin have also increased in proportion. In 1835, Cornwall yielded only 140 tons of lead ore; since which one mine, the East Wheal Rose, has returned as much as 6,000 tons, and although this mine's produce has fallen off, others more than make up the deficiency. The returns of lead ore raised in England for the year 1852 were 62,411 tons 9 cwt., yielding 43,813 tons 7½ cwts. of lead; Wales, 18,379 tons of ore, yielding 13,708 tons of lead; Ireland, 4,493 tons 14 cwts. of ore, yielding 3,222 tons 18 cwts. of lead; Scotland, 3,499 tons of ore, yielding 2,381 tons 7 cwts. of lead; Isle of Man, 2,415 tons of ore, and 1,835 tons 5 cwts. of lead: total, 91,498 tons of ore, and 64,960 tons of lead. Of the above quantities, Cornwall produced 8,998 tons 14 cwts. of ore, which yielded 6,220 tons of lead, and 250,008 *ounces of silver*, the average being 35 ozs. per ton, and the silver realized, at 5*s.* per ounce, £62,502. Devonshire yielded 2,921 tons 19 cwts. of lead ore, 1,873 tons 11 cwts. of lead, and 91,340 ozs. of silver, the latter realizing £22,835. The average produce of silver in the lead of Devonshire is 40 ozs. to the ton, the highest average of any county in England, Ireland, or Scotland. The total quantity of silver produced from the lead mines of Great Britain and Ireland in 1852 was 818,325 ozs., yielding, at 5*s.* per oz., £205,080. In regard to tin, the produce of black tin, from the reigns of Charles I. to George I., averaged 1,500 tons annually. From 1750 to 1837, 2,500 to 3,500 tons. The present returns I should think more than double the latter quantity. I have given enough, however, to show the great importance of the mining interest, although based, as it is necessarily, upon speculation.

I do not remember in any one year such great and frequent fluctuations in the value of mining property as we have had in the year 1853. In the early part of it we had a period of great success amongst the productive mines, a state of excitement in the market for all descriptions of shares, and a run of high prices for dividend stocks; and the latter, if not the former, has continued to the end. Almost anything, too, in the shape of a new mine would sell at a premium; and it may be supposed, without any great stretch of the imagination, that the market was well supplied with speculations, all of them of "the greatest promise," so long as the furor lasted, but few of which survived the effects of the panic, brought on by over-speculation in the first instance, and made worse at last by wars and rumors of wars in the East. So great was the dread during the latter period of holding speculative property, which was liable to calls, that many shares, which bore good premiums a few months before, were given away, when parties could be found to take the risk. The calls upon the new shares, as well as the old, were ruinously heavy, and parties were disheartened from paying at all when they found that no sooner had they paid one, than their shares were depreciated in value at once, fully to the extent of the call so paid.

At the close of 1852, a great impetus had been given to mining by the high price of copper, the standard being then £132, at a produce of 7¼. On Jan. 13th it rose to £152 5*s*., with a produce of 6⅞ per cent. On the 27th of the same month it reached £164 14*s*., with a produce of 5⅞, this being the highest standard for many years.* The price kept up pretty well for a few months, and the mines made large profits. Even the refuse ore, which had been laying upon the mines for years as valueless, was sold at a profit, and many new bargains, too, were set in mines which would not previously pay for working. It is scarcely to be wondered at, therefore, that larger dividends were declared than had ever before been paid. About March, copper began to fall; in April, the standard had receded to £130 10*s*., produce 6⅝; May 12th, £118 17*s*., produce 6⅛; and on the 19th, £113 7*s*., produce 7¼, this being the lowest point. After a time it slightly recovered, although it remained low for some months, but in October and November it made a decided advance, and has now reached £148 14*s*., produce 6⅞ (December 22).

I am thus particular in noticing the fluctuations in the price of copper ores, as they bear such an important—I might say, the most important—relation to the prosperity of our largest mines. A low standard, with high prices for materials and labor, would be ruinous to many; but, looking at the fact that in the early part of the year most of the refuse ores were sold, and that at many of the mines the reserves were touched, owing

* The highest standard on record was in 1805—viz., £169 16*s*., produce 7⅛.

to the high price obtainable, and now that the supply of ores is much smaller, and likely to continue so, the chances are in favor of a still greater rise in copper. It was remarked, as a rather peculiar feature, at the time the standard for the copper in the ore was so high, that the smelted article did not bear a proportionate price, and many opinions were afloat as to the cause of the difference, the most general being, that the monopoly of smelters wished to drive a few of the small buyers from the market, and in this they appear to have partially succeeded. The monopolists, when they have the whole market in their own hands, raise or lower the price of ore as they feel disposed, and great complaints have been continually made as to the unfair prices obtained by the mines for their produce. During the past year, several plans have been proposed for the formation of a miners' and consumers' smelting company, but nothing at present has come of it, although, if properly carried out and properly managed, it is estimated that it would pay enormously, and be a great boon to the mining interests of Cornwall.

The price of lead and tin fluctuated with the price of copper; but now, I am glad to say, we have a good and remunerating price for all metals, and as both labor and materials are somewhat cheaper, the new year will commence with good prospects for the productive mines.

DIVIDENDS OF 1858.

The dividends this year (always the best part of mining) have been unusually large, and in the following table will be seen the amount paid by each mine from the first of January to the 31st December, 1858, in comparison with those paid in 1852:—

BRITISH MINES.

Name of mine.	Amount paid.	Market value.	Dividend per share.	Total in 1858.	Dividends in 1852.	Increase in 1858.	Dec. 1858.
Devon Gt. Cons.	£1	£430	£68½	£65,024	£46,080	£15,944	£ —
Wheal Buller .	. 5	1000	177½	45,440	24,960	20,480	—
Wheal Basset .	. 10½	625	120	30,720	21,760	8,960	—
Alfred Consols .	2½	25	£4 1	20,736	16,128	4,608	—
United Mines .	. 40	210	22	11,600	5,600	6,000	—
South Frances	. 70	226	24½	6,076	6,696	—	620
Carn Brea . .	. 15	50	10	10,000	6,000	4,000	—
North Pool .	. 22½	130	30	6,000	7,000	—	—
North Basset .	. —	10	1	6,000	1,500	4,500	—
West Caradon	. 20	250	41	10,496	7,424	3,072	—
South Caradon	. 2½	370	25	6,400	1,250	5,116	—
Trelawny . .	. —	40	10	5,200	—	5,200	—
Botallack .	.132	400	45	6,000	2,550	3,450	—
West Providence	5	40	6½	6,656	10,752	—	4096
South Tamar .	. 1½	4	½	7,875	4,500	3,375	—
Phoenix. . .	. 30	750	—	10,000	10,000	—	—
Condurrow .	. 20	150	18	4,668	6,079	1,386	—
Bedford United .	2½	7	£1 8	4,700	4,000	700	—
South Tolgus.	. 16	140	9	2,504	7,168	—	4664
Ballewidden.	. 11	10½	£1 11 6	2,367 16	1,548	—	—
Wheal Owles	. 70	520	30½	4,040	£996 16	£3,043 4	—

BRITISH MINES, CONTINUED.

Name of mine.	Amount paid.	Market value.	Dividend per share.	Total in 1859.	Dividends in 1858.	Increase in 1859.	Dec. 1859.
Par Consols	1½	9	¼	4,800	15,360	—	10,560
North Roskear	5½	125	17	2,380	910	1,470	—
Wh. Friendship	128	105	28	3,584	1,024	2,560	—
Wheal Seton	107	200	17	3,366	5,346	—	1980
Polberro	—	—	3½	3,250	1,377	1,873	—
Great Work	100	165	17½	2,082½	3,451	—	1368½
Tremayne	9¾	12	1	1,042	3,328	—	2286
Trebane	1¾	9	2	2,048	128	1,920	—
Tincroft	7	6	10s. 6d.	3,150	3,150	—	—
Wheal Jane	8	30	5	1,792	256	1,546	—
Dolcoath	257	79	14½	2,595	—	2,595	—
Trumpet Cons.	95	150	15	1,500	2,000	—	—
Bat Holes	1¾	2	¼	2,500	—	—	—
Drake Walls	7¾	2	¼	960	640	—	—
Marke Valley	4¼	5	¼	750	—	750	—
Mendip Hills	8¼	8	¼	2,500	—	2,500	—
West Treasury	10¼	4	1	1,024	—	1,024	—
Herodsfoot	8¾	10	1½	1,920	—	1,920	—
Exmouth	4¾	9	½	1,070	1,605	—	—
Mary Ann	5	45	3½	1,729	1,024	—	—
Treviskey &c.	180	35	4½	740	4,770	—	4030
Levant	9¾	150	2	320	320	—	—
Providence	20	35	1½	640	—	640	—
St. Ives Consols	80	125	5	470	1,274	—	—
Spearne Consols	1½	8	3s. 6d.	[illegible]	[illegible]	—	1280
Rix Hill	6¾	8½	8s.	779	389	—	—
Wheal Clifford	—	150	2½	568¾	£260 10	—	—
Wheal Proctor	—	—	1s.	320	—	320	—
Wheal James	—	¼	2s.	600	—	600	—
Bosweddin	—	20	5	620	—	620	—
Wheal Lovel	38	50	2½	1,075	4,300	—	3224
Trelyon Consols	7	27	¼	429	—	429	—
Wh. Margaret	79	105	8½	952	392	560	—
Wt. Darlington	12½	6½	¼	256	—	—	—
Peak United	7½	15	1	500	—	500	—
Great Leisure	—	—	¼	256	—	256	—
Trewetha	2¾	4	¼	1,000	—	1,000	—
Wheal Arthur	9	31	¼	614	—	614	—
Eyam Mines	8½	15	5½	1,700	—	—	—
Total					£629,014 18s. 6d.		

SCOTCH MINES.

Name of mine.	Amount paid.	Market value.	Dividend per share.	Total in 1859.	Dividends in 1858.	Increase in 1859.	Dec. 1859.
Black Craig	—	1½	½	625	—	—	—
Kirkcudbright	—	4	½	589	—	—	—
Total						£1,214.	

WELSH AND OTHER MINES.

Name of mine.	Amount paid.	Market value.	Dividend per share.	Total in 1859.	Dividends in 1858.	Increase in 1859.	Dec. 1859.
Lisburne	75	—	37½	15,000	9,000	6,000	—
Merllyn	3½	2	[illegible]	2,250	[illegible]	—	3250
Cwmystwith	60	150	15	1,920	—	—	—
East Darren	28	92½	2	[illegible]	600	—	—
Blaenavon	—	—	1	8,000	—	—	—
Nantlle Vale	—	—	1s. 6d.	925	—	—	—
Wrysgan	1	¼	1s.	750	—	—	—
Total						£39,445.	

IRISH MINES.

Name of mine.	Amount paid.	Market value.	Dividend per share.	Total in 1859.	Dividends in 1858.	Increase in 1859.	Dec. 1859.
Wicklow Cop	—	—	2½	13,750	12,500	—	—
Luckamore	—	—	1s.	1,000	—	1,000	—
Newtownards	—	—	8s.	3,760	—	3,760	—
Kenmare	—	—	1s. 6d.	1,500	—	1,500	—
Dhurode	—	—	2s. 8d.	£2,666 13 4	—	£2,666 13 4	—
Total					22,676 13s. 4d.		

FOREIGN MINES.

Mines.	Per share.			Amount.		
Cobre	£6	0	0	£7[illegible],000	0	0
St. John del Rey	4	0	0	44,000	0	0
Mariquita	0	8	0	10,000	0	0
General Mining Association	0	10	0	10,000	0	0
Mexican and South American	0	12	6	12,[illegible]	0	0
Linares	1	3	0	10,750	0	0
Alten Mining Association	0	15	0	[illegible]	0	0
United Mexican	0	4	0	8,6[illegible]4	0	0
Oberahof	0	1	0	1,500	0	0
Total				£173,134	0	0

GRAND TOTAL.

British Mines	£329,014	18	6
Foreign	173,134	0	0
Irish	22,676	13	4
Scotch	1,214	0	0
Welsh	29,445	0	0
Total	£556,484	11	10

For the sake of comparison, I give the dividends from profits paid in British mines since 1845:—

Year ending 1845, in 18 mines	£215,450
" 1846, in 28 "	158,[illegible]
" 1847, in 30 "	155,[illegible]1
" 1848, in 22 "	1[illegible],[illegible]24
" 1849, in 38 "	1[illegible]3,741
" 1850, in 42 "	214,[illegible]
" 1851, in 45 "	216,1[illegible]6
" 1852, in 50 "	261,[illegible]67
" 1853, in 60 "	329,014

From the above list, we find that the dividends paid this year on 60 mines amount to £329,014 18*s.* 6*d.*, and exceeds the sum paid in any other year since 1845 by £67,747. Two mines alone (Devon Consols and Buller) have paid this year £110,464, and Basset £30,720: these three making together more than was paid by 22 mines in 1848, although in that year East Rose paid £25,500, and this year the latter mine has not paid any profit, but has been making calls for extra machinery. Some years East Rose paid as much as £50,000 a year profit, and divided altogether nearly £500,000.

DISCOVERIES OF 1853.

We have not had many wonderful discoveries this year; in fact, we had been singularly barren in discoveries at all, in the way of rich deposits of either lead, tin, or copper, until the last few days, when a discovery, said to be of great value, was made at Sortridge Consols, near Tavistock, and the mine rose to £24,000 premium in a few days. A fine lode is said to have been met with at Pendeen also; this latter mine being in St. Just. Last year we had the Hot Lode at United, which sent up shares from £40 to £450 each; but both the heat of the lode and the ardor of the shareholders have since considerably abated. The mine, however, has divided £11,600 profit during the last twelve months, and is reported as looking as well as it has ever done.

The fluctuations in the prices of shares have been very great. United Mines, which this time last year had risen from £35 per 400th to £175, have receded to £210; Basset, risen from £525 to £650; Buller, from £800 to £1100; West Caradon, from £200 to £250; South Caradon, from £140 to £400; Alfred Consols, from £13 to £28, and now £25. Tremayne fell from £35 to £7, and then rose to £12; West Providence dropped from £57 to £32, and then rose to £40; South Tolgus receded from £250 to £125, and then rose to £140; Boscean rose from £20 to £120; Black Craig down from £4 to £1 5s.; Treviskey down from £120 to £35; West Alfred Consols down from £38 to £8, and then up to £20; Great Baldern down from £4 10s. to 10s., and then up to £1 5s.; Cupid down from £14 to £5; East Rose down from £250 to £80; Mary Ann up from £30 to £45; Condurrow, from £100 to £130; Tincroft, down from £11 to £6; West Frances, from £10 to £30; Bedford, £6 to £10. Among the smaller fry, and especially the new mines, which bore high premiums on coming out, the fall has in many instances been from pounds to pence.

At Wheal Unity, a striking instance of the sudden changes which sometimes take place in mining has lately occurred. In all the workings, from a considerable distance east and west of the engine-shaft, and down to the depth of 82 fms., with the exception of an occasional bunch of copper ore, nothing but poor arsenical tin was found, leaving a monthly loss to the adventurers. Still, from the first, expectations were entertained that eastward, and towards the Clowance caunter lode, a regular copper deposit would be met with. This expectation was strengthened by the opinion of several eminent miners of the neighborhood. Notwithstanding this, however, several shareholders resolved to throw up their shares, leaving little more than half the original number to proceed with the undertaking. A few weeks since, after passing a second cross-course, the lode eastward totally changed; and in the 30 fm. level, which is 20 fms. ahead of any other, became productive for copper, and was worth, when last reported on, £30 per fathom. The improvement continues. A sampling of 40 tons has taken place, and sanguine hopes are entertained that the concern will soon become a profitable undertaking.

Last year, speaking of the Camborne district, I referred to the expectation that Dolcoath, the oldest mine in Cornwall, and which has been worked for upwards of a century, and yielded nearly £2,000,000 worth of copper, would again pay profits; and the mine has done so to the amount of £2,595.

FOREIGN MINES.

The Imperial Brazilian Mining Association was established in 1825—the shares being issued at £5 prem. There were 10,000 shares, of £25 paid, equal to £250,000. In ten years the association extracted from its mines 35,000 pounds' weight of gold, and has paid to its shareholders to the present period £380,000, besides paying £354,000 to the Brazilian Government as duty. The duty has just been abolished.

This association, independent of its reserved fund, establishments, etc., possesses nearly thirty square miles of the richest land in the world, in a climate perfectly salubrious from its elevation above the level of the sea; and prosperity appears now returning to this old mining company under the auspices of Mr. Duval, who was several years chief commissioner in the Brazils, and during whose administration the concern was so highly remunerative. New life has been diffused into every department, the returns of gold have considerably increased, and the development of the Camara lode leads to the most sanguine anticipations.

The Company having decided to dispose of such portions of their landed property as they do *not utilize*, are now endeavoring to sell two estates, containing together 6,000 acres, comprising two valuable mines, "Antonio Pereira" and "Catta Preta." The price asked is £20,000; and in the event of it being obtained, it will be distributed as a bonus on the shares—viz., £2 each share.

The Linares Mining Company has this year divided £7,500 profit, and have a large accumulation of lead on the mines.

The New Linares Company was started early in this year, for the purpose of working eight concessions of valuable lead mines in the immediate neighborhood of the Linares; and from the latest reports, the most favorable results are anticipated, especially at San Roque, where the lode in the 20 fm. level is yielding 2½ tons of lead per fm.; and a winze sinking below, 5 tons per fm.

The San Fernando Mines, in the district of Linares, have just been introduced to the public. The present returns of the mines are 250 tons of lead ore per month. The smelting furnaces, with Patterson's desilvering pans, etc., all in full operation, are calculated to smelt 400 tons of lead monthly. A contract for 2,000 tons of lead has been executed for Messrs. De Rothschild, of Paris, and a further contract entered into for the delivery to them of 4,000 tons. The Company at present pays the shareholders 12 per cent.

GOLD MINING IN ENGLAND.

In the year 1851 we had a mania for gold mining in California, in 1852 for gold mining in Australia; and calculating the premiums at which shares were sold, I am within bounds, when I state that £3,000,000 sterling, at least, have been spent by John Bull during the gold fever, of which, I calculate, he will see but little again. This time last year, six Australian companies represented a market value of £1,285,000; seven Californian companies, £1,415,000.

There is no denying that gold has lately been found in different gossan, and iron ores, and quartz rocks, and in larger quantities than found in many of the Brazilian mines; and we could not well close without referring to a matter, the event of which upon our commercial relations it is impossible to foresee. Lord Bacon says, "There are, moreover, inventions which render it probable that men may pass over and hurry by the most noble discoveries which lie immediately before them. It appears at first incredible that any such should be made: and when made, appears incredible, again, that it should have so long evaded notice; but when error is so fundamental that it leads men, not so much to think falsely as not to think at all, it is by no means strange that what was never sought should never have been found.

And there are many now who disbelieve the existence of gold in England, although testimony the most positive has been produced to prove it. Whether or not, however, it can be found in sufficient quantities to pay the enormous profits calculated by many excited individuals, is a question I shall refer to hereafter. In the mean while, it may be as well to trace the history of gold in England; and in doing so, we find the most indubitable testimony that at the earliest periods gold abounded in this country; and this in a great measure tends to explain the remarkable series of invasions continued from time to time, by one nation and another, during 1000 years, and which in showing the abundance of the precious metals as one of their main incentives, throws additional light on the whole introductory period of our annals, while the records of history they further maintain are confirmed by various antiquarian relics of indisputable origin. In the reign of Edward III. commenced a list of legislative enactments, that sufficiently attested the presence, and obstructed the development, of gold in England. In the 34th year of the reign of this king, a writ was issued to John Jugg, and Henry of Wisbeach, as follows:—"Whereas, we are informed that certain mines of lead, mixed with gold and lead ore, are found in the county of Salop, we will that the Barons of the Exchequer and the Treasurer may be certified of the manner of finding the said mines, and whether any metals hath been transported, and by whom." (Sir John Pettus's *Fodinæ Regales*, p. 34.) Henry IV., by writ of mandamus, dated 11th May, in the second year of his reign, commands Walter Fitzwalter, upon information of a concealed mine of gold, in Essex, to "bring all

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ON THE GOLD-
STATES.

MINES, VIRGINIA.

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The country around is of a
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mill, with a powerful engine, 72 stamps have
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shed by the pumps from below. The amalgama-
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t a considerable amount of gold must remain in the
and an examination of them justified our conviction.
quantities of tailings are spread over the ground, and
them are the result of the rude workings of former
Now the iron pyrites, having been exposed to the action
tmospheric agents, have partly become decomposed; we are,
erefore, satisfied that it would pay handsomely to work them
over again, by the use of Chilian or drag mills.

Since the beginning of the present year, the Company has employed about one hundred hands, forty of whom are working underground. These mines are now under the superintendence of Captain Thomas Phillips, a gentleman of long experience in gold mining operations; we anticipate that their prosperity may be such as to induce English capitalists to augment their investments in our mineral regions.

THE BUCKINGHAM AND THE ELDRIDGE MINES, VIRGINIA.

These two mines, situated only a few miles from the Garnett and Moseley, are, nevertheless, of quite a distinct character. They are both on one vein, upon adjoining properties, and underground are connected by a gallery, although belonging to two different parties.

The vein has a course 25° E., and an inclination of 75° N. W.; it is from 10 to 15 feet wide, increasing in depth, and of a truly promising character. There are extensive surface excavations on the course of the vein, which the former owners of the properties worked out to a depth of from 20 to 40 feet, where the slate was become hard and solid on account of the uncomposed auriferous pyrites in it. The "soft ore," taken from those holes, and also the ore raised from the shafts, was said to have yielded from fifty cents' to five dollars' worth of gold per bushel. In one pit we found several specimens of fibrous (asbestiform) such persons as he in his judgment thinks fit, that do conceal the said mines, and bring them before the king and his council." It is stated also by Sir J. Pettus, in his *Fodinæ Regales*, that Cunobeline, Prince of the Trinobantes, coined at Camelodunum gold obtained from a mine in Essex.

After 350 years, the ruinous effects of these enactments on mining enterprise rendered their continuance in the statute-book so insufferable that they were repealed in the reign of William and Mary; and here the curtain may be said to have dropped on the affair as a matter of public recognition and national pursuit. There were no essential reasons, however, for this result; but it is to be accounted for by the exclusive attention afterwards devoted to the inferior and more accessible metals, in the visionary notions entertained by alchemists, and in the imperfect assistance afforded by metallurgy. Here we shall find the causes of that profound oblivion, under the influence of which—soon stealing over the human intellect, soon drowning the past in the present—the indigenous existence of British gold sounds as a fable or a dream

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Art. III.—EXAMINATIONS AND EXPLORATIONS ON THE GOLD-BEARING BELTS OF THE ATLANTIC STATES.

THE GARNETT AND MOSELEY MINES, VIRGINIA.

Recently we visited the mining district of Buckingham county, Virginia, south of the James river. A singular geological feature, called the Willis's mountain, characterizes this section of country, and the volcanic convulsion, by which it was produced, seems to have been the cause of the richness and superiority of several mines in its neighborhood. The country around is of a remarkably metalliferous appearance, and numerous indications of veins are met with on the surface.

The Garnett and Moseley mines,* located within two or three miles of the Willis's mountain, are now owned by an English company, and worked more extensively than most other mines in Virginia. The property contains about 1,600 acres, and there are five or six different veins on it, two of them being explored by a number of shafts and excavations for nearly half a mile. The main vein, which is now chiefly worked, runs N. 35° E., and is from 14 to 16 feet wide, with a dip of about 40° to S. E.; the other running parallel with the main vein, at a distance of 30 or

* As a detailed report on these mines was given in No. 2, Vol. I., of the Mining Magazine, we shall confine ourselves to some additional remarks, and refer to said report for particulars.

40 feet on the surface, is from 10 to 12 feet wide, and dips about 85 S. E., so that both veins will unite and form one lode.

The bulk of the ore consists of auriferous pyrites, which abundantly impregnates a hard metamorphic slate; but there are also rich portions of quartz interspersed throughout the vein, which contain native gold in numerous grains and spangles, and sometimes in pieces of considerable size, furnishing specimens of great value. Copper is met with only in braces. The main shaft is 115 feet in depth; the galleries extend to about 400 feet, and a good deal of stoping work has been done. For crushing the ore, 24 stamps have heretofore been employed; but since the erection of a new mill, with a powerful engine, 72 stamps have been in operation. A sufficient supply of water for stamps and boilers is furnished by the pumps from below. The amalgamation is performed on two sets of shaking tables. As the ore passes through the mill without being roasted, it is reasonable to expect that a considerable amount of gold must remain in the tailings, and an examination of them justified our conviction.

Vast quantities of tailings are spread over the ground, and most of them are the result of the rude workings of former years. Now the iron pyrites, having been exposed to the action of atmospheric agents, have partly become decomposed; we are, therefore, satisfied that it would pay handsomely to work them over again, by the use of Chilian or drag mills.

Since the beginning of the present year, the Company has employed about one hundred hands, forty of whom are working underground. These mines are now under the superintendence of Captain Thomas Phillips, a gentleman of long experience in gold mining operations; we anticipate that their prosperity may be such as to induce English capitalists to augment their investments in our mineral regions.

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The vein has a course 25° E., and an inclination of 75° N. W.; it is from 10 to 15 feet wide, increasing in depth, and of a truly promising character. There are extensive surface excavations on the course of the vein, which the former owners of the properties worked out to a depth of from 20 to 40 feet, where the slate was become hard and solid on account of the uncomposed auriferous pyrites in it. The "soft ore," taken from those holes, and also the ore raised from the shafts, was said to have yielded from fifty cents' to five dollars' worth of gold per bushel. In one pit we found several specimens of fibrous (asbestiform) actinolite. Fifty or sixty feet from the surface, in some parts of the vein, the iron pyrites are already strongly intermixed with copper pyrites, and at a depth of less than a hundred feet a fine copper ore makes its appearance, accompanied by a rich brown and blackish gold-bearing gossan, while auriferous pyrites still continue in abundance. Specular iron of a great variety, in form and color, is frequently met with. There were shown to us pretty specimens of heavy spar (sulphate of barytes) and talcite, taken also from these mines.

Several shafts have been sunk on both mines, from 70 to 160 feet in depth, and galleries driven to some extent on the vein. At the Buckingham Mine the main shaft is now being sunk to a depth of about 200 feet; and a steam-engine of 40-horse power is to be set up, and also a set of 24 stamps, shaking tables, and other machinery. The owners of the Eldridge Mine are likewise making improvements in machinery, and prosecuting the development of their valuable lode.

Both mines will, at present, chiefly be worked for gold, and they give good promise to pay well with proper management. The ores, even by being treated in the manner intended, will, without doubt, yield a handsome per centage. At a depth of 250 or 300 feet, we anticipate that a good copper lode will be made, and compel interested parties, to their advantage, for the future to make gold by means of copper.

The same vein, on which the Buckingham and the Eldridge mines are located, we traced into the adjacent plantation of Thomas Eldridge, Esq., and thus found three other parallel veins on these lands, which had partly been explored by a number of pits and cuts, and were said to have yielded gold wherever they had been tested. The surface appearances indicate that there are more veins, yet undeveloped, on the same property, which contains about 250 acres. There is also a fine water-power, which has been employed for driving a mill, wherein Mr. Eldridge, the former owner of the Eldridge Mine, for about 15 years worked all the ores taken from that mine, and at least 200,000 bushels of tailings are lying on the ground, which might now be worked over again, in a proper manner, to great advantage. This valuable mining tract, we understand, has lately been secured by an enterprising gentleman of New York; and as there is scarcely a chance to embark in mining operations with more safety than at this place, one vein on it being largely proved by the explorations of two neighboring mines, we expect that another will soon be added to the already well-established mines in this part of Virginia.

THE RHEA MINE, NORTH CAROLINA.

The land upon which this mine is located, which consists of 575 acres, is about nine miles from Charlotte, and with the

Oatha mine forms the property of the Mecklenburg Gold and Copper Company. Charlotte is a rapidly-growing town, in the centre of a rich mining district, which is now connected by railroad with Wilmington, North Carolina, and Charleston, South Carolina, to which will soon be added a direct railroad communication to Richmond and Norfolk, Virginia.

With respect to the geological formation of this locality it is only necessary to state, that it is within the limits of the second metalliferous belt crossing the State; the nature of which has been sufficiently set forth by others.

On this property there is a cluster of veins, three of which (No. I., A B C) are sufficiently developed to show the following courses:—A., N. 65° E.; B., N. 62° E.; C., N. 70° E. They are vertical, and run through the property for a distance of about 1,900 feet. Veins A and B form a junction within its limits.

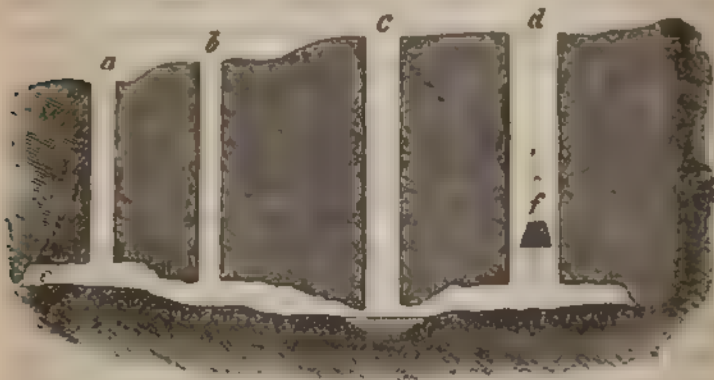
Besides this cluster, there are two other veins. One (No. II.) running N. 60° E., crosses the property in its centre, for about 9,900 feet in length. This vein has been extensively worked by numerous surface diggings between the vein walls, with an average width of 18 inches. Several shafts have also been sunk in this vein, and abandoned on account of the prevalence of copper ore, of which specimens may be found in the refuse, near an old whim shaft. A former owner of this property stated that large sums had been realized from the surface workings at different periods, and there is sufficient "soft ore" still remaining to be highly remunerative, if worked with suitable machinery. The walls of this vein, being vertical, are visible in many places to a depth of from 10 to 20 feet. They are well defined, leaving no doubt as to their permanency, and I am of opinion that a more extensive exploration would develop a copper lode, which must increase in depth, and may be depended upon. At a short distance south-east of this vein, there is a small parallel vein, on which two openings have been made, and it was stated that a rich "brown gold ore" had been obtained there.

Vein No. III., on the south-east side of the tract, runs N. 60° E. about 1,050 feet through the property. It was formerly worked for gold by a shaft and adit level, and also by several surface diggings. The yield of the ore is reported to have averaged $3 to the bushel. On examination of this vein I found very handsome specimens of copper ore obtained from the bottom of the shaft, which, in connection with other indications, justifies the conclusion that this also will prove a rich and reliable copper lode.

There are numerous indications of other veins yet unexplored on the property.

All former operations have been exclusively directed to the production of gold, and it is stated that the ore taken from the backs of the veins has yielded from $1 to $5 per bushel, with very imperfect machinery for its extraction, and frequently a larger amount has been obtained. This ore must still be very abundant to a depth of 30 to 50 feet, where carbonate (malachite) and sulphuret of copper begin to predominate. The sulphuret of copper is of a superior quality, and will be the reliable treasure of these veins.

The present mining operations on this property are confined to veins A and B of cluster No. 1. On vein A the excavations have been most extensive, and the ore is taken out between the walls to the depth of 50 or 60 feet, and about 130 feet in length. The aperture has been partially timbered and filled, leaving a communication with four shafts which have been constructed in it. At this place the Company commenced their operations, the progress of which will be more fully understood by reference to the following engraving.



a. Present working shaft, 43 feet,
b. Ladder shaft, 34 feet,
c. Whim shaft, 43 feet,
d. Old shaft, 60 feet,
e. New gallery.
f. Cross cut, 10 feet long.

They are now driving a gallery in a south-western direction on the vein, where it presents a very promising appearance, and yields a handsome supply of copper ore intermingled with gold. They have also commenced extending the working shaft, with the intention of sinking it to the depth of 300 feet. The plan of operations adopted is to follow vein A by the gallery to its junction with vein B, where another shaft will be sunk. On vein B operations have also been commenced, by sinking a whim shaft to the depth of 100 feet. This is nearly completed.

Upon the property there is an abundant supply of wood and water for working the mine and its ores.

THE CATHA MINE.

This mining property, consisting of 120 acres, is about five miles from Charlotte, and within one mile of a plank road.

There are two veins partially explored. The principal one runs N. 65° E., with a dip of 45° to the S. E., and yields, at a depth of about 20 feet, a rich "gold gossan," and shows a string of copper ore nearly one foot in thickness. Upon this vein a shaft is now being sunk, which is intended to strike the vein at a depth of about 60 feet. The other vein runs N. 55° W. Both will be found to unite not far from the present openings.

The prospects of the above mentioned Company are very flattering. Upon their properties there is, beyond doubt, an abundance of material for very extensive and highly remunerative operations. Two companies could advantageously be made of the one, and by division secure to each the energy they merit. The directors state that an engine and suitable machinery is on its way to the mines, and they hope to put it in operation in about two months. With this and skilful management the stockholders must at an early period receive that earnest from their investment which is always acceptable, and confidently expected from all enterprises. The Company have been eminently successful in securing the services of Mr. James Richards as mining captain, as upon the competency of the manager depends the success of all mining enterprises.

THE HALE MINE, SOUTH CAROLINA.

The tract containing this mine was once celebrated as a vast deposit, whose treasures attracted hundreds of persons to obtain with ease a golden harvest far exceeding the hard-earned crops of their fields; then the picks sounded there, and the mills creaked, and human voices echoed through the solitude of the forests. This mine, however, suffered the same fate with many others in the Southern Districts—it was gradually abandoned; its name and reputation only survived in the memory of the public, while the statistics of the large amounts of gold derived from it can be found on record in the bank at Camden, S. C., a permanent witness of its richness. Strange as this fact appears, this mine affords, at the same time, the best key for explaining that seemingly secret fate, and shows evidently that mining is a business which, to be lasting, must be understood, and that the best mine can be made worthless to its owners by rude workings and the want of the necessary skill and knowledge. The Southern people worked their mines as they do their fields, from which they seek to get as much as possible without troubling themselves with improvements for future days, well knowing that they possess an abundance of untilled virgin soil to be cleared in place of that which may be worn out. But it is easier to find new soil than new and rich mines, and hence the decline, after a short-lived vigor, of mining enterprise in the Southern States, until Northern men entered the field and started upon the ruins of abandoned places new mining establishments, with that energy and skill which results from their habit of struggling with Nature for her treasure.

The Hale Mine is situated in Lancaster District, S. C., about twenty-five miles north of Camden, on the route to Monroe, N. C., and eighteen miles from Lancaster village. The mining tract is said to contain one thousand eight hundred acres; it forms nearly a parallelogram, and was separated from a larger plantation with special regard to the mineral veins and conveniences for mining operations on it. The ground is broken and forms two ridges, each of them carrying a vein lengthways through the property, which covers their extent for about two miles. Both veins bear a course of N. 55° E., and run about two hundred yards distant from each other. They are crossed by two trappean dikes in a direction of north-west and south-east. There are regular outcroppings of a third vein along the north-western slope of the ridge, on the south-east side of the property. This vein has not yet been explored, and we feel inclined to believe that it is no independent one, but will unite in depth with the main vein embraced by that ridge.

A creek, with a fair supply of water, runs through these lands, and it was in one of its branches, which crosses the north-west vein in its course, where, in the year 1827, Benjamin Hale discovered the first gold on his property. For the next years following the search for that precious metal was confined to washing the banks and bottom of this branch and the lower end of the creek, until, in 1832, gold was found on the back of the vein south-west of the branch, where the first pits were then dug. Soon afterwards Evans, a relative of Hale, opened the same vein on the other side of the branch, on an elevation called Chase Hill, being guided by washing the surface, which is said to have yielded there fifty pennyweights per bushel. Much working was done for more than half a mile on the course of this vein and considerable gold was obtained from a number of pits dug there. Encouraged by such results, they soon extended their search over the other ridge, and gold was also discovered on the back of the south-east vein, just at that point where it is intersected by a cross-dike and where explorations could be expected to become highly remunerative. And in fact the extreme richness of this place, as well as the facilities offered to their rude workings, by its being elevated about sixty feet above water level, soon made it the centre of operations, and here the most extensive diggings and also the slight beginnings of systematical mining have taken place. The circumstances and conditions under which this mine was then wrought, deserve here a particular notice, as they caused partly the ruinous way of exploring which was adopted, and account for the final abandonment of a mine of inexhaustible wealth and productiveness.

Mr. Hale permitted any individual or party to work independently on a distinct portion of the veins on his lands, under the stipulation that they should deliver to him, every twenty-one days, all the gold they might collect, for which he paid them sixty cents per pennyweight. The real value of it was from ninety to ninety-three cents. He gave no mining leases for certain periods, and kept himself at liberty to dismiss parties at any time he found them guilty of violating his regulations. The chances offered by such an arrangement drew people from all quarters to the Hale Mine, and numbers, varying at different times from fifty hands up to several hundreds, were gathered there in search of gold. The place above mentioned, on the southeast vein, about the cross-dike, presenting peculiar attractions; the ground there, on the back of the vein, was laid out in lots of six feet square, each lot of which was worked on by separate parties. The result of their diggings was several large holes extending down to water level and exhibiting now the appearance of open quarries, one of which is about two hundred feet long and from forty to fifty feet wide. There are also extensive cavities hollowed out under the surface ground, which remained—places looking rather dangerous for workmen. Most of the stuff dug out from those holes has been worked and yielded gold, at different spots, though of different rates. Near the cross-dike, pockets of an extraordinary richness were frequently met with, a week's labor there sometimes affording a fortune in return. Those who were favored by finding a "leader" or "feeder" on their lot, became also richly remunerated for their exertions, while those who by chance got their lot on the back of a "horse" or a "capel" were less prosperous.

The vein, in these excavations, has been explored to a width of about forty-five feet near the surface, and twenty feet on the bottom, and is chiefly composed of three big branches. By the intersection of the cross-dike the shape of this monstrous vein has there become somewhat irregular, but much less so than it is usual under similar circumstances. The foot-leader which bears, south of the cross-dike, a course of N. 40° E., shows an average dip of 65° N. W., and is, at a depth of about twenty feet from the surface, twelve feet wide. Between this and the next branch, which dips 70° N. W. and has a width of eighteen inches or two feet, there is a mass of ground from twenty to twenty-five feet wide, which is richly intermingled with pyrites, and is said to have yielded, by direct amalgamation, without washing, at least one pennyweight per bushel. But as the pyrites spoiled the mercury so much as to cause a loss of about half a pound of the latter in working five bushels of the stuff, an abundance of it was left remaining around the excavations, in heaps containing hundreds of thousands of bushels, waiting for a new and more perfect method of extracting the gold from it. The dead work represented by these masses shows for itself, that there must have been something very faulty in the operations performed at this mine, and indeed the greater amount of that stuff would never have been thrown out had it not been in consequence of such a rude manner of working that they were compelled to raise it. By extracting the ore from the leaders, and following them right down from the surface, in their sloping dip, they had always a hanging body of earth remaining over them, and to prevent the danger of its caving in upon them, they were obliged to remove it; or the earth, being to a depth of thirty or forty feet pretty soft, was washed down by heavy rains and filled up the diggings. The fruitless labor becoming necessary under such circumstances, and constantly embarrassing their operations, consumed, of course, a great deal of their gain, the more so as they worked deeper. Hence the number of hands at the mine became gradually reduced, and many of them returned to their cotton fields. A third leader to the lode of this vein was not sufficiently accessible to permit a close examination, but from the report of a miner, who formerly worked there underground, it bears a still greater inclination to the horizon than the other two, and unites with the next one a little under water level, where they form a lode from ten to twenty feet wide. As there are at least two other, and probably more, branches leading down, at a proper depth a lode of a most extraordinary size may be expected. It should here be mentioned that this vein, like many others in the same formations, exhibits, above water level, no solid walls, the whole of it, and also the adjoining country, being in a soft and decomposed state, and intermixed with auriferous pyrites or the results of their decomposition—a fact which frequently puzzles the practical miner, who is not acquainted with this kind of metalliferous deposits. As the former diggers got nearer the junction of the leaders, the ore became richer and richer, and they were so well remunerated as to attempt to continue their operations even below water level. Now the consequences of their faulty method of working began to be most seriously felt; wherever they dug down the spot became a cistern for all the water accumulating in the excavations. At this period Gustav Sider, a German miner, with remarkable good sense, run a tunnel, about two hundred feet from the hill side, near the creek, to the bottom of the largest excavation, which it enters fifty-four feet from the surface, for the purpose of draining this as well as the adjoining excavation, both being connected by a cut through the cross-dike, which had been left standing between them. Sloping galleries were now driven by several parties on the course of the vein, and their entrances secured by walls against the direct influx of water. But as there was no chance for draining by whims and buckets, they were compelled to resort to "bailing," and then abandoned the spot as soon as this work became too toilsome. We were informed that the ore in some places in those galleries yielded from thirty to fifty pennyweights per bushel, and that in one of them a quartz vein was struck, which was richly interspersed with native gold. It was also stated that another leader was cut by driving the tunnel. In the dry season an attempt was made to sink some shafts in the bottom of the excavations, and whims were erected on the top of the hill for draining and hoisting. One of the shafts was sunk sixteen and another twenty feet under water level. In a third shaft, which was sunk at the northwest corner of the largest excavation, and timbered down from the surface, the working of the mine, after being abandoned for several years, was recommenced, about three years ago, by Thomas Hale, a son of Benjamin Hale, who died in 1849. He had employed some English miners, and they sunk down to a depth of eighty-four feet from the surface, whence they drove a cross-cut southeast thirty feet, and another westward eighteen feet in length. All the stuff taken from these cuts was worked, and yielded well, and near the end of the longer one a string of "a yellowish green ore," about two inches thick, was struck, which, to use the expression of one of the miners who worked there, "was nearly all gold." Two short galleries were also driven from the shaft in opposite directions on the course of the vein. After eighteen months, however, the mine was again abandoned, on account of the inability of the miners to overcome the water by whims and buckets—a steam-engine being as yet a mere thing of imagination in this section of the country. If the stranger now approaches this lonesome spot, his ear is struck only by the call of a black boy to his mule, and the jarring sound of an old circular mill, wherein a man daily works a few bushels of tailings from a place at the lower part of the creek.

The gold-bearing rock of this mine is chiefly a hornblendic schist of various colors—gray, black, green, and yellowish. In some parts of the veins, talcose schist of a dark color is predominant. The (bluish) gray hornblendic and the talcose schists contain the gold in invisible particles, associated with iron pyrites; in the black, green and yellowish varieties which are the richest on gold, neither gold nor iron is visible, before the ore is pulverized and washed. There is also a white earthy rock of the lime and magnesia family, which yields gold, and demands a closer examination. Another rich ore, which is very compact, and changes from black into reddish brown and pale yellow, appears likewise worthy of investigation. The ore, in general, resembles mostly that of the Washington, Wiatt and Huey mines in Union county, N. C. It is of the richest and most reliable kind, improving in depth, and there is no fear or hope for an early intervention of copper.* Above water level

* The results of Analyses to be made on average samples from this mine, will be given hereafter.

the schist is soft and of paler colors, and sometimes stained with rust, in consequence of the decomposition of the auriferous pyrites. One of the leaders there, which is the "path of the lode," carries a cellular quartz, with a gold-bearing ferruginous clay (gossan). As already stated, the gold is not confined to the veins, but is also found in the gangue, and to some extent in the strata on either side, which presents in this region a change of the talcose state into feldspathic rocks.

In the early period of this mine the ore was worked by hand rockers near the creek. In 1837 a Frenchman, by the name of Gugnot, built the first mill. Soon after other mills were erected, and there have been eight or ten near the mine, and five upon neighboring plantations; most of them were circular mills with iron wheels, and some drag mills. At the lower part of the creek a dam was built, which is now broken up, and the greater part of the tailings settled in the pond, formed by the back water of the creek. They lie there in a bed from two to five feet or more in depth, covering several acres, and seem to amount to millions of bushels. We tried them by "panning" on the spot, and found more or less gold in them. If we consider that by the constant motion of the water the gold has had a fair chance to settle, and also that at the first mining operations the workings were of the rudest kind, and most of the gold was lost, it will be apparent that the under layers of these leadings must in some places be very rich. They deserve a thorough examination.

This extensive mining tract undoubtedly contains one of the richest natural gold deposits in the Atlantic States. Vast amounts of that precious metal, which all men are most desirous to obtain, lie there concealed in the bowels of the earth, and it is time that American enterprise and industry, with the wand of science, raise those treasures, so long left undeveloped through want of energy and knowledge. A. P.

Art. IV. THE LACKAWANNA COAL BASIN. ITS GEOLOGY AND MINING RESOURCES AROUND SCRANTON, PENN.—By Prof. Henry D. Rogers.

The valuable coal and iron-ore estate of the Delaware, Lackawanna, and Western Railroad, and Lackawanna Iron and Coal Company, at Scranton, a brief description of which I here propose to submit, is situated in the Lackawanna Valley, south-west of Cobb's and Leggett's Gaps, and east, south, and south-west of the village of Hyde Park, the town of Scranton being approximately in its centre. One portion of these lands lies outside, or to the south-east, of the natural boundary of the Lackawanna *coal field*; and this division, important chiefly for an extensive bed of excellent iron ore, and for its timber, is estimated to contain about 2,000 acres of surface. The other, and far more valuable part of the estate, embraces all the south-eastern side and central tracts of the coal basin, extending up the valley, north-east, to within a mile or so of the villages of Dunmore and Providence, and in the opposite direction, south-west, with some interruptions, two miles and a half from Scranton—its northern and north-western boundary being on the table-land north of the Lackawanna meadows. The amount of productive coal lands thus situated, belonging to the Companies, is estimated at about 3,000 acres. Before proceeding to a more special description of the *coals and ore beds* embraced within these estates, some brief preparatory general remarks on the geological features and structure of the Wyoming and Lackawanna Coal Basin seem called for, as tending the better to exhibit the relative position which the strata of this district occupy in the whole coal field.

GENERAL TOPOGRAPHICAL FEATURES.

Like the other anthracitic coal fields of Pennsylvania, this large and rich basin of the Lackawanna and north branch of the Susquehanna is surrounded by a double belt of mountain summits; but instead of that usually entire separation of the inner and the outer ridges, which is so conspicuous in the Pottsville, the Shamokin, and other coal valleys, the intervening deep narrow valley of red shale is here only a high, sloping platform, or bench, on the side of the exterior mountain, and the interior crest but a subordinate ridge or shoulder between this bench and the main valley. This feature in the encircling high lands, of a coalescing of the two parallel ridges into one mountain mass, grows more and more obvious as we advance north-eastward along the Wyoming and Lackawanna Basin, increasing as the soft shale formation which produces the valley between the ridges lessens in thickness, and as the dip of the strata—another influential condition—becomes progressively flatter. Towards the west end of the basin, where the easily excavated red shale, and the soft sandstones belonging to it, hold a thickness of several hundred feet, and where, moreover, the inclination of the strata is as steep as from thirty to forty-five degrees, we may discern from any high point, like those overlooking Solomon's Gap, the distinct division of the inclosing mountain into its two crests; but from Wilkesbarre, north-eastward, and especially between Pittston and Carbondale, where the shales thin down, and at last almost disappear, and the dip declines to no more than ten or twelve degrees, this separation grows to be very dimly defined, except just where, as in the upper valley of Stafford Meadow Brook, and its prolongations, the waters that have ploughed the surface have been assisted in cutting a deeper than ordinary longitudinal trough by the extra strength and keenness of current, imparted to them through the existence of transverse notches, promoting their rapid outflow.

The coal field, or trough of the coal containing strata, encompassed by this picturesque mountain rim, is a very elongated valley, some fifty miles in length, from Beech Grove to Carbondale, and not more than five miles wide in its broadest central portion, between Solomon's Gap and the entrance of the Susquehanna at Pittston. Its form is that of a very regular, symmetrical crescent, curving in its course as much as fifty degrees—the northern horn at Carbondale pointing nearly North twenty degrees East, while the western one, at Beech Grove, is directed only twenty degrees South of West. In its interior features, this valley is extremely diversified, and it is full of landscapes of uncommon beauty. From Pittston to Nanticoke, or between the points where the Susquehanna enters and leaves the basin, the northern half of the main bed of the valley is a wide, level, fertile plain, or low diluvial floor, watered by the tree-fringed river. A similar but narrower belt of low ground, underlaid in like manner with a deep deposit of drift or gravel, winds through the whole length of the upper north-eastern portion of the valley, or that occupied by the Lackawanna. Everywhere else between these river plains, and the flanks of the bounding mountains, and throughout the western end of the basin, its surface is undulated with a multitude of approximately parallel chains of hills and denuded ridges, which are sharp-crested, steep, and much ravined and cut, in nearly all the district between Beech Grove and Wilkesbarre, but show wider summits, and softer slopes and outlines, progressively, as we follow them in the direction of the Lackawanna and ascend this valley. This change of feature is very striking when we contrast the long, steep-sided, narrow-backed ridges from the south-western end of the valley to Solomon's Gap, with the wide, flat-topped, or gently sloping plateaus from the falls of the Lackawanna north-eastward to Carbondale.

GENERAL VIEW OF THE STRATA.

Taking now a comprehensive glance at the several rocky strata which surround and are embraced within the Wyoming and Lackawanna Basin, they will be found to constitute four distinct groups, differing in their positions, composition, and the value of their imbedded deposits.

1st. The first and lowest in the order of stratification, is a thick series of gray sandstones, occasionally pebbly, and including beds of shale. This outcrops high on the inner slope and summit of the outer broad mountain ridge of each border of the basin. The formation is several hundred feet in thickness, and is the lowest or oldest of our American carboniferous strata, but in this part of the mountain chain of the country contains no coal nor any notable amount of iron ore. It is called the Vespertine Series, in the nomenclature adopted by Professor Wm. B. Rogers and myself for the rocks of the Alleghanies. Some of the extreme south-eastern tracts of the Company's estate extend into this formation, where it forms the high mountain bordering the upper reach of the valley of Stafford Meadow Brook.

2d. Next in succession, overlying the previous set, and out-cropping to form the bench, or sometimes valley, which follows the inner slope of the outer or main mountain all round the coal basin, is a mixed group of strata, red shales in the inferior portion, gray sandstones and buff-colored slates in the middle, and a peculiar hone-like, very close-grained calcareous sandstone in the upper. Such is the character of this formation in the vicinity of Scranton, and elsewhere on the borders of the Lackawanna division of the basin, where its total average thickness does not amount to 350 feet, and where the red shale of the lower member of this mass is extremely thin, and in places altogether absent. But further south-westward, especially from Solomon's Gap to Beech Grove, the red shale assumes great relative bulk; and the middle and upper divisions, as at Nanticoke, are comparatively quite reduced—the whole formation being here from two to three times as thick as where it bounds the Lackawanna valley. It is among the layers of the lower or shale group of this formation that we encounter the interesting *calcareous iron ore* of the Stafford Meadow Valley, now extensively mined there on the Lackawanna Iron and Coal Company's lands, and largely smelted in the furnaces at Scranton. The whole formation is the Umbral Series of mine and my brother's classification, or the Middle Carboniferous formation. To the easily-worn nature of the shaly beds of this mass, contrasted with the far superior resisting power of the Vespertine sandstones beneath them, and of the equally hard middle and upper members of its own formation, supported by the still more massive and cohering conglomeration of the base of the coal measures just overlying these, must we attribute the prevalence of the mountain valley or broad bench on the mountain side, already described, as so general a feature around the outer edge of the coal field.

3d. Immediately over the fine-grained, hone-like sandstone of the top of the Umbral Series, rests the coarse, massive, white and gray conglomerate, which constitutes the base or supporting member of the productive coal measures, or Upper Carboniferous Series. This is the Seral Conglomerate of our classification. All round the Wyoming and Lackawanna coal field, this well-known and easily recognized rock is composed of two sets of strata—a lower group, made up in large part of extremely coarse pebbles of nut size, of white quartz and gray sandstone, compactly cemented into thick and ponderous beds, and an upper set of less massive layers of a smaller-grained conglomerate and dark gray sandstones, the pebbles seldom exceeding the size of a pea, or small hazel-nut. The average thickness of the lower mass on the south-east side of the basin is from seventy to eighty feet, whereas on the north-west side it seems nowhere to exceed forty feet; that of the upper, fine-grained rock, varies from sixty to ninety feet, but shows no such marked reduction in passing from its south-eastern to its north-western outcrop. At Scranton, on Roaring Brook, the coarser rock is about eighty feet; and the finer-grained, which is here quarried, and makes a valuable, strong building-stone, is about the same thickness. In some parts of the anthracite coal region, and possibly in certain localities on the borders of the Wyoming Basin, indications exist of the presence of a bed of coal in the shales which sometimes separates these two divisions of the conglomerate. This fact, and the identity in composition of the upper member with the coarser grits of the true coal measures, induce me to class it as a part of these, though, as it usually lies below any workable coal, it may equally retain its place as a division of the conglomerate, upon which it directly reposes, and into which it in many places graduates. In fact, a comprehensive study of the lower coal strata, and of the conglomerates interstratified among them, distinctly shows that even the main undermost coarsest pudding-stone, or Seral Conglomerate, is itself properly but a member of the true coal measures, and in no sense an independent formation. There are districts in Pennsylvania where productive coal seams occur imbedded within this coarsest, lowest mass, and others indeed where such exist even beneath or outside of it.

It has been the superior firmness of cohesion or solidity of this rock, compared with that of the softer overlying coal measures, and underlying Umbral groups, both abounding in slates and shales, which has enabled it better to resist the tremendous furrowing action of the waters that carved the land into its present inequalities, and to stand out above the deeper-ploughed surfaces of those formations. Wherever a notch or breach through the conglomerate, and a considerable steepness of dip, have permitted a deeper than usual grooving of the Umbral shales behind it, this coarse rock rises forth in a more or less ragged and naked crest, the inner of the two mountain summits already mentioned as bounding the coal basin: but where the denudation has been more even down the mountain side, and the inclination of the strata is gentle, it forms rather the front or supporting edge of a horizontal or sloping shelf, than a separate ridge. The edge of this mountain shelf or ridge, as it may be, is the readily distinguishable boundary of the productive coal measures, the lowest notable coal bed usually outcropping on the valley side, and some distance below the slanting ledge of naked, coarse pebble rock. Where the dip is extremely flat, however, and the conglomerate uncommonly thin, the last coal seam will often have its margin or outcrop almost as high on the mountain side as the pudding-stone, but it then outcrops at a still wider interval inside of that rock. This latter state of things prevails in the vicinity of Scranton, on Roaring Brook, and elsewhere on the south side of the coal basin. The average dip of the strata north-westward does not there exceed from three to five degrees; and as about 100 feet of lower coal measures, embracing two or three thin coals, intervene between the top layers of the upper conglomerate and the lowest seam worked, the horizontal space between the pebbly rock and this coal bed is often 800 and sometimes 1,000 feet. To determine therefore the true limits of the available coal lands of a district by the position of the exposed outcrop of the conglomerate, in default of sufficient openings in the coal itself, demands a nice attention to the several circumstances of the rate of dip, the thickness of the interposed strata, and the features of the denudation, or of the washing away of the overlying coal-containing rocks from off the barren floor of conglomerate.

4th. The last and highest of the formations of the region in the order of stratification, is the coal formation proper. In the Wyoming and Lackawanna basin, this consists, as is well known, of coarse and fine-grained gray micaceous sandstones, pebbly in some of their beds; and of argillaceous sandstones, shales, slates, and fire-clays—some more silicious and gritty, some more aluminous and smooth; and between all these are interstratified beds of anthracite of all dimensions, from a few inches to many yards in thickness. All the coal seams, with one or two very local exceptions, yield either white or gray ashes; and, as in the Pottsville and Shamokin basins, the coals of this character are overlaid by a group of beds, producing red and brownish ashes, such as are not here met with, it is fair to infer that in this Wyoming Valley we have the representatives of only the lower or White Ash series of the other great basins. Denuding action, which has been especially powerful here, may have swept off the once overlying and more exposed Red Ash series, or these possibly may never have been formed in this northern district.

It is impossible to estimate with precision, until researches now in progress are completed, the total thickness of the coal measures in the deepest parts of the Wyoming and Lackawanna basin, nor to count with accuracy the number of the available beds of coal in those localities. For my present purpose—that of a general sketch of the geology and vast mining resources of this valley, it will be sufficient to state here that exact measurement has already disclosed, in the vicinity of Wilkesbarre, the widest and apparently the deepest portion of the coal field, the existence of from 1,000 to 1,200 or more feet of coal-bearing strata, and the presence within these of sixteen or eighteen separate beds of coal—two or three of them being compound seams of great size, and about ten or more of the whole series being permanently of ample dimensions for profitable mining. This depth of the coal measures, and the number of the contained coal seams, grow less, of course, from the centre of the basin towards its two margins, and also towards its two contracting extremities.

As a provisional classification, for present convenience of reference, I will divide the whole body of the coal measures, or coal-containing strata of the basin, into two groups: *first*, a *Lower Series*, comprehending all the coals, some nine or ten in number, great and small, from the seral conglomerate to the highest of the set, embracing the great Wilkesbarre or Baltimore Company's seam; and *secondly*, an *Upper Group*, of about seven or eight beds in all, commencing as a base with the large Pittston or fourteen-feet bed, and terminating with the four-feet coal of the immediate vicinity of Wilkesbarre, the uppermost whose position I have yet positively determined anywhere in the coal field. It is proper to observe, that while the lower group contains, where it is fullest and best exposed, some ten independent coals, there are usually not more than five of these of such dimensions and purity as to fit them for profitable mining; while from the great fluctuations in both of these conditions, to which this series of coals is liable beyond all other divisions of the whole coal formation, there are districts where no more than two or three of the beds are large enough and good enough to prove of any commercial value. In like manner, while the upper group includes of large and trivial beds as many as seven or eight, there is no neighborhood where more than four of these are of suitable size and quality for working, and in some localities the number of such is even fewer.

As regards the limits and distribution of these two divisions of the coal measures within the basin, it suffices for our present purpose of a general comprehensive survey to recognize the fact that the Upper Group is restricted to a comparatively short and narrow elliptical belt in the very central tracts of the coal field, its southern margin passing through the low grounds south and south-east and east of Wilkesbarre, and by the valley of Laurel Run and White Oak Hollow to the south of Pittston, and the whole of this basin of the upper measures terminating some two miles to the north-east of the mouth of the Lackawanna river. On the other hand, the Lower Series occupies the entire area of the coal field, underlying the small central basin of the Upper Group, and emerging to the surface all round it—one broad outcrop filling the whole south-eastern side of the valley, from the margin indicated to the south-eastern conglomerate barrier, and another, the north-western, to the same terminating rock on the opposite mountain; while below Nanticoke, and above the vicinity of Pittston, throughout the Lackawanna basin, these same great lower coals fill the whole breadth of the valley from mountain to mountain, unconcealed by any overlapping beds of the upper set.

ART. V.—NORTHAMPTON DISTRICT. THE WILLISTON LEAD AND COPPER MINE.—BY C. S. RICHARDSON, CIVIL AND MINING ENGINEER.

THE survey of the mineral lands of this district, which has been going on during the present winter, has led to the development of a large mass of valuable mineral property, and there is every reason to believe that this is a mere tithe of what will be found in this part of Massachusetts in a very short period of time. Indeed, it is already known that valuable lodes of zinc, lead, and copper exist, which, from their surface indication, offer every promise of productiveness. The mine which forms the subject of this article, was discovered a few months since, or we should rather say, its qualities were re-discovered and made known to the present generation. It will be remembered that in the description given of the Loudville Mine, the lode is said to be known to run for several miles in almost a direct line. In tracing this lode through the woods, some ancient shade or mine pits were found; the attle heaps near them were examined, when it was discovered they contained very rich stores of silver lead ore, as well as copper; one of the old pits was then cleaned out and the debris removed from the place where the ancient miners appear to have left off. Here a small leader of solid lead was found in the lode, which was hollow, down as far as the men could go for the water. At this stage of the proceedings nothing further was done for a time; subsequently, leases for a large tract of land on the course of the lode were purchased, some tackle put up over one of the pits, and the result was as follows:—

THE LODE.

This lode is nothing more than a continuation of the Great Loudville lode, heaved a little from its course by a counter copper lode that intersects it at the old shaft, on the road leading to Southampton. Its apparent bearing is 30° north-east, or 10° more easterly than the lode in the other mines. It is 20 feet thick, and is composed of friable quartz, gneiss-capel alternating in veins of unequal thickness; throughout this is disseminated spots of yellow copper and blende, green and blue carbonate of copper and silver lead ore. The leader or pith of the lode, is not in its centre, but nearly on the foot wall. It is a vein of about 2 feet 6 inches thick, in a compact capel; it appears, at 6 feet from the surface, 2 inches thick; at 10 feet deep it is 5 inches; at 20 feet 9 inches, and at the lowest part, viz., 30 feet, it appears to be 14 inches thick. This is nearly solid silver lead ore. I am of opinion the ore will continue to widen until it fills the entire width of the vein, after which the other veins in the lode, of which I believe there are several, will unite with it, and the whole go down together. The lode itself becomes contracted in size, and the minerals concentrated in one vein. It holds out at present very promising features of productiveness, and, I must say, enticing to the mining adventurer, for, apart from any expensive mine works, there can at the present time, with half a dozen men, be 5 tons of ore, worth from $85 to $100 per ton, raised monthly, and if an engine was erected and a shaft put down on the course of the lode, I think 10 tons per month could be very easily returned above the 10 inch level. The country in which this lode is embedded is granite. The set is three-quarters of a mile in length on the course of the lode. The county road runs through the property, and is within 2 miles of the new Canal Railroad: it is partly in the township of Westhampton, and partly in Southampton. The mine at present belongs to some private local parties who purchased the mineral rights for ever; consequently there are neither rents or royalties to encumber the property. I am informed that a regular Mining Company is in course of organization at New York, whose object is to develop the mine in a spirited manner. There is an old story current that in sinking the old Loudville shaft, a course of ore was opened on 2 feet solid. This discovery at Williston goes far to prove the accuracy of this tale, for the lead at the latter mine has just the same appearance, excepting that it contains much more silver. Several assays have been made of the ore, and it is found to give an average of 72 per cent. for lead, and 19 ounces of silver to the ton. My next article will give some account of the Northampton Mines at Northampton, of which two have been opened, and one is in course of working.

Art. VI.—PRACTICAL ASSAYING.*

The term assay, as commonly used, is applied to different and almost distinct operations. In the one case, it is intended to

* Manual of Practical Assaying, intended for the use of metallurgists, captains of mines, and assayers in general. With copious tables for the purpose of ascertaining, in assays of gold and silver, the precise amount in ounces, pennyweights, and grains, of noble metal contained in one ton of ore from a given quantity. By John Mitchell, F. C. S. 2d edition, entirely revised and greatly enlarged, with 360 illustrations, 8vo., pp. 568. H. Balliere, 290 Broadway, New York, and 219 Regent st., London.

designate the method by which the precious metals are separated from their alloys, and a greater degree of purity obtained. In the other case, it is applied to the analysis of a compound mineral—the resolution of it into its constituent parts. This might strictly be designated a chemical analysis of a mineral. It is performed either by smelting, and is termed the "dry" analysis, or by solvents, and called the "humid or wet" analysis, and its object may be either to determine the kind of matter of which a substance is composed, or the quantity of each kind, and it is thus respectively known as the qualitative or quantitative analysis. But the distinctions have already been noticed in these pages.

We are led to these remarks by an examination of the extensive and practical work of "Mitchell upon Assaying," which has reached a second edition in England, and is already somewhat known in this country as one of the most extensive and valuable works upon the subject in our language. Previously to the appearance of this volume, the most important work upon the subject was that of Berthier, entitled "Traité des Essais par la Voie Sèche." It was both a large work and written in a language unknown to many desirous of understanding the processes of assaying. Under these circumstances, this author entered upon his task, with a design of preparing a suitable text-book for pupils. This idea was so far enlarged as to lead to the very excellent Manual before us, embodying information in every branch of assaying, either by the wet or the dry processes.

The author has very closely followed the plan adopted by Berthier in his large work, and also derived much valuable matter from his pages. The plan which he has followed has been to treat, Firstly, the mechanical and chemical operations of assaying in full, inclusive of a description of the apparatus required, their mode of use, etc.; Secondly, furnaces, fuel, and crucibles, together with a description of the best pyrometers and their applications; Thirdly, the fluxes, their properties, preparation, use, etc.; Fourthly, an essay on the use of the blow-pipe, and all its appurtenances, as fluxes, supports, etc.; Fifthly, the action of fluxes on some mineral substances; Sixthly, a method of discriminating many minerals by means of the blow-pipe, aided by a few tests by the humid method; Seventhly, the humid analysis of many mineral substances, their composition, locality, etc.; Eighthly, the complete essay of all the common metals, in addition to which the assay of sulphur, chromium, arsenic, heating power of fuel, etc., is fully discussed; Ninthly, a copious table is added for the purpose of ascertaining, in assays of gold and silver, the precise amount in ounces, etc., contained in a ton of ore from the assay of a given quantity. Full instructions for the discrimination of all the more commonly occurring gems and precious stones are added.

In the preliminary remarks on the introduction of the blow-pipe, and the improvements and extension of its use in chemical analysis, and also in the whole article on blow-pipe assays, we were somewhat surprised to miss entirely the name of the great blow-pipe operator, and founder of the quantitative analysis by means of that instrument, C. T. Plattner. In 1853, the third edition of his admirable work, Die Prabirkunst mit dem Lothrohre, (The Art of Assaying with the Blow-pipe,) etc., was published; it is not yet translated into English. The article on this subject is chiefly based upon the works of Berzelius and Griffen, although enriched by original remarks and investigations of the author.

The subject of crystallogy is very fully elucidated, and with numerous illustrations. The reader will find this a very clear and satisfactory, though brief portion of the volume.

We have looked over the pages devoted to the analysis of gold for the method of its extraction from pyrites. This is an interesting and important topic at this time, and especially so to those engaged in the gold mines in the Southern States. We do not find any thing worthy of special note or comment in relation to it, or we should here insert it.

The importance of tin as a metal, and the few traces of it which have yet been noticed in this country, induce us to extract the writer's able and clear article, both for the sake of extending more widely a knowledge of the mineral, and the aspects under which it is found, as well as to lay before our readers a specimen of the manner in which all the subjects of this valuable volume are treated.

THE ASSAY OF TIN.

This metal is always found by the assayer in the state of oxide.

Oxide of Tin (SnO_2.)—The appearance of this mineral gives no indication, excepting to an experienced eye, that metallic matter enters largely into its composition; yet its great density would lead one to suppose such to be the case. Its color varies from limpid yellowish white to brownish black and opaque, passing from one to the other by all intermediate shades. It usually possesses a peculiar kind of lustre, which cannot be readily described, but once seen can scarcely be mistaken. It occurs crystallized in square prisms, terminated by more or less complicated pyramids. These crystals, derived from the octahedron, are often macled or hemitropic (see p. 47–8), so that they often possess re-entrant angles, which is to a certain extent characteristic. The principal varieties are the following:—

1stly. *Crystallized Oxide of Tin* is found in more or less voluminous crystals of the color and form as above.

2dly. *Disseminated Oxide of Tin*.—This variety occurs in grains of various sizes, sometimes so small as not to be visible to the naked eye. It is found in the primitive rocks.

3dly. *Sandy Oxide of Tin* forms pulverulent masses often of great extent; in appearance it is merely a brown sand.

4thly. *Concretionary Oxide of Tin, Wood Tin.*—This variety occurs in small mamellated masses, the fibrous texture of which resembles that of wood: hence the name.

The following is an analysis of a sample of oxide of tin from Cornwall:—

Tin	77·50
Oxygen	21·50
Iron	·25
Silica	·75
	100·00

Assay of Pure Oxide of Tin.—Pure oxide of tin may be very readily assayed in the following manner:—Weigh off 400 grains; place in either a black-lead or charcoal-lined crucible, cement on a cover by means of Stourbridge clay, and subject to the fire. The heat should for the first quarter of an hour be a dull red, after which it may be raised to a full bright red for ten minutes, and the crucible removed with care, so as not to agitate or disturb the contents: tapping, in this case, must not be resorted to. When the crucible is cold, remove the cover, and a button of pure tin will result: this weighed and divided by four gives the percentage. If the operation has not been carefully conducted, it sometimes happens the tin is not in one button, but disseminated in globules, either on the charcoal lining or on the sides of the black-lead pot; in this case, the charcoal on the one hand, or the black-lead crucible on the other, must be pulverized in the mortar and passed through a sieve; the flattened particles of tin will be retained by the sieve, and can be collected and weighed. If any small particles escape the sieve, they may be separated from the lining or crucible by vanning, as described at page 64 *et seq.*

If a charcoal or black-lead crucible be not at hand, an ordinary clay pot may be used, but not so successfully, excepting under certain circumstances to be hereafter described. Indeed, in Cornwall, the ordinary mode of conducting this assay is in a naked crucible, thus: About 2 ounces of the ore are mixed with a small quantity of culm, and projected into a red-hot crucible. If the ore seems to fuse, or work sluggishly, a little fluor spar is added, and after about a quarter of an hour's fusing at a good high temperature, the reduced and fused tin is poured into a small ingot mould and the slag examined for metal by pounding and vanning. This method never gives the whole of the metal. To effect this, without fear of mischance in the assay sometimes occurring, as already described with both black-lead and charcoal lined crucibles, it may be thus conducted,—always supposing the oxide to be pure, or nearly so; or at least containing little or no silicious matter.

To 400 grains of ore add 100 grains of argol, 300 grains of carbonate of soda, and 50 grains of lime; mix well together, place in a crucible, which the mixture half fills, cover with a small quantity of carbonate of soda and 200 grains of borax. Place the whole in the furnace with the necessary precautions, raise the heat very gently, and keep it at or below a dull red heat for at least twenty minutes; then gradually increase until the whole flows freely. Remove the crucible, tap it as for copper assay, and allow to cool. When cold, break it, and a button of pure metallic tin will be found at the bottom, and a flux perfectly free from globules, and containing no tin.

There is yet another process, which is more easy of execution; but the reagent employed is more expensive, not so readily obtainable, and more difficult to keep without decomposing than any of the substances above employed. The reagent now to be discussed has been introduced to the notice of the student, in another part of this volume, as a blowpipe flux, and in the assay of copper ores by standard solutions as "cyanide of potassium." This is the most effective reducing flux for tin ores yet known. It acts by absorbing oxygen to form a compound known as cyanate of potash: thus—

$$SnO_2+KCy=Sn+KO,CyO.$$

The assay, by means of this substance, may be made in ten minutes: thus—

To 400 grains of ore add 200 grains of cyanide of potassium and 300 grains of carbonate of soda. Well mix, place in a crucible, submit to the furnace; raise the heat as rapidly as is consistent with the safety of the crucible, and when the whole contents have been in a state of fusion for about five minutes, the assay is complete. The crucible may be removed, the proper precautions taken to insure the subsidence of any globules of tin which may either be floating in the flux or adhering to the sides of the crucible, and the whole allowed to cool. When cold, the crucible is to be broken as usual.

Assay of Oxide of Tin admixed with Silica.—Although oxide of tin is completely reducible by charcoal or other carbonaceous matter, yet it has such an affinity for silica, that whenever that substance is present the metal cannot be wholly reduced, excepting at the highest temperature of a wind furnace. The following experiments will show the influence of silica on the return of tin in an assay of oxide of that metal with black flux:—

Ore	100	100	100	100	100
Quartz	25	66	100	150	300

The first gave 52 per cent. of tin; the second, 43 per cent.; the third, 28 per cent.; the fourth, 10 per cent.; and the last nothing.

The slags also produced in the treatment of tin ores in the large way, give no return with black flux. This mode of assay, however, has been recommended by some, but, from the foregoing experiments, is proved to be perfectly fallacious; that is, unless the quantity of silica present be very small in comparison to the amount of oxide of tin; and even when the latter is present in four times the quantity of the silica, as in experiment No. 1, a loss of 20 per cent. of tin is sustained.

Assay of Tin Ores containing Silica and Tin Slags.—It having just been shown how injuriously the presence of silica influences the produce of tin, both in ores and slags, other methods of assay than those just described must be adopted for such substances. These will be now detailed.

Tin ores containing silica may be treated by two methods; in the first, the silica must be carefully separated by vanning; if the ore be well pulverized this is the best and most expeditious method. In conducting this assay, take 400 or more grains of the pulverized ore according to its richness (if poor, as much as 2,000 grains may be taken), van in carefully, dry the enriched product, which will, if the operation has been properly conducted, be nearly pure oxide of tin, and assay it as already described for ores containing no silica. The other process of assay may be thus conducted, and is dependent upon the fact that iron displaces tin in its combination with silica: thus, if a compound of oxide of tin and silica be heated to whiteness with metallic iron, a portion of the iron oxidizes and replaces the oxide of tin, which was previously in combination with the silica as a silicate of tin, and metallic tin and silicate of iron result, the tin so reduced combining with any metallic iron that may be in excess; and the button thus obtained is an alloy of tin and iron, whilst the slag is entirely deprived of tin.

In this kind of assay, mix 400 grains of the silicated oxide of tin with 200 grains of oxide of iron (either pulverized hæmatite or forge-scales will answer this purpose), 100 grains of pounded fluor spar, and 100 grains of charcoal powder; place the mixture in a crucible, and cover with a lid; gradually heat to dull redness, and keep at that temperature for half an hour; then heat to whiteness for another half hour, and remove the crucible from the furnace; allow to cool, and break. The button so obtained is to be treated in the humid way, as hereafter described.

The assay of tin slags is conducted in the same manner, or simply by mixing the pulverized slag with 20 per cent. of iron filings, and fusing.

Assay of Tin Ores containing Arsenic, Sulphur, and Tungsten (Wolfram).—In the assay of such ores, it is necessary to remove arsenic, sulphur, and tungsten, before attempting to obtain the tin in a pure state by dry assay. Ores of tin which contain either one or all of these substances are most common: hence this mode of treatment will be generally required.

Most assayers usually submit the ore to the same mode of treatment it undergoes on the large scale by calcination, or rather roasting, by which the greater part of the arsenical and pyritic matter is removed: this process fails however to remove the whole of these substances, and does not at all affect the tungsten. The following process, adopted by the author, is therefore preferable, and is founded on the fact that arsenical and other pyrites, as well as tungstate of iron (wolfram, usually accompanying tin ores), are completely decomposed by nitro-hydrochloric acid (*aqua regia*) at the boiling temperature, the oxide of tin alone not being affected:—Take 400 grains or more of the impure tin sample, place them in a flask, and add 1½ ounce of hydrochloric acid, and ½ an ounce of nitric acid; heat gently for about half an hour, and then boil until the greater part of the mixed acids have evaporated. The sulphur and arsenic will by this time be converted into sulphuric and arsenic acid, and the wolfram completely decomposed, its iron and manganese having become soluble, and its tungstic acid remaining in the insoluble state with the oxide of tin and any silica that may be present. Allow the flask and contents to cool, add water, allow to settle, and decant, and so on until the water passes off tasteless. The insoluble matter in the flask is now oxide of tin, silica, and tungstic acid. To remove the latter, digest for an hour at a very gentle heat with one ounce of solution of caustic ammonia, with occasional agitation; add water, and van the remainder to separate silica. Nothing remains now but oxide of tin, with perhaps a little silica. This is now to be dried, and assayed as directed for ores containing little or no silica.

If only an approximative assay be needed, it may be accomplished after this treatment by taking the specific quantity of the remaining oxide, so that all ores of tin may be thus roughly assayed, it being premised that the above operation has been so carefully performed that nothing but oxide of tin and silica remain. The specific gravity of the thus purified ore is to be taken in the bottle as described at pp. 203 and 204. All now that is necessary to be known is the specific gravity of oxide of tin, its percentage of pure tin, and the specific gravity of silica, and a simple calculation gives the result. The following is the formula:—

Let a represent the specific gravity of oxide of tin.
" b " " " silica.
" c " " " the mixture left after treatment with acid, &c.
" w " weight of rough oxide of tin, or mixture left after treatment with acid, &c.
" x " " oxide of tin.
" y " " silica.

$$\text{Then } x = \frac{a\,(c-b)}{c\,(a-b)}\,w;$$

$$\text{And } y = \frac{b\,(a-c)}{c\,(a-b)}\,w.$$

Or in arithmetical form, thus:—

1. From the specific gravity of the rough oxide of tin (mixture of oxide of tin and silica) deduct the specific gravity of the silica.

2. Multiply the remainder by the specific gravity of the oxide of tin.

3. Multiply the weight of the rough oxide of tin by the last product, which will make a second product, which may be called P.

4. From the specific gravity of oxide of tin deduct the specific gravity of silica.

5. Multiply the difference by the specific gravity of the rough oxide of tin.

6. Take this product for a divisor to divide the above product P: the quotient will be the weight of pure oxide of tin in the rough oxide, and the quantity of metal can now be readily calculated.

The following is an assay worked out in this manner:—

400 grains of the ore are treated with nitro-hydrochloric acid and ammonia as above described, washed and dried. Suppose the dried matter weighed 250 grains. The 250 grains thus obtained are placed in the specific gravity bottle, and the specific gravity is found to be 5·4.

Specific gravity of tin oxide (approximate) . . .	6·9
" silica " . . .	2·6

Sp. Gr. Rough Oxide.		Sp. Gr. Silica.		
5·4	—	2·6	—	2·8
		Sp. Gr. Pure Oxide.		
2·8	×	6·9	—	19·32
Weight of Rough Oxide.				P
250	×	19·32	—	4830
Sp. Gr. Pure Oxide.		Sp. Gr. Silica.		
6·9		2·6	—	4·3
		Sp. Gr. Rough Oxide.		
4·3	×	5·4	—	23·22

$$\frac{4830}{23 \cdot 22} = 208 \cdot 4$$

208·4 grains is therefore the weight of pure oxide in the 400 grains of ore. Now oxide of tin contains 78·61 parts of pure tin, and a

$$\frac{208 \cdot 4 \times 78 \cdot 61}{100} = 163 \cdot 72$$

So that 400 grains of rough tin ore contain 163·73 grains of pure tin, and

$$\frac{163 \cdot 72}{4} = 40 \cdot 93.$$

The rough sample first operated on contains, therefore, 40·98 per cent. of metallic tin.

Estimation of Tin by the Humid Method.—There are several methods of effecting this analysis, the chief difficulty being found in the intractable nature of the oxide of tin, it resisting the action of all acids. This, however, may be overcome, as first shown by Klaproth, who found that very finely levigated oxide of tin was soluble in hydrochloric acid after a prolonged fusion with caustic potash. The following is his process:—

50 grains of the tin ore, reduced to the most minute state of division by levigation or otherwise, is mixed with four times its weight of caustic potash. The best mode of mixing is to place the caustic potash in a silver crucible, add its own weight of water, and apply a gentle heat until the potash is dissolved; then stir in tin ore, and gradually evaporate to dryness, stirring all the time to prevent loss by spitting, as in the analysis of iron stone. When thoroughly dry, inclose the silver crucible in one of clay, and submit the whole to a dull red heat for at least half an hour: rather more than less renders the perfect solution of the oxide of tin more certain. When cold, act on the contents of the crucible with dilute hydrochloric acid, transfer the liquid and any undissolved matter to a flask, add some strong hydrochloric acid, and boil for half an hour. If at the end of this time any of the tin ore remains unacted on, it must be separated by decantation or otherwise from the solution, dried, again fused with potash, and then treated with hydrochloric acid, in which it will now be found totally soluble. This second operation will not be needed if care has been taken to reduce the ore to the finest possible state of division at first. The solution, however, obtained, is to be evaporated to dryness, and when cold treated with a small quantity of hydrochloric acid, allowed to stand for half an hour, then water added, boiled and filtered: the whole of the tin will pass through in solution as chloride of tin, and any silica or tungstic acid that may be present will remain in the filter. If the ore contained copper, lead, and iron, these metals will also be in solution—at all events, the

lead partially so; but if the ore had, previously to its fusion with caustic potash, been treated with *aqua regia*, as already described, then it will contain tin alone It is always better thus to separate foreign matters before attempting the solution of the tin, as the after process is thereby simplified. Supposing, however, that the rough ore had been submitted to fusion with potash and then dissolved, the solution must be thus treated:—A bar of zinc must be placed in the solution, which will in course of time precipitate tin, copper, and lead. When all the metals are thus thrown down, the zinc is washed and removed, the precipitated metals well washed and dried. To the dried metals strong nitric acid is now to be added, the mass gently heated, and then evaporated to dryness; when cold, it is moistened with dilute nitric acid, water added, and the whole filtered. Lead and copper will pass through the filter as soluble nitrates, and the tin will be found in the filter as insoluble peroxide: this is to be well washed, dried, ignited, and weighed. It contains 78·61 parts of metallic tin The amount of tin thus obtained, when multiplied by 2, will represent the percentage of the ore.

If, before the action of caustic potash, the ore had been submitted to the action of *aqua regia*—sulphuretted hydrogen may be passed through the solution of chloride of tin—sulphuret of tin will be precipitated; this is to be washed, dried, gently calcined in a platinum crucible until all smell of sulphurous acid has ceased, allowed to cool, reheated with a fragment of carbonate of ammonia, as in the case of roasting sulphuret of copper, and when cold weighed as pure oxide of tin. The calculation for metal is made as above.

Humid Analysis of the Alloy of Tin and Iron as obtained in the Treatment of Silicious Ores and Slags. The alloy obtained as already directed is dissolved in boiling hydrochloric acid diluted with water, and the solution, if necessary, filtered. To the filtered solution add a little hydrochloric acid and pass an excess of sulphuretted hydrogen through it, collect the precipitated sulphuret of tin, and proceed according to the directions already given.

Estimation of Tin by means of a Standard Solution.—This process is due to M Gaultier de Claubry, and may be thus performed:—The standard solution is made by dissolving 100 grains of iodine in 1 quart of proof spirit (spirit of wine having a specific gravity of ·920), and is thus standardized. Ten grains of pure tin are dissolved in excess of hydrochloric acid, the solution boiled, and allowed to cool; the burette is now filled with the solution of iodine, which is gradually added to that of the tin until the former ceases to be decolorized: as soon, therefore, as the tin solution assumes a faint yellow tinge, sufficient iodine has been added; the quantity thus found sufficient is then noted, and the amount of tin each divisionful of iodine solution is equivalent to is calculated as for iron, copper, and the other standard solutions.

In the actual assay of tin ore by means of this solution, it is necessary the whole of the tin present be reduced to the state of protochloride This may be readily effected by boiling the solution of tin for a quarter of an hour with excess of metallic iron, and filtering. To the solution so obtained the iodine is added as above. The tin ore is dissolved by any of the methods already described.

JOURNAL OF MINING LAWS AND ORGANIZATIONS.

AMERICAN MINING COMPANY.

The annual meeting of the American Mining Company was held at the office of the Company, in Windsor, Vermont, onthe 13th day of March, instant, at 2 o'clock, P. M.

The following persons were duly elected Directors, viz.: Erastus Fairbanks and Horace Paddock, of St. Johnsbury; Henry Keyes, Newbury; Abel Underwood, Wells River; Isaac W. Hubbard, Joseph D. Hatch, and George Wardner, Windsor, Vermont; David A. Simmons, Boston, Mass.; William E. Trask, Nathaniel Hayden, and Francis E. Phelps, City New York.

At a meeting of the Directors, on the same day, F. E. Phelps was unanimously re-elected President.

ISLE ROYALE COMPANY.

Truman Smith, President; Chas. P. Pratt, Secretary and Treasurer; and Head and Perkins, Transfer Agents, in Boston. Directors:—Truman Smith, Washington, D. C.; Clement Marsh, New York; Chas. H. Nichols, Washington, D. C.; C. C. Douglass, Portage, Michigan; Thomas S. Tratt, Washington, D. C.

MINNESOTA COPPER COMPANY.

At the annual meeting of the stockholders, held March 8th, the following officers were elected:—

President, John C. Tucker: Directors, John C. Tucker, Wm. Pearsall, Jun., Moses A. Hoppock, Wm. E. Dodge, Wm. Hickok, of New York; Chas. P. Woodruff, Michigan: Treasurer, Moses A. Hoppock: Secretary, Samuel J. W. Barry.

PHOENIX MINING COMPANY.

At the annual meeting of the stockholders of the Phoenix Copper Company, of Lake Superior, the following Board of Directors was chosen:—

Chas. D. Head, Boston; O. A. Farwell, ditto; J. A. Dupree, ditto; J. W. Ward, New York; Samuel W. Hill, Lake Superior. Horatio Bigelow, of Boston, was re-elected Secretary and Treasurer.

WASHINGTON SLATE COMPANY.

The organization of this Company consists of Courtney Schenck, President; Alexander C. Wilson, Secretary; Alexander Wilson, Treasurer. Directors: Merritt Clarke, Courtney Schenck, Benj. O. Warren, Francis H. Ruggles, J. H. Wainwright, Alexander C. Wilson.

Office, New York.

MINING SPECULATION.

A case was recently decided in the Court of the Sheriff of Cornwall, at Truro (Mr. P. P. Smith presiding as under-sheriff), which, to some extent, held up for public information the manner in which mining adventures have been got up in London, and how the promoters take advantage of any successful results which may arise, but are always prepared at any moment, in case of indications of an adverse nature, to induce the public to adopt the scheme, and eventually to "pay the piper."

Mr. Chilcott, in opening the case for the plaintiff, said that since the establishment of the county courts the proceedings before the sheriff had become much more rare than before. In the case under consideration, the county court could not be availed of, as the claim was for services in Ireland, and the defendant resided in London; and to bring it within the jurisdiction of the sheriff's court, plaintiff had reduced his claim from 21*l.* 16*s.* 2*d.* to 19*l.* 19*s.* 11*d.* It was an action brought by Mr. Joseph Champion, son of Capt. Champion, of East Wheal Rose, to recover from defendant, Mr Robert Smith, of London, for balance of salary and expenses as resident manager of Crow Hill Mine, in Ireland. The cause was undefended. Mr. Chilcott produced two or three letters in support of the justice of the claim, one of which was particularly graphic and confidential: it urged upon plaintiff the necessity of sinking certain shafts with all speed, and to push on the workings as much as possible, for if they cut the lode productive, and could bring to market about 200*l.* worth of mineral in three or four months, they could do better by keeping it to themselves; but if it turned out a poor bare thing for copper, and not much lead, and thus required money for machinery, in that case, before they calculated on anything, or even made a sale of mineral, it would be better to make it public from the commencement.

Mr Joseph Champion, the plaintiff, said, that in July, 1852, he was employed by defendant to be resident agent of Crow Hill Mine, but his salary was not fixed at the time, being told it should be settled afterwards. He continued agent to April, 1853, when he was told by defendant's brother, Richard Smith, that the mine was sold to another company, and that the services of neither of them were further required. In January he received a letter from defendant, with an account annexed, in which he had put him down at 5*l.* 5*s.* per month; after which plaintiff always charged that sum as his salary in the cost-sheets. He had often seen defendant on the mine, and had frequently heard him say he had the sett. One of the defendant's letters further showed defendant's connection with the mine, as in it he ordered all work to cease, with the exception of six men only. Plaintiff claimed for one month's salary after his discharge, as was the custom; the amount, including salary and postage, was 58*l.* 13*s.* 2*d.*, from which, deducting the money paid, the balance was 21*l.* 16*s.* 2*d.*, which, as before stated, was reduced to 19*l.* 19*s.* 11*d.* The brother of the plaintiff corroborated many points of his evidence, and the deputy-sheriff summed up, when the jury immediately gave a verdict for the plaintiff—damages 19*l.* 19*s.* 11*d.*

THE COMMON LAW OF MINING LICENSES.*

In the above cases, there was simply a right either to control, *pro tanto*, the right of ownership in the lands of another, or to use and occupy the land for a definite purpose, and without any liberty for converting or appropriating the land for other purposes. But a license to work mines is of a very different description. It confers not only a right to enter and occupy, but to commit waste, and carry away part of the land itself—viz., the minerals. This right may, as we shall afterwards see, be in some instances revocable at the will of the party; but even then it will, of course, exist in full force till revocation. It seems, therefore, impossible to contend that this right is not an interest within the Statute of Frauds. To assert that, it would be necessary to maintain that the minerals are not part of the land.

An interest in land may exist where there is no actual estate in the land. And it has, in other cases, been determined that such an interest is within the meaning of the statute.

Thus, it has been decided that sales of growing poles, of standing underwood, of a crop of growing grass, are all within the statute. It is true the cases upon this subject are very conflicting, and that the leaning in the later decisions is certainly in favor of bringing the produce of the land not within the first and fourth sections, but the seventeenth section, which enacts, that no contract for the sale of goods, wares, and merchandise, for the price of ten pounds or upwards, shall be allowed to be good, except the buyer shall

* Continued from page 170, vol. ii.

accept part of the goods so sold, and actually receive the same, or give something in earnest to bind the bargain, or in part of payment, or that some note or memorandum of the bargain be made and signed by the parties, to be charged by such contract or their agents thereunto lawfully authorized. But, notwithstanding this inclination, it is not to be supposed that the courts will ever repudiate the distinction of Lord Ellenborough in the case of Crosby *vs.* Wadsworth, where he said, with respect to a growing crop of grass, that, in the outset, he felt himself warranted in laying wholly out of the case, the provision contained in the seventeenth section, as not applicable to the subject-matter of that agreement, which could not be considered in any proper sense of the words as a sale of goods, wares, or merchandise, the crop being at the time of the bargain (and with reference to which he agreed with Mr. Justice Heath in Waddington *vs.* Bristow, that the subject-matter must be taken) an unsevered portion of the freehold, and not movable goods or personal chattels.

In a late case, where a farm was agreed to be let by parol, and the tenant was to take the growing crops and pay for them, and also for the work, labor, and materials, in preparing the land for tillage, it was decided that this case was within the fourth section of the statute. It was held by the court, that at the time when the contract was made, the crops were growing upon the land, the tenant was to have had the land as well as the crops, and the work, labor, and materials were so incorporated with the land as to be inseparable from it. He would not have the benefit of the work, labor, and materials, unless he had the land, and they were of opinion that the right to the crops, and the benefit of the work, labor, and materials were both of them an interest in the land.

It must, therefore, be concluded, that a license to work mines is within the first, third, and fourth sections of the Statute of Frauds; that it must be in writing, either from the grantor or an agent lawfully authorized by writing under the first section; that it might be transferred, or surrendered in writing either by the assigner, surrenderer, or some agent also lawfully authorized by writing, under the third section; and that under the fourth section a bare agreement only for a license, if in writing, may be entered into either by the intended grantor or his agent lawfully authorized, and the authority of the agent need not be in writing. But a license cannot be within the exception of the second section, which applies only to leases.

It was decided in the above case of Carrington *vs.* Roots, that an agreement under the fourth section, though altogether void, may have some operation in communicating a license, so far as to excuse what would otherwise be a trespass, but such a license could confer no interest, and would be always countermandable at the will of the party.

It is a general rule, that a bare personal right or a bare power cannot be assigned. We have seen, however, that a license to work mines confers a distinct interest in the land, which may, therefore, be assigned in the same manner as a power coupled with an interest, or a power to cut down trees. But the right or liberty must, of course, be exercised by the assignor in the manner pointed out by the original grantor. A license often expressly extends to the assigns of a grantee.

An agreement was entered into by the committee of a lunatic, under the following circumstances. The lunatic was tenant for life, without impeachment of waste, with remainder to his first and other sons in tail, with other remainders over. The lunatic was unmarried. Coal was found upon the estate, but not in sufficient quantity to justify the sinking of a shaft; but the coal might be worked by means of a shaft in the adjoining land. Part of the estate of the lunatic was mortgaged, and the mortgagee was in possession. The income of the lunatic was considerably reduced, and there were other debts which could not be satisfied. The committee, therefore, agreed with the owner of the adjoining land to work the coal. The master, who was attended by the next of kin, reported this to be for the benefit of the lunatic. Lord Eldon, on confirming the report, said, the circumstances were singular. The next of kin had an interest that the coal should be worked. The heir at law had no interest, there being various remainders over. He thought it might be done by the committee; it was like cutting timber.

TRANSFER BY DEED.

All contracts and conveyances effected by deed or specialty, must be both signed and sealed. Signature is now required in all cases by the statute, and sealing is required by the common law. But, of course, when sealing is not required by the common law for giving validity to any instrument, signature alone will be sufficient.

Thus, leases were originally granted for a very small term of years, and though afterwards granted for longer periods, they continued to be created, before the statute, by parol, for any number of years. It follows, therefore, that since the statute, leases for years may both be created and assigned by simple signature without sealing. But they will not, in this state, acquire the full operation of an indenture or deed, and the covenants which usually accompany them, are specialties which require the proper formalities to be observed. Leases and assignments, therefore, are usually made in the same manner as deeds in general.

When the mines form part of the general inheritance, they will, of course, be transferred along with the lands without being expressly mentioned in the conveyance; but when they form a distinct possession or inheritance, a title to them must be established, without reference to the general title to the lands in which they are situate.

In the latter situation, the mines will still, of course, retain the qualities of real estate, and will be transferred by conveyances applicable to the particular disposition of them intended to be made.

They are capable of livery, and of being made the subjects of ejectment. "By the name of *minera*," says Coke, "or *fodina plumbi*, etc., the land itself shall pass in a grant, if livery be made, and also be recovered in an assize."

It has been stated that if a grant of mines be made without livery, the grantor will only take a power to dig and work them. But although the grantor would, in such a case, take no legal estate or right at all, except the liberty to work, yet his title might be perfected by a court of equity, on the ground of contract.

It has been stated, indeed, that a common recovery could not have been suffered of a quarry, or a mine, because they are not in demesne, but in profit only. But since the later cases upon the subject of mines, it may be clearly laid down that there is no distinction. Mines and minerals are parts of the very lands or demesne themselves.

A distinction has been attempted to be taken between the transfer of opened and of unopened mines. Unopened mines have been thought so far to resemble an estate in remainder, as to be incapable of livery of seisin, and to be only passed by grant. This opinion has been founded on the decision that unopened mines are not liable to dower. It will be afterwards shown that that doctrine rests upon very different grounds from those founded on the notion that unopened mines bear any resemblance to an estate in remainder. All mines, whether opened or unopened, are parts of the freehold and inheritance, and they are equally, in all cases, in the possession of the tenant. It has been expressly held that mines do not lie in grant. As real hereditaments, they pass by livery of seisin. Unopened mines are not incapable of livery. The mines are not the subjects of transfer, but the minerals which are acquired by mining. These minerals, or the mineral veins, are almost always so far accessible from the surface as to be capable, either by ordinary or mechanical means, of livery, without the actual operation of mining. It is submitted, therefore, that there is no distinction in this respect, between opened and unopened mines; but it would certainly appear, that the modern form, by lease and release, is more applicable in both cases, than a conveyance depending upon livery of seisin.

It may here be observed, that a license for a grantor and his heirs to exercise a right over the lands of another person will confer a freehold interest; and will, therefore, require to be created by deed, without reference to its being an interest in land under the Statute of Frauds.

It is scarcely necessary to add, that all leases and licenses for lives, or any other freehold interest, will require similar formalities. A license being an incorporeal hereditament, should be created by grant; but a license for years may be created, like a lease for years, by simple signature under the first section of the Statute of Frauds, although it is a usual practice to confer it in the form of a demise, accompanied with the ordinary covenants and stipulations.

The subject of leases and licenses will be resumed in the next chapter.

Mines are very frequently excepted in a conveyance. When the exception contained in a deed of feoffment is in favor of the grantor, there can be no necessity for livery, because the grantor will never have been out of possession of the thing excepted. But when the exception is in favor of third persons, or strangers to the legal estate, this livery cannot be dispensed with.

A conveyance in fee was made by a mortgagor and a mortgagee, in fee of certain lands to a purchaser; and the purchaser, by the same deed, covenanted and granted to the mortgagor and his heirs, that it should be lawful for them to enter and work coal or other mines, with a proviso that deduction for damages done should be made from a yearly rent which was also granted to the mortgagor. The mines were worked under the authority of persons claiming under a title derived from the purchaser; and an action of trover was brought against them by one claiming under a title derived from the mortgagee. The question was, whether the mortgagor had an exclusive right to the coal under the lands conveyed, or only a concurrent right with the purchaser, from whom the defendant claimed: and it was contended for the plaintiff, that the covenant and grant amounted to a reservation and exception of the coal in the grant to the purchaser; the legal estate and inheritance of which remained in the mortgagor, and those claiming under him. It was held by Lawrence J., that the covenant could not operate as an exception or reservation in favor of the mortgagor who had no legal estate in him at the time, but only the equity of redemption. He was in law no more than a stranger to the estate, and could not except or reserve that which he had not before. The covenant, therefore, could only operate as a grant; but a grant would not pass the land itself without livery.

It must also be observed, that there must be an express exception or reservation of the mines, or a clear intention that they are not to pass under the conveyance, even when the grantor is in possession of the legal estate—for otherwise they may be granted over, and a mere license to work for, and carry away the minerals, may thus be only reserved.

This was the case of Lord Mountjoy, who was seised of two parts of a manor, and who conveyed them to purchasers, with a proviso and covenant, that it should be lawful for the grantor and his heirs to dig in the heath ground of the premises, sufficient ores for the making of alum or copperas, without interruption of the purchasers or their heirs. This was no exception of the minerals.

BY WILL.

There is nothing to engage particular attention in the transfer of mines and minerals by will, but there are some consequences arising from the duties of executors and trustees, which it will be proper to consider in this place.

Mines, under almost any circumstances, are of variable and uncertain value. They are described by Lord Hardwicke, as being in the nature of a trade. Mines, therefore, constitute part of the perishable property of a testator, which is subject to particular regulations.

These regulations, however, can only apply to personal property, or to real hereditaments which are directed to be sold and converted into personal estate; and which are in equity immediately upon the death of a testator invested with all the qualities of personality. When mines, therefore, — whether worked or unworked, and whether forming a distinct inheritance or not, are devised as the freehold or copyhold hereditaments of the testator without any directions for conversion, or if they descend in this state to the heir, they will follow the course of alienation pointed out by the testator, or by the will of the law, without being subject to the rules applicable to personal property of a perishable description; for in such cases, mines will be placed beyond the general control of trustees and personal representatives. They must be enjoyed in the manner in which they devolve or descend.

If, again, the mines form part of the personal property of the testator, either in connection with the lands in which they are situate, or as a separate possession in the lands of others, and are devised as a specific bequest, either immediately to the parties entrusted, or through the intervention of trustees for them, the subject of devise must also be taken and enjoyed in the mode appointed by the testator.

COMMERCIAL ASPECT OF THE MINING INTEREST.

New York, *March 20th.*

Since our last report, there has been great activity in the mining stock market, but generally at a decline in rates. This decline has been occasioned, as much by the unfavorable state of the money market, as by any other cause. All stocks have been more or less unfavorably affected for this reason, and speculation for a rise for the moment at a stand. The accounts, however, received from the mining interest generally, are very favorable. From the Lake Superior Region the news was never better. *Toltec*, *Algomah*, and *Fulton*, which are most dealt in here, have been heavy; but in the former, they are getting out large masses of copper, and a great deal of barrel and stamp work, and the mine is advancing rapidly to the condition of a dividend-paying concern. The Algomah, which has the Toltec Vein, is also proving up very rich; as likewise the Fulton, which more than equals the expectations of its friends. In the Toltec, an assessment of one dollar per share has been called, payable on 1st of May. The stock has fallen from 12¾ to 10½, and now stands about 10¾, with an upward tendency. Algomah may be quoted at about 4½, and Fulton at 1¾. In the other Lake Superior mines, the prices of the stock are steady, without much disposition either to buy or sell.

In *North Carolina Stocks* there have been large transactions within a few days, based upon a reported discovery of great quantities of silver in their copper ore. This is said to have been extracted by a very economical and original process, so as to make the product of great value. The report, however, needs confirmation, and it would be better for all persons to be on their guard how they buy the stock at high prices, based upon this report. This is not the first time original and economical processes for extracting ore have been presented to the public. The test of truth is reason, and not *vision*. It is also reported that the Mineral Company, whose property is adjoining the North Carolina, have struck the vein of the latter, and the stock has consequently advanced rapidly from 25 cts. to 65 cts. per share. Although now held at the latter figure, it would be difficult to make sale of any amount at that figure. From the *McCullough*, the accounts are all that could be wished. Their machinery is all up and working well; in fact, to the full satisfaction of the stockholders. It is expected that this will soon be a dividend-paying stock. It stands about 7½, and is held by a few parties who are content to keep it, in anticipation of much higher rates. In *Lindsay*, there is no change, the price remaining about 80 cts. From the *Phœnix Gold*, the President writes:—

"Every thing is working well, and to my entire satisfaction. We shall have both Chilian mills and six head of stamps at work very soon, when we shall be making a very snug little sum per diem over and above all expenses." "We have just got the water out of the Orchard Vein, and have commenced breaking out ore to-day." "Phœnix has passed through the ordeal all new companies are subjected to, and promises shortly to take high rank as a dividend-paying stock." It has a small capital, which is much in its favor. The price continues to average from 75 cts. to 80 cts. per share.

Gold Hill continues about the same, and paying its ten per cent. dividend every sixty days, with promise after June next of making the amount larger. Should this be the case, the stock will doubtless advance to par, $5.

The transactions in *Pennsylvania and Lehigh* have been large. Most of the stock is now held by Philadelphians, and the office of the Company will probably be removed to Philadelphia. They have confidence in its ultimate value as an investment. There is scarce any limit to the sale of zinc paint, which is growing daily in favor, and bids fair to supersede white lead entirely.

The *American White Zinc Company* are said to be doing a good business, but their stock is heavy, and for the moment almost unsaleable at any fair figure.

The Asphalte Mining Company, of which some particulars are given in another part of this Number, we learn has commenced operations in earnest. From the demand which exists for the products of this Company's manufacture, we see no reason why it should not satisfy the expectations of the projectors. The Company exhibits the various products, with the uses to which they may be applied, at their office on Broadway.

The M'Culloch Gold and Copper Company has begun to give evidence that the sanguine reports of its President were not without foundation. We learn that a sale was made of one hundred tons of copper ore last week, by the M'Culloch Gold and Copper Mining Company, to the Humphrey Smelting Works, of New Haven, netting the Company about $12,000. It is as yet uncertain whether this Company's mines will prove richest in gold or copper.

From the *Chatham Cobalt Mines* the news continues favorable. If the product of mineral comes up to anything like what is anticipated, the mine must prove quite profitable. We had not supposed that there existed such an extensive demand for the metal as is evidenced by the proposals which the Company has received.

Rocky Bar Company has revived after its long suspension, and under the able management of Mr. Satterthwaite, eventual success is looked for with confidence. We have no doubt that some who have forfeited their shares by neglecting to pay up, already regret having done so.

Quite a number of new mining stocks have been placed upon the list of the Mining Board, but the transactions in them have been limited.

Fluctuations to March 20th, 1854, in the different Mining Stocks sold at the New York Stock Exchange and Mining Boards, showing their Highest and Lowest Points, and the Date, with the Market Value on March 20th, Gain or Loss from February 20th, and number of Shares sold in each.

Name of Stock.	Shares.	Par.	Highest Sales.	Day Mon.	Lowest Sales.	Day Mon.	Value Mar. 20	From Feb. 20. Gain	From Feb. 20. Loss	Shares Sold.
Algomah	20,000	25	4½	9	4½	17	4¼		¼	780
Allegany	—	—	10½	14	8½	9	9	—	—	1,950
Caledonia	....	....	4½	10	3½	3	4½	—	½	2,775
Conrad Hill			90c	24	80c.	4	¾		—	1,900
Cumberland Coal	50,000	100	33¼	6	30	16	32¼	1	—	43,220
Dauphin and Susquehanna	[illegible]	50	25	17	—	—	25	—	—	25
Dolly Hyde	......	....	6½	13	5½	9	6	½	—	1,850
Douglas Houghton	......	....	6	16	—	—	6	—	—	50
Fulton Copper	100,000	5	1½	9	1½	8	1½	—	—	4,500
Gardiner Gold	40,000	5	3½	7	2½	15	3½	—	—	5,700
Gold Hill	200,000	5	5	7	3½	21	4½	1½	—	37,350
Hiwassee			5½	1	4½	23	5½	—	—	750
Lindsay	100,000	10	90c.	8	50c.	16	¾	—	—	4,780
McCulloch Gold	200,000	5	8	4	7	15	8	—	½	2,100
New Creek Gold	200,000	10	3½	22	2½	17	3½	½	—	4,250
New Jersey Zinc	96,000	12½	10½	7	9½	22	10	½	—	11,725
North Carolina	100,000	5	4½	10	3½	28	4½	½	—	3,950
Ohio Lead and Marble			1	18	—	—	1	—	1	100
Parker Vein	20,000	100	8½	4	7½	17	7½	½	—	57,500
Pennsylvania Coal	60,000	50	109	24	103½	4	107	½	—	5,875
Pennsylvania & Lehigh Zinc	100,000	10	8½	7	3	25	3½	½	—	18,750
Phoenix Mining and Manuf.	20,000	100	8½	21	5½	4	7	—	3	8,200
Phoenix Gold			85c.	18	75c.	9	80	5c	—	6,800
Potomac	100,000	10	4½	4	3½	16	4	½	—	5,800
Potosi Lead	200,000	5	3	24	1	14	4	—	1	8,400
Rapley	40,000	12½	4	18	—	—	4	—	—	400
Rocky Bar	200,000	5	50c.	18	—	—	½	—	—	800
Rutherford		....	1½	9	1½	9	3½	1	—	1,500
Ulster	100,000	5	1½	4	1½	21	1½	—	½	6,500

BOSTON MINING SHARE MARKET.

Boston, *March* 20, 1854.

Mining Stocks continue in good demand, but there is less activity within a week or two, and prices have slightly receded. No large amount of stock in any of the Companies which have had sufficient time for development could be obtained at the present quotations. The confidence in Copper Mining Stocks is becoming more general, and we hear little said now of "humbug" when speaking of this class of stocks. Every mail from Lake Superior brings renewed proofs of the general success of the different Companies; and many which have been very unsuccessful before, and hardly brought into notice, are now meeting with the reward of patient perseverance.

Isle Royale has been a prominent stock of late, and advanced from 20½ to 24, including the assessment of $1 per share due March 6. This sudden advance has caused stock to come on to the market, and the price has fallen to 23 The real merit of this Company will, however, prevent any serious reduction in the market value of the shares, and we look for a handsome advance within the next six months. At the adjourned meeting of the stockholders, held in Washington, March 6, the Directors were authorized to call for farther assessments, not exceeding $5 per share, at such times as the wants of the mine may require. The proposition to reorganize the Company under the general mining law of Michigan, and increase the number of shares to 20,000, did not meet with favor. At some future time the Company may organize under the general law with 12,000 shares, the present number.

Copper Falls is in good demand, and the accounts from the mine are favorable. The annual meeting of the Company is to be held in Boston, April 8, when an elaborate report will be presented, giving a detailed account of operations at the mine, illustrated with important maps and diagrams.

An informal meeting of the *Forest* stockholders was held at the Treasurer's office, March 20, to hear the statement of Mr. Livingston, the agent, who has just arrived from the mine. The details which he presented were highly favorable, and holders of stock look to the future for important results. The agent recommends a further outlay, in sinking new shafts, and the purchase of an hundred horse-power engine, to carry on the work more successfully.

Minnesota is in better demand, and sales have been made at 180. There is some talk of increasing the number of shares from 8,000 to 10,000, but the measure will not be carried out for some months, should it be finally decided upon.

Pittsburg is in fair demand, at 144 to 145, and at that price it is considered safe as an investment which will pay 15 to 20 per cent. per annum on the purchase money. The work at the mine is progressing favorably, without anything specially important, the mine having long since arrived at a point which renders its value a matter of certainty.

National is firm at 80, with occasional sales at that figure. *North American* steady, at 75 to 80, but the amount of stock sold in this market is comparatively small.

Phœnix is in good demand, at 9½ bid, and the favorable accounts from the mine would warrant a much higher price. In consequence of the Superintendent's report not having arrived, no detailed report was presented by the Directors. It was voted that farther assessments be authorized, not exceeding $5 per share, as the wants of the mine may require.

The following assessment has been called for since our last:—

COMPANY.	AM'T PER SHARE.	WHEN PAYABLE.	WHERE PAYABLE.
Bohemian.	50 cts.	April 10.	Philadelphia, Pa.

O. D. Ashley, Esq., is transfer agent in this city, to whom assessments can be paid. The whole number of shares is 16,666, on which an average of $3.94 per share has already been paid in.

The stock of the *Bohemian* is heavy at $5 per share, without transactions. The mine has several good locations, which are being worked with energy, and the indications are very fair for success.

Algomah, which adjoins the Toltec, and has the same vein, is looked upon with favor, although the general depression in stocks has caused the shares to fall off to $4.

Toltec has been heavy, and declined to 11, at which point there is a fair demand for the stock. A forthcoming assessment of $1 per share, tends to keep the price down for the present. There is little doubt that the stock is very cheap at the prices now ruling. We should class it among the most promising of the new mines.

Ripley has declined 3½, but the stock is scarce at that figure.

Winthrop holds steady at 2¾, and as there is now but little doubt that this Company have the famous "Hill Vein," the stock must be considered very low at the present price.

Webster, Shawmut, Star, Dana, Glen, and Fulton, are all dull at quotations, with greater desire to sell than buy. A few weeks, however, will probably entirely change the aspect of things, as the present decline is occasioned by a stringency in the money market, which forces the sale of shares held by weak parties, who cannot here obtain the necessary funds for carrying their stock.

By the following table, it will be seen, that the sales in February have been somewhat smaller than usual, and prices are lower, with some exceptions, than on the 20th of last month :—

BOSTON MINING SHARE LIST.

Fluctuations for February, 1864, in thirty-one different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their Highest and Lowest Points and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

Mining Stocks, Boston.	Nominal Capital.	Shares.	Par.	Paid in Mar. 20.	Highest Sales.	Day Mon.	Lowest Sales.	Day Mon.	Value Feb. 29.	From Jan. 31 Gain.	From Jan. 31 Loss.	Shares sold in February	Value Mar. 20.
Adventure, *Copper*	$250,000	10,000	25	$11.00	—	—	—	—	5	—	1	No sale	5
Algomah	500,000	20,000	25	1.87½	4½	4	4	10	4½	½	—	1,845	4
Bay State	500,000	20,000	25	†2.00	—	—	—	—	2	½	—	No sale.	2
Bohemian	250,000	16,666	15	3.94	5½	18	4½	1	5½	½	—	1,200	5
Boston	500,000	20,000	25	†2.00	—	—	—	—	1	0	0	No sale.	1
Copper Falls	500,000	10,000	50	18.00	59½	7	57	9	59	3	—	701	60½
Dana	500,000	20,000	25	1.02½	2½*	22	1½	2	2*	—	½	567	2
Forest	200,000	10,000	20	15.00	14½	28	10½	6	14	2	—	145	13½
Fulton	500,000	100,000	5	†2.00	1½	4	1½	9	1½	—	½	3,750	1½
Glen	500,000	20,000	25	†2.00	2½	14	2½	14	2½	—	½	10	2
Isle Royale	120,000	12,000	10	7.00	21	24	19½	14	20½	1	—	508	22½*
Mahone, *Sandstone*	400,000	40,000	10	†3.00	80	7	70	20	75	½	—	950	½
Manassas, *Mining*	1,000,000	100,000	10	†2.00	—	—	—	—	½	0	0	No sale.	½
Manitou, *Copper*	100,000	10,000	5	1.25	—	—	—	—	½	—	½	No sale.	½
Minnesota	800,000	8,000	100	22.00	171	10	170	25	175	10	—	4	178
National	250,000	10,000	25	2.00	—	—	—	—	1	—	½	No sale.	[illegible]
Native	250,000	10,000	25	4.25	2*	23	2*	23	2*	0	0	160	2
North American	300,000	10,000	50	20.00	—	—	—	—	75	5	—	No sale.	77
Norwich	100,000	20,000	5	4.50	—	—	—	—	15*	0	0	No sale	11
North Western	....	9,000	—	12.00	—	—	—		18	3	—	No sale.	19
Phoenix	300,000	10,000	20	6.00	10	4	9	17	9½	½	—	250	9½
Pittsburg, (*Cliff*)	....	6,000	—	18.50	147	2	144½	25	144	1½	—	47	144
Ridge		10,000	—	6.50	—	—	—	—	5½	0	0	No sale.	5½
Ripley	500,000	40,000	12½	†2.00	4½	3	3½	20	3½	—	½	5,044	3½
Shawmut	500,000	20,000	25	2.50	2*	11	1½	4	2*	½	—	680	2½
Star	500,000	20,000	25	3.50	6½	15	6½	15	7	½	—	10	6½
Summit	500,000	40,000	12½	†5.00	—	—	—	—	5	1	—	No sale.	5
Toltec	500,000	20,000	25	4.00	12½	18	11½	3	12	0	0	2,667	11
Winthrop	500,000	20,000	25	15	2½	2	2½	23	2½	—	½	1,070	2½
Webster	200,000	40,000	5	†3.00	2½	7	2	1	2	0	0	923	2
W. Castleton, *Slate*	1,000,000	50,000	20	†6.00	3	17	3	17	3½	½	—	30	3½

† These are fully paid stock, not assessable. * Assessment paid

50 shares Nebraska Copper Co. were sold Feb. 23 at $3½ per share, and 20 shares Rockland Copper Co., Feb. 10, at 12½ per share.

NEW YORK METAL MARKET.

COPPER.

South American	per lb.	20c	a	—
U S Soft Ingot		32	a	—
Sheathing		31½	a	32
Braziers'		35	a	—
Yellow metal		26	a	—
Ingot		32	a	—
Tubing		45	a	—

IRON.

Iron ores, magnetic and hematite	per ton	$3	a	6
Iron Bars, American hammered		75	a	85
Do. American refined		100	a	—
Do Superior brands		—	a	97
Do. English common		75	a	77½
Do. do. best		—	a	97½
Do. Swedes refined		95	a	100
Do. Norway bars, fork & N1FK brands		102½	a	104
Russian		86	a	94
Do. Sheet American	per lb.	6¼	a	—
Do. do. English, No. 1 to 20		4½	a	—
do. 21 to 24		5¼	a	—
do. 25 to 28		5½	a	—
Do. do. Russian		18½	a	—
Iron Sheet, English, Damaged		3¾	a	4
Do. Galvanized		$10½	a	14
Do R. R. bars by contract p. ton		—	a	80
Do. Pig American red short		38	a	40
Do. White Charcoal for found.		36	a	45
Do. do. do. for mal cast.		45	a	50
Do. for car wheels		45	a	60
Do. Scotch, for cash		35	a	—

LEAD.

Galena Pig, as per quantity	6¾c	a	7
Spanish	6½	a	6¾
Sheet	8	a	6¾
Pipe	7½	a	—
Old Scrap	—	a	6¼

SPELTER.

Spelter, as per quantity	6	a	7
Do. in slabs	6½	a	6¾
Do. Sheet	8½	a	9½

TIN.

Block Banca	—	a	34
Do. Straits	—	a	33
Do. Spanish	—	a	28
Do. Bars	—	a	35

New York, *March 21st*, 1854.

LONDON METAL MARKET.

March 3, 1854.

The *London Mining Journal* gives the following quotations, to which we add the duty *ad valorem*, United States Currency, rate of freights, and Foreign Exchange.

ENGLISH IRON.

Duty 30 per cent. ad valorem.

Bar and bolt *a*	per ton.	£9	10	0	$45	98
* In Wales *a*		8	10	0	41	14
* In Liverpool *a*		9	10	0	45	98
* In Staffordshire *a*		10	10	0	50	82
Sheets, single *a*		12	10	0	60	50
" double *a*		14	0	0	67	76
Hoop *a*		11	15	0	56	87
Nail rod, round *a*		11	0	0	53	24
" square *a*		10	10	0	50	82
Rails (Wales) *b*		8	0	0	38	72
" (Staffordshire) *b*		8	10	0	41	14
Railway Chairs Clyde *b*		5	17	6	28	44
Pig, No. 1, Clyde *b*		3	18	0	18	91
3-5ths No. 1, and 2-5ths No. 3		3	18	0	18	91
No. 1 in Wales *c*		4	10	0	21	78
Scotch Pig No. 1 in London		5	0	0	24	20
Stirling's Non-laminating or Hardened Surface Rails	£9 to	9	5	0	43 56 44 05	
Cold blast, No. 1 Foundry	£5 10s. to	6	10	0	26 62 31 46	
Charcoal bars		14	10	0	70	18
Stirling's Patent Toughened Pigs Glasgow		3	12	6	17	59
Ditto. Wales £4		4	5	0	20	57

FOREIGN IRON *a*.

Duty 30 per cent. ad valorem.

Swedish	per ton.	$12	0	0	$58	08
Russian CCND		17	0	0.	82	28
Indian Charcoal Pigs in London		6	0	0	29	04

FOREIGN STEEL *a.*

Duty 15 per cent. ad valorem.

		£	s.	d.	$	c.
Swedish keg, nominal	per ton.	£16	0	0	$77	44
Ditto faggot		—	—	—	—	—

SPELTER *a.*

Duty, in pigs, bars, and plates, 5; sheets, 15 per cent. ad valorem.

		Price	$	c.
On the spot	per ton.	£90 0 to 94 0 0	$116	16
To arrive		90 0 to 94 10 0	118	58

ZINC.

Duty 15 per cent. ad valorem.

		£	s.	d.	$	c.
In sheets *d*	per ton.	£32	0	0	$154	08

ENGLISH COPPER.

Duty: bolt and braziers', 20; pig, bar, and old, 5 per cent. ad valorem; Sheathing FREE.

		£	s.	d.	$	c.
Tile 14 to 28 lbs, *a*	per ton.	£126	0	0	$609	84
Tough cake *a*		126	0	0	609	84
Sheathing for ships 14 by 48, and bolts *a*	per lb.	0	1	2		28¼
Sheet *a*	"	0	1	2		28¼
Bottoms *a*	"	0	1	3		30¼
Old *a*	"	—	—	—		—
Yellow Metal *a*	"	0	1	0		24
Wetterstedt's Pat. Met.	per cwt.	2	0	0	9	68

ENGLISH LEAD *a.*

Duty 20 per cent. ad valorem.

		£	s.	d.	$	c.
Pig	per ton.	£25	0	0	$121	00
Sheets		26	0	0	125	84

FOREIGN LEAD *a.*

Duty 20 per cent. ad valorem.

		£	s.	d.	$	c.
Spanish in bond	per ton.	£24	0	0	$116	16

ENGLISH TIN *c.*

Duty 5 per cent. ad valorem.

		£	s.	d.	$	c.
Block	per cwt.	£6	10	0	$31	46
Ingots	"					
Bar	"	6	11	0	31	70
Refined	"					

FOREIGN TIN.

Duty 5 per cent. ad valorem.

		£	s.	d.	$	c.
Banca	per cwt.	£6	10	0	$31	46
Straits (uncertified)	"	6	7	0	30	73

TIN PLATES.

Duty 15 per cent. ad valorem.

		£	s.	d.	$	c.
IC Charcoal	per box.	£1	14	0	$8	23
IX Ditto	"	2	0	0	9	68
IC Coke	"	1	7	6	6	66
IX Ditto	"	1	13	6	8	07
Canada Plates *a* ton	"	16	0	0	47	44
Quicksilver *f*	per lb.	0	2	4		57

Terms.—*a* 2½ per cent. dis.; *b*, net; *c*, 3 ditto; *d*, 1½ per cent. dis.; *e*, 2 ditto; *f*, 1½ ditto; delivered in Liverpool 10s. per ton less. + Discount 5 per cent.

* Delivered in Liverpool 10s. ($2 42) per ton less.

EXCHANGE, New York, March 21, 1854.—Rates are ranging from 8½c. to 9c. premium in favor of London.

FREIGHTS at Liverpool are about 20s. 0d. ($4.84) per ton for iron in pig or bars.

JOURNAL OF GOLD MINING OPERATIONS.

GEOLOGY OF GOLD.

The geology of gold may be considered as tolerably well understood *In situ*, it is found in the primitive rocks, granite, gneiss, mica-slate, clay-slate, and porphyry; and having been freed from its original bed by the decomposition and disintegration of the rocks, and washed out by the rains, it is found in the beds of mountain streams and rivers, and in many alluvial soils in flat countries, through which mountain torrents occasionally flow. It is most frequently associated with quartz and oxides of iron, and with iron pyrites, sometimes with felspar, hornstone, calcareous spar, barytes, red silver ore, silver glance, sulphuret of copper, peacock copper ore, malachite, the various ores of lead, sulphuret of zinc, gray ore of antimony, cobalt, manganese, copper nickel, arsenical pyrites, and orpiment; and this information will enable parties in possession of mineral lands to form a judgment whether specimens from them are worthy of a trial for the production of the precious metal.

APPEARANCES OF NATIVE GOLD.

It is divided into three sub-species—the first of which may be considered the pure native metal, of a beautiful yellow colour, and a specific gravity of from 17·0 to 19·0. Brass-yellow native gold is of a bright yellow color, more or less light, or pale, and sometimes inclining to silvery white. It occurs disseminated—massive, capillary, mossy, reticulated, and in leaves; and when found crystallized adopts the forms of the cube, octahedron, dodecahedron, and double six-sided pyramid; its specific gravity is about 13·713, and its average component parts are—gold, 96·0; silver, 3·0; iron, 1·0 = 100·0. Grayish-yellow native gold is of a brass-yellow color, verging on steel-gray; it occurs in very small flattish grains, like platina, glistening at surface, never crystallized, heavier than brass-yellow, but lighter than gold-yellow native gold. Gold is found in another form, termed by mineralogists "electrum"—an argentiferous native gold, which is insoluble in either nitrous or nitro-muriatic acids; its color is brass-yellow, passing into silver white; it occurs in small plates, dentiform, and in imperfect small cubes; but little general information has yet been obtained of this mineral. An artificial alloy of this description is made for the manufacture of delicate philosophical instruments.

METHODS OF ASSAYING GOLD.

In assaying gold, a portion of pure silver is necessary, sufficient being added to produce a mixture containing twice as much silver as fine gold; the mass is then wrapped in lead, and placed in the furnace for about twenty-five minutes, but experience must dictate as to time: by this operation the lead, with copper or any other base metal, will have descended to the bottom of the cupel, leaving a small button of pure gold and silver, which must be hammered with a bright hammer on a bright anvil, and passed through a flatting mill, when it is called a "cornet." It is then dropped into dilute nitric acid, and placed on a sand bath, heated by fire beneath, when the silver is dissolved out; the gold is then brought to a red heat by the blowpipe, termed "annealing," when a button of pure gold, of a rich yellow color, will be the result. An easy and convenient method of assay by the wet way is, to subject the alloy to the action of concentrated *aqua regia* (three to four parts of muriatic, to one part of nitric acid); then filter the solution with great care, water being added to the insoluble precipitate to wash out all the dissolved gold. Sal-ammoniac is then added, and if a precipitate is formed, the infusion is again filtered. The solution is then evaporated to dryness, and alcohol of 0·84 specific gravity repeatedly added, digested, and poured off, until no longer colored. Sulphate of iron is then added, which will precipitate the pure gold in the form of a brown powder, which is then to be washed, filtered, heated to redness, and weighed.

EXHAUSTIBILITY OF THE CALIFORNIA GOLD FIELDS.

All the sources of information to which credit is attached in the public mind give no positive indications of a decline in the gold yield of California. The amount constantly shipped, and statistical returns, alike, show an increase in the yield up to the present time. If we consider the increased number of miners, compared with two or three years ago, the increase in the yield has been proportionately smaller. That is, the same number of persons at present engaged, with all their skill and facilities, could, if employed three years ago, have obtained a greater amount in twelve months than they do at present. What does this prove? Some will say, it shows a decline of the yield and an exhaustion of the source of supply. We do not view it in this light. To us it appears as an indication that the methods of obtaining gold at present in use in California, and which are adapted chiefly to one form in which the precious metal appears, have reduced the supply to be obtained through their agency. The application of science and skill through methods suited to extract it from its combinations will yet yield a rich supply. In other words, there are some indications of an approaching change in California, from a mere gold-washing country, to a scientific, intelligent gold-mining country. How long such a change may be in taking place time only can demonstrate. A large portion of the present miners must disappear, or give place to the control and guidance of a different order of men, or they must educate themselves to meet the change. It is with these views that we give place to the annexed extracts from a letter in the *New York Herald*, expressive of the sentiments of a desponding gold washer; and, if it were necessary, we could point to the same change in progress in other districts of our own country and other countries. In some parts of the world the inhabitants heretofore have not been sufficiently enterprising, wealthy, and scientific to adapt their industry to the altered circumstances, and gold mining has ceased; but we may now anticipate better things. It may not be amiss to say that many important financial considerations present themselves under such a view of California, but these pages do not furnish the proper place to enlarge upon them:—

I would call the attention of your readers, particularly the commercial classes, to the future prospects of this State, particularly the mining portion. My views differ materially from those of many others in relation to the future yield of the mines. Steamship companies, expressmen, stage contractors, traders, speculators, and all that *genus*, will not only differ from me, but denounce any writer who may express an opinion that the mines are nearly worked out, and will not continue to yield as they have formerly.

I have worked for upwards of three years in the mines as hard as any man in the country, and believe that I am as capable as any man to give a correct opinion, more especially when derived from facts and personal experience. I have travelled during the past summer and fall from one extreme of the mining region to the other.

By reference to Eddy's map of California, (which, by the by, is not quite accurate,) you will see that the gold region—or rather that portion upon which gold has been discovered—commences at the San Joaquin river in the south and extends to Oregon, a distance of about three hundred and fifty miles; the width is from three to thirty miles; not one hundredth part, however, yields gold in sufficient quantity for a man to make his board.

That portion that yields gold has been worked and reworked until large portions will not now pay fifty cents to the men per day. Some of the richest streams have been worked over nine and ten times, and have been entirely deserted by white men. Thousands of men, many of whom are fully qualified to fill almost any public situation in the State, are this day working for wages ranging from fifty cents to two dollars a day.

All kinds of appliances are used to bolster up monopolists. The interior papers publish all the rumors of strikes that they can hear of—many of them creations of their own imaginations—though the number of strikes are getting beautifully less. The papers publishing these strikes do not want to give a fair or correct impression of the actual state of affairs in the mining region—they do not tell us that while one company make a strike of a few hundred dollars, that they (the company) have not paid expenses the last six months, and that there are fifty companies who have not made board. Some few months ago it was said in the dry diggings, "if we had water we could make money." Canals were cut, and the water let in, but the desired result was not obtained.

From among many hundred instances I will cite Moquelumne Hill, in Calaveras county—water was brought on and not one company in ten could make enough to pay water dues, which were four dollars a day for each sluice stream, and hundreds left for other diggings, the Amazon or the "New Republic." At the same time, and with the facts before their eyes, subsidized presses will publish accounts that "A, B and C yesterday took out of their claims thirty ounces, and more of the same sort left"—giving the impression that there is plenty of remunerative employment to be had there. Such is the case throughout the mines. The papers all complain of the "dullness" of the times, and attribute it to anything else than the right cause. Want of gold is the sole cause; it is not in the ground, and hundreds of speculators must go down. If I had employment for men I could obtain thousands, who would work hard on contracts that will not pay them one dollar a day above their board. Such has been the case last fall in Toulomne and other mining counties. Any number of "fillibusters" can be obtained if their expenses be paid to Sonora or anywhere else.

The facts of the hard times do now and then leak out; papers in the interior contain advertisements of bankers, which read, "Owing to the scarcity of gold dust, we, the undersigned, are compelled to raise the price of exchange on San Francisco."

The stores in the mines are supplied with upwards of twelve months' stock, as are the warehouses in the cities, to say nothing of the immense number of ships from eastern ports now due here.

The shipments of treasure in this month (January) have fallen off considerably, (even taking the published statements of the shipments, which have been notoriously incorrect,) from previous months, and three fourths of the amount of the two last were in coin; and mark my prophecy—the yield of gold for the next twelve months from California, will not exceed one half of that of 1853, and that of 1855 will be decreased in the same ratio.

If I can stop the tide of immigration to this State, and the immense shipments of goods that are in contemplation, I should feel that I am repaid for the labor of laying the facts before your readers.

I have been here three years, and have made nothing—unless premature age be called a gain—but still continue in hope; but if the ensuing summer does not bring the long desired consummation of my hopes I shall return home.

I before stated that I differed from hosts that were interested in keeping up the excitement; but my statement will not be disputed by one man in ten thousand not connected with speculation. They will say: "You have not given a sufficiently graphic description of the country."

QUARTZ VEINS IN CALIFORNIA.

Everything relating to the character of these veins becomes of interest as the indications increase that they must ultimately be looked to for a large amount of the gold which California may at some future day yield annually. In Grass Valley they have thus far probably been more fully investigated than elsewhere in the State, and we here introduce some remarks upon that region, from an extensive work upon the Mineralogy and Geology of California, by Prof. James Blake—a work which unfortunately was almost entirely consumed in manuscript by one of the late destructive fires in one of the cities: —

In following up this region of country, the next spot we strike where the veins of auriferous quartz have been worked to any extent, is Grass Valley, and as mining has been carried on in a more systematic manner there than in any other part of the state, I shall dwell at some length on the Geological and Mineralogical features of the neighborhood, illustrating as they do the principles to which I have already alluded as governing the distribution and richness of these mineral veins.

The general character of the rock is porphyritic, running in some places into trap and in others into greenstone and granite. This belt of primitive rock is about two miles broad, running north and south, in which direction it can be traced for many miles. Its breadth, however, varies, expanding as we proceed northward toward Nevada, and being encroached on by the slates to the south. It is in this belt of primitive rocks that all the richer veins of quartz, that have been worked up to the present time, in the neighborhood, are found. The most westerly lode that has been opened is on Gold Hill, which has furnished some very valuable ore. The most easterly mines that have been worked are those on Osborne Hill, about two miles east of Gold Hill. Other lodes are found between these, many of which are of undoubted richness. In consequence, however, of the rolling nature of the surface of the country, and the depth of alluvial soil formed by the softened porphyries, there are undoubtedly many veins traversing this region of the country which yet remain to be discovered, and which can only be found by carefully conducted researches. Up to the present time it is only where by some peculiar accident in the conformation of the surface, or by the removal of the alluvial soil for the purposes of placer mining, that the quartz veins have been exposed, and as the places where such an occurrence can take place are infinitely rare, in comparison with the localities where the outcropping of a vein would not present itself we have every reason to conclude that other explorations conducted on scientific principles will lead to the discovery of numerous other lodes. The direction of the veins in this region is usually north and south, but occasionally cross courses are met with; however, here, as in other portions of the country, the north and south lodes are the best. The Lafayette lode, the Gold Hill lode, the lodes on Ophir, Osborne, and Daisy Hills are regular lodes, and all furnish ores of considerable richness. But the course of the veins in this portion of the country is subject to the same irregularities as have been noticed in veins occurring in primitive rock in other parts of the country. In the veins on Gold Hill, for instance, the general direction is north 15° west, but toward the north side of the hill, it forms an angle with its former course, the outcrop being north 60°. The same deviation from the regular course is seen in the lodes in Ophir and Osborne Hills, and at these localities, it is in the same direction and about the same degree. The explorations that have up to the present time been made have not pointed out any law as governing these deviations; they are, however, unaccompanied by faults in the lode, which can be traced continuously at the place where it changes its course. I have, however, noticed here and elsewhere, that the convexity of the angle formed where this deviation takes place is directed to the east. It would seem that the fissures through which the quartz was injected, did not in these hypogene rocks follow so direct a line from north to south as we generally find has been the case in the stratified. The dip of the lodes, as in other parts of the country, is very irregular, although as a general rule they are inclined less in the primitive than in the stratified rocks. It varies from forty-five to eighty degrees, frequent changes taking place in the same lode; but as a general rule, we find them most inclined the lower we descend. The veins dipping to the east are most common, but I do not find any connection between the direction of the dip and the character of the ore, analogous to that which has been noticed in the course of the vein. The breadth of the vein is subject to great variations even in the same lode, which sometimes expands from one or two inches to as many feet within a very short distance: the average breadth is about eighteen inches. The character of the ores is different in different mines; in some lodes they contain a large portion of the sulphurets of iron and molybdenum, while in others the proportion is but small, the pyrites being found principally in the cap rock surrounding the ore. There is one advantage which the ores in this region possess, which is, that the gold is found in them in small particles, which, however fine, do not consist of such excessively fine *laminæ* as are often met with in the ores from the States; this is a great advantage, and the extraction of gold by quicksilver is much easier when it is in solid particles than when it is in *laminæ*, as fine frequently as gold-beater's leaf. There can be no doubt but that from this cause the extraction of the gold in this district is much more complete than in other sections of the country, and we also see why the same arrangements that succeed here in saving all the gold, should fail in other places where it is in a different state of mechanical division. The gold is more frequently found directly in the quartz, and not associated with the pyrites to the extent it is in the ores from the States.*

AUSTRALIAN GOLD FIELDS.

I. *On the Gold Fields of Victoria or Port Philip;* by H. G. WATHEN, Esq., Mining Engineer, (Quart. Jour. Geol. Soc., vol. ix. p. 74, communicated by P. N. JOHNSON, Esq., F.G.S.)—*General Description, Geographical and Geological.* A chain of mountains, or rather a series of distinct ranges, runs round the southeastern corner of Australia, nearly parallel to the coast line, and from fifty to eighty miles from the sea, forming part of the main chain of the continent, and rising at its highest summit, Mount Kosciusko, to 6500 feet above the sea-level. This mountain chain in Victoria consists of clay-slates, mica-slates, and flinty slates, in successive steps, forming collectively, a recurring series.

The slates are nearly or quite vertical, with a north and south strike, and are intersected by numerous quartz-veins, running at an acute angle with the slates. Vast plains of trap, forming high table lands, run up to the base of the mountains and probably cover their lower slopes. It is in the valleys and gullies of these mountains, and not very far from their junction with the trap-

* As some may be interested in knowing the richness of the ores worked in this locality, I have ascertained, as carefully as possible, the amounts that have been taken out, when they have been worked at the mills. I cannot vouch for the absolute correctness of these data, but I believe they are very near the truth:—

Ore from old portions of Gold Hill vein, as calculated, the greater portion being worked by hand	$2,000	to	$100	per ton.
Ore from Gold Hill vein now worked	50	to	10	"
Ore from Lafayette Lode	150	to	50	"
Ore from Daisy Hill	50	to	30	"
Ore from Ophir Hill	60	to	20	"

pean plains, that the rich deposits of gold are found. The auriferous districts are commonly broken by deep valleys and precipitous steeps. The hills are thickly forested; the soil poor and gravelly, and the surface strewn with angular fragments of white quartz.

Gold-fields.—Gold has been found at several points remote from each other along this zone of mountains; but incomparably the richest deposits hitherto opened in the Colony of Victoria, and indeed in the entire continent, are those of Ballarat and Mount Alexander, the latter far exceeding the former in extent and richness, while even the former is said by Californian miners to surpass in richness and yield all that they have witnessed in that region of gold.

Mount Alexander Gold-field.—Mount Alexander lies in latitude 37° South, longitude 144° 20′ East, and is about 75 miles north-west of Melbourne. It was named by the first explorers Mount Byng, and is thus distinguished on many maps. It is a rocky granitic mountain, with a rugged flattened outline, towering some hundreds of feet above the summits of the forested ranges of slate rocks which surround it, and of which it is the centre and nucleus.

The enormous amount of gold which this district has yielded has chiefly been derived from two valleys with their lateral gullies and ravines. These valleys are known by the names of the streams or "creeks" that run through them. One of these, Forest Creek, takes its rise in Mount Alexander itself; the other, Fryer's Creek, has its source in the high and broken ranges of slate that environ the Mount. Both creeks are tributaries of the River Loddon. The workings extend five or six miles along the valley of Fryer's Creek, and about ten along that of Forest Creek. At Fryer's Creek gold has been found in large quantities beneath the bed of the stream, near its source, in the upland gullies. Forest Creek, on the contrary, appears to grow barren as it approaches the higher granite country, where it originates. On the banks of the River Loddon gold is found in small quantities, lodged in the crevices of the rocks, but no large deposits have been met with on the river; and even the stream into which Forest Creek runs, though itself only a feeder of the Loddon, proves far less rich than Forest Creek and its mountain affluents. In short, it would seem that the gold had been arrested in the small mountain ravines and gullies, and was never washed down to the large streams. Auriferous sands on river-banks or in alluvial plains are unknown in the Colony. When within 12 inches of the surface, the gold is disseminated in a quartzose gravel; when found at lower depths, it is almost always imbedded in clay, usually of a very tenacious kind.

Ballarat Gold-field.—The Ballarat gold-field, which is about fifty-five miles north-west of Geelong and Port Phillip Bay, lies at the junction of the slates with the trappean country, about seven miles from an extinct and now forest-grown volcano, known as Mount Boninyong. A second similar black volcanic mount rises out of the slate ranges, about ten miles due north of Boninyong. Granite crops out in small patches between the two Mounts.

This auriferous tract is united to that of Mount Alexander by a succession of similar dark forested ranges, rough, rocky, and sterile, strewn over with quartz, and consisting of the same series of micaceous, flinty, and clay-slates.

Volcanic tract.—At the western base of these sombre hills lies a large tract of the most fertile and beautiful country—the garden of Australia Felix—the rich soil of which is the product of decomposed lava. These park-like plains, sprinkled over with groups of trees, are diversified by numerous dome-like lava hills, without trees, but of the richest verdure. I have counted no less than twenty-four of these remarkable bold hills from the summit of one of them. The south and east sides are commonly steeper than the others. They are usually flat at the top; but in one of them, which I named Mount Lyell, after the illustrious geologist, there is a small crater, which had the reputation of being fathomless, but which I found to be in fact about 50 feet deep, consisting of an upper cup or crater about 15 feet in diameter, contracting below into a narrow rocky shaft or well, 30 feet deep, and three or four wide. The freshness of the traces of the flow of the lava, which is of a soft and perishable kind, indicates that the epoch of igneous action cannot be very remote. Altogether this volcanic region forms a most interesting subject for geological research and speculation.

(To be continued.)

LONDON AND VIRGINIA GOLD MINING COMPANY.

The proceedings of the first meeting of the stockholders of this Company in London were noticed in the last number of this Magazine, on p. 305, No. III. It was there stated that their property was known as the Garnett and Mosely mines. This was an error. Their property is known as the Eldridge mine.

THE EZELLE GOLD MINE.

This mine belongs to the Yorkville (South Carolina) Mining Company, of which Wm. Chonney is President, and Andrew C. Getty and E. L. Snow Trustees. From a report of Mr. Stephen P. Leeds, Geologist, we gather the following interesting facts:—

The Ezelle Gold Mine is located in Lancaster District, South Carolina, immediately adjoining the State line, which forms the boundary of one side of the property.

It occupies a prominent position in that rich slate belt which contains the Gold Hill Mine on its north-eastern portion, the Union Mines in its central section, and the renowned Dorn Mines on the south-western terminus. This belt of mineral wealth has never been surpassed by any other, for permanent productiveness, and has long maintained a high reputation based upon the continued returns from the mines above enumerated.

The geological connection of this extensive range is unbroken and uniform throughout; and though not equally rich in all parts, still it holds many points of extreme value, and evinces in these more important portions of its extent a certainty of rich and profitable material.

The Ezelle Mine is situated in the central part of this belt, about five or six miles from the Union Mines, and covers a surface of one hundred and thirty-three acres, so laid out as to embrace the greatest extent of the vein, and forming an arm or elbow, extending to the waters of Twelve Mile Creek, rendering available to the property a valuable water privilege which is derived from this never failing stream.

The vein is composed of silicious hornstone slate, which, in common with most of the leading rocks of this part of the country, are decomposed, and partly disintegrated, for a distance of fifty to sixty feet below the surface. This friable character which is attached to these rocks, renders the separation of the gold from those ores which have been subjected to its influence, a matter of comparatively easy performance. In some cases so complete has been the disintegration, that the rock is reduced to a fine and almost impalpable powder, which requires simply washing to separate the gold. Between the laminæ of the slate, when separated, the particles of gold are often plainly visible, in the form of minute scales. Some portions of this character of ore will yield as high as seventy-five dollars per bushel, while the general average will maintain a value of from two and a half to three dollars per bushel.

This ore can be raised at a moderate expense, when compared with those ores of a harder and more tenacious character which compose the chief rocks of some less favorable mines. Wherever this disintegration extends, the ore can be marked out with a pick alone; no blasting will be required until the decomposed portion of the rock has been cut through; and, even then, the laminated formation of the rock will render this process a highly effectual one.

It is estimated that the ore can be raised from this mine, and milled, at an expense not exceeding six cents the bushel, when once the mine is in full operation.

Each hand employed at excavating can get out two tons of ore per day.

Each ton will contain sixteen bushels of ore.

The average width of the vein is about three feet, and it extends over three-fourths of a mile on this property.

A large portion of this vein has never been broken, even upon the surface, and where the vein has been opened upon, the work was never prosecuted below the water level the point at which most of the mining labors ceased, owing to the inefficient means at the command of those who were working the mine.

Several pits were opened near the State line, or boundary of these premises, and the work was also carried forward in another portion of the vein, nearly a quarter of a mile distant. About half a mile of the vein is therefore in its original condition.

There are on this property at various places, contiguous to the main vein, several lateral veins, which at each of the respective shafts opened upon them, have been very rich in gold. This is a characteristic feature of the whole of this slate belt; the same peculiarity is witnessed at Gold Hill and the Union Mines; and where the main vein carries the largest quantity of gold, these parallel veins also contain a valuable supply of ore.

The total amount of gold which has been derived from this mine amounts to nearly one hundred thousand dollars in value, and this with a depth of working not exceeding forty feet, and extending at intervals over one-fourth of a mile of surface. In this space, several shafts have been sunk, and short galleries driven on the course of the vein; but so small an amount of work has been done, that the whole might be considered as merely proving the vein. These shafts could be rendered useful in working the mine, as air shafts or ventilators, and would also be valuable as indications of the true position of the vein at their floors. When the work ceased, owing to the presence of water, which with the means employed could not be overcome, the vein still presented at the lowest points attained as favorable an appearance as it had manifested at any previous portion of the work.

About half a mile of the vein upon this property has never been opened.

At all sections of the great mineral belt upon which this mine is located, wherever the laborers have penetrated to a considerable depth below the surface, the ores have either increased in value and richness, or, under the most unfavorable aspect, have maintained their surface percentage.

At the Dorn Mine, at the Union Mines, and at Gold Hill, where the deepest shafts have as yet been sunk, the ores have invariably improved as the work has deepened; and at other mines upon this same belt, the same fact has been observed.

It ceases, therefore, to be a matter of speculation, as to the yield which can be drawn from the remainder of the vein, when its whole extent shall be wrought, and where a depth shall be attained commensurate with ample power, and fully adapted to machinery. All the work upon the mine hitherto performed, has been done by the instrumentality of the simple windlass, and the common horse whim.

A good dwelling house is on the property, with a blacksmith shop, in good order.

The land is well stocked with timber, from which at all times there can be obtained any quantity necessary for building operations, or for mining materials.

The Wilson Gold Mine.—This mine is also the property of the Yorkville Mining Company, and from the same report of Mr. Leeds we make the following extracts in relation to it:—

The mine is situated in York District, South Carolina, about eight miles from Yorkville, the county seat.

It consists of two tracts of land, one of which comprises an area of fifty acres, the other covers an extent of one hundred and forty-nine acres. The survey of both these plots of ground was extended in such a manner as to comprise the greatest possible portion of the vein which traverses each plot through the section of their extreme length.

The vein lies between walls of sedimentary rock, probably belonging to the Silurian Epoch, but which from the metamorphic influences that have been at work upon them, have been greatly transposed and modified in their character. At the surface, and for fifty or sixty feet in depth, this rock is so fully or nearly decomposed, that it is easily reduced to that fragmentary state which renders the sinking of shafts comparatively easy. Below that depth at a point beyond which these chemical changes have ceased to be manifest, the rock assumes a harder and more compact form, and as a necessary consequence shafting would progress with less rapidity—but the work would be more durable, and where the work was carried down through the solid rock, much of the expense of timbering would be obviated.

The gangue stone is ferruginous quartz, cavernous or cellular in its formation, the cells or spaces of which are partially or nearly filled with the brown oxide of iron, the resultant of the decomposition of the iron pyrites or sulphuret of iron. It is in this metallic oxide that the gold is most abundant; it bears the technical title of "brown ore," and when properly freed from the quartzose rock, will yield an average product of gold to the value of two and a half dollars to the bushel. In some rich portions of the vein this "brown ore" will yield from twenty to thirty dollars per bushel, and in the poorer sections will not rise higher than twenty cents to the bushel. The quartz rock is impregnated with gold in many portions of the vein where there is no "brown ore" accompanying it.

When raised from the mine and carefully dressed, the ore is divided into two portions—the "brown ore" which requires no stamping, and the "flint ore," as the quartz is termed, which requires the abrasive action of the stamping mill.

The matrix, or vein stone, is highly charged with this "brown ore;" and from the character and position of the wall rocks, each miner could probably send to the surface two tons per day of vein rock, comprising the quartzose rock and "brown ore," the average weight of which would give from sixteen to eighteen bushels to the ton: of this quantity the "flint ore" will claim the largest proportion, leaving about two bushels of brown ore to the ton, which, with four bushels of waste rock, will make the "flint ore" amount to about ten bushels. This estimate is predicated upon the amount the vein returned when worked some years since. It will undoubtedly become more valuable as the vein is cut at a greater depth than has heretofore been reached, since the uniform character of true metallic veins is to improve in richness as they deepen in position.

The yellow sulphuret of copper is also disseminated through the gangue stone—and from the accompanying indications, such as the presence of great quantities of iron pyrites, and the lining of many of the crevices of the rock with the cupreous oxide, known to miners as copper blood, there is every reason to believe that this metallic ore will prove to be sufficiently abundant at a more advanced stage of the mine, to become an object of high importance on the score of profit. This ore yields, under analysis, thirty three per cent. of copper, and under the smelting process will produce from eighteen to twenty per cent. of copper. At the present rate of copper, this would make the ore, at twenty per cent. of copper, worth ninety dollars per ton, from which the cost of transportation would have to be deducted. This latter item of expenditure, however, will not be a very serious item, since the mine is but six or eight miles distant from Yorkville, the present terminus of the "King's Mountain Railroad," which connects with the whole chain of railroads intersecting the Southern States.

The character of the vein may perhaps be more fully comprehended by following the old workings, beginning at the most northerly shaft, and terminating at the point where the operations were suspended. At the first, or Stewart shaft, a depth of fifty feet was attained. At the floor of this shaft, a gallery was then driven along the course of the vein, and a fine body of good ore was extracted from it. At the next shaft, at the depth of sixty-five feet, the vein was somewhat irregular, but exceedingly rich; here a level was driven along the course of the vein, from which also a highly valuable ore was derived. The next, a whim shaft, sixty feet deep, still stands in good order. This shaft could at once be made available. The next shaft was carried down sixty feet, and here, too, a level was driven on the course of the vein. The deepest shaft comes next, which was carried to the depth of sixty feet. The other shafts reached a point of fifty and sixty feet respectively. At these points the vein had not failed, nor become impoverished, but held its uniform size, and gave evidence of a long continuance. A shaft was also sunk upon a small branch vein, which proved exceedingly rich.

By bearing in mind the various depths of the different shafts, it will at once be perceived that the vein has never been worked below the water level, and that from about sixty feet from the surface, the riches it contains remain undisturbed.

There are few properties that will surpass this in actual value, and not many that are more favorably located for convenience and facility of being improved. There is an abundant supply of timber on the land, and fuel would cost but the expense of cutting and drawing.

GARDENER GOLD COMPANY.

The mines of this Company are located at the extreme northern boundary of Spottsylvania county, Virginia. The Company above mentioned is organized under the laws of New York, with a capital of two millions. The officers of the Company are C. Zabriskie, jr., President; Charles Ely, Anthony P. Halsey, Charles Tracy, Frederick G. Wheeler, Joseph Belknap, Perry G. Gardner, Trustees; Geo. C. Ripley, Treasurer; Richard Vose, Secretary.

GOLD IN THE GILA RIVER.

Specimens of gold have been brought from this distant region by officers of the United States troops, respecting which one writer thus reports:—

We had the opportunity of examining some specimens of gold brought in by Major Steen, of the United States dragoons, from the vicinity of the copper mines in New Mexico, in the neighborhood of Fort Webster, where he has been stationed. The specimen is from surface washings, but sufficient to show that the precious metal exists there, and subsequent washings will doubtless prove its existence in larger quantities.

Major Steen has also a sample of the gold found on the river San Pedro, which empties into the Gila river from the south, in the Mexican province of Sonora, near where the boundary line between the United States and Mexico, as projected by Mr. Bartlett, strikes the Gila. The San Pedro is the only stream entering the Gila from the south. Beyond the mountains are the ranches of San Bernardino and Santa Cruz, and on the other side of the San Pedro at Taos Leon, places mentioned by Col. Cook in his Expedition to California. It is from this mine that the gold bullets used by the Indians are procured. Mr Aubrey alludes to them, and Dr. Abadie, of the United States Army, sent some of them to Major Walker, of this city.

In this connection the Major mentions another fact illustrative of the abundance of gold in that region. An Indian applied to him for clothing. The Major promised to furnish what he wanted if he would bring him gold from the Gila. The Indian replied that if he had known it he could have brought him "handfuls" from the late feast of the Gilenos, for it was plenty there. He went away, and in a few days returned with a pound or more. The Major being absent, the Indian sold it to an interpreter. Of him the Major obtained his sample. It is in large lumps or grains, and unlike the washings obtained in California. There can be no question that there is a mineral tract of country on the Gila that will soon attract an immense population.

TOUGHENING GOLD.

Wolf proposes, in the Practical Hand-book for Jewellers, to fuse the brittle gold in a new crucible, and when melted to throw in one or two pieces of sulphur of the size of a pea, to shake the crucible a little with the tongs, and to cast it rapidly into a heated mould. He also proposes to render small pieces malleable by coating them with powdered borax, and heating them in the blowpipe flame, until the surface commences fusion.

Both of these methods are resorted to at the United States Mint, but the choice of either depends upon the nature of the accompanying metals that give the gold its brittle character. When there is a quantity of iron present, the gold is fused with a mixture of sulphur, potash, and soda, which will remove it by making the very fusible mixture of sulphurets of iron and alkali. If tin, arsenic or antimony be present, a good flux is a mixture of borax, soda, and saltpetre, the last for oxidizing the foreign metals into their respective acids, the soda to give base to those acids, and the borax to collect the slag. In both these cases a sand or clay crucible is preferable to a black lead pot, in which last the graphite acts reducingly. Where lead is present this process may partially effect its removal; but it is more completely effected during quartation and by washing the fine gold thoroughly with hot water, after extracting the silver by nitric acid. Another method of removing lead would be to fuse the gold with a little saltpetre, borax, and silica, whereby a fusible slag of oxide of lead would result, and might be skimmed from the surface of the gold. Palladium and platinum, not unfrequently present in California gold, are also removed by the nitric acid in parting silver from gold. Grains of iridosmin have been observed in California gold, in distinct particles, even after three or more fusions, and seem to have no tendency whatever to enter into an alloy; but, whilst casting such gold, these particles collect at the bottom of the pot, from their greater specific gravity, and, by remelting in a small crucible, and carefully casting, they may be obtained mixed with a small quantity of gold. The latter is dissolved by nitromuriatic acid, and the iridosmin obtained pure.

QUARTZ CRUSHING MACHINES.

James Hamilton, of New York, has patented a quartz crushing machine, respecting which he thus describes his claim.—

"I do not claim the cylindrical pestle, or roller, in itself, as it has been used on a flat surface, and I am also aware that the cylindrical pestle has been used in a concave dish, or basin, but in this case, so far as the rolling motion is concerned, the same operates similarly to the ordinary rollers in oil mills, &c., but the sliding motion is dependent on the weight of the pestle, causing the same to slip on the inclined part and rub the ore; whereas, in my machine the ore is first cracked by the grooved upper surface of the pestle, which I am not aware has ever been before used, and the grinding is performed by a pestle set on a shaft, and having a partial rotary motion, which grinds the ore against the sides of the basin, without having any rolling motion at all; therefore, what I claim is, the means described and shown for cracking and grinding metallic ores, consisting of the cylindrical pestle, provided with grooves in its upper part to crack the lumps of ore, and set on a shaft, on which it has a partial rotary motion, and operating in connection with the basin, in which said pestle moves to grind the ore into powder by the gradual approach of the sides of said basin to the cylindrical pestle, said pestle being also provided with a scraper or agitator in its lower surface, to operate as specified."

ROCKY BAR MINING COMPANY.

The mining engineer of this Company, Mr. Seyton, under date of Jan. 29th, writing from Grass Valley, thus speaks of his operations:—

He states that the weather had been unusually cold, which had interfered with all mining operations for a few days. In reply to the President, he says: "You ask me the specific question of what I should do with $10,000, $20,000 and $30,000 respectively. In any case I should in the first place raise from each of our separate parcels of claims, as near as possible, 100 tons of rock; at the same time I should sink two or three shafts on the line of the proposed tunnel, so as to determine the exact position of the "bed rock" of Massachusetts Hill, in the direction of our largest lot of claims. To do this without chance of obstruction or hindrance to the works being pushed quickly on, I must have a strong pumping apparatus, as the level of water in the hill is considerably above the greenstone, and it would be impossible to reach this last without efficient pumping power. Say that our pumping machinery, fixed and ready to work, costs $4,000. I can raise 400 tons of rock for $6 per ton, but I will say, including hauling, $7 per ton—this will take $2,800. I can have it crushed separately in Atwood's new mill for $7 per ton—again $2,800. Put my extra shafts at $1,000, in all $10,600 for expenses—say that the rock will average $20 per ton, this will give $8,000, and if you add to this, the value of the pumping machinery, and of the shafts and other work done on the property, the experiment would pay its own expenses and leave something over.—This I can do for about $10,000. It is very possible that I may find this system of drainage by pumping so effective, as to warrant me in laying aside the tunnel, either as useless or too expensive.

The only part of this *modus operandi*, that is objectionable, is, the having to let out the crushing, but it would be impossible to get a mill properly fixed up, in addition, without going considerably over the sum mentioned. For $20,000 I would pursue the same course as I have already mentioned, with the exception of letting Atwood have the crushing, while in addition, I could so alter and refit the mill, that it would be a sufficient machine until we were warranted by success to erect a more powerful one. For $30,000 I would in addition (in case I found the bed rock lie less than 100 feet on the line of tunnel) recommend the prosecution of the tunnel, but if we find the greenstone to run so far on the line of tunnel, as to constitute the base of the mountain, it would be the best plan to drive a level at least forty feet above the present one, or at such a height as to present but little obstruction from the greenstone. I will, however, raise and crush 400 tons of rock and have their value carefully tested, and the result ascertained, with all possible certainty, before I will recommend driving a foot of the tunnel or expending a dollar on new machinery.

If the rock is really worth crushing, it will be best to shift the position of the mill. A well-built Chilian mill, of two-thirds the diameter of the present one, and with wheels twice the breadth of ours, would be a very good machine for crushing.

A joint resolution is now before the Legislature, embodying the idea of tenure in the mines. If passed and sent to Washington, that will be what every sensible man acknowledges as the great want in this country, the common law of property. Let them give holders of claims a patent in fee simple, and in three years the yield of gold will be more than doubled.

JOURNAL OF COPPER MINING OPERATIONS.

THE COPPER PRODUCT OF 1853.

On page 369 of this number of the Mining Magazine, will be found the produce of copper from all the British mines in 1853. On page 320, Vol. II., are the returns of copper and copper ore exported from South Australia during the first six months of 1853 The annual product of the mines at Falun, in Sweden, is about 200 tons annually. No returns of any extent have at present come to hand, relative to the produce of copper in other countries of the world. We now add the amount of copper sent down from the mines of Lake Superior during 1853, and received at the Saut, by Messrs. McKnight, and Spaulding & Child, the two forwarding houses at that point.

Copper.	Tons.	Pounds.
Cliff Mine, Eagle River,	1,351	328
Minnesota Mine, Ontonagon,	769	1,090
North American Mine, Eagle River,	165	574
North West Mine, Eagle Harbor,	181	648
Copper Falls, do.	70	1,642
National Mine, Ontonagon,	42	538
North Western Mine, Eagle Harbor,	32	144
Siskowit Mine, Isle Royale,	19	447
Norwich Mine, Ontonagon,	29	1,425
Forest Mine, do.	35	1,876
Isle Royale Mine, Portage Lake,	15	1,788
Adventure Mine, Ontonagon,	11	1,129
Ridge Mine, do.	11	1,419
Aztec Mine, do.	10	512
Toltec Mine, do.	6	933
Portage Mine, Portage Lake,	5	1,028
Pittsburg and Isle Royale Mine, Isle Royale,	3	1,729
Douglass Houghton Mine, Ontonagon,	4	699
Bohemian Mine, Ontonagon,	2	603
Ohio Trap Rock Mine, do.	2	246
Derby Mine, do.	2	867
Phœnix Mine, Eagle River,	2	1,729
Fulton Mine, do.	2	1,276
N. Y. and Mich. Mine, Copper Harbor,		1,981
Ohio Mine, Ontonagon,		1,001
Meadow Mine, Eagle River.		500
Total,	2754	232

This statement shows the amount forwarded to market, which is the basis upon which every estimate must rest. At many of the mines there are many tons not yet sent forward, which must be placed in the report for the present year.

LAKE SUPERIOR COPPER MINES.

Great activity is displayed among the mining companies in this distant region, and we continue the record of the progress of operations at the several mines, and the new features which have been manifested since the last mention of each in these pages:–

PORTAGE LAKE DISTRICT.

Pewabic Mine.—This mine was last noticed on page 416 Vol. I., Mining Magazine. It is in the Portage Lake region, and joins the Ripley on the west, and lies immediately upon the lake. Work was commenced at the mine in June, 1853. The following additional facts are stated by the superintendent, Mr. C. C. Douglass:—

We are now sinking shafts on veins Nos. 2, 5, 6, 7, and 8. A shaft 39 feet deep, B shaft 41 feet do., C shaft 15 feet do., D shaft 30 feet do., E shaft 35 feet do. The vein in A shaft is over 2 feet wide, well defined, has perfect walls, is composed of quartz, epidote, chlorite and copper. The vein is now increasing in size rapidly, and is looked upon by all who have seen it as a vein of much promise, and I consider it as such myself. B shaft is on vein No. 5, and is 41 feet deep, and much of the vein-stone is well charged with fine copper. It is supposed to be the Montezuma vein, and is composed of spar, quartz, epidote, trap and copper. The latter is mostly in fine specs, but these are increasing in size with depth. At the present time the vein is looking well. C shaft, No. 6 vein, contains more crystallized quartz than any of the other veins, and carried quite as much copper for its depth as any of them. It is a large vein, and one of much promise, size not fully determined, but will exceed five feet.

D or No. 7 vein contains a fine amount of spar and epidote, and less quartz and copper than either of the other veins.

E or No. 8 vein has a close resemblance to that belonging to the Montezuma, carries some copper, and appears to be improving with depth.

I have, as my works will show, thought it advisable to open on several veins; hoping by that means to determine their respective values to a considerable extent, the present winter.

I shall increase the force on B E veins, if not on some of the others, and shall endeavor to push the work forward as fast as things will warrant.

Portage Lake Mine.—This mine, previously noticed at pages 295 and 416, Vol. I., and p. 198, Vol. II., is thus described by a correspondent at this time:—

Four shafts have been commenced upon the Portage vein, the depths of which are now 60, 101, 75, and 80 feet, and two upon the Isle Royale vein that are down 39 and 72 feet, making in all 418 feet of shafts. The drifting is yet confined to the first level, and amounts to 450 feet. Copper has been found in all parts of the vein, near the surface as well as at the lowest point reached in the mine. As a general thing, however, copper is found in greater abundance upon the foot rather than upon the hanging wall. Both the shafts upon the Isle Royale vein contain copper, but one of them is particularly rich, and has been so from the commencement. The appearance of the copper and vein stone at this point is the same as upon the Isle Royale location. It is difficult to form an opinion of the comparative richness of the Portage and Isle Royale and Portage veins. They run parallel, and are about 200 feet apart. Both are large veins, and contain very nearly the same mineral ingredients, with a very similar appearance, and both improve as you sink upon them.

The force employed numbers 68 men—34 miners, 4 wheelers and fillers below the surface, and 30 surface-men.

Albion Mine.—This mine, a report upon which will be found on page 414, Vol. I., is situated within sixty rods of the north shore of Portage Lake, and joins the Portage mine on the north-east. The Company commenced operations in August last. The shafts are now 85, 60 and 40 feet deep; the drifting amounts to 120 feet.

The force employed consists of 56 men—26 miners and 30 surface-men. A considerable quantity of copper has been raised, and a large amount of surface improvements completed. It is the intention of the Company to commence sinking upon the Isle Royale vein in a short time.

Sheldon Mine.—The veins upon which this mine is located are the same as the Isle Royale and the Portage, and are described on pages 295 and 415, Vol. I.

The Company commenced operations in November. Two shafts have been begun, one on the Portage vein and the other on the Isle Royale. These shafts are now down 20 and 25 feet. In both copper has been found, accompanied with some silver. The property of this Company extends to the Lake, and possesses great advantages for mining. The Portage and Isle Royale veins extend through the entire property, and are a sufficient guarantee of its value. The Company are working a force of eight miners and three surface-men.

Webster Mine.—This mine is east of the Sheldon and Albion. Two shafts have been sunk on the same vein and are down 30 and 28 feet. The vein is of good size (five to ten feet wide) and is a well defined and rich appearing vein, well charged with copper in both shafts. The force now employed consists of six miners and four surface-men. The work was begun on this location late in September, and so far with encouraging prospects.

Montezuma Mine. This mine is noticed on page 416, Vol. I. Operations were commenced about the first of October last. The mine is on a parallel vein of the Isle Royale, and west of the Sheldon and Portage mines, and is working a good force. The work has been commenced at the Lake by driving an adit from the Lake shore along the course of the vein. The shafts have been sunk. The vein is well defined, has good walls, and has yielded a considerable amount of stamp work. It improves as the work progresses.

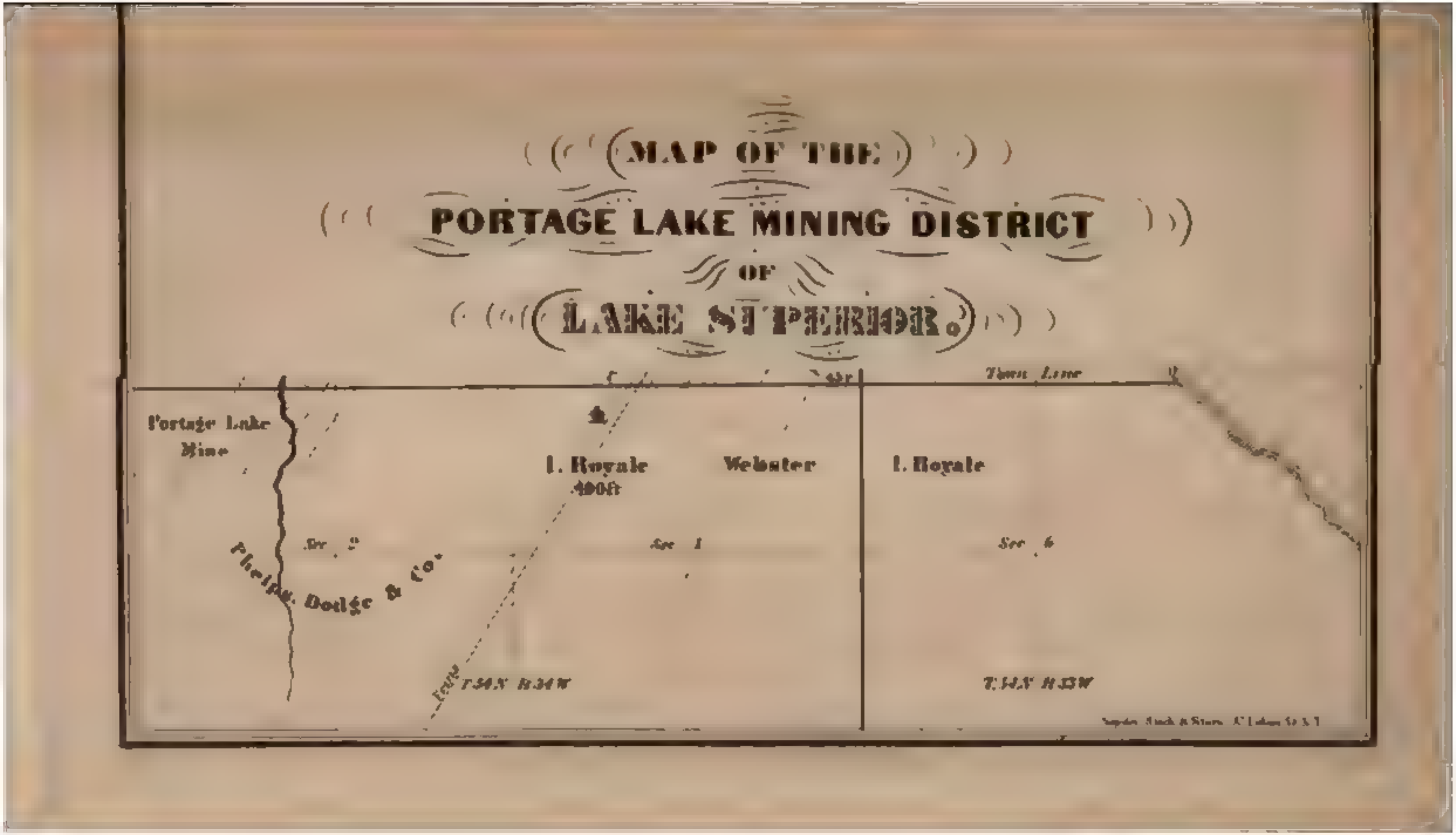
Huron Mine.—This is a new enterprise upon Section 2, south-west of the Isle Royale location and joining it. The Portage and Isle Royale veins run through the section. A shaft has been begun on the Isle Royale vein, and sunk deep enough to show the character of the vein. The vein has also been uncovered at different places on the section, and without exception it has proved to be rich in copper. The shaft commenced on this location is as rich as has been opened on the Lake.

Ripley Mine.—This is comparatively a new enterprise, some particulars of which are noticed on p. 416, Vol. I. The company is thought to possess the Isle Royale vein after it crosses Portage Lake, and on the north side, where they own a large tract of land. They have drifted upon a vein near the line of the Isle Royale, as it has been run, that is rich in copper, and further investigations may prove it to be the Isle Royale vein.

The cross-cut adit, designed to cut Nos. 1 and 2 veins, has been carried through No. 2. The vein is at this point well filled with copper. They are now finding copper in the shaft on No. 6 vein, and specimens brought in from the place where the explorations have been made for the Isle Royale vein, are very fine. Two shafts have been sunk to the depths of 47 and 65 feet; two drifts 55 and 40 feet, and one cross-cut adit 70 feet. There has, in addition to this, been a great amount of exploring done.

There are 40 men employed—14 miners and 26 surface-men.

Quincy Mine.—This mine is on the west of Portage Lake. They have recently, at the depth of one hundred feet, driven a cross-cut into new ground that is proving very rich in copper. No finer specimens of copper have been found upon the Lake. The Quincy is working a small force, and in an economical and judicious way proving the mine.


MAP OF THE
PORTAGE LAKE MINING DISTRICT
OF
LAKE SUPERIOR.
Town Line
Portage Lake
Mine
I. Royale
400ft
Webster
I. Royale
Sec. 2
Sec. 1
Sec. 6
Phelps, Dodge & Co.
T.54N R.34W
T.54N R.33W

Washington Mine.—This mine is northerly about 11 miles from Portage Lake. The work was not commenced until recently, but a shaft has been sunk about forty feet upon a vein that runs with the formation. The vein is about five feet wide and well filled with shot and lump copper, producing rich stamp work. The prospect of the mine is very encouraging.

ONTONAGON DISTRICT.

The Forest Mine.—On page 517, Vol. I., is a summary of the financial condition of this Company, on September 1st, 1858.

The Forest Mining Company commenced work, in the winter of 1850, on a property of 2,360 acres of mineral land, lying on the western side of the River Ontonagon, and twenty miles from its mouth. It has the same range of hills as the Minnesota and National Companies, which are only interrupted in their regular course by the valley of the river. The river is navigable for large keel boats to the landing of the Forest Company. At this landing the Company, for the convenience of shipment, and a reliable supply of water, have erected a large stamp and saw mill, driven by an engine of thirty horse power, now in successful operation; in the neighborhood of this is a mineral house, a large frame warehouse, and six dwelling houses. Leaving the landing is a good road, about one mile and a half long, with a gradual rise of about 800 feet to the mine. Here is a large clearing of well cultivated ground, comprising about fifty acres of land, with fifteen good dwelling houses, mostly framed, and affording sufficient accommodation for upward of 150 men. There are also three whim houses, blacksmith shop, stables, etc.

The mine was opened by sinking a shaft on a row of ancient diggings; the early works were directed most to the eastward from the shaft, where several feeders came into the main lode. While the work was confined to the main lode the mine was remarkably productive, and the yield of the first year had only been equaled by the Minnesota Mine for the same number of hands employed. In prosecuting the work to the eastward the miners were led off from the main lode by feeders, and considerable time was lost in consequence. The last eighteen months the work has been directed to the westward, where two shafts have been sunk on the main lode, and connected by two levels with the main shaft, and nearly so on the third level, while a fourth lift has been commenced from shaft No. 1. The vein is wide, varying from two feet to ten feet, and is constantly improving in regularity and richness as worked in depth and to the westward. Its product, like the Toltec and Isle Royale veins, is in small masses, barrel and rich stamp work. The last letter from the agent says: "I don't think it will trouble me much to send you 100 tons next season. Every working point in the mine yields more or less copper. It has never happened that copper has held its richness throughout our work as constantly as it now does." There was prepared for shipment last year to November 1, 42 tons of copper. The total force employed at the mine, stamps, etc., is about 140 men. The number of feet opened in the mine in the four shafts and levels is 4,862 feet—the lowest shaft being 220 feet deep. The amount expended is about $150,000. Total amount of copper shipped, 75 tons. The advanced state of the Company's surface improvements and the appearance of the mine indicate that it will soon be in a paying condition if the present vein continues its present encouraging look. Two other important veins have been discovered the past year, running parallel with the one now worked, and both within a distance of 800 feet. As they are to be worked on adjacent land belonging to other companies, their value will be tested without expense to this Company.

The Company have set off to four companies, to each 320 acres of their mineral land, viz., to the Glen, Devon, Tremont, and Shirley. The Glen are working a rich, strong, and regular vein. On the other localities, surface examinations were commenced last autumn, and several veins explored; the explorations were not completed, but will be continued when the snow is gone.

The Forest Company will retain 1,000 acres and one mile in length of vein, which will be sufficient for their purposes. The Company has a special charter from the State of Michigan, with 10,000 shares. Stephen Ball is President; Horatio Bigelow, Secretary and Treasurer; Robert B. Livingston, Superintendent.

Minnesota Mine.—In addition to the particulars respecting this mine, last stated on page 315, Vol. II., the Superintendent has reported the following additional facts:—

No. 6 shaft carries a strong lode only forty feet from the surface, which has continued down to the level. The ten-fathom level east of No. 2 shaft, has a good lode also; and in the twenty-fathom level we are engaged in cutting up the large mass (of over 100 tons) already advised. The lode eastward in this level is *very rich*, containing masses and barrel work. In the drift west of this shaft the vein is two feet thick, of good barrel and stamp work. Several pieces in the bottom of the thirty-fathom level show a good lode, and masses of copper extending down, from which it is fair to judge of what we shall find in the forty-fathom level beneath. Near No. 3 shaft especially, we have just come upon a rich lode, which will produce masses. In twenty-fathom level, west of shaft No. 4, the lode appears well, with some masses. In ten-fathom level, also west of No. 4, the lode is very rich. In the adit level, near the west end, we have a mass of over 40 tons still fast in the vein, though we have already tried two or three blasts behind it, and we are now stoping the ground still further to have another trial at it. Near No. 5 shaft we are still cutting up the other large mass (of over 100 tons) heretofore advised, which will require several weeks yet to complete, some of the cuts being over five feet thick of pure and solid copper. The lode is large and rich from the cross cut west of this shaft, and is also good in the shaft under the level. The lode in the new shaft (No. 7) was small at the start, but has been steadily improving in the drift, and a few days since we raised from it a mass of 1,000 lbs. On the whole I may say that the mine generally has now more copper in sight than has ever been seen before, especially at this season of the year.

Rockland Mine.—This mine, situated east of and adjoining the Minnesota works, was commenced in June last. Two shafts have been sunk 300 feet apart, and to the depth of about 65 feet each, and they are now drifting to connect them at that level. An adit is also driving up midway between the shafts, at the depth of 127 feet, which is expected to connect with a winze from the level above, so as to secure perfect ventilation by spring. Shaft No. 1 intersects the vein at the depth of 24 feet, which at that point is two or three feet thick, carrying barrel and stamp work, and some small masses. From this shaft one mass of 3,000 lbs. and several from 300 to 600 lbs. each were taken. The drift west has just commenced, and shows an improvement in the vein already. No. 2 shaft has about the same general character and prospects as No. 1, though such masses have not been met with. A force of 28 men is employed. All the necessary buildings are constructed and an additional one is going up to accommodate 30 or 40 more men.

The Flint Steel River Mine.—The shaft commenced in December, 1852, and the adits in May last, have been connected at the depth of 70 feet. The vein in the adit east of the shaft, was not large, though carrying some copper; but west of the shaft it has improved rapidly—and at the point now reached (about 40 feet west of the shaft), there is a strong regular vein, from 20 to 15 inches wide. The lode is so strong, writes the Superintendent, that we are unable to throw it down by blasting; we have therefore turned the drift by it, and about 5 feet of the vein thus exposed appears to be solid copper. If the work at this mine is pushed forward as it should be, from present developments, we shall have immediately to provide more buildings to accommodate a much larger force in the spring.

Shawmut Mine.—This mine is described on page 317, Vol. I. The progress of operations is thus reported by the Superintendent:—

We have made the following surface improvements: An office, 18×20 feet; two boarding houses, 22×26 feet each; 1 stable and granary, 16×24 feet; 1 blacksmith shop, 18×18 feet; 1 coal house, 18×18 feet; 1 carpenter shop, 18×20 feet, 2 plank-shaft houses, 19×12 feet; and one powder magazine: making in all ten buildings, which are built in a substantial manner, and present the appearance of a nice little village.

Under ground, the vein looks remarkably well. No. 2 shaft, which is 300 feet east of shaft No. 1, is down 41 feet, and shows good stamp work. No. 3 shaft, 300 feet east of No. 2, is down 56 feet. The vein in this shaft is well defined, and rich with stamp work. This vein is precisely of the same nature as the Toltec. I have let a contract to drive 50 feet on the course of the vein on the north part of the location, from which I have taken pieces of copper. This drift is in but a few feet, and its appearance is very promising; and there are now hanging in drift several pieces of copper the weight of which we are unable to estimate. Upon the whole, the mine looks very encouraging; we are now working 27 men—10 miners, 4 windlass men, 1 wheeler, 1 carpenter, 1 blacksmith, 3 coal burners, 2 teamsters, and 4 surface-men.

Ridge Mine.—From the same source we gather the following particulars relative to this mine:—

In a day or two the fourth level will be connected, and the shafts recommenced sinking below that level. In driving this level there has been a large quantity of copper exposed, much more than in any other of their levels. One piece taken out weighed a ton. Stoping will be commenced in the backs of this level as soon as it is holed to give ventilation. From the appearance of the vein, in the level, the stopes will undoubtedly turn out a large amount of copper. The stopes in back of No. 2 level are now producing copper in masses, barrel and stamp work. There will be about 30 tons of copper shipped from the mine on the opening of navigation, showing a great increase over last year. The stamps will be in operation some time in April next. They have a large body of stamp work at surface ready to dress, and a large amount of ground opened ready to be stoped.

The Fire Steel Mine.—The shaft is now sunk 50 feet, over half a ton of copper has been taken out, and a large mass of stamp work. The vein is two feet wide, with regular and well defined walls.

Douglass Houghton Mine.—Respecting this mine the Superintendent writes:—

Our mine is showing more copper than I ever saw in it before, and that we shall increase our shipments of copper this year over that of last about tenfold. Our stamps are working well, and we are able to stamp all the mineral as fast as it is raised to the surface.

The Evergreen Bluff Mine.—This mine lies immediately west of the Bohemian, and is reported as yielding sufficient copper to pay expenses during the winter.

COPPER HARBOR DISTRICT.

Manitou Mine.—The report from this mine states that in January 12 miners were employed. In the adit level, 420 feet in length, the vein has varied from one to two feet in width, and at present is very well diffused with stamp copper. A few men are working on another vein a little to the west, which has recently been reached by one adit; as yet the vein is not fully exposed, although there is some copper in view.

Star Mine.—This Company employed in January 21 men, including 10 miners. The upper adit is 115 feet in length, the vein at this point being three feet wide, and very much diffused with fine copper. The lower adit is 108 feet, where the vein is only about one foot wide, and being near the surface, carries but little copper. The shaft, which is nearly equidistant between the adits, is down 76 feet, where the vein at this time is a little deranged. This vein appears very regular and well-defined, and has been traced and opened at different points for more than 2,000 feet.

Empire Mine.—Eight men employed in January. This Company commenced work late last fall, since which two houses have been erected, and some work bestowed upon a very promising vein, which the Agent represents as being two or three feet in width, and well filled with stamp and barrel work. The geological position of this mine is about the same as that of Copper Falls, about 1½ miles northeast from the Bluff Mine.

Bluff Mine.—27 men, including 14 miners, are employed. The Agent states that the vein averages about three feet in width, and carrying good stamp work, with occasionally a little barrel work, at each point, the ten-fathom level going north looking rather the best. Depth of shaft No. 1, 85 feet; No. 2, 143 feet; length of adit No. 1, 681 feet; No. 2, 124 feet.

North-west Mine.—115 men, including 50 miners, are employed working on three different veins—the Hogan, Stotenburg and new vein; the latter is looking very well in the bottom of the shaft. The north part of the Stotenburg vein is also looking very well, where they are finding very good stamp and barrel work, with some masses. The latter vein has improved some since fall.

Summit Mine.—20 men, including 16 miners, are employed. The vein varies in width from one to three feet, and carries fair stamp, with a little barrel work. Shaft No. 1, on east vein, is down 85 feet, which, by driving about 10 feet further, will be intersected by an adit level 260 feet in length. They are also driving north from said shaft; this level has been extended 70 feet. Width of vein about 1½ feet, and looking better than farther south. Several men are employed in exploring for a vein east of this, which as yet has not been discovered. This mine is described on page 195, Vol. II.

North-western Mine.—100 men, including 36 miners, were employed in January. The Agent reports this mine as looking remarkably well at all points, and rich in stamp and barrel work, producing more of the latter than formerly. They have a mass in view estimated to weigh 2,000 to 2,500 pounds.

BRISTOL MINES, CONNECTICUT.

This extraordinary rich copper mine, which has been worked some ten years, and returned in that time above $200,000 worth of the finest ore, is now being surveyed and valued by Mr. C. S. Richardson, who is to prepare a perfect set of geological plans and sections of the property. It may be remembered that this mine was always considered to be a mere deposit, but from some circumstances that have recently transpired, there are grounds to believe a contrary result will be arrived at. We learn that a powerful pumping water-wheel is in course of erection and will shortly be set to work. The produce of the mine is now paying a profit of about $1,400 per month, and when the new machinery is completed it is anticipated the mine will pay remunerative dividends on the capital expended for many years to come. After the shaft has been run down some thirty or forty fathoms, which it is believed can be done with the steam-engine, the dip and bearing of the lode will be proved;

then, if it should be found desirable, a perpendicular shaft may be sunk and a Cornish pumping engine erected.

The property is held by private parties at present, but a company is in course of organization; the mineral rights of the set have been purchased for ever, consequently there are neither dead rents or royalties to encumber it. It is considered a very promising speculation, and one that should be prosecuted with spirit; this is the fourth mine opened on this great champion lode, and it will be surprising if there are not as many more set to work within two years from this time.

KEWEENAW POINT COPPER AND SILVER MINING COMPANY.

During the week we have inspected some rich specimens of native copper and copper ore in large masses which have arrived from the mines. The copper appears to be diffused through all parts of the vein-stone, and a great quantity of silver is disseminated through it. From the reports, it would appear that, though there is great difficulty in breaking the stuff, more especially in cutting through the masses of native copper, yet that the chippings are sufficient to pay for the labor of extraction. It is not the intention of the Company to export any of their ores to this country. Smelting work sare already established at Detroit, on the American side of Lake Superior, and a ready market is obtained for the copper in the United States. If the production of that useful metal progresses as it is anticipated, but a few years will elapse before the United States of America will not only be able to supply themselves, but likewise become exporters.—*London Journal.*

PERKOMEN VALLEY COPPER COMPANY.

The property of this Company is located in Frederick township, Montgomery county, Pennsylvania. It has been noticed in the Report of Professor Rogers on p. 375, Vol. I. "Perkiomen" is the same locality, although expressed with a different orthography. The officers of the Company are: A. Oaksmith, President; J. W. Howard, Secretary; Frederick Swift, Treasurer; and B. F. Sawyer, General Agent.

We are not aware that the Company have published any extended report of explorations on their own property. The views of Professor Rogers on this district as a mining section of country—a point not particularly expressed in his Geological Report above mentioned—we regard of sufficient interest to insert in this connection:—

You have asked me to express frankly my impressions respecting the value, as a mining district, of the mineral belt of country, which ranges across the Schuylkill river, near the Perkiomen and Pickering creeks, in Montgomery and Chester counties. I willingly comply with your request, for I deem it but just and right and fair, that I should candidly avow to you, and to all persons interested in the prosperity of the region referred to, the convictions I have arrived at from the study I have thus far been able to make, of the mineral veins and mines of your neighborhood. Most sincerely do I wish to see the vast native resources of every part of our gifted State of Pennsylvania receive the recognition and development which they deserve. I am, therefore, as free to speak hopefully of a mineral district which offers unquestionable geological evidences of wealth, as I would be prompt to dissuade from investment that rest on no such proofs.

In giving you my views of the probable value of the mineral zone of

Montgomery and Chester, I wish to say that I have not yet completed my examination of its mining resources, and that possibly my conceptions may be somewhat modified upon a closer acquaintance with the ground. I think, however, that a more detailed investigation will tend to strengthen, not to impair, the convictions I have come to.

I hesitate not to declare that I entertain a very firm belief that your region is destined to become, at an early day, a quite important mining district, when regularly wrought mines of the ores of lead and copper will return steady and remunerative profits upon the exercise of proper skill and prudence.

This opinion, now much more confidently entertained by me than in former years, I rest upon observations I made last spring, and again during a recent visit, which exposed to me a number of important facts, connected with the veins containing ores of lead and copper, going all to indicate, with more or less of positiveness, the permanency and productiveness of the yield of the veins.

The feature quite familiar to yourself, of the remarkable regularity and parallelism of the mineral lodes, is itself an excellent indication of their consistency, as all analogy with similar groups of mineral lodes plainly teaches.

Another fact which should give you encouragement, is the exceedingly *well-defined character* of these mineral lodes, which do not spread and lose themselves or their ores in the adjoining strata, to more than a very trivial extent, at least, but insulate themselves from the rocks of the country by plainly marked parallel walls, between which, as between the cheeks of so many great fissures, all the metallic ores of the region, and associated gangue stones, are contained. This essential feature of productive metalliferous veins or lodes, is here displayed as conspicuously as in any mineral country known.

Some of the veins are of a length already explored and opened of several hundred yards, or even several hundred fathoms, and displaying moreover all the well admitted proofs of being *true intrusive lodes*, having, that is to say, regular walls filled with igneous minerals and metallic ores, and showing great continuity as fissures, both in their direction and their dip. These features certainly justify a belief, that when opened in greater length and depth for extensive and economical mining, the veins will be steadily remunerative.

The veins which I have seen bear all the external marks of true and regular metalliferous lodes. These proofs are to be found in the mineral nature of their gossans, or the weathered vein-stones at their outcrops. They give other indications of their internal metallic wealth, by their retaining, over great lengths, not only their general average thickness, but the average proportion and distribution of their metallic ores. The constancy of the mineral nature of the materials of the same veins, is also another quite encouraging symptom of their richness. A further very important feature, is the gradation we witness in passing downwards from the outcrops of these veins. *First*, we have only the vein-stones with nearly the whole of the metalliferous substances weathered out or dissolved. *Then* at a few fathoms below the surface, we find mingled with these vein-stones, those metallic ores of lead, copper, and zinc, which are known to be the most readily vaporized by heat; and deeper still the same vein-stones contain these last combinations of the metals, in constantly lessening proportion, united with more and more of the sulphurets and those other permanent ores, which in all copper and lead mining countries, are regarded as the most reliable and persistent forms in which these metals are known.

I need not say what a boon and blessing your mining district will prove itself to the industrial prosperity of the whole of this quarter of Pennsylvania, should your efforts and those of others, who like you, are enlisting their best energies to call some of its hidden wealth to the surface, realize the hopes which appearances strongly encourage me to indulge for you.

EMPIRE MINING COMPANY OF LAKE SUPERIOR.

In the January No. of our Magazine, Vol II. p. 75, we noticed the organization of this Company, and the favorable auspices under which it went into operation. The mine is situated about four miles south-west of Copper Harbor, Lake Superior, on the north slope of the Mineral Range, on Sections 3, 10, and 11, Township 58 north, of Range 29 west, and contains something over 611 acres of mineral land. Before the work was commenced at the mine, we learn that a thorough exploration of the location was made by able miners and geologists, which brought to light one of the largest and most promising native copper veins that have been discovered in the Lake Superior country.

S. H. Broughton, Esq., Superintendent of the Bluff Mine, in a letter to the Secretary of the Company, thus speaks of this discovery: "Your explorers on Section 11 have succeeded beyond my most sanguine expectations. Yesterday afternoon, we struck the Iron City vein near the Bluff trail, about the middle of the quarter section, where it is about two feet wide, of excellent character, containing a large percentage of good stamp work. Tracing it a few rods farther north, we again opened it, and the first thing we took out was a sheet of copper weighing over six pounds. Clearing away the dirt about three feet in length along the vein, we took out another sheet weighing about the same as the first, along with a number of smaller pieces.

"We worked but a short time upon the vein, as it was near night, but sufficiently to show that it was one of the best surface indications ever opened in this country. There was another mass in sight much larger than either taken out, which will weigh, at least, twenty pounds. The whole matrix of the lode is most thoroughly impregnated with copper. I have never seen a better show. But comment is unnecessary—the specimens which Mr. Hungerford brings down will speak for themselves. It is impossible to say, at present, how large the vein is here. It evidently does not attain its full width upon the surface, though it is there two feet and over in width. The location is worth to-day $50,000. There should not a day elapse before it is worked."

Mr. Broughton writes again Nov. 21, a month later, as to further discoveries on this vein.

"I take the present opportunity, which may be the last this fall, to acquaint you with what has been done on the location belonging to the Metropolitan, *now* the Empire Mining Company. Since Mr. Hungerford left for the Saut to procure his winter supplies, we have opened the vein some six hundred feet farther north than the opening out of which the solid copper was taken, which he brought down. The vein here is larger than in any of the previous openings, being three and a half feet in width and richly impregnated with copper. We were not enabled to work down into the rock far enough to see the vein in its most favorable aspect, but even on the extreme surface its appearance is highly encouraging. I have not seen a vein in the country that, with the amount of work which has been done upon this, has shown more copper, it being thoroughly and plentifully disseminated throughout its whole extent. Winter being upon us, we have turned our whole attention to erecting a house, and getting in readiness to prosecute mining work upon the vein as soon as possible. We shall get ready to sink upon the vein in about two weeks, when I hope to be able to advise you of a second and larger addition of *masses* than those now in sight.

"Taken together the vein is one of great promise, and bids fair to be one of the most valuable on the Point."

With such a favorable "show" of copper, notwithstanding the lateness of the season, the Company sent on to the ground an Agent with men and supplies for commencing mining operations at once. Buildings were erected and miners set at work, and recent advices from the mine indicate that the work has been prosecuted with energy and with great success. They are taking from the shaft and adit excellent stamp and barrel work, with small masses of copper, and confidently expect to do, what is seldom done, make a handsome shipment of copper the first year of mining.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

LAKE SUPERIOR SILVER MINE.

In the shipments made from the mineral region of Lake Superior in 1853, is reported, one barrel, one box, and one keg of ore from the Michipocoten mine.

SILVER IN CALIFORNIA.

Some facts relating to a silver mine on the San Louis ranch (Aurora), is furnished by one of the prints at Stockton.

It is situated in the lower part of the valley of San Joaquin, about one hundred and fifty miles south of Stockton and ninety miles east of Monterey. It was discovered some months since by a party of Mexicans engaged in catching the wild horses that roam through the valley; but has only been partly worked during the past few weeks, on account of snow. An intelligent Mexican acquainted with the mines in Mexico, and who has visited Aurora, states that but one mine in Mexico surpasses it. To the cargo of three hundred pounds the yield is one hundred and twenty ounces. About one thousand five hundred cargoes have been got out by a party of thirty-nine persons, Americans and Mexicans; but, in consequence of the snow, but very little work can be done at present. Preparations are going forward for working it on a much larger scale. It is thought that a large proportion of this valley abounds in silver, and that the first discovery of silver ore in California will be followed by much richer discoveries in this unexplored section of the State. The route is from Stockton via Toulumne City; though from the last named place there is no road or direct trail, the country being wild and unexplored.

LEAD ORE.

We have on our table a couple of specimens of lead ore from a mine of Carter county, Tennessee. One of the specimens is a simple "blossom," found on the top of the ground, and is full of small particles of metal The second came from two feet below the surface, and is, from appearance, almost as pure as the metal itself We learn that many of the hunters of the region in which this ore is found, use it as lead, obviating the necessity of purchasing the article. There are inexhaustible quantities of this ore imbedded in the hills and mountains of Carter, and its existence has been known for many years, though from the difficulty of getting to market, of course the mines have not to any extent been worked.—*Rogersville Times.*

PLYMOUTH LEAD MINE.

We subjoin a brief report, by Mr. C. S. Richardson, of a lead mine in the neighborhood of Plymouth, Conn.:—

At the head of the village of Plymouth, Conn., near the confluence of two roads, is situated the Plymouth Lead Mine. The discovery was made through the outcrop of a mass of fine gossan. A pit was sunk a few feet, when some small stones of lead were met with. On this becoming known, some mining gentlemen in the neighborhood took a lease of the sets, and commenced operations by sinking a shaft. They had not got down more than 10 feet when the lode opened itself to view, full eight feet thick, composed of rich gossan, mundic, barytes, friable quartz, silver lead ore, and beautiful fluor spar. The sinking was continued until they had reached 24 feet in depth, where the water was found so quick that it became troublesome and expensive to be kept in fork by means of the barrel and windlass. The work, therefore, for a time has been suspended, and will not be resumed until the Company have prepared the necessary pumping machinery. The stratum is granite of the quartzose description, and is found easy to break, thus rendering the sinking of an engine shaft not a matter of very serious expense. The set embraces a length of nearly half a mile on the course of the lode. To the north is a large sparry metalliferous cross-course that will intersect it, at which point a rich course of ore may reasonably be expected; on the western side, the gneiss formation prevails, and a junction of the two will occur in some part of the set. This is a very favorable circumstance, for if the lode should continue in the line of the intersection its being highly productive almost amounts to a certainty. About three-quarters of a mile to the westward is the Plymouth Copper Mine, the main lode of which bears in an east and west direction, and must come into this mine if it continues its course in a direct line, thus greatly enhancing the value of this mineral property. There are surface indications of the existence of other lodes, but as nothing has been yet done in the way of shoding on the main lode, but little can be said about them. The bearing of the lode is apparently 55° north-east, underlaying about two feet to the fathom. At present the excavations have not been made deep enough to get into a settled country, therefore only one wall of the lode is found to be regular. There is here every requisite to characterize it as an ore bearing lode. Its matrix possesses every thing desirable and congenial, and if we are to judge a good lode by its surface indications, it is here seen to perfection. I am of opinion that when the lode gets into a more settled country, that it will lessen in size, become more regular in its stratification, and assume its true course. The veins of quartz and barytes, which are now oblique and irregular, will form a more parallel bearing, the gossan will wear out, and regular veins of silver lead come in. Some of the stones of ore that have been taken out are rich in silver, and their associations with fluor spar will increase their value. As an infant mine, I should advise the erection of a small engine on the present shaft—this should be run down 20 fathoms, and levels be driven both ways on the course of the lode at that depth for 10 or 15 fathoms. It appears to me that the main part of the lode will be found going southerly, and that the site for the permanent engine shaft will be in the meadow on the opposite side of the road; the lode is to be very plainly seen there, and looks promising. In a short time I hope to make a complete survey of the tract, when I shall be able to give a more extensive account of its properties. In the mean time should the Company go on with the present shaft, they cannot do wrong. I beg to congratulate them on their present discoveries, and my opinion is, that they have a good mine in view, and all that is wanted is capital, a little time, and patience.

MINERAL PRODUCT OF CHILI, S. A.

The mineral wealth of Chili has long been regarded as immense. Little, however, has been known in detail of the product of the mines of that country or their nature. The following facts are reported by Mr. A. Dillon, a mining engineer at Valparaiso:—

The northern province of Chili bounds Bolivia, embracing the entire longitude of the State, and is designated in history as the Desert of Atacama, the term desert very properly applying to all the territory northward of the latitudinal parallel of Valparaiso, all equally rocky, impassable, unfertile, and devoid of interest. There are three tongues of land, from a quarter of a mile to a mile wide, extending from the sea landwards, from Coquimbo, Huasca, and Caldera, possessing some fertility; all the rest is a desert, not of sands, but sterile rocks, broken and craggy mountains of the primitive formation, on which neither tree, shrub, nor plant grows. In this desert, at distances from ten to forty leagues apart, and lying parallel with the coast, are several mining districts, the exact geographical position, owing to the passive character of the inhabitants, not being known. Those of Coquimbo and Huasca produce copper ore the richest in the country, yielding from twenty to forty per cent., and probably averaging twenty-five per cent., the exports in the aggregate amounting probably to £400,000 a year. The most important item, however, in the industrial resources of Chili is the silver of the district of Copiapo, the two principal argentiferous regions being Charnacillo and Tres Puntas, and which lie in a south-easterly and north-easterly direction from Copiapo, about twenty-six leagues. The Descubridora, as its name implies, was the first silver mine discovered in the province of Charnacillo, about 1830, since which it has never ceased to be productive, and has secured large wealth to its possessors. To this succeeded a chain of other discoveries, situate in a straight line, ten degrees east of north, continually unbroken and uninterrupted in two different hills, although separated by a deep ravine; the vein dips westward. In addition to the Descubridora, the best mines are the Colorado, Manto de Ossa, San Francisco, and San Francisquito. There may be one or two more of first-rate quality, after which all the rest are but second-rate. The average yield of these first class mines is from one hundred and fifty to two hundred pounds per cajon of three tons, occasionally the produce is much higher, and has reached ten times that return; but such are extraordinary cases, while it may be said the produce rarely falls below one hundred and fifty pounds. Tres Puntas contains three principal and rich mines, the Buena Esperanza, the Salvadora, and Al Fin Hallada. The first of these is the best, yielding ore in abundance, and averaging a produce of one hundred and twenty-five pounds per cajon. The Salvadora gives one-third of the quantity of the Al Fin Hallada, but the ore contains double the quantity of silver. All the other mines are equivocal, yielding either nothing, or worse than nothing, by which is meant such as, without any produce, are a continual drain on the fortunes, earnings, or enterprise of their possessors, borne with the hope that Dame Fortune will one day smile upon them. There may be about twenty good first and second class mines in all, in Copiapo, producing probably £1,300,000 annually, and two hundred mines or more producing nothing, or worse than nothing.

THE VALLECILLO SILVER MINING COMPANY.

The property of this Company contains the silver mine of Jesus Maria, in New Leon, Mexico. It has been described on page 570, Vol. I., and page 84, Vol. II., with analysis of the ores, and the Mexican method of extracting silver, etc. This mine was formerly worked to a considerable extent, but operations were suspended owing to circumstances in the country. The old workings have been cleared out, and the great richness of the mine can be distinctly seen.

The present proprietors of the property are devoting their energies entirely to the working of the mine on an extensive and systematic plan, and on a scale commensurate with what is to be expected at rich Mexican mines. We have already stated, that the largest Cornish engine ever made in this country, had been manufactured for them at the works of Messrs. Thomas, Carson, and West, at Norristown, Pennsylvania. This, with the pumps, is now on the way to the mine. In all respects, the operations of this Company are on a model plan, such as must insure successful and valuable results. Their property is entirely paid for, as well as their machinery, and the investments of all new stockholders are devoted to carry on the operations of the mine. There is, as we are informed, only a little of this stock to be had.

The Company have an office at 111 Broadway.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE FOR 1854.

Amount shipped from Richmond to close of the week, ending March 11th, 1854	12[illegible],680	tons.
Same time last year	112,833	"
Increase	12,442	"
Amount sent by Reading Railroad	356 254	"
Ditto Schuylkill Canal	28 345	"
Total	3[illegible] [illegible]00	"
To same period last year	[illegible]34,[illegible]10	"
Increase	7[illegible],289	"

RATES OF TOLL AND TRANSPORTATION BY RAILROAD, TO JULY 1ST, 1854.

From Mount Carbon to Richmond	$1 70
" Schuylkill Haven "	1 65
" Port Clinton "	1.45
" Mount Carbon to Philadelphia	1 60
" Schuylkill Haven "	1 56
" Port Clinton "	1.36

RATES OF TOLL BY CANAL, TO JULY 1ST.

From Port Carbon to Philadelphia	$0.70
" Mount Carbon "	0.69
" Schuylkill Haven "	0 67
" Port Clinton "	0 55

The freights by Canal opened at the rates fixed by the boatmen, $1 80 to New York, and 80 cents to Philadelphia, from Pottsville and Port Carbon, and 5 cents less from Schuylkill Haven.

The trade is represented as opening this spring under the most favorable auspices. The markets are all bare, and the demand for all kinds of coal, particularly white ash, lump, and chestnut, is very brisk already. The prices for both white and red ash opens about thirty-five cents per ton in advance of the opening rates last spring, (which, by the by, were extremely low, and in many instances below the cost of production,) and about thirty cents per ton less than the high prices which ruled last fall.

PENNSYLVANIA COAL COMPANY.

The report of this Company for 1852–3 will be found on page 308, Vol. I. Out of the business of 1853, the Company announced a semi-annual dividend of five per cent. on the capital stock, payable in stock.

The Company having increased its production of coal during the last two years 200,000 tons, and expended for the necessary additional cars, canal boats, &c., large sums out of its working capital, have deemed it advisable to replace the same by a dividend in stock. The following is a statement of the business of the year, showing a net profit of over eleven and a half per cent. on the capital stock :—

CR.

Sales of coal delivered to January 1, 1854	$1,71[illegible],518 69
Coal sold for winter delivery	250 [illegible]3 30
Coal on hand for sales to opening of canal	2[illegible]5,458 26
Coal on hand at Hawley and on line of canal	9,335 00
Amount received for transportation over Company's Road, &c., &c.	2[illegible] 088 68
Balance of interest account	1[illegible],852 60
Total	$2,255,806 46

DR.

Coal on hand May 1, 1853	$207,467 41	
Cost of coal mined in 1853	343,044 70	
Transportation and road expenses . . .	808,722 85	
Canal tolls and freights	310,565 48	
Port Ewen expenses	56,167 87	
Expenses of yards, offices, &c., at New York .	101,504 01	
Interest on $600,000 mortgage bonds . .	42,000 00	
State tax, depreciation on barges, tools, &c. .	38,435 93	
		1,908,108 42
Balance		$358,198 04

COLLIERIES.

For the following particulars relative to some anthracite collieries, we are indebted to the *Pottsville Register* :—

The Colerain Colliery.—This colliery, near Beaver Meadow, belonging to the estate of John O. Cleaver, deceased, has been sold to Lewis Audenreid, Esq., of Philadelphia, for the sum of $75,500. The sale of property includes coal-breakers, screens, three stationary engines, pumps, fifty-seven drift cars, twenty-six miners' houses, a steam saw-mill adjoining, and a lease on the coal veins and lands for the period of twenty-five years.

Glen Carbon Collieries.—There are two collieries in Schuylkill county, known by this name. There are five veins worked, all above water level, and producing white ash coal. One of these works is driven by John Stanton, operating on veins known as "Black Valley," ten feet in thickness, and the "Mammoth," sixteen feet in thickness; both having a southern dip. On this work there is over one mile of gangway driven, and ninety-two yards of tunnel. In the breaking of coal, a twenty horse-power engine is employed. When in full operation, the colliery gives employment to some hundred and forty hands, and sixty horses and mules. The capital invested is put down at about $60,000.

The other colliery is in charge of Oscar F. Moore; operating on three veins, the "First," seven feet in thickness; the "Middle," three feet and a half; and the "Back," eight feet in thickness. Here there are two miles of gangway, and one hundred and sixty-nine yards of tunnel driven. The depth of slope is about thirty-eight yards. The mechanical power employed consists of two engines—one of forty horse power to hoist coal, and one of fifteen horse power to break and screen coal. The veins have a north dip. The investment is over $20,000. Both of these collieries are capable of producing annually, and in the aggregate, about eighty thousand tons of coal.

Broad Mountain Colliery.—This colliery is in the West Branch portion of the region. The mining business has been carried on by R. H. F. Horton, operating on three veins, all above water level, viz. : the "Mammoth," white ash, thirty feet thick; "Black Heath," thirteen feet thick; and "Primrose," nine feet, both the latter red ash. These veins all have a south dip. The investment at this colliery is about $25,000. There are six hundred yards of gangway, and three hundred and thirty yards of tunnel driven. There is one engine of twenty horse power employed breaking coal. The works, when in full operation, can give employment to one hundred and fifty hands. There are about fifty miners' houses connected with the works.

DELAWARE, LACKAWANNA, AND WESTERN RAILROAD AND COAL COMPANY.

This is the name of a consolidated Company, whose railroad will connect the Great Bend on the Erie Railroad with the Delaware, passing through Scranton and Cobb's Gap. That portion of the road from Scranton to Great

Bend is in operation; that from Scranton to the Delaware, and thence to York City, by the New Jersey Central, is not yet completed.

The coal region of Scranton is thus tapped by a road which will transport its coal northward to the Erie, and eastward to the New Jersey Central. The geology of this coal deposit will be found quite fully described in the report of Professor Rogers, in the preceding pages of this number of the Magazine. We refer, in this place, to the recent report of this enterprising Company, to notice the operations of their coal department during the last year:—

COAL DEPARTMENT.

As the charter of the Company limits them to the possession of 1,000 acres of coal lands, care was taken at an early day to secure some of the choicest tracts in the valley, lying in the immediate vicinity of their principal depot, at Scranton. The amount expended in the purchase of these lands, the cost of opening mines, and erecting the necessary machinery and fixtures for working them, and preparing the coal for market, including also the expense of sundry improvements at other places, for stocking and shipping coal, is $145,422 01.

During the past year the steam-power coal-breaker, at the Diamond Mines, (commenced in 1852,) has been completed and put into operation. Additional screens and schutes, and other apparatus for preparing the coal for use, and loading it in cars, have been erected, the importance of which will be stated hereafter.

Contracts have been made for sinking two slopes and a shaft near the present openings, at the Diamond Mines, for the purpose of reaching the lower and larger veins, and considerable progress has been made in the work. The necessary engines and other machinery for working these new openings are all being built.

At the commencement of their coal operations, and until about January, 1853, the Company worked their own mines, but it was subsequently deemed expedient to have this work done by contract. Accordingly, an agreement was entered into on 1st of April last, with Mr. Thompson Peckens, and his associates, for working the mines of the Company for the term of five years; the Company paying him stipulated prices per ton, for coal mined, prepared and loaded into the transportation cars; and the contract has thus far been performed to the satisfaction of the Board.

The stock of coal on hand on 31st of December, 1852, was		10,718,02	tons.
During the past year, there were taken from the Diamond Mines	75,647,83		
Purchased from other parties	21,590,17	97,238,00	"
		107,956,02	"
Of which sales were made to the extent of		103,931,85	"
Leaving the stock on hand, December 31, 1853		4,024,17	"
The total sales of coal, as above stated, produced the gross sum of			$358,191 46
And the estimated value of the stock remaining on hand Dec. 31, 1853, was			9,117 15
			$367,308 61
The value of coal on hand, Dec. 31, 1853, was estimated to be	$36,553 99		
The total expenses of mining, transportation, repairs of fixtures, superintendence, etc., during the year, was	254,809 53		291,363 52
Showing the net revenue from this department to be			$75,945 09

As is common to all new enterprises of this nature, some embarrassment has arisen from want of experience; and in the commencement of the Company's operations, not having the necessary apparatus for preparing their coal in a proper manner, they were under the necessity of forwarding it to market in the condition in which it came from the mines. In consequence of this, a prejudice was created in the minds of some consumers against the *quality* of the coal, but the managers feel assured that they have now removed the difficulties heretofore encountered in this branch of their operations. They have not only succeeded in reaching the best veins of coal, but by the erection of steam coal-breakers, and revolving screens, for preparing it, and extensive pockets and schutes for loading it into the cars, they now possess every facility for shipping it in the best possible order.

Besides the openings already made, and the two new slopes and shaft now being constructed at the Diamond Mines, the Board have resolved to proceed at once to the erection of similar works on the Griffin Farm.

The results of the past year's business, with the product of less than 100,000 tons of coal, have been already stated. It is the intention of the Board to increase the amount in 1854 to 200,000 tons, and arrangements have been made accordingly. Judging from the sales already effected, and the constantly increasing demand, it is believed that the whole amount may be disposed of at satisfactory prices.

In view of the large prospective demand for our coal, and the necessity of making timely arrangements for supplying the same, and in order not only to ascertain the quantity of coal on the lands, but also to establish its quality, the Board have recently had the whole most thoroughly surveyed, both by Mr. Needham, Mining Engineer, and Prof H D Rogers, State Geologist of Pennsylvania, the results of which are, in all respects, highly satisfactory.

From both these surveys it will appear that the quantity of minable coal on the Company's lands will exceed FIFTY MILLION OF TONS; that the different veins are adapted, respectively, to the various purposes of generating steam, smelting and manufacturing iron, and for all other manufacturing and domestic uses; and that the *quality* for all these various purposes is fully equal to any other coal produced.

Should the supply of coal from the Company's mines at any time prove inadequate to the capacity of the road, ample quantities will be offered by the proprietors of other collieries in the vicinity. In addition, the Lackawanna and Bloomsburg Railroad, soon to be built, will open to market every coal-field in the Wyoming Valley, including the valuable red ash coal of Plymouth, by the shortest and most favorable route to tide-water. Upon the completion of the Southern Division, and the connections now in progress, coal may be transported from the mines at Scranton and Wilkesbarre to Elizabeth Port, or Jersey City, opposite New York, in ten hours' time. An order may be given by telegraph in the morning, and the coal delivered at tide-water the same evening—*and at all seasons of the year.*

SUSQUEHANNA COAL AND IRON MANUFACTURING COMPANY.

This is a new Company, organized with a capital of $375,000, and intended to operate in the Shamokin coal region. The expectations of the Company are briefly noticed in the following paragraph:—

In consequence of the completion of the North Branch Canal to the State of New York, the greater portion of the coal from the Wyoming region will hereafter find its way to Buffalo and the Lakes, where the anthracite coal is in demand, and commands enormous prices. This region of the Susquehanna, Baltimore, and the Southern market generally, must therefore look to the Shamokin coal mines for a supply, and fortunately, that field contains an inexhaustible supply of the purest and best coal, both for manufacturing and domestic purposes, in the country. The specimens of coal are of a very superior quality. It can be mined above water level in immense quantities, for a half century; and, by the Susquehanna Railroad running from Bridgeport to Sunbury, which will be completed in course of a year, and the Pennsylvania and tide-water canals, will have facilities for market unequaled.

WAGES AND PROFITS OF COAL MINING.

A coal agent of the Cumberland region thus corrects an "erroneous statement" in circulation, respecting the profits of mining :—

Hauling out from the mines should be 7 cents instead of 5, error . .	2
The 4 cents for repair of roads, props, and ties for mine, does not include the smithing and repairing of cars, error	3
The cost of agents, bosses, and clerks at the mines, may in most cases be taken at 4 cents, but the writer has entirely omitted the commission and expense of agency at Baltimore	12½
He also omits cost of loading vessels in Baltimore	12½
Wharfage, likewise	6
Insurance and guarantee, commission, 2½ per cent., also . . .	10
Also all office expenses, stationery, etc., (say)	2
	48

Which reduces his *assumed profit* of 69 cents per ton, to 21 cents. I know more than one Company that would be glad to compromise on the business of last year, at 15 cents per ton *profit*.

THE MONTEVUE COMPANY.

The lands of this Company possess many resources. They are located in the Cumberland coal mining region. The property contains five veins of coal, viz., one of twenty-eight inches, one of three feet, one of forty-four inches, one of six feet, and one of eight feet, as it is called, consisting in reality of two veins of three feet each, with a layer of fire-clay between. The railroad runs through the small veins for more than two miles. All the veins drain themselves, and can be easily mined. The Company also own a portion of the big vein of coal on Savage Mountain. The iron ores on their property are of great value. Between the small veins of coal on the Baltimore and Ohio Railroad, the iron ore beds are from one to four feet thick. They are of three qualities, viz., clay iron-stone, red hematite, and brown hematite. About two-thirds of them are clay iron-stone, and the rest hematites. There are also other ores in the larger coal veins. They are well adapted to the manufacture of malleable iron, sheet iron, and wire. The timber lands of the Company are also very valuable. The forest is very thick, and consists of white oak, yellow and white pine, poplar, wild cherry, chestnut, and other woods. Fire-clay abounds in great quantities, as also limestone. The surface soil is likewise, in many parts, well adapted to agricultural purposes. The entire property of the Company comprises more than 40,000 acres of land.

THE CALEDONIA MINING COMPANY.

This is one of the independent coal companies operating in George's Creek. Their lands consist of about 350 acres of the big vein coal, constituting the "Caledonia Farm," recently belonging to the Parker Vein Company. The inclined plane and all other necessary works were completed and in perfect order, and the mines in operation, at the time of the purchase, and the Company is now fully prepared to turn out, upon the resumption of mining, the mineral of that region. The mines are situated on the Lonoconing Railroad, five miles from Piedmont, and are thus almost in immediate proximity with the Baltimore and Ohio Railroad. The Company have already a contract to furnish one third of the coal consumed by the Baltimore and Ohio Railroad Company during the present year.

ANTHRACITE IN TENNESSEE.

The *Knoxville* (Tenn.) *Journal* mentions that anthracite coal of excellent quality has been discovered in Blount county, on or near the line of the Rabun Gap Railroad. Also, that further discoveries of copper have been made in Knox county.

HAMPSHIRE COAL AND IRON COMPANY.

The property of this Company was described on page 328, Vol. II. From the Report of the President and Chief Engineer of the Company, we take the following extracts relative to their plans:—

The practical question arises, how are these rich coal deposits to be rendered available, and at what cost for preliminary arrangements? It must be obvious that the sole difficulty is in reference to the highest or great bed; and to the solution of this difficulty, we shall now address ourselves. The other seams are at such moderate elevations as to be reached by ordinary means.

As before stated, the 13 feet bed is 980 feet above the Baltimore and Ohio Railroad, at our proposed depot, and at a horizontal distance from it of only 5,350 feet, or one mile and fifty feet. To overcome this great vertical height, we must resort to expedients advantageously employed at many localities in Pennsylvania, Maryland, and elsewhere, that is to say, by self-acting inclined planes (in the steeper grades) in which the moving power is gravitation, checked and regulated by whims, and the application of brakes, and then on the more moderate grades by tram-roads of greater or shorter length. Six companies in George's Creek successfully operate by these means, while others are preparing to adopt them. Of those above referred to, all are at a less elevation than ours.

We propose to convey the coal from the great bed, first, by a plane 2,000 feet long, and a descent of 700 feet, then 2,500 feet long and a descent of 130 feet, and then to the depot or dump-house by another plane 750 feet long and a descent of 140 feet. The only disadvantage under which we labor, in comparison with those named, is that of an additional plane, which we believe is more than counterbalanced by other advantages.

From the working gallery at the head of the upper plane, the water naturally flows into Montgomery's Run, a tributary to the Potomac, crossing the Baltimore and Ohio Railroad at our projected depot. An examination of the maps will show, that to follow this course of drainage, will afford us great facilities in the construction of the planes and tram-road, subjecting us to but little expense in the way of graduation and masonry. By reference to the very minute and particular estimates of the engineer, it will be seen that the whole cost for the planes and tram-road (double track), sidings, wheel-house, machinery, schutes, dump-house, equipments, etc., etc., will amount to only $25,318.00; and he goes on to say, "I think the prices named are liberal, and the whole, in many particulars, is likely to be done for less than caution induced me to assume as a *standard*."

The above estimate includes almost everything that will be necessary for the commencement of business on a large scale, except buildings for offices, superintendents, and laborers, the number and extent of which must depend on the exigencies of the case, and the amount of business to be transacted.

The quality, superiority for certain purposes over all other American coals, facility of access, comparative cheapness of transportation, and demand in proportion to possible supply of Cumberland coal, are so well known, that to attempt to set them forth in this short Report, would be an act of supererogation. It would not be a "three" but an "hundred" told tale. In its physical and chemical characteristics, it is nearly identical with the justly celebrated Welsh coals of Merthyr Tydvil, which is employed in its natural state for the reduction of iron ores, and yields coke of an excellent quality, for either locomotives or metallurgic purposes. There is no reason why the Piedmont coal should not, with properly constructed ovens, produce an article of equal value. In this way, the fine and waste coals (for it is proposed to sift the coal at the depot) could be turned to profitable account by converting them into coke, alongside of the Baltimore and Ohio Railroad, where large quantities will be wanted for passenger locomotives and for other purposes. Besides this, it may be confidently anticipated, that a great demand will spring up at this point for the raw coal, to be used by the burden locomotives, and that at no other locality can it be supplied of a better quality or at a cheaper rate.

It is not our purpose to institute injurious comparisons between the property of the Hampshire Company and that of other Companies operating in the same mining region; but to set forth, in plain language, the abstract advantages which we believe it possesses. All are doubtless valuable, and there should exist none other than a generous rivalry between them as to which shall send the most coal to market, and at the least expense. There is more than enough for all to do, and the statistics of the coal trade clearly demonstrate that if every railroad at present leading to the coal formations on the Atlantic slope of the Alleghanies were double-tracked, and every canal double-locked, they could not, five years hence, supply the probable demand calculated on the experience of the past. Besides this, we must bear in mind that the *demand* presses on the *supply*, and would continue to do so, even if the latter should increase in a much higher ratio than for the last five years. This condition of things will necessarily lead to the opening of new avenues and the enlargement of old ones; for trade, like water, seeks its natural channel, and you can no more dam it up than you can roll back the current of the Mississippi to its sources. The Baltimore and Ohio Railroad has secured the means of laying a second track to Piedmont, and stocking it with ample rolling power, chiefly in reference to the coal traffic. The State of Virginia, feelingly alive to her domestic interests, is lending her aid to extend the Alexandria and Manassa Gap Railroad to the vicinity of Piedmont, whilst another and more direct line to Alexandria has been commenced, to connect at or near the same point with the Baltimore and Ohio Railroad. The latter road is expected, by a short branch, to connect with the Chesapeake and Ohio Canal, by a navigable feeder down the valley of the south branch of the Potomac. Thus it may be said, by a figure of speech, that this mineral region leans towards the Atlantic waters, as vegetables growing in the shade seek the light of day. These works, at least the two last named, will be completed in a few years, *beyond all question*. This will result from an inevitable necessity; for the laws of trade are as imperative as the laws of nature. The effect, when these new avenues shall have been opened, will be not only to offer us increased facilities and a choice of shipping ports, but will place us much nearer to navigable water than many parts of the coal-field in Maryland. At this time it is nearer to Baltimore, by the existing means of communication, than the greater portions of that region, with the exception of the comparatively small fields lying on the drainage of Braddock's and Jenning's Run; and when we take into consideration the close proximity of our mines to the Baltimore and Ohio Railroad—the small cost at which they may be developed—the additional thickness of the great bed (some four feet thicker than the same bed on those waters)—the large demand for coal and coke almost at the pit's mouth, it cannot be regarded as presumptuous, if we claim, notwithstanding the elevation of our great bed, that in proportion to its extent, our property, to say the least of it, is not inferior to that of any other company in the mineral district.

ANALYSES OF COALS.

Annexed we copy from the Report of the Sixth Annual Exhibition of the "Maryland Institute for the Promotion of the Mechanic Arts," just issued at Baltimore the statement of Professor Morfit and the gentlemen associated with him on the Committee, touching the relative powers and values of ten different varieties of coals submitted for analysis. It is proper to premise that the "Baltimore Company's coal," so called, is mined (by a Company bearing that title) from the Wyoming Coal Field in Pennsylvania; and that the "Short Mountain coal" is mined by a Company bearing the corporate name of the "Short Mountain Coal Company," from the "Short Mountain" in Lykens' Valley, Dauphin county, Pennsylvania. The coal of the first is a hard white ash anthracite, while that of the latter is a free burning red ash anthracite coal. Both these Companies are acting under charters granted by Pennsylvania, but have their offices in Baltimore, as that city is their shipping port.

The former has paid large and regular dividends for several years; the latter Company has just commenced sending coal to the Baltimore market, and owns the nearest purely anthracite coal lands to the city of Baltimore—being but 110 miles distant. The coals of these two Companies, it will be perceived, have been pronounced to be superior to the others examined, and, though differing in character, are shown to be nearly equal in *power*.

The several varieties, styled "Mordecai's Black Diamond," "Black Diamond," and "not labeled," are also from the Wyoming coal field. They are hard white ash anthracite coals. "Pompey Smash," "Withers," and "Frostburg" coals are semi-bituminous, from the Cumberland region.

The first is mined by Percey & Co., the second by the "Withers Mining Company," and the third by the "Frostburg Coal Company."

We cannot avoid the expression of a doubt whether these specimens sent to the Committee were fair samples of Cumberland coal. The "Somerset, Pennsylvania," and the "Cannel, Marion county, Virginia," are highly bituminous coals.

The Report, proceeding from such a source, commends itself to the attention of the public.

The Report of the Judges is as follows:—

To the Committee on Awards:—

The undersigned, Judges in Class 58, have examined the Chemical Report of Professor C. Morfit, on the coals deposited for competition in the late Exhibition of the Maryland Institute, and fully concur in the statement therein made.

Very respectfully, E. PRATT, HORACE ABBOTT.

The following is the Report of Professor Morfit:—

BALTIMORE, MD., 29th *October*, 1853.

THOMAS TRIMBLE, ESQ.,
Chairman of Com. on Exhibition of the Maryland Institute.

I herewith report the following table showing the results of analyses of the coals handed me through Messrs. Lovegrove and Selby, for the purpose:—

TABLE.

DESIGNATION	Specific gravity at maximum density of water, ml	COMPOSITION: Carbon.	Hydrogen.	Oxygen and Nitrogen.	Ash.	Heating power of 1 lb. of the Fuel: Pounds of water raised [illegible]	Pounds of water evaporated from [illegible] boiling 100[illegible]	Proportionate value.
Baltimore Co. White Ash	1.5022	0.8866	0.0472	0.0038	0.0606	8801	11.3	1.——
Short Mountain Co.'s Red Ash	1.5365	0.8800	0.0475	0.0367	0.[illegible]	7761	11.3	0.9[illegible]
Montezuma Diamond	1.[illegible]	0.[illegible]	0.[illegible]	0.0264	[illegible]	7564	11.7	[illegible]
Black Diamond	1.[illegible]	[illegible]	0.[illegible]	[illegible]	[illegible]	[illegible]	11.6	[illegible]
[illegible] washed)	1.5541	0.7800	0.0357	0.0373	0.[illegible]	7391	11.3	[illegible]
Pompey Smash	1.[illegible]	0.83[illegible]	0.0410	0.0961	[illegible]	7314	11.1	[illegible]
Withers Mining Co.	1.[illegible]	0.7990	0.0470	0.[illegible]	0.0[illegible]	7014	10.9	[illegible]
Somerset, Pa.	1.[illegible]	0.6874	0.0514	0.1[illegible]	0.1740	6115	9.9	[illegible]
Frostburg	1.[illegible]	0.[illegible]	0.0436	0.1[illegible]	[illegible]	5173	8.4	[illegible]
Cannel, Mason Co., Va.	1.4711	0.[illegible]	0.0461	0.2174	0.2020	[illegible]	5.9	0.[illegible]

The specific gravities have been ascertained by an apparatus especially designed for the purpose, and are I think more reliable than ordinary. This characteristic, however, is of little importance as an indication of the value of the coals otherwise.

The four next columns give the elementary constituents of the coal ascertained as in organic analysis. The oxygen and nitrogen have been taken together, for your instructions did not authorize me to go to the extreme pains of separating them, as I should have preferred doing. However, as the nitrogen is always a small fraction of the aggregate, it is not of so much importance; and in the calculations for the succeeding columns, the whole aggregate has been considered as oxygen.

These succeeding columns give the heating power of the several coals, calculated upon the well determined effects of the carbon and hydrogen (in excess above what is required with the oxygen given to form water) which they contain.

This heating *power* is different from the heating *effect* which might be observed in experiment, or in practice, with the several coals, and which depends to some extent, and sometimes to a considerable extent, upon the form of furnace used, and upon the management of the fire.

The results here given are freed from these uncertainties, and are intended to show the utmost possible heat that can be evolved from the several coals by the most perfect arrangement and by the utmost care.

The captions of the two first columns sufficiently explain themselves, and the last column shows the probable proportionate value of the coals; according to which also they have been ranked in the table.

Respectfully submitted by

CAMPBELL MORFIT.

BORD AND PILLAR WORKING.

In working seams by the bord and pillar, the most approved plan practised in the north of England is that of getting the coal in districts or panels, with a strong pillar between each panel which is got out. Three capacious main roads are driven, the middle one being the main travelling road and fresh air-road; the two side ones return air-roads, and not used for travelling. A panel of bords or drifts is worked parallel to these main-roads on each side; and at three or four pillars' length from the face of the bords the process of getting the pillars is going forward, thus leaving a very limited area of the seam standing in the pillars, and only for a short period, so that the coal will be less injured by being crushed than if large areas of the mine were left in pillars for a length of time. The panel on one side of the main-roads is worked a pillar in advance of the other. The coal is brought from the bords through the doors, placed in the stenting or opening next to the face of them; and the coal from the pillars is brought through the doors, placed in the stenting or opening next to the face of the pillars. This arrangement of the workings is adapted for a flat seam.

In working seams which have an inclination on the bord-ways course in districts or panels, a panel of bords or drifts is worked up to a determined distance, when the process of getting the pillars begins at the rise part of the panel, the bords or drifts in the next panel being excavated at the same time. Strong pillars are left between each panel of bords to bear the pressure caused by the sinking roof when the pillars of the adjoining panel are got out. This arrangement leaves as limited an area of the seam standing in pillars for as short a period as circumstances will allow.

Seams with a strong roof are worked in bords four to five yards wide, and pillars left proportioned to the depth of the seam below the surface. A strong roof and soft floor require wide pillars to be left, to prevent the heaving or lifting of the floor, which is caused by the pressure forcing pillars of inadequate strength into the floor. In the mining language of the North this is called a *creep*. The escape of gas from the measures beneath the coal will also frequently force up the floor, an occurrence that may be prevented, to a great extent, by drilling short holes into it, in order to facilitate the escape of the gas.

There is considerable advantage in working a seam with a tender roof and soft floor, in panels; a limited area of the seam is opened at once, and for a short time; consequently there is less destruction in the bords by the falling of the roof and heaving of the floor, and less timber required than if a large area was first worked in bords before getting out the pillars, and also less injury to the pillars, by weight upon them. The long standing pillars in some seams only yield from thirty to forty per cent. or about one-third of large coal, whilst if they were got out expeditiously they would yield seventy per cent. or nearly three-fourths of large coal.

In working with wide bords, attention should be paid to the nature of the strata a distance above the seam, some seams having a thin bed of strong roof upon them with tender measures above; such a roof may stand very well in wide bords or drifts working whole coal, but when the pillars are being worked and a weight comes over the face, it will break through the thin bed of strong roof in the bords or drifts, and partially close them up some distance down from the face of the pillars; in such cases, and in the partial closing up of long standing bords, either by the falling of the roof, or heaving of the floor, the pillars have frequently to be split or jenkinged in order to get them, and this frequently entails a great loss of coal.

When it becomes necessary to split a pillar in order to get it, less coal will be crushed and lost by driving a loose jenking or a portion worked from one side of the pillar when it is practicable, than by driving a fast jenking or a place up the middle of the pillar; nevertheless, cases may arise when it is better to split the pillar up the middle.

Consideration is not generally given in regard to leaving the strength of the pillars proportioned to the depth of the seam below the surface, the consequence of which is that they get crushed, and yield a small per centage of large or round coal, and the cost of timber in supporting the roof, and of labor in maintaining roads, is considerably increased. A creep, moreover, may take place and bury large areas of pillars. The hasty working of the mine when the shafts are first sunk also causes pillars of insufficient strength to be left, which brings on effects similar to those just described, and besides renders the shafts insecure or probably useless. These last consequences frequently result from a desire to gratify employers by raising large quantities of coal before it is either prudent or practicable to do so, and in many instances from ignorance as to of what strength the pillars should be.

The system of ventilation adopted in working a seam in districts or panels is thus. the middle road is the main travelling-road of the mine, and also the intake or fresh air-road; the two side-roads are return air-roads. No air doors are fixed on the main-roads. Each panel or district takes its supply of air from the middle main-road, and is controlled by a regulator fixed on the return from each. When the air has ventilated the faces of the main-roads, it is conducted to the faces of the bords in each panel by means of bratticing from the headways or end next to the face, and at the bottom of the bratticing in the headways or end, a swing door or cloth is hung to allow a passage for the tubs. The air passes from the bords or whole coal workings to the faces of the pillars in the same panel, along which it sweeps and presses towards the goaf, forcing the gas from the men at the face, and finally being sent over a part of the goaf into the return air-course, it is conveyed into the upcast shaft without going along any of the travelling-roads of the mine. The advantage of this arrangement of the ventilation over that where the air circulates through the mine in one current is evident when bodies of gas are liberated from the goaves by atmospheric changes, or sudden outbursts take place. The main-roads between the panels can be separately ventilated if the state of the mine requires it.

The method of ventilating seams having an inclination, and being worked in districts or panels, is as follows: the middle bord and the upper headways or ends of the main-roads are the intakes or fresh air-roads, and also the travelling-roads of the mine unobstructed with doors. All the districts are supplied with air from these main-intakes or fresh air-roads, by regulators placed on the delivery. The whole coal workings are first ventilated, the air then passing to the pillar workings in the next panel, and returning down the far bords or drifts. This mode of ventilating the panel has a tendency to draw the gas from the goaf towards the men at the faces of the pillars, and is not to be compared for safety with the panel ventilation before mentioned, or the following.

The panels have each a separate ventilation; the return from each is delivered at the rise part of the panel, where the gas would by natural drainage be given off. Some previous preparation of the workings is here necessary, before a panel can be worked with a separate ventilation. The headways or ends at the low side and top side of the panels must first be driven, and connected with a pair of drifts or bords, separated with the panel or division pillar at the extremity of each panel. The main current of air passes up the near bord or drift of the panel, and sweeps the faces of the bords by means of bratticing. Each of the other bords or drifts is ventilated with a scale of air. In working the pillars, the air sweeps across the face, presses towards the goaf, forces the gas from the men, is sent over a portion of the goaf, and carries any liberated gas into the return.

The goaves are connected with the return air-courses, so that a drainage of gas will go forward. The exploring drifts can each have a separate ventilation.

If packs or stone pillars are built along the panel pillar, a current of air will sweep between it and the goaf, which will be some protection to the men working this pillar.

THE COAL FIELDS OF ALLEGANY COUNTY, MARYLAND.

In the Report of Dr. James Higgins, Agricultural Chemist of the State of Maryland, is a sketch of the coal fields of Allegany county, which is an interesting statement:—

The main coal field of Allegany county is embraced between Dan's mountain on the east, the slope of Savage mountain on the west, the Potomac river on the south, and Mason and Dixon's line on the north. It is about thirty miles in length, about four in breadth, and makes altogether 120 square miles. In figure it curves slightly from north to south, rising sometimes from its synclinal axis to its eastern and western borders, and resembles an Indian canoe, except that its sides are not so perpendicular. On the eastern side some of the small veins penetrate Dan's mountain and overlook the Potomac; on the west it does not reach the summit of Savage mountain. A more minute description of this field is deemed unnecessary, as all its characteristics are familiarly known to the public.

There are *fifteen* veins in this coal basin, some of which, however, have no economical value.

The chief veins are: 1st, the *two-foot* vein; 2d, the *three-foot* vein; 3d, the *forty-inch* vein; 4th, the *six-foot* vein; 5th, the *eight-foot* vein; 6th, the *big* or *fifteen-foot* vein.

The most important veins, however, and those now worked for exportation, are the big vein, the six foot vein, and the forty-inch vein. The big vein is considered the most valuable; it contains an average thickness of *eleven feet* of workable coal.

It is estimated that there are in this field 20,000 acres of workable big-vein coal; 80,000 acres of the six-foot vein, and 80,000 acres of the forty-inch vein. It will thus be seen that the smaller veins embrace a much larger area than the big vein. They do not suffer so much by denudations.

The following is a calculation of the amount of available coal in the main coal field. The big vein, comprising 20,000 acres of workable coal, eleven feet thick, contains in every acre 17,747 tons of coal, or, in the whole vein, 354,933,333 tons. Deduct one-fourth for wastage of every kind and we have 266,200,000 tons of merchantable coal of unsurpassed excellence. The six-foot vein contains in each acre 9,680 tons of coal; this multiplied by its number of acres, 80,000, will give 744,400,000 tons of coal. Deducting as before, we find it is capable of furnishing 580,800,000 tons of coal. The four foot vein contains also 80,000 acres; each acre 6,050 tons of coal; the whole vein therefore contains 284,000,000 tons of coal. Deducting one-fourth for wastage and we have 363,000,000 tons as the quantity it can furnish.

Thus it will be seen that these three veins alone will supply *one billion, two hundred and ten millions of tons of coal!* In all conscience, is not this enough?

The quality of this coal is now beginning to be appreciated. As a fuel for the generation of steam, it possesses, in a higher degree than any other, the three important qualities, quickness, continuance, and steadiness of combustion. Its leading chemical constituents are a large percentage of carbon, a small percentage of ashes, a trace of sulphur and nitrogen, very little water, and a moderate quantity of bitumen. This bitumen, if in excess as in the Richmond and Pittsburg coals, would give a rapid fire, but one of short duration; if it does not exist at all, as in anthracite, combustion would be slow, and each addition of fuel would deaden the flame. The Cumberland coal contains just enough bitumen to secure quick combustion, and just enough carbon to preserve a uniform heat. It is, therefore, the very best known fuel for the generation of steam. Professor W. R. Johnson established this point in 1844, when, after elaborate experiments with over thirty different varieties of coal, he reported to the Navy Department that a pound or bushel (equal weights or equal bulks) of Cumberland coal would generate more steam than the same amount of any other coal in the country.

Cumberland coal, being remarkably free from sulphur, is also admirably adapted for the smelting of iron and other ores. It makes a beautiful compact coke, and in this shape is used to great advantage in the manufacture of all kinds of metals. It is also pre-eminently the blacksmith's coal, and for domestic purposes cannot be surpassed as a fuel. The charge that it is liable to spontaneous combustion is not only not true, but chemical analysis demonstrates its impossibility.

The middle coal field of Allegany is situated between Negro and Meadow mountains. The coal in this region is a fine compact mineral, with a larger proportion of bitumen than that of the main field. The veins are thick, and when facilities for reaching market are provided, this coal will bear a very high character.

The western coal field of Allegany is situated on the Youghiogheny river. It contains veins, two, four, five, and six feet in thickness, with which are associated iron ore in large quantities. The time will come when this will be one of the most important mineral districts of the county. At present it has no outlet to market.

IRON AND ZINC.

EUREKA IRON COMPANY.

The property of this Company, and the assays of their ore, are described on page 541, Vol. I. The officers of the Company are: E. B. Worth, President; T. W. Lockwood, Treasurer; and Geo. Thurber, Secretary. Their office is in Detroit, Michigan. The capital of the Company is stated in the Report at $500,000, of which $30,000 has been paid in.

At present they have a water-power saw-mill nearly completed, and quite a good force chopping cord-wood for coaling next summer. Their works are about two miles from the village on the Iron Mountain road. They are raising iron ore on their place, and intend erecting a furnace this spring.

IRON MOUNTAIN AND PILOT KNOB, MISSOURI.

For some interesting particulars respecting this rich iron region of Missouri, we are indebted to the *St. Louis Republican.* The treasures of this region appear to be almost inexhaustible, and the prospect for their rapid development is most flattering.

The Iron Mountain and Pilot Knob are the largest and most extraordinary deposits of iron in the known world—the quantity, the quality, and the facility of obtaining the ores are the distinguishing features of these inexhaustible stores of wealth.

The ore of these mountains is what is known by mineralogists as specular oxide. Fair specimens yield by analysis from sixty-five to sixty-six per cent. of pure iron, six to eight per cent. of earthy matter (alumina and silica), the remainder oxygen. There is nothing combined, therefore, with the ore in its natural condition to prevent the production of the finest metal. The ore from the other localities is equally rich, and equally adapted to the production of pure iron. The ore of the Iron Mountain is remarkable for its uniformity of character; the smallest specimen, accidentally picked up, is a fair specimen of the entire mass. That of the Pilot Knob is more variable. In some places, particularly near the summit of the mountain, it assumes somewhat of a porphyritic character, and consequently involving a greater amount of earthy matter than above stated, but much the largest part of the Knob appears to be as pure as the Iron Mountain.

The ore of the Iron Mountain covers an area of about five hundred acres. The mountain is situated in the valley of St. Francis, and rises about two hundred and sixty feet above the plain of country that surrounds, and entirely separates it, from all other elevations. The mountain has been estimated to contain *two hundred and twelve million tons of ore* above the base. The ore usually presents itself in lumps or boulders, from the size of pebbles up to those of two or three hundred pounds in weight, and thousands of tons can be picked up upon the mountain without the use of crow-bar or pick. The ore is so pure and free from other substances, that no difficulty has been found in working it directly into blooms.

The Pilot Knob covers an area about equal to the Iron Mountain, and rising to an elevation above the adjacent valleys of about five hundred feet. On the northern side of the Pilot Knob, the ore rests upon red porphyry, and is here seen to dip with considerable rapidity towards the south from the culminating point of the mountain; therefore it may be assumed to be iron ore down to at least a level with the adjacent valley, or say five hundred feet thick.

Near the Pilot Knob stands the Shepherd Mountain, abounding in rich ores that are highly magnetic, and said to produce steel of the finest quality. There are several deposits of rich iron ore in the neighborhood.

The Pilot Knob and Shepherd Mountain belong to the Madison Iron Mining Company, who are actively engaged in the manufacture of pig metal and blooms.

The Iron Mountain belongs to the American Iron Mountain Company, who are largely engaged in the manufacture of pig metal, which is now carried to Ste. Genevieve in wagons, a distance of forty miles, at which point it is worth, for shipment, from two to three dollars per ton more than the Tennessee and Ohio metal.

The ore of these vast formations is quite in demand at the river, and sells readily at Ste. Genevieve for $10 per ton for shipment to the Ohio. This pays well for the hauling, when the teams are not engaged in transporting metal and blooms.

The Iron Mountain is distant from St. Louis seventy-eight miles, and the Pilot Knob is six miles south of the Mountain, and eighty-four miles from St. Louis. The St. Louis and Iron Mountain Railroad is now under contract, and will be completed from St. Louis to the Mountain and Knob by the first of November, 1855, which will bring those great resources within four hours' transit of St. Louis, and the ore can then be furnished to manufacturers in St. Louis at three dollars per ton, including all expenses. The common ores usually cost that price at the furnace.

The Railroad follows the Mississippi river about twenty-eight miles, thence up Joachim Creek about twenty miles, crosses Big river, and follows Mill Creek about ten miles; the last three streams afford an abundance of fine water-power, suitable for forges and furnaces, in the midst of fine timber, and we may soon expect to see such establishments dotted all along the railroad.

But St. Louis must become the great manufacturing point. Here the ore will be met by the Cannel coal from the Osage, brought over the Pacific Railroad. Experiments have shown that this coal can be substituted for charcoal without impairing the quality of the iron, and experienced iron-masters are sanguine of making rails, by the use of Cannel coal, direct from the ore, and of a quality, for toughness and durability, superior to any now in use.

THE CLEVELAND IRON COMPANY.

The Cleveland Iron Mining Company have expended about $120,000 for various purposes; buying a town site, (Marquette,) building piers, warehouses, furnaces, etc. Their furnace was destroyed by fire in December last, and now they abandon the manufacture of iron on Lake Superior, and sell all the ore they can get down. All the ore they deliver comes from the Jackson mine. With present facilities, it costs $5 to bring the ore from Marquette to Cleveland. When the Ste St Marie Canal, and the railroad from Lake Superior to the iron mines are finished, there will be no difficulty in furnishing Cleveland thousands of tons of ore per year, from the Lake Superior county. The

Cleveland mine is about twelve miles, and the Jackson mine nine miles from the Marquette landing. The line of railroad is now partially graded for a plank road, and will be about sixteen miles long, to the Cleveland mine.

THE FOREST IRON COMPANY.

The Forest City Iron Company of Cleveland are pushing ahead their works as fast as the weather will permit. They will probably commence manufacturing about the first of April. They are a very energetic Company, and if the Renton process is what it is claimed to be, they will make a great deal of money out of it. This Company have contracted with the Cleveland Iron Mining Company for one thousand tons of ore delivered at Cleveland for $12 per ton, which they intend to mix with ore from their mine at Salineville, on the Cleveland and Pittsburg Railroad.

PRICES OF IRON.

The Secretary of the Treasury of Virginia, in reply to a resolution of the State Senate adopted a year ago, has reported the average price of iron for the last ten years preceding 1853, at markets of production abroad and at home, as follows:—

Average of merchantable bar iron at Liverpool	$31 78
" of merchantable bar iron at New York	56 52½
" of merchantable bar iron at Pittsburg	55 45
" of best refined iron in Liverpool	47 64½
" of best refined iron at New York, 6 months credit	75 50
" of railroad iron in Wales	34 61
" of railroad iron in New York	42 20¼
" of pig iron at Glasgow	18 21
" of pig iron at New York	25 76
" of pig iron at Pittsburg	26 57

THE IRON TRADE OF GREAT BRITAIN.

Retrospect since 1806; and the increased proportion which Scotland bears to the whole.

FURNACES IN BLAST, AND PRODUCTION IN GREAT BRITAIN.

	Furnaces.	Production. Tons.
1806	216	243,851
1825	374	581,367
1840	402	1,396,400
1845	623	[illegible]
1852	655	2,701,000

OF WHICH THERE WERE, IN SCOTLAND—

	Furnaces in blast.	Production. Tons.	Price.
1806	18	22,840	£7 0 0
1813	16	23,450	6 0 0
1823	22	30,500	4 15 0
1833	31	44,000	2 16 0
1843	62	248,300	2 5 0
1853	114	740,000	3 1 6

DURING THE LAST TEN YEARS—

	Furnaces in blast.	Production. Tons.	Stock. Tons.
1844	73	295,000	190,000
1845	94	400,000	230,000
1846	97	[illegible]	145,000
1847	89	540,000	90,000
1848	108	600,000	100,000
1849	115	692,000	195,000
[illegible]	105	[illegible]	230,000
1851	114	775,000	[illegible]
1852	118	775,000	450,000
1853	114	740,000	270,000

PRODUCTION OF MALLEABLE IRON IN SCOTLAND.

	Tons.		Tons.
1845 . .	35,000	1849 . .	90,000
1846 . .	46,000	1850 . .	80,000
1847 . .	60,000	1851 . .	90,000
1848 . .	80,000	1852 . .	90,000
		1853 . .	100,000

AVERAGE PRICES OF PIG AND BAR IRON FOR THE LAST TWENTY YEARS.

	Pig Iron.	Bar Iron.		Pig Iron.	Bar Iron.
1834	£4 5 0	£6 18 6	1844	£3 14 9	£6 2 6
1835	4 10 0	6 10 0	1845	3 15 0	9 6 0
1836	6 18 0	10 12 0	1846	3 11 6	9 18 0
1837	4 0 [illegible]	9 12 6	1847	3 5 0	9 18 0
1838	4 0 0	9 5 0	1848	2 4 4	6 11 6
1839	4 10 0	9 16 6	1849	2 6 0	5 17 6
1840	3 15 0	8 7 6	1850	2 4 7	5 8 0
1841	3 0 0	7 4 0	1851	2 0 6	5 7 6
1842	2 10 0	5 19 0	1852	2 5 0	9 15 0
1843	2 5 0	5 0 0	1853	3 [illegible] 6	9 0 0

SHIPMENTS FROM SCOTLAND.

	Foreign. Tons.	Coastwise. Tons.	Total. Tons.
1845 . .	54,671	183,225	237,896
1846 . .	119,100	257,841	376,941
1847 . .	143,460	227,005	370,465
1848 . .	162,151	227,838	387,984
1849 . .	153,193	221,948	375,128
1850 . .	134,[illegible]76	190,088	324,859
1851 . .	193,670	260,088	453,758
1852 . .	224,097	199,971	424,068
1853 . .	314,270	302,035	616,305

ANALYTICAL ASSAY OF IRON ORES.

The following method of assay, says the celebrated Berthier, cannot be too much recommended to iron masters, for all the facts necessary to be gotten in relation to the ores they smelt, are imparted in a very simple and expeditious manner; and by varying the experiments, and by employing as fluxes the ordinary substances used for that purpose, a knowledge of the mixtures which will answer best in the high furnace, may be obtained without loss of metal or much expense.

By performing simple operations on the mineral before fusion, a double assay may be dispensed with, and much useful knowledge gained as to the nature of the body; indeed, this method is only second to an analysis by the humid method. These operations are comprised in roasting or calcining, to drive off any volatile or combustible matters; in treating the ores with certain acids, the object of which is to ascertain the amount of insoluble matter by difference of weight before and after the action has taken place.

The hydrated ores are calcined to estimate water; those ores containing manganese, to reduce it to a fixed known state of oxidation (sesquioxide). The carbonates are roasted to expel carbonic acid; the ores from the coal formations, to burn the combustible matter with which they are mixed. Slags and dross are roasted to free them from charcoal. A simple calcination sometimes is sufficient, as in the case of carbonates; but when mixtures of per and protoxide of iron are to be assayed, they must be subjected to a long roasting in order to convert all the contained protoxide into peroxide.

Diluted and cold nitric and acetic acids are employed for minerals whose matrix is purely calcareous or magnesian, as these acids dissolve the earthy carbonates without attacking either stones, clogs, or the oxides of iron. The residue is to be well washed, dried and weighed, and the amount of carbonates calculated by the difference. It is now to be treated with boiling hydrochloric acid, or, what is preferable, by *aqua regia*. The ores which contain substances insoluble in these acids are generally of a clayey or flinty nature. These are to be weighed, and according to their weight that of the flux to be added in the assay is determined, as will be shown hereafter.

It must be borne in mind, however, that the clays are absolutely insoluble in hydrochloric acid, for a certain quantity of alumina is always dissolved, which is greater in proportion to the proportion existing in the clay.

The ores containing titanium are boiled with concentrated sulphuric acid, after they have been reduced to the finest possible state of division. All the oxides of iron, titanium, and manganese, are dissolved, and the stony gangues which resist the action of this acid can be estimated. The utility of this estimation will be pointed out as we proceed.

When all the operations necessary for each particular case have been completed, we know the proportion of volatile substances, of substances soluble in acetic acid, and those insoluble in hydrochloric and sulphuric acids, contained in the substance under assay.

The suitable flux is then added, and the fusion proceeded with as usual. In general we have a choice of a variety of fluxes, but if the assay is to be verified and made as accurate as possible, fixed fluxes must be employed, or fluxes which lose only a determinate amount of volatile matter. Carbonate of lime, and carbonate of magnesia, are examples of this sort of flux.

Let A be the weight of the rough or non-calcined ore; B, the weight of the same calcined; C, the weight of the fluxes in a rough state, D, the weight of the same calcined; P, the weight of matter insoluble in hydrochloric or sulphuric acids, R, the weight of the fixed substances soluble in acetic or nitric acids, a weight which can be readily calculated when we know the loss which the ore, not treated by acids, suffers by calcination, and the residue of the treatment of this substance by acetic or nitric acids; M, the weight of the button of metal and scattered globules; S, the weight of the slag; and O, the loss of weight in the assay which represents the quantity of oxygen disengaged during the reduction.

The following is the disposition of the data from which, at one view, all the useful results of the assay can be determined.

In the assay has been employed:

A, rough ore — calcined ore	B
C, of rough fluxes added — fixed flux	D
Total of fixed matter	B+D

The result has been:—

Metal—M, Slag—S } Total	M+S
Loss	O
Fluxes	D
Vitrifiable matter	S−D
Substances insoluble in hydrochloric acid, etc.	T
Substances soluble in hydrochloric acid, etc.	S−D−T
Substances soluble in acetic acid	R
Substances insoluble in acetic acid, and soluble in hydrochloric acid	S−D−T−R

When the iron in the substance assayed is in a known degree of oxidation, and when but little manganese is present, the quantity of oxygen (O) ought to correspond very nearly with the quantity of metal (M) produced; if it does, the assay must be correct.

A rigorous correspondence between the two numbers, however, cannot always be obtained, because the iron is not pure, but always contains carbon, so that in ordinary assays the peroxide of iron loses but from twenty-eight to twenty-nine per cent. of oxygen.

On the other hand, the quantity of iron remaining in the slag makes up in part for the carbon combined with the metal reduced; but when the assay has been made with a suitable flux, the quantity of oxygen remaining is very small, and never exceeds one per cent. of the weight of the slag. When the iron is in an unknown degree of oxidation, the loss (O) produced in the assay gives the degree, if it has been made without accident; but if there is any doubt, and the result is of importance, the assay must be recommenced for verification. If the ferruginous matter contain manganese, and if that metal be in the state of protoxide, the verification just described can be made without modification, because the manganese dissolved in the slag is always at the *minimum* of oxidation; and when a sufficient quantity of flux is employed, the amount reduced is of no consequence. But when the manganese is in a state of red oxide, it parts with a certain quantity of oxygen on being reduced to the *minimum* of oxidation, and which quantity is estimated in the loss (O), so that a perfectly accurate verification cannot be made. Nevertheless the difference between the loss (O), and the quantity of oxygen calculated from the metal (M), cannot be very great, because the red oxide of manganese loses but ·068 of oxygen in its transformation to protoxide.

Titanic acid behaves in iron assays exactly as the oxides of manganese. It disengages at most but ·06 of oxygen when dissolved in the earthy gases in contact with charcoal.

It sometimes happens that the assay is not fused, or but imperfectly so. This can happen from two causes: firstly, because the heat has not been sufficiently strong or continued; secondly, because the flux has not been employed in proper proportion, or has not been calculated to form fusible compounds with the foreign matters mixed with the oxide of iron. In both cases the oxide of iron is completely reduced; and if the assay has been made with care, the loss of oxygen indicates the amount of iron in a very approximate manner, and nearly always with an exactitude which is surprising to those not accustomed to this kind of operation.

The assay buttons which are not fused have a gray and homogeneous appearance. They flatten under the hammer, take a metallic lustre by friction with a file, and disengage hydrogen on being moistened with hydrochloric acid. The iron they contain is in imperceptible particles.

In the imperfectly fused buttons, the iron is disseminated in globules throughout the whole mass of slag. It forms a scoriform button mixed with much slag, without the possibility of complete separation.

Sometimes there is not even an agglomeration, and the mixture submitted to assay forms but a grayish metallic powder, in which case the assay is useless, as it is impossible to collect the whole without loss, even by washing the charcoal lining with the greatest care.—*Mitchell.*

WISCONSIN IRON ORE.

The first Annual Report on the Geological Survey of Wisconsin, by Prof. Edward Daniels, is full of interesting information relative to the geological formations and mineral wealth of this prosperous State. A brief notice of the iron ore of Dodge and Washington counties is comprised in its pages, which precedes a more extended report to be made at a future day. We insert it as valuable information respecting that extensive deposit :—

This deposit of iron ore consists of a bed of great horizontal extent, included between layers of limestone above, and a bed of clay, underlain by limestone, below. It presents an occasional outcrop along a distance of fourteen miles, and may be traced, with frequent interruptions, through the whole distance from Iron Ridge, Dodge county, in a south-east direction, to the town of Hartford in Washington county. It varies in thickness from 8 to 30 feet. It undoubtedly extends over at least ten or twelve square miles, constituting one of the most extensive beds of iron ore known. It presents every evidence of being an included stratum, having a distinct stratification conformable to the rocks above and below it. The whole formation of rocks dips slightly towards the east. The structure of the ore in place is usually that of small flattened nodules, cemented together. By partial decomposition, the ore on the surface has been separated into its constituent nodules, which resemble flaxseed in their size, color, and greasy feel. This loose material is called seed ore. Occasional lumps of compact hematite occur, which seem to be a secondary form of the ore. The limestone adjoining the bed of ore is frequently discolored by it, and crystals of hematite occur, lining its cavities. True analyses have been made of this ore, the details of which I have not by me at this moment. They prove it to contain about 50 per cent. of iron, combined with alumina, silica, manganese, etc. This percentage is eminently favorable, as any addition of iron beyond 60 per cent. diminishes the working value of the ore, except for transportation. The combination is such in this case that the ore reduces readily, without the necessity of any flux except the accompanying clay. The experiments recently made upon the quality of the metal produced, prove it equal in toughness to the best American iron. Two Companies have been organized to work this ore—the North-Western Iron Company, and the Hartford Iron Company. The North-Western Company have now in operation a steam-blast furnace at Iron Ridge, capable of producing from six to eight tons of pig iron per day. They contemplate erecting two furnaces, of a superior capacity to this, at the same place. I am informed by Charles Burchard, Esq., of Waukesha, an active member of the Company, that pig iron can be produced at these works cheaper than at any furnace in America. The ore delivered at the furnace costs only fifty cents per ton. The immense forests amid which it is located furnish abundant fuel, while its peculiar composition renders it very cheaply reduced.

Not a single furnace for the manufacture of pig iron exists west of Indiana, except at Iron Ridge. The demand for this material is very great, and is constantly increasing. This deposit of ore is practically inexhaustible, and when extensive works are erected upon it a source of wealth whose value can scarcely be overrated will be developed.

Of the operations of the Hartford Company, I have no definite information at hand. Among its principals, however, are numbered Byron Kilbourn and Hiram Barber, Esqs., whose connection with such an enterprise entitles it to the confidence of the public.

The works of the North-Western Company have been placed under the superintendence of James Tower, an ironmaster of great skill and large experience.

This brief notice is given here merely to call attention to the value of this deposit of ore. The examinations upon which it is based were made two years ago, with the exception of a hasty reconnoisance the present season.

IMPROVEMENTS IN FURNACES.

Mr. R. Gordon, of Heaton Norris, Lancashire, England, has patented a peculiar construction of furnace, in which the fuel is deposited in a hopper at the mouth, and slowly carried forward during combustion on the upper surface of revolving cylinders, until it is deposited in the form of ash at the bridge gate. The air necessary for complete combustion is supplied through hollow tubes and openings, in several discs. The speed at which the revolving bars cause the coal to travel through the furnace is regulated according to the time required for complete combustion.

IMPROVEMENTS IN FUSING IRON.

Mr. Wm. Ireland, of Leek, Staffordshire, England, has taken out a patent for an improved mode of melting iron, or other metals, consisting of improved means of feeding the furnace, by which flame is prevented appearing above the charging door during the time of charging, and until the time of blowing down. The cupola is filled with fuel to two feet above the tuyere previous to putting in any metal, when the pigs are arranged on each other crossways, filling up the interstices with scrap metal and coke. The furnace is made much higher than previously, and has a taper form internally above the contraction, to prevent the metal sticking to the sides. The contraction has a large space below to afford room for a large quantity of melted metal. If found too large, a false bottom may be inserted.

PLUMBIC-ZINC.

The discovery that a thin sheet of lead, allied to one of zinc, acquired properties of endurance which these distinct metals do not possess uncombined, is giving rise to experiments in various latitudes, and more or less impregnated atmospheres. In these trials are included all the ordinary metals used for the covering of domes, roofs, and floors of halls, staircases, etc., and the comparison appears to be singularly in favor of the plumbic-zinc. Upon the completion of these experiments, others of high chemical consideration are to be entered into, and the conclusions will be published by the discoverers, Messrs. Morewood and Rogers, of the Steel-yard, London, who, although commercially, cannot be more earnestly interested than the scientific world in the results adduced.—*London Journal.*

ZINC-WHITE FURNACES.

James Renton, of Newark, has taken out a patent for zinc-white furnaces, of which the following is the claim:—

I do not claim to have invented any mode of treating the oxides or other substances, after they are evaporated, but I claim, 1st. The combination of any number of ore tubes and spaces, placed side by side, and communicating with each other through openings in their sides, the ore tubes being exposed to a degree of heat sufficient to evaporate the oxides or other substances contained therein, and make them pass through the openings into the spaces, the said spaces being protected from the heat by the ore tubes, and serving either to collect and condense the oxides or other vapors, or to convey them to any other suitable receptacle substantially as set forth.

2d. The hood, or trunk, furnished with suitable openings for the admission of air, and placed over the air tubes F, and tubes or spaces M, substantially as described, for the purpose of receiving, leading off, and cooling the oxides or other vapors escaping from the ores, as described.

QUARRIES AND CLAYS.

THE WASHINGTON SLATE COMPANY.

This Company is organized for the purpose of quarrying and preparing for market, roofing slate, from its quarries in Hampton, Washington county, Vermont. The capital of the Company is $500,000, in one hundred thousand shares, sixty thousand of which will not be in market prior to February, 1855, nor then, unless a dividend of 12 per cent. is earned on the whole capital stock. From the Report of the Company we gather the following facts:—

The quarry belongs to the tract known, as the "Slate Region of Vermont," which extends from the neighborhood of Castleton southward some thirty miles, to the Hoosac mountain, covering an average width of three and a half miles. Of this territory, the portion upon the west side of the valley, reaching into the adjoining sections of New York, is ascertained to possess the finest quality of slate, such as obtains the readiest sale in the market. Only occasional points in this slate stratum are found available for working.* Much of the mineral is discovered in flats, where the operations of the quarrymen are directly downward, instead of horizontal; are impeded by water, and where the cost of elevating the stone to the level of the ground is too excessive to admit of favorable working. Yet in two or three instances quarries of this description have been worked with profit, which can only be regarded as small when compared with the yield of more advantageous locations. As a rule, however, attention is chiefly directed, under the present demand for the article, to points where the most abundant and immediate results may be obtained; and hence the value of the property of the Washington Company, which is confessedly adapted for extended and successful operations.

In the preparation of roofing slates for the market, there are three stages: 1. The extraction of the slate, in convenient blocks, from the quarry. 2 The splitting of such blocks into sheets, or laminæ, of the proper thickness. 3 The reduction of those sheets to a rectangular form and established sizes. Two classes of laborers are required: 1st, an inferior class, constituting two-thirds of the whole number, whose average rate of wages is *ninety cents* per day; 2d, a better class, composed of practical slaters, to whom the second and third stages of the work are entrusted, and whose maximum rate of wages is $1 50 per day. After the surface of the quarry is laid bare, *these wages constitute the sole working expense*, a fact which enables us to reach with accuracy a fair estimate of profits. The working capital is only applicable to the opening of the quarry, and the erection of buildings for the families of employés. But in the case of the Washington Company, the stratum of stone removed in uncovering the slate is worth the full expense of the labor employed, because indispensably needed in the construction of buildings; and as these buildings yield a net annual interest, in the way of rent, of twenty-five per cent. upon their cost, it may not be unsafe to say, that no part of what is termed the working capital, is needed in actual operations.

The present market price of slate, *at the quarry*, ranges from $3 to $4 50 per hundred square feet; dependent upon the greater or less size. But, as the major portion obtained is of the larger sizes, the average price of one hundred square feet, or, as it is technically termed, "a square," may be stated, within bounds, at $4. But the lowest average product of finished slate per day for each man employed, is three-fourths of a square; other quarrymen, under more favorable circumstances, obtain a *whole square*, and others have no difficulty in making a square and a quarter per day for each hand. One square per day, with any judgment in the conduct of affairs, may be regarded as a perfectly safe estimate. * * * * * *

It will be observed, the profit increases in direct ratio with the number of men employed, and it must also be remembered that this latter estimate is founded upon the *highest rates of wages*, the *lowest* average of product, and the *lowest* average of market prices. *It will also be observed that the cost of a square of slate is* $1 50, *while its price at the quarry is* $4 Wild and extravagant as it undoubtedly seems, it cannot be reduced without doing violence to facts. It may be augmented without that difficulty. If operations be confined merely to the production of roofing slate, it amounts pretty nearly to a certainty, so rapidly does the demand increase, that the price must advance rather than recede. But it has long been ascertained that slate may be cut, dyed, polished, and varnished, so as to counterfeit the finest marbles, while costing but half the price, and, consequently, an active demand has

* See Article, "Vermont Slate Quarries," Vol. II., p. 271, Mining Magazine.

sprung up for it for such purposes. The Castleton Slate Company has erected machinery, and is cutting tiles, mantel, and table tops, slabs, pavement flagging, and similar articles, to very great advantage and profit. The Washington Company proposes to turn its attention to the same department of business, at the earliest practicable day.

The slate of the Washington Quarry is either purple or green, the former color largely predominating. The slate has been tested in order to determine its relative density, and consequent durability, in comparison with Welsh slate from the famous Bangor Quarry, with the following result:—

Density of Water	100
" Welsh slate	243
" Purple slate from the Washington Quarry . .	261
" Green slate	243

In other words, the purple slate is found to have every advantage in the particulars of hardness and indestructibility, while the green is but little inferior to the Welsh.

Another important quality of good roofing slate is, its incapacity to absorb the water which falls upon it, the water thus absorbed tending to disintegrate its particles. By subjecting samples of Welsh and Washington slate to immersion in water for a day, the following results were obtained:

	Weight.	
Welsh slate	dry, 1,000 grs.,	wet, 1,004 grs.
Purple slate from Washington Quarry .	" 1,000 "	" 1,003 "
Green slate " " .	" 1,000 "	" 1,001 "

The advantage being in favor of the Washington slate.

The Washington Quarry is situated within a mile of the depot of the Albany and Rutland Railroad, at West Poultney, Vermont, and within fifteen miles (mainly of railroad) from the canal connecting the Hudson River with Lake Champlain. The Company already owns the right of way to the Albany and Rutland Railroad, and has the most conclusive assurances that the Railroad Company will at once throw off a branch to the quarry, so as to secure the freight. By this means the works will be in direct communication with the Canadian, New England, Southern, and Western markets, through the various divergent roads with which the Albany and Rutland Railroad connects at either end.

The quarry occupies the face of an extensive hill side, the slate lying either upon or immediately beneath the surface, the greatest depth being five feet. The superstrata are of loose earth and talcose rock; the latter, as has been previously remarked, being requisite for the workshop and buildings. The property of the Company embraces the whole quarry, an adequate water-power, a large stretch of level ground on either side of the main road leading from Poultney to Whitehall, which passes directly in front of the quarry, a wide and deep ravine, into which the waste slate may be discharged; in all, about thirty acres of land, exclusive of the right of way to the railroad just mentioned.

PRESENT PRICES OF SLATE.

[*From the published Circulars of two leading Vermont Companies.*]

14 by 9	. per square,	$5 22	20 by 10	. per square,	$6 34
16 by 8	. "	5 26	22 by 12	. "	7 75
16 by 10	. "	5 76	24 by 14	. "	8 15

MARBLE HILL QUARRY, INDIANA.

This is represented as a very rare and fine quality of marble. After an examination of it, Dr. D. D. Owen describes it in quite flattering terms:—

The rock is referable to the lower silurian period, and is situated toward the top of the blue limestone formation. The upper cliff is composed chiefly of magnesian limestones, and at their base is the four-foot bed. It is a water-limestone; seventy-three feet below this is the shell-marble bed, twenty feet in thickness.

This rock, by reason of the whiteness of the shells, and the purity of the cementing calc-spar, presents, on the "*drove surface*," a cream white, only a shade darker than the purest white statuary marble, and preserves its appearance better than the white Baltimore marbles, and white enough for any practical purpose. When polished, the shells appear white, with light shades of yellow and pink, contrasted upon a warm gray ground, which gives the marble a darker appearance than the drove surface. At the upper opening, the white filling of the shell is frequently surrounded by a zone of pink, the matrix being reddish gray; and one of the uppermost layers of this part of the quarry contains bivalves of considerable size, converted into calc-spar. . . . . At the lower opening, the best layers, toward the bottom of the quarry, are from two to three feet. The Marble Hill Quarry is, therefore, capable of affording dimension stones of almost any required size.

Dr Owen submitted this marble to various approximate tests, in comparison with other well known rocks. Among these are Italian statuary marble; limestone, from the knobs of Floyd county, Indiana; Seneca freestone, from Maryland; Little Falls freestone, from New Jersey; fine-grained freestone, Scioto Valley, Ohio; carboniferous sandstone, Perry county, Indiana; buff fine-grained magnesia limestone, Scott county, Iowa. Of twelve varieties of rock, of which we have named a portion, it was found that the Marble Hill marble stood next to the Italian white statuary marble, in closeness of texture. It consequently cannot imbibe water to any great degree. In this respect it stands on an equality with the Italian marble. For this reason the Indiana marble is not liable to scale, and chemical tests show that its cohesive power is very great. It stood No. 1 in the sulphate of soda test, excelling even the Italian marble in some points.

Dr. Owen says, "I have no hesitation in pronouncing it the best and most beautiful material for constructive and ornamental purposes that has come within my notice from any Western locality."

MISCELLANIES.

THE ASPHALTE MINING AND KEROSENE GAS COMPANY.

This Company has been formed for the mining, shipping, manufacture and sale of asphaltum, and asphalte rocks, of every description. The office of the Company is at 86 William street, New York.

The property owned by the Company, consists of mining licenses, (portions of which are secured by leases from the owners of the soil,) comprising an area of thirty square miles, in the counties of Westmoreland and Albert, in the Province of New Brunswick, and contain within their limits the most valuable mining district in British North America, abounding as it does in inexhaustible deposits of asphaltum, asphalte rock, bitumen, gypsum, grindstone, freestone, manganese, and other valuable minerals.

These several deposits are freely accessible to commerce; the district in which they are situated being intersected by the rivers Peticodiac and Memramcook, both of which are navigable for vessels of the largest class.

In addition to the mining licenses above referred to, the Company own 204 acres of land in the county of Albert, on which exists the main vein of asphaltum.

The applications of asphaltum, bitumen, and asphalte rock to the production of gas, and various other manufactures, are of recent discovery: and in order to thoroughly develop the mineral riches of their lands, the Company have purchased the various rights and inventions connected with the manufacturing of the same, and which embrace every known appliance in this new but highly important department of industry, as follows:—

1st. The patent-right granted to Dr. Abraham Gesner, in January, 1850, for the United States, (except Washington City and California,) for the manufacture of gas from asphaltum or mineral pitch; a new and simple process adapted to the common gas retort.

2d. Dr. Gesner's invention for the United States, for the manufacture of kerosene, burning fluids, mastics, and concretes, application for which for the United States, was filed on the 20th day of July, 1853.

3d. The Right Hon. the Earl of Dundonald's inventions for the United States for the coating of telegraphic wires with asphaltum, and for improvements in the construction and manufacture of sewers, drains, water-ways, and pipes, receptacles for liquids or solids, for insulating telegraphic wires, and for other useful purposes.

The first invention referred to, viz., the manufacture of illuminating gas, called kerosene gas, from asphaltum, bitumen, or mineral pitch, has been thoroughly tested, as can be seen by reference to the appendix. Its advantages may be briefly summed up as follows:

1st. The mineral yields one-third more the quantity of gas than can be obtained from the best cannel coal.

2d. The illuminating power of this gas is nearly twice that of ordinary coal gas, and the light is very agreeable to the eye.

3d. The gas is obtained in two-thirds les stime, and consequently with less fuel and labor, than coal gas, and by a cheap and simple process.

4th. To make the kerosene gas in existing gas-works, but slight alterations are required.

5th. This gas may be safely and economically introduced into private houses, hotels, manufactories, printing offices, theatres, lighthouses, churches, on sugar plantations, etc., etc., and by a peculiar adaptation of it, into ferry boats, shipping, locomotives and railroad cars.

The mode of manufacture is cheap and convenient, and as before stated, the lands of the Company abound in the material employed.

The second invention, (that for the manufacture of kerosene burning fluids, etc., etc.,) produces a number of new and extremely valuable manufactures, and the *most economical light ever offered for public or private use.*

The materials employed, are asphaltum or asphalte rock of any kind, as well as naphtha from the manufacture of kerosene gas, etc., (the asphalte rock from the Company's quarries being preferable.)

The products obtained, are a series of new fluid hydro-carbon, denominated "kerosene," by the discoverer.

One variety of this fluid has the power of rendering atmospheric air passed through it, a beautiful, cheap, and safe illuminating agent, in every respect equal, if not superior, to common gas, and capable of being supplied on any scale; the very atmosphere we breathe contributing largely to the production of the light.

The advantages of this light are as follows:—

1st. No purifiers, condensers, retorts, or furnaces are necessary. No fire need be used. No tar, or any sort of impurity or residual product, formed in its application.

2d. The light is of perfect whiteness, of great intensity, and at least fifty per cent. cheaper than coal gas.

3d. Like common gas, it may be readily lighted or extinguished, and the consumption may be regulated according to the varying requirements of time and place.

4th. The products of combustion are as pure as those of the finest wax, injurious neither to health nor furniture; and its odor not unpleasant, but sufficient to betray it, in case of escape.

5th. It is a cheap, simple, and safe light, peculiarly adapted for isolated and detached dwellings, country residences, lighthouses, publication offices, theatres, manufactories, churches, ships, ferry boats, etc., etc.

Another variety of this fluid can be used in the same manner as camphene, and is well adapted to wick, gas, or argand lamps of every description, the fluid being capable of carbonization to any desired extent, and *not explosive*, while it can be produced at a cheaper rate than any heretofore sold in the market.

The kerosene fluids dissolve gutta percha and India rubber with the greatest facility, and on this account their value is still further increased. Pure mineral naphtha, lubricating oil, or railway grease, mineral tar, and a bright varnish, are also products of the manufactory, while from the ashes of the coke of the material employed, mixed with the mineral tar, the discoverer produces a superior hydraulic cement, equal in value to the Sesseyl asphalte, now extensively used by the British government at the price of £15 per ton. In fact every part of the original material is used in the manufacture; the coke affording one half of the fuel required, while the uncondensed gas is sufficient to supply the manufactory with light.

By a combination of Dr. Gesner's invention with those of the Earl of Dundonald, a complete mastic is also formed suitable for foundations, pavements, kitchen-cellars, out-houses, stucco-work, roofing, lining gutters, covering arches, coating railroad sleepers and ties, preventing wood from decaying, preventing the corrosion of metals, and insulating telegraphic wires laid under ground, for lining drains, tanks and reservoirs, preventing damps from rising, cementing all kinds of marble, stone, brick, sand, pebbles, and for many other useful purposes.

The peculiarities of this composition are its great adhesiveness, plasticity by heat, and solidity when cooled. It is capable of withstanding the extremes of heat and cold in any climate.

The raw material requisite for the manufacture of the above enumerated articles is both abundant and cheap; the extensive mining rights, leases and purchases of the Company giving them an unfailing supply of the mineral, while the various inventions assigned to them give them exclusive rights, both to the material and modes of manufacture.

All the products are obtained by a few very simple operations.

The requisite buildings, fixtures, and machinery, are, comparatively speaking, inexpensive, and under the direction of a superintendent, the work can be carried on by common laborers.

The Company have secured as manufacturing chemist and superintendent, Dr. Abraham Gesner, who is thoroughly and practically acquainted with every division of the work.

In conclusion, the trustees would observe that the passage of atmospheric air through a hydro-carbon fluid for the production of illuminating gas, is a recent discovery; having been known in Great Britain and France for a period of not over four years.

Chas. H. Mansfield, Esq., of Cambridge, England, obtained, in the year 1849, a patent for the passage of air through a new hydro-carbon (benzole), which, in conjunction with Mr. Lowes' apparatus, resulted very successfully and satisfactorily as an experiment; but the subsequent difficulty experienced in obtaining a cheap and constant supply of the *fluid* (benzole), has retarded this method of illumination in England. *Kerosene*, the article now introduced to public notice, while possessing all the luminiferous qualities of benzole, can be manufactured in such unlimited quantities, and at so cheap a rate, as to insure its general use.

MAILS TO THE LAKE SUPERIOR COPPER REGION.

The Lake Superior copper region mails are carried by Indian half-breeds, travelling in snow shoes over vast frozen spaces, accompanied by dog trains, the method being thus described:—

There is no route or trail over which there is travel enough to tread down the snow and make a solid path; and without this a horse is unable to travel.

Notwithstanding this, the government has provided these remote settlements with winter as well as summer mails. Ours came by the way of Green Bay, Escanawba, Marquette, and the Anse; and often the first trip of the season reaches here in about eight days from Navarino. It purports to come once a fortnight.

A man carries from 50 to 75 pounds, and walks 30 to 50 miles. His two dogs go before him with a sledge or sled, with a flat board bottom, and draw 250 to 300 pounds.

This load, however, is not all letters and packages. All men must eat, and an Indian in particular. He must carry a half axe, or hatchet, a plenty of blankets, and something for his dogs to eat as well as himself. What can be more desolate than such a journey? Yet many persons from here make a trip every winter, on business, in company with the mails.

Sometimes they have the trail of a previous party; but the snow, which falls almost every day, soon obliterates their footsteps. Perhaps there is a line of blazed trees which they follow, but more often they are guided through the forest by the "make of the ground," or by the sun, if it should occasionally peep out through the mists and snow of a winter sky.

Thus they go, from the first dawn of day to the twilight of evening, over lakes and mountains, through swamps and thickets, that in summer would be impassable, but now smoothed up level with snow. The universal evergreen trees are bending to the ground, with a load of snow on their branches, that frequently obstruct the way. This dismal procession of Indians, white men, and dogs, go in single file a few feet apart; and for hours they travel on at the height of their speed without a word or a laugh.

It is too much of a task to clear away the snow, start a fire, heat the water, thaw the bread, and prepare a forest meal, to stop for it at noon. But at evening, when the shades of a hyperborean night begin to gather among the branches of the trees, and the northern winds howl more earnestly, the company look about for a sheltered place, in some ravine where there is water and some dry wood for a fire, and there deposit their load of blankets and provisions. They scrape away the snow, with their snow shoes, down to the ground, thus making a wall of frost around them three or four feet high.

Some cut wood for the night; others break off the boughs of the pine, balsam, or cedar, and lay them down for a bed. Another procures some birch bark that is dry, and some dry sticks, and some one striking fire by his flint and steel, or his matches, has a cheerful flame, with its grateful heat enlivening the place. It is also necessary to build a lodge or house of boughs overhead, to keep off the falling snow, under which they all gather and cook their supper with great glee. If a camp of Indians has been passed during the day, there will be seen some fresh venison, that will occupy the best position around the fire, suspended upon the sharp points of limber sticks set in the ground and leaning toward the heat. There may be, however, only some salt pork, or ham and flour, made edible by means of a short-handled fork, and some water.

The blankets being well spread, the fire made for the night, the dogs fed, and the dishes washed, the crowd—animal and mortal, Indian and white—doubles itself together in most friendly contiguity, and goes to sleep. Long before daylight the inmates of this snow-bound lodging are in motion. The sounds that issue from it are English, French, and Indian, and all grades of a language composed of a mixture of them all. The moccasins are taken down from their drying places; the hasty morning repast, which was cooked the night before, is swallowed, the packs made up, the dogs harnessed, and all made ready for a start at the first light of day. What piteous howlings these dogs set up as they are attached to the train! The human part of the cavalcade sling their packs, and all betake themselves again to the dreary labors of the day.

It is thus that this communication will reach you; but before many years we hope to have an open road from the settlements, and a beaten path, over which there would be the best of sleighing between four and five months in the year. As yet the snow has not been over a foot in depth, and the thermometer at five degrees below zero.

A CHEMICAL CAUSE OF CHANGE IN THE COMPOSITION OF ROCKS.

The following is an abstract of a paper read before the British Association, by Prof Johnston. The first example of a chemically altered rock adduced by the Professor was the rotten stone of Derbyshire, a light and porous substance, used chiefly for polishing metals, and stated in Phillips' "Mineralogy" to be composed of silica, alumina, and carbon It is obtained from a ridge covered with "drift" 10 or 20 feet thick, consisting of brown clay, with masses of black marble, chert, and rotten-stone. The rotten-stone is so soft whilst in the soil that the spade goes through it readily, but it hardens on exposure. The holes from which it is dug are sometimes only two feet deep; at others, from six to eight feet. On examining a series of specimens, Prof. Johnston found that whilst some were homogeneous, others had a nucleus of black marble; he then treated specimens of the black marble with weak acid, and found that on the removal of the carbonate of lime there remained from 15 to 20 per cent. of a silicious substance perfectly like the natural rotten-stone. He concluded that there existed in the soil some acid, which penetrated it and dissolved out the calcareous matter of the rocks below The agent, in this case, might be the carbonic acid of the air, brought down by rain; but there were instances not capable of explanation by this agency alone, and attributable to other acids, which are produced under certain conditions and exercise a much wider influence The bottoms of peat bogs present very strong evidence of the action of acids; the stone and clay are bleached and corroded, only silicious and colorless materials being left. The source of the acid is here the same as in the former instance; the vegetable matter growing on the surface produces in its decay acid substances, which exert a chemical action on the subsoil, and escape by subterranean outlets, carrying away the materials dissolved in their progress. Another instance was afforded by the mineral pigotite, formed in the caves of Cornwall by water dripping from the roof This water contains a peculiar organic acid, derived from the soil of the moors, which dissolves the alumina of the granite and combines with it. The organic acids are very numerous, and different in composition, but agree in producing chemical action upon rocks. They are produced over the entire surface of the earth, especially over uncultivated tracts, and are the means provided by nature to dissolve the mineral food of plants; they are also amongst the chief causes of the exhaustion of soils. The author then alluded to Prof. Way's examination of some of the green sand strata of Surrey, known as fire-stone—a light and porous rock, containing silica in a soluble state. It was well known that common sandstone, quartz, or rock crystal, were not acted upon by potash or soda at ordinary temperatures; but of the fire-stone, 30 per cent., and sometimes 60 or 70 per cent., may be dissolved In all such cases, the silica must have been originally in a state of chemical combination with lime, alumina, or something else, which has been subsequently removed. The silica in the rotten-stone was soluble, but he had never met with instances of black marble in a bedded state converted into rotten-stone He believed, however, that a similar cause, operating over a wide area, and during a long period, had produced the altered condition of the firestone. Prof Johnston then alluded to the nodules of phosphate of lime in the green sand and crag, and suggested that the phosphorus had been derived from animal remains in higher strata, dissolved out by acids, and re-deposited at a lower level. The last example was the fire-clay of the coal measures, a stratum almost universally found beneath beds of coal. It differs from the other clays both in color and composition, being whiter, and containing less of those substances which acid bodies could dissolve, viz., the earthy basis, which would render the clay fusible in fire. The condition of the fire-clay might be accounted for by the action of acids developed during the production of the vegetable matter now forming coal.

THE QUICKSILVER MINES OF ALMADEN (OLD SPAIN).

Half the world knows that the quicksilver mine of Almaden, sixteen miles north of Seville, is the finest that exists. Its annual produce is twice as great as that of all the mines of the same kind in Carniola, Hungary, the Palatine and Peru put together. Almaden therefore is worth visiting. The place has its own traffic, and no other. There is no high road in its neighborhood, and the quicksilver raised is carried by muleteers to the Government stores of Seville, where only it may be distributed; not being delivered at the mine to any purchaser. The muleteers take to Almaden, wood, gunpowder, provisions, and all necessaries; and thus the town lives and supports its eight thousand inhabitants. It is built chiefly in the form of one very long street, on the ridge of a hill over the mine, which in every sense forms the foundation upon which it stands. It used to be under the care of a sleepy old hidalgo of a governor, but it is now controlled by a scientific officer, entitled the superintendent, and there is a good deal of vigor and practical sense displayed in the arrangements of the place. There is a town-hall in Almaden, a well-endowed school, and a hospital for the diseases of the miners.

Storehouses, magazines, and workshops, are the leading features of the little town. Everything manufactured that is used—even to the ropes—is made upon the spot; and the workshops, like the whole engineering details of the mine itself, are planned in an unusually massive way, and carved out of the solid rock. The quicksilver mine belongs to the Crown (under which it is let out in four-year leases to contractors rich enough to pay a very large deposit), and its details are all somewhat of a legal character. There used to be disasters frequently occasioned by the sinking of the works, and by fires. The last fire raged for upwards of two years and a half. The employment of wood, except for temporary purposes, has therefore been abandoned, and magnificent arched galleries of stone are built through every one of the new cuttings. The deposits are almost vertical; and great pains are taken to supply the void left by the removed ore with a sufficiently strong body of masonry. Half the ore is, however, every where left standing as a reserve in case of any future accidents; and the whole yearly supply drawn from the mine, is limited to twenty thousand quintals. This supply is drawn by mule power from the bowels of the hill, through a grand shaft constructed on the usual impressive scale. There is not much trouble given by water in the mine. What water there is has to be pumped up by means of an engine built for the place by Watt himself, which would be a valuable curiosity in a museum.

The ore lies, as I have said, in a lode, almost perpendicular. There are three veins of it, called respectively St. Nicholas, St. Francisco, and St. Diego, which traverse the length of the hill, and intersect it vertically; at the point where they converge, galleries connect them all together. The thickness of the lode varies between fourteen and sixteen feet; it is much thicker where the veins intersect, and seems to be practically inexhaustible, for as the shaft deepens, the ore grows rich both in quality and quantity. The yield consists of a compact gray quartz, impregnated with cinnabar and red lead. Associated with it is a conglomerate called by the miners Fraylescar, because in color it resembles the blue gray of the familiar cassock worn by freyles (friars) of the Fransiscan order.

The chief entrance to the mine is out of the town, on the hill-side, facing the south, the town itself being on the hill-top. The main adit leads by a gallery to the first ladder, and by galleries and very steep ladders the descent afterwards continues to be made. Though the mine is one of the very oldest in the world—the oldest, I believe, of any kind, that still continues to be worked—the workings have not, up to this time, penetrated deeper than a thousand feet.

The quicksilver is procured out of the ore by sublimation over brick furnaces about five feet in height, and as the furnaces are fed with the wood of cistus, and other aromatic shrubs, this part of the process is extremely grateful to the senses. There are thirteen double furnaces and two quadruple ones, partly erected at Almaden, partly at Almadenejos—little Almaden—in the neighborhood. The minerals having been sorted, are placed in the chambers over the furnaces according to their quality in different proportions and positions, the best at the bottom. The whole mass, piled upon open arches in the form of a dome, is then roofed over with soft bricks made of kneaded clay and fine particles of sulphuret of mercury, a free space of about eighteen inches being left between the ore and roof, in which the vapor can collect and circulate. The mercurial vapor finally conducted along stoneware tubes luted together, condensing as it goes, is deposited in gutters, which conduct it across the masonry of a terrace into cisterns prepared to receive it. The quicksilver, there carefully collected, is then put into jars of wrought iron, weighing about sixteen pounds apiece, and each holding about twenty-five pounds English of the finished produce of the mines.

As for the antiquity of the mine at Almaden, that is immense. Pliny says that the Greeks had vermillion from it seven hundred years B. C., and that the Romans in his day, were obtaining from it ten thousand pounds of cinnabar yearly, for use in their paintings. The working of the mine fell, of course, into aberance in the Dark Ages, but was resumed again in the fifteenth century. After the expulsion of the Moors, the mine was given as a present to religious knights of Calatrava, and it reverted to the Crown more than three centuries ago.

The present workings are not quite on the old spot. Fugger Brothers, of Augsburg, farmed it in those past days; and having drawn a fortune out of it, by which they became a byword for wealth, ("Rich as a Fucar," say the Spanish miners still,) they gave up their lease as worthless. Government could make nothing of the mine, and therefore caused the ground to be attentively explored. The extraordinary deposit upon which the miners now are operating was in that way discovered.—*Household Words.*

PLATINA.

Mervin & Johnson, Hatton Garden, London, supply pure platina at the rate of $6.75 per oz.; the price in Paris is 34f.—$6.32 per oz.; and at the great refinery of Alberstadt, Germany, 8½ thalers—$6.37½. The crude platina (*mine de platina*) is not worth over half this amount, as it contains a heavy per centage of osmium, iridium and rhodium, metals of trifling value, with magnetic oxide of iron and other foreign ingredients. The cost of manufacture is likewise heavy.

The California platina contains a large amount of a refractory alloy of rhodium and iridium, perfectly infusible.

The solvents are expensive acids, and after purification, the mere act of forging a small bar of platina occupies two men with machinery from three weeks to a month, as it can only receive one blow at each heat, and consequently but a few dozen blows per diem.—*Placer Times.*

SEPARATION OF NICKEL FROM COBALT.

Liebig has found that when a current of chlorine is passed into a cold solution of the double cyanides of cobalt and potassium, the liquid being kept alkaline by the addition of caustic soda or potash, the nickel is completely converted into sesquioxide and precipitated, while the cobalt remains in solution as unaltered double cyanide. The sesquioxide of nickel may be washed and ignited, and the nickel weighed in the form of protoxide; it is perfectly free from cobalt. The solution after passing the chlorine must still be alkaline. The smallest trace of nickel gives an inky black color when dissolved in cyanide of potassium, and treated with chlorine. This method of separating cobalt and nickel has perhaps some advantages over Liebig's second method, which, it will be remembered, consists in boiling the mixed double cyanides with oxide of mercury, which precipitates the nickel but not the cobalt.

MINERS' FUSEES.

M. Davy, England, patentee. The inventor proposes covering these fusees with a substance which shall be an efficient protection against moisture. The fusee being made, it is placed within a tunnel, and passes out from its top, which is pierced with a small hole. This tube is then filled with a liquid of the following composition:—1 part resin, 1 part Burgundy pitch, 4 parts gutta percha. This mixture is placed in a furnace heated by steam; this steam, conducted by a tube, serves also to heat the conical reservoir in which the liquid has been turned. The fusee is rolled upon a large bobbin, and by means of a crank it is unrolled and made to pass in the tunnel; in quitting this it is passed over a pulley plunged in a vessel of cold water, and is rolled upon another pulley which is above the water. *Scientific American.*

A NEW METAL.

A very remarkable discovery was announced to the Academy of Sciences, by M. Dumas, at its last sitting. He stated that M. Saint Clair Deville had succeeded in obtaining from clay a metal as white and brilliant as silver, as malleable as gold, and as light as glass; it is fusible at a moderate temperature. Air and damp do not affect this metal, which is called aluminium; it retains its brilliancy, and is not affected by nitric or sulphuric acid, either strong or diluted, if the temperature be not raised. It is only dissolved by very hot chlorhydric acid. Several specimens of this metal were exhibited to the Academy, and on the proposition of Baron Thenard, it was voted unanimously that a sufficient sum should be placed at the disposal of M. Saint Clair Deville to enable him to make experiments on a large scale.

IMPROVEMENT IN STEAM HAMMERS.

The advantage of steam over other hammers is in their power of action, and in the control which may be had over their movements. The latter point is of particular importance in finishing forged work, as without it, accuracy of form cannot be obtained, and there is great waste of iron and labor in turning and planing. Power of action is also essential in making sound forgings.

Mr. Robert R. Taylor, of Reading, Pa., has made an important improvement in the valves and passages of steam hammers, and has built hammers, with these improvements, so sensitive to the valve as to allow of placing a watch upon the anvil, and of breaking only the crystal, without injuring the dial. The claim attached to his patent shows the importance of the points to which his improvements tend. It is as follows:—

"I claim the arrangement, as described, of the steam ports and passages, the variable automatic valve for directing the steam alternately above and below the piston, and for admitting a variable quantity of steam beneath the piston, and the adjustable hand valve, to exclude altogether the steam from above the piston, or to admit a greater or less quantity of it, both valves being adjustable while the hammer is in operation, so that the steam can be made to act with a variable force on either the up and down strokes of the piston, or of both, or prevented from acting on the down stroke, without interrupting the action of the hammer, as set forth."

THE GREAT SALT LAKE.

Experiments upon the properties of the water of the Lake for preserving meat, were made by Mr Stansbury and his associates. A large piece of fresh beef was suspended from a cord and immersed in the Lake for over twelve hours, when it was found to be tolerably well cured. After this, Mr. S. states that all the meat they wished to preserve was packed into barrels, without any salt whatever, and the vessels were then filled with the Lake water. No further care or preparation was necessary; and the meat remained perfectly sweet, although constantly exposed to the atmosphere and sun. They were obliged to mix fresh water with the lime to prevent the meat from becoming too salt for present use.

An analysis of the water of the Lake, shows that it contains rather more than 20 per cent. of the pure chloride of sodium, and not more than 2 per cent. of other salts, forming one of the purest and most concentrated brines in the world. Its specific gravity is about 1·17, but this slightly varies with the seasons, being probably affected by the immense floods of fresh water which come rushing down into it from the mountains in the spring, caused by the melting of the snow in the gorges.

The western shore of the Lake, for a considerable distance, is lined with a substance somewhat resembling in appearance the brown, dried sea-weed of the ocean. Under the magnifying glass, however, it was found to consist of the larvæ, or dried skins of a dipterous insect. They comprised a stratum some six inches in thickness, and had evidently been driven upon the shore at different periods; some appearing fresher and of a different texture from others, the insects being of a larger size. Where these larvæ originated may furnish a theme for curious speculation. Nothing living has ever been detected in the Lake, and only a few large insects in the brackish springs, which do not at all resemble these remains, either in shape or size. That they have existed in almost incredible numbers is evident, as the shores are lined with their skins, and the bottom, in many instances, for a long distance from the shore, is covered with them. In some places they lie on the bottom of the Lake a foot thick, mixed up with the oozy mud.

On the flats, near the west shore of the Lake, Mr. S. and his party discovered a large field of solid salt, which was beautifully crystallized upon the sand, about half an inch thick. The crystals were from one to two inches in diameter, and "glittered in the bright sunshine like a bed of diamonds." The evaporation of the shoal water between the island and the main shore, has left this beautiful deposit of salt.

There are some large islands in the Lake, the principal ones being Gunnison, Antelope, and Stansbury islands. The latter is twenty miles long and fifty-seven in circumference. It is a high rocky ridge, and attains a maximum elevation of nearly three thousand feet.

The buoyant properties of the waters of the Lake are very remarkable. Mr. S. says that a man may float stretched at full length upon his back, having his head, neck, both his legs to the knees, and both arms to the elbows, out of the water. If a sitting position be assumed, with the arms extended to preserve the equilibrium, the shoulders will remain above the surface. The brine is so strong that the least particle getting into the eyes causes the most acute pain. Upon one occasion one of the party fell overboard, and although a good swimmer, the sudden immersion caused him to swallow some mouthfuls of water before rising to the surface. The effect was a most violent paroxysm of strangling and vomiting, and the man was unfit for duty for some time afterwards.

It is almost impossible to find water fit for the ordinary purposes of life along the western shore of the Lake; and yet such is the delightfulness of the climate that one may sleep in the open air with perfect impunity.

On or near the eastern shores of the Lake are a number of hot and cold springs. They issue at the foot of a flanking tower of hills, and have excavated for themselves a circular hole fifteen feet deep, with sloping sides and a deep channel leading into the meadow. There are currents issuing between different strata of conglomerate and limestone, within a few feet of each other, of which one is a hot sulphur, a second warm and salt, and the third cool drinkable water.

At numerous places fine salt is brought up, and jets of gas emitted; the salt forms an incrustation around the hole, and is fine enough for table use. Three miles from the Salt Lake City is a hot spring. From the hot spring to the city are numerous warm fountains, that deposit gypsum and other sulphates. These waters give delightful baths, and destroy the fertility of the soil.

The soil on the banks of the several rivers on the eastern shore of the Lake is very productive. Lieut. Gunnison states that a continuous field can be made from the Tempenagos bottoms to the Wa-ke-te-ke Creek, and the Utah Valley made to sustain a population of more than a hundred thousand inhabitants. At different points along the rivers are magnificent water powers.

The shore line of the Lake, exclusive of offsets extends 291 miles.

We have seen no statements as to the depth of the Great Salt Lake. —*Stansbury's Report.*

PURIFICATION OF GRAPHITE FOR LEAD PENCILS.

Runge proposes to purify poor graphite for lead pencils by digesting the mineral in fine powder for 36 hours, in about twice its weight of strong sulphuric acid, then diluting the acid with water, and washing the acid away. Graphite thus prepared is very much cheaper than the ordinary English, and quite as pure as the best Borrowdale lead. The decanted sulphuric acid contains iron, sulphate of alumina, etc.; the latter may be separated when large quantities are operated upon. Runge also proposes to add a little lamp-black, to give a deeper tint to the lines made by the pencils. Certain kinds of manganese may probably be used for the same purpose.

AN ARTESIAN WELL IN NEW ORLEANS.

We learn from the *New Orleans Bee* that the artesian well recently commenced in that city has been bored and tubed to a depth of one hundred feet. This is the first elaborate attempt at piercing beyond the alluvial crust of the Mississippi, and will probably lead to valuable geological discoveries. The various formations thus far encountered have become progressively denser, and indicate, it is thought, the presence of a rocky structure much nearer the surface than has been supposed. The last formation consists of a tenacious greenish clay, mixed with fragments of lime. Immediately above this was found a layer of fine sand, interspersed with beautiful white shells. The completion of this enterprise, which has been rendered doubly difficult hitherto by the necessity which has existed for tubing the bore, will settle the question whether spring water can be found there at the usual depth of artesian wells, and thus afford others who wish to dig, an opportunity to judge of the probable success which would attend their efforts.

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Art. I.—THE LACKAWANNA COAL BASIN. ITS GEOLOGY AND MINING RESOURCES AROUND SCRANTON, PENN.—No. 2. By Prof. Henry D. Rogers.*

GENERAL STRUCTURE OF THE BASIN.

In order to convey a correct conception of the conditions under which the coal beds of the vicinity of Scranton lie, and their availability for mining, it is expedient to detain the reader a little longer from the more local descriptive details pertaining to that district, to offer a few preliminary but important remarks respecting the general geological structure of the whole coal field. He will be thus prepared to understand much more precisely the degree to which this structure affects the middle part of the Lackawanna basin, where the Scranton lands are situated, and the extent to which it influences the distribution and the mining of the coal.

In general configuration, the Wyoming basin is a wide and shallow trough, somewhat deeper in the middle than at the sides, yet deepening so gradually towards the centre as to be, if we disregard the subordinate undulations of its strata, approximately flat. This prevailing levelness of its bed or floor, notwithstanding the considerable angles of dip—frequently more than thirty degrees—is at once apparent when we compare the great width of the valley—four or five miles in its middle district—within the very moderate depth of 1,200, or 1,500 feet, or perhaps 1,800 feet, which my sections seem to assign to it in this its most capacious portion. Laborious explorations and measurements have enabled me to bring to light within the general basin the existence of a great number of nearly parallel lesser troughs or basins, with intervening saddles or anticlinal waves in the coal strata, and to trace these individually, and to develop the law of their direction and their effects on the local distribution of

* Continued from p. 395, Vol. II.

the beds of coal. These investigations have shown me that the same coal seams and other strata are repeated, within certain limits, from one wave to another, so as to maintain, despite the local steepnesses of dip, this average uniformity in the depth of the coal field, at any given cross section. This general levelness of the bottom is independently established by a comparison of the vertical thickness of the strata with the breadth of the valley.

The whole coal valley may be likened to a flat-bottomed boat, tapering gradually from the middle towards each extremity, and as gradually shoaling up in those directions; but the boat is not a straight one, but curves constantly, crescent-like, towards one side; and the resemblance is further deficient in the bottom not being smooth, but ridged with the waves above spoken of. This shoaling, or thinning, by superficial removal, of the coal measures towards either end of the trough, though locally modified within restricted limits by the undulations, is not a uniformly progressive feature, but advances more suddenly and then more slowly along certain portions of the valley. Thus it seems to proceed rather rapidly from Wilkesbarre north-eastward past Pittston, and to be almost arrested; thence along the Lackawanna valley, from near the mouth of Spring Brook, until we pass beyond Scranton; while a more rapid lifting out of the strata seems again to commence near Leggett's Gap, and to continue steadily to the termination of the basin at Carbondale. This fact of the very slow rise of the coal rocks, as we ascend the Lackawanna from the Falls to a mile or more beyond Scranton, would seem, at first glance, to nearly equalize the quantity of available coal for equal areas throughout this reach of the valley; but a detailed examination of the comparative resources of the several tracts of this district, will disclose quite remarkable differences, dependent on various conditions not connected merely with the depth of the coal measures. Among these modifying circumstances, it will suffice for the present to advert to such as are of conspicuous importance. These are, the variations in the number, thickness, and purity of the coal beds within the same mass, or thickness of coal strata; the comparative quantities of minable coal above the beds of the ravines and valleys; the accessibleness of the coal to economic mining and ready drainage, as affected by the direction and degree of dip of the strata; and the greater or less extent to which the strata, and the seams of coal especially, are obscured, preventing successful mining, or concealed altogether from discovery by the very unequal covering of drift or gravel, which hides from view large patches of the coal formation in this part of the basin. So influential are these and other conditions on the productive capacity of any given tract, that it may be said that a different mining value characterizes every different half square mile of the valley, rendering it quite unsafe to infer from the ascertained geology and resources of one range of land the commercial values of grounds adjoining, unless these have been themselves carefully and experimentally opened, and the specific relations of the unknown portions to the known established. Circumstances, seemingly the most trivial,—as whether, with a gentle dip, the coal beds lying above the water-level of a valley incline *into* the the hill or table land which bounds it, or *outwards* towards the low grounds,—determining whether machinery must or need not be used, will oftentimes make a difference in the economy of mining the coal equivalent to the whole margin of average profit to be anticipated, and, therefore, no speculative anticipations beyond very vague and general ones are to be built upon any generalizations extended to unexplored lands from those where the geological structure, mineral contents, and mining capabilities are already ascertained.

GENERAL FEATURES OF THE UNDULATIONS OF THE BASIN.

There are several features connected with the undulations of the coal measures in the Wyoming and Lackawanna valley which claim attention in any general survey of the structure and mining capabilities of this basin, or in any comparison of the resources of its different sections. Some of these concern the directions of the undulations with respect to each other, and to the course of the general valley which contains them, while others belong to the forms of the undulations and the law of their steepening and subsiding.

1st. The feature of widest generality connecting these anticlinal and synclinal waves, or saddles and troughs of the strata, is their remarkable approximation to parallelism throughout the entire range of the basin, irrespective of the bending course of the main valley and its including mountains. This constancy in the direction of the waves, though singularly close, is not absolute, when those of distant sections of the valley are compared, there being a difference between the anticlinals of the vicinity of Wilkesbarre and those of the Lackawanna valley of some six degrees, the former ranging about North sixty-seven East, while the latter observe an average course of North seventy-two or seventy-three East. It is, with few exceptions, strictly maintained, however, among the flexures of the same district.

As a natural consequence of this approximate permanency of direction of the undulations, and the curving outline of the general basin, it is only in the lower or western end of the valley that these rolls of the strata are parallel, or even nearly so, within the main course of the valley. There, the chief groups among the anticlinals approach to a coincidence in direction with the mountain forming the southern side of the basin. Advancing north-east to the Wilkesbarre and Pittston districts, this parallelism with the mountain border is more and more departed from; and with its progressive deflection to the northward along the south-east side of the Lackawanna valley, the obliquity of the undulations to the line of the basin and its barriers grows conspicuously greater. From the vicinity of Wilkesbarre—and probably from further westward—the whole way to Carbondale, these anticlinals come forth in succession from the mountain sides of the valley at larger and larger angles as we advance towards the north-east, the anticlinal waves, broad and flat on the slope of the mountains, pointing down obliquely westward into the valley, and contracting and growing steeper, while the synclinal troughs between them rise out of the central bed of the basin, flattening and shoaling up to the eastward to disappear at higher levels on the same mountain sides. This arrangement is discernible on the flexures of both sides of the basin; but those of the south-east side being more numerous, of steeper flexure, and less obscured by diluvial drift, the feature is there more conspicuous. Each of the two mountain barriers of the valley, with its set of anticlinal spurs passing off from it at successively increasing angles, may be likened to a curving fish-back, one concave, the other convex, sending out its spires or rays at increasing obliquities, but in mutual parallelism with one another.

2d. A further general fact connected with these undulations of the coal measures—interesting for its geological bearings, and not less so for its practical consequences—is the curious declining gradation observable in the sharpness of the successive undulations as we proceed from south-west to north-east along the basin. Not only does each anticlinal of the south-eastern side of the valley grow gentler or flatter in its dips as it slowly rises to the eastward, but the successive ones are fainter and fainter at the same proportionate sections of their length as we cross them obliquely in going towards the north-east. Those of all the lower or western end of the valley, from Beech Grove to Nanticoke, show inclinations as high as forty-five degrees; those between Nanticoke and Wilkesbarre, show dips exceeding thirty degrees; and those between Wilkesbarre and Pittston, dips averaging twenty or twenty-five; while following the Lackawanna division of the basin, we have no longer anything approaching this last steepness of flexure—except just near the ends of the saddles,—but rather a low, broad waving of the rocks, growing feebler and feebler as we advance, until, passing Scranton into the district between it and Archibald, regular undulations become almost imperceptible, and are lost in the very gradual dips into the middle of the general trough from the two borders of the valley. Accompanying this progressive smoothing out of the waves, or corrugations of the strata, from the south-western towards the north-eastern end of the whole basin, there is a like gradual transition of declension in the topographical features,—from sharp and narrow-crested ridges and deep hollows, to rounder and gentler spurs and valleys; and along the Lackawanna, to wide-topped summits, bluffs, and open denuded plains.

3d. Other points of general structure appertaining to the interior undulations of the main basin, have reference to the prevailing *form* of the anticlinals and their troughs. A main feature in the individual waves is a progressive increase of flexure, or a steepening of the dips on both sides of the anticlinals as they advance from the mountain sides, where they originate, out into the central tracts of the valley to near their terminations, which are therefore comparatively abrupt. Remarkably clear exemplifications of this structure present themselves to any close observer of the anticlinals between Wilkesbarre and the Lackawanna. If these be carefully traced from the eastward down to this district, they will be seen to grow steadily sharper and sharper in their dips, until they approach in their oblique course to the banks of the Susquehanna, in the neighborhood of which they nearly all subside by rounding rapidly off. In proof of this abrupt cessation, we have only to remark the contrast between the general steepness of these undulations where they are crossed slantingly by the old stage road, or even by the plank road, and the extreme gentleness and absolute disappearance of many at the canal, and especially at the shore of the river. The very position in the valley which the river has taken between the mouth of the Lackawanna and Wilkesbarre, is an evidence of the sudden dying out of this southern system of anticlinals. It would seem as if the waters, in scooping the lower valley or plain within which the Susquehanna flows, had been unable to pass the succession of barriers presented to them by the ridges in the strata, and were forced to recoil by the northern flanks and bold ends which these saddles protruded against them, swinging off in their rebound to follow the deflecting course of the waves of the strata towards the outlet of the drainage of the valley, the wide notch in the northern mountain barrier at Nanticoke.

The northern or north-western side of the valley appears to have its own set of anticlinals or saddles, as already intimated; but whether these observe the same law, in descending obliquely into the valley from the westward, of a progressive increase of dip on both their flanks, I am not prepared at present to maintain, as the structure of this portion of the valley is largely disguised by surface drift, and as the points of many of the spurs or saddles are hid by the deep diluvium of the Wyoming and Lackawanna flats. All analogy, and every theoretical consideration of the origin of this curious feature in the anticlinals, would intimate, however, that the same steepening towards their terminations belongs to these waves, which characterizes those coming from the opposite mountain from the eastward. Whether any of the flexures of the upper strata cross the basin entirely, passing westward from the southern mountain to coincide with undulations proceeding eastward from the northern, cannot be at present known; but the general cessation of both sets towards the middle of the basin, is a strong contradiction to the probability of such a condition.

4th. Besides the long, parallel, tapering anticlinal waves coming very acutely off from the mountain borders of the basin, there are numerous shorter and narrower ones, having the form of oval keels or saddles, which do not run into the mountains, but lie more or less insulated between these. Undulations of this class are more frequent in the central tracts of the valley than towards the sides, and their relative proportion to those of the longer form seems to increase steadily towards its upper or north-eastern end, becoming beyond Scranton to Carbondale rather the prevailing type. In the uppermost parts of the Lackawanna basin, we may indeed describe the flexures of the strata generally, less as continuous waves or ridges, than as successions of these elongated elliptical swells, some of them bulging into considerable steepness, but the chief part of them low and gentle waves, often too obscure to be detected externally in the topography, or in the dipping of the rocks, yet obvious in the mining of the coal, over which the feeblest undulations exert an almost tyrannic control as regards the directions of the levels and gangways of the mines. It is a consideration of this practical connection between the forms of the crust waves and the whole economy of mining in our undulated coal fields, that induces me in this place to depict so specially the several shapes which these assume.

5th. There is still a lesser class of undulations in the coal rocks, which the progress of mining in the region is constantly bringing to light, and which demands some mention here. These are the small, irregular, subordinate rolls, or short and narrow, but not always flattish wavings of the strata, on the flanks of the principal anticlinals. In some districts of the anthracite basins, these secondary flexures, whether on the backs or sides of the main saddles, or in the troughs between them, are for the most part parallel with the principal undulations which support them; but in the Wyoming and Lackawanna coal fields, and other regions of oblique anticlinals, they are themselves acutely oblique to the axes of the great waves which sustain them. Their arrangement is somewhat analogous to that of the small feathers or plumelets on the side of a bird's wing: while the whole wing diverges and tapers from the body of the bird —the mountain boundary of the basin—these lateral lesser plumes diverge and taper in their turn from the main direction or axis of the wing. Wherever this structure prevails in its fullest symmetry, the mine levels or gangways, when extensive, will, in winding in and out on the sides, or at the foot of a chief anticlinal ridge, have that variety of the scallop form which we may call oblique, the convex loops all pointing in one direction, namely, that towards which the main anticlinal is itself subsiding. These secondary rolls are numerous in the great mine of the Baltimore Company near Wilkesbarre.

6th. Viewing the undulations of the Wyoming and Lackawanna coal field transversely, or in profile, they exhibit in the main the same feature of a preponderance of steepness of dip on their north-western sides which characterizes the chief part of the secondary flexures of the Pottsville basin. But, inasmuch as all the inclinations of the rocks of this northern district are far gentler than those of that southern coal field, in the same proportion is the inequality less in the slopes of the opposite sides of the anticlinals, until, in the Lackawanna valley and other very gently undulated districts, the difference in an average of several waves is almost imperceptible. The general trough-like structure of the valley in these sections disputing its influence on the inclination of the strata, with the local flexures, the undulations of the south-east side of the basin show their steepest dips to the north-west, or towards the bed of the valley, while those of the north-west side exhibit theirs on their south-east flanks, or towards the same controlling synclinal line. In the western end of the Wyoming valley, the undulations being there sharper, the general law of inequality in the slant of the sides of the waves is much more conspicuous than in the Lackawanna valley, where all the flexures are flatter, and where local swells have a relatively greater power to disguise the existence of any general law of form in the undulations.

Having in the foregoing paragraphs unfolded as succinctly as was compatible with clearness the general characteristics of the structure of the curiously-fashioned, beautiful coal field of the north branch of the Susquehanna, it is incumbent on me to offer now a more special and minute description of the better-developed districts of the valley.

OF THE COAL MEASURES, AND IRON ORE STRATA, OR MINERAL RESOURCES OF THE IRON AND COAL ESTATES OF THE COMPANIES.

The Coal Measures.

It has been already stated, that the coal-containing strata of the vicinity of Scranton appertain to the lower group of the white ash coal measures of the anthracite basins; and it was also remarked that this group exhibits greater fluctuations in the dimensions and quality of the coal beds than any other subdivision of the whole coal formation. These fluctuations, it is appropriate to add, belong equally, or in a greater degree, to the rocks which fill the intervals between the coal beds. It would seem as if the physical conditions under which these earliest coal strata were deposited, were more inconstant than those which belonged to the later stages of the formation. The spaces over which the nearly perfect state of repose of the surface prevailed, necessary to the accumulation by slow growth of the vegetable peaty mass producing each seam of coal, were evidently of a narrower geographical extent than afterwards; and the currents and disturbances of the earth's crust, which buried these successive peat swamps under the clayey, sandy, and even coarse, gravelly strata that rest upon or between them, were obviously much more violent than in the middle and final ages of the great coal period.

Nowhere, perhaps, in the anthracite country, are the proofs of this instability of the surface, during the first stages of the coal formation, more conspicuously manifested than in the Wyoming and Lackawanna basin. Here we find, in certain neighborhoods, in the same few hundred feet thickness of these lower coal strata, as many as ten or twelve separate beds of coal, while in other localities there exist not more than half, or even a third of this number; and what is more material, the very same individual bed, which in one quarter possesses an ample, or indeed superabundant thickness, is in another but a dwindled seam, too thin or too impure for profitable mining. Without attempting any close continuous tracing of the several coals, which can only be done as the consummation of an elaborate and protracted survey, I may exemplify the variability of these coal measures by appealing to the very different types which they assume in the three meridians of Solomon's Gap, south-west of Wilkesbarre, Spring Brook, south-east of Pittston, and the vicinity of Scranton.

At Solomon's Gap, this group of lowest coal measures, extending from the foot of the mountain north-west across the basin to the edge of the diluvial flats of the Susquehanna, includes, in a thickness of nine hundred or one thousand feet, as many as thirteen beds of coal, of various sizes, from one foot to nineteen feet; and the total thickness of coal, fit and unfit for mining, embraced by this section, may be estimated at nearly eighty-four feet. But out of this aggregate quantity, the thickness susceptible of being profitably wrought does not probably amount in all to more than forty-five or fifty feet. Traced eastward and westward, these coal beds undergo, even in the space of two or three miles, some very remarkable variations. Thus the fifth in position from the bottom, from a thickness of seventeen feet at Solomon's Gap, enlarges in that distance to the noble bulk of twenty-eight feet opposite to Wilkesbarre, beyond which neighborhood it seems again to decline even more rapidly than towards the south-west. These fluctuations arise partly through the coalescing of two or more beds into one, or conversely, through a splitting and diverging of the thicker seams into two or three thinner ones; or partly, again, by the gradual alterations of size of the same coals, independently of such unions and subdivisions.

If we turn now to the district of Spring Brook, we shall find all the features of the formation so altered as to present not one subdivision, neither coal bed nor other stratum, which we can recognize or identify as a member of the series visible in the vicinity of Solomon's Gap. In a total thickness of several hundred feet of coal measures, embraced between the outcrop of the main Pittston seam and the conglomerate of the mountain to the south-east, only six coals in all, according to the largest estimate, have ever been brought to light, after close and persevering researches there, and only two of these appear to have a size and purity adapting them for successful mining. There would seem to take place between the Solomon's Gap, or Wilkesbarre neighborhood, and this quarter, a progressive impoverishment of these lower strata in the number and size of their included coal beds, and likewise a considerable thinning down of the entire formation. As a result, this portion of the southern skirt of the valley maintains at this time no collieries of any magnitude.

Another and opposite change, back to a very productive condition of the coal measures, is exhibited as we continue our progress along the same side of the basin, north-eastward up the Lackawanna valley, and approach the vicinity of Scranton.

In the immediate neighborhood of Scranton—a portion of the coal basin, where the coal measures are unusually well developed by natural features in the topography, and through the researches directed by the Companies,*—the coal rocks, counting from the upper surface of the seral or lower conglomerate, to the highest sandstones of the plateau south-west of Hyde Park Village, disclose, upon careful measurements, an aggregate thickness of about seven hundred feet; and in this depth of strata, the whole number of coals, large and small, amounts to no less than twelve, not estimating as separate seams any layers which might be regarded as subdivisions of compound beds. The assembled thickness of these twelve plates of anthracite is not less than seventy-four feet, taking for some their mean, for others their minimum dimensions; and the thickness available for market, under judicious mining, I would estimate at thirty-nine or forty feet. These aggregates, arrived at through careful personal observation, and many patient measurements, exhibit certainly an unusual amount of coal in so moderate a depth of strata, being nearly eleven feet of the former to each one hundred

* Skilfully and successfully conducted by Mr. Wm. Needham.

feet of the latter; or, of good salable coal, the high proportion of six feet to every one hundred feet of rock. The immediate and encouraging inference from this incontrovertible statement of thicknesses is, that here is a tract particularly eligible for mining by perpendicular shafts or pits, since the whole body of the coal measures, possessing generally but a gentle dip, may be perforated, and the coal reached to the large amount above mentioned, by shafts descending only a few hundred feet from the surface. An inspection of the appended column of the Scranton coal measures, discloses the still more interesting fact, that in a depth of no more than four hundred feet, starting with the third coal from the surface, or the five-feet seam, found near the base of the hills, and ending below with the lowest included in my estimate as workable—the six-feet bed, or the third up from the bottom—the thickness of coal amounts to fifty-eight feet, of which the quantity available for mining may, at a prudent estimate, be computed to equal at least some thirty-five feet divided in seven different workable beds. These seven beds are equivalent to sustaining seven separate collieries, capable of delivering their coals to the surface through a single wide shaft, or better, through two shafts, neither of them more than four hundred feet in depth.

Of course, it must not be understood that this entire body of coal measures, nearly seven hundred feet in total thickness, underspreads the soil throughout every part of the Scranton coal field. It is only in the higher hills belonging to the north-western and western sides of the estates that the uppermost coal beds of the group have escaped destruction by denudation, and here these seams may be advantageously entered for mining above the water level of the immediate valley of the Lackawanna. Under that drift-covered plain or valley, the highest beds yet mined, those designated I and K in the column, and locally named the seven-feet and the five-feet coals, descend to a very moderate depth in a narrow trough near the Lackawanna; but between this belt—which is a little to the south-east of the base of the Hyde Park range of bluff hills or table land, and the south-eastern edge of the basin, at the outcrop of the conglomerate—the lands contain only the middle and lower coals. The whole basin being undulated in four gentle anticlinal waves, and growing more shallow on rising towards its south-eastern side with each successive wave, these middle and lower seams, after basining between the anticlinals, crop out in their turn further and further in that direction, as they are nearer the bottom of the series, until the last, lowest beds of all, finally emerge to the surface in the sloping border of the valley. In the gently slanting plateau of hills north-west and west of the meadows of the Lackawanna, the upper coal seams ascend with scarcely any undulations, and at a very moderate angle, above the level of the river flats, the ten-feet bed, or coal H, presenting its lower, or dipward edge, or outcrop, just a few feet above the plain, and giving a frontage towards the valley extremely favorable for economical mining. A little higher in the same hills, and equally accessible, lie the seven-feet and the five-feet beds, or coals I and K, with courses of iron ore in large nodules. The ten-feet bed, or H, reënters the ground, and maintains itself under cover throughout the wide belt which lies between the north-western edge of the plain, or the Sweatland meadows, and the foot of the Scranton and Dunmore ridge. Here shafts between three and four hundred feet in depth will give access to the coal of the five principal workable beds of the series, namely, to H, G, F, D and C, or the so-called ten, six, twelve, eight, and six feet coals; or if only the four middle larger beds should at first be aimed at, these, beginning with H, and terminating with D, can be all reached by pits not deeper than about two hundred and fifty feet. This valley tract, underlaid as it is by an aggregate thickness of coal between thirty-six and forty feet, in four beds, proved by actual mining in several localities to contain from twenty-seven to thirty feet of excellent merchantable fuel, is assuredly most advantageously circumstanced for extensive and economical mining.

I shall now proceed to give some account of the individual coal beds and layers of iron ore in the Scranton coal measures, omitting, on this occasion, any statements respecting the intervening rocks.

DESCRIPTION OF THE COAL SEAMS AND BEDS OF IRON ORE OF THE SCRANTON COAL FIELD.

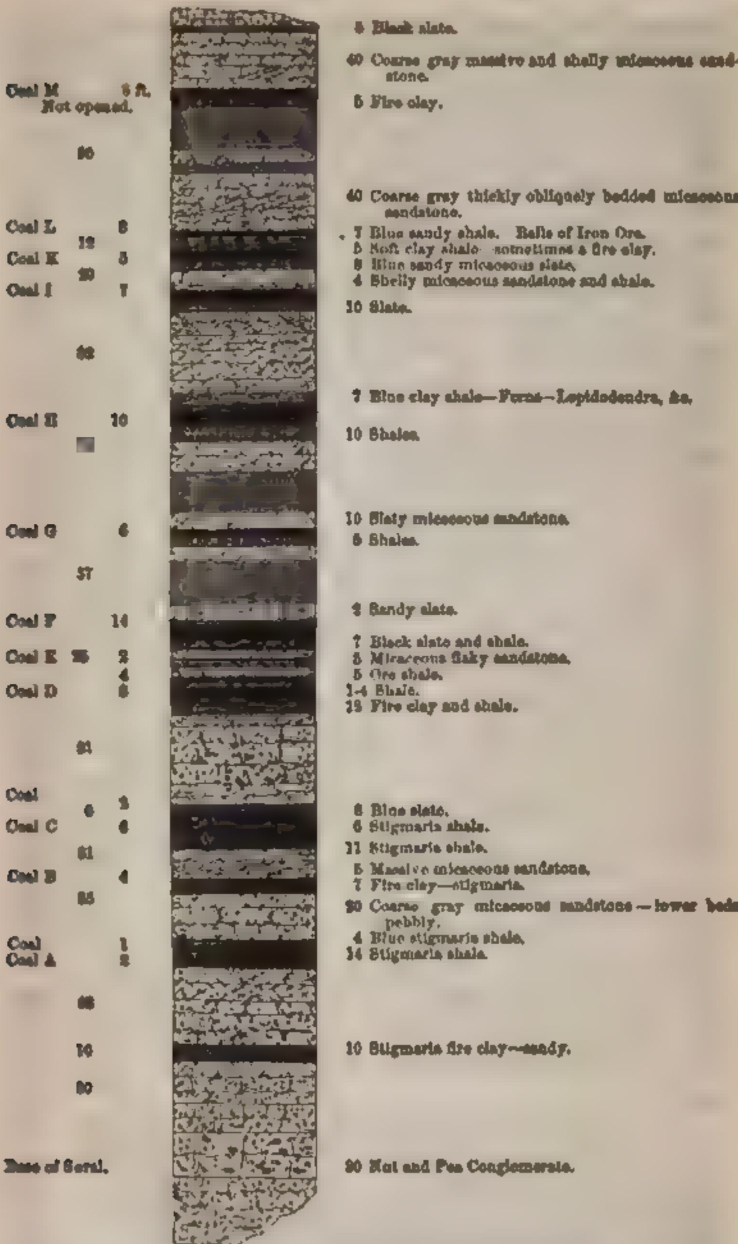
Commencing with the lowest layer of coal in the series, and ascending to the highest, our enumeration will comprise, as already stated, twelve independent beds, not counting as separate seams certain attendant thinner bands which, in some places, coalesce with the main ones, and in others thin down and disappear, and which are generally of fluctuating size. In those cases where the beds have been opened or mined at sufficiently numerous and remote points to show their own fluctuations, if such exist, the limits and nature of these will be briefly stated. In the absence of a detailed topographical and geological map and sections of the coal field, no attempt is here made to describe with exactness the lines of outcrop or the margins of the several coal beds, nor to estimate more than in a loose, aggregate manner, the amount of coal embraced within the estate.

Coal A.—Immediately above the upper layers of the main or seral conglomerate, we trace on the south-eastern side of the basin the outcrop of the small double coal seam, which is the lowest in the Lackawanna series. Near Scranton, it is well exposed on both sides of Roaring Brook, the railroad cuttings disclosing its true position in relation to the other strata. It is here separated from the sandstones, terminating the conglomerate by about fourteen feet of coarse stigmaria shale. The coal is in two bands, one two feet, the other one foot thick, divided by a bed four feet thick of blue stigmaria shale. This coal bed, seldom fit for mining, is neither large nor pure enough at Scranton, but at Dunmore it has been mined on a moderate scale at Plane No. 6 of the Pennsylvania Railroad. It is the coal there seen at the railroad bridge across Roaring Creek, where it dips to the northward.

Coal B.—This coal, measuring four feet thick at Roaring Creek, has not hitherto been mined there, partly through an impression of its unfitness, partly through the prevalence of thicker coals adjacent to the main outlet railroad. It rests upon five feet of fire-clay, containing the rootlets of stigmaria, so characteristic of the floors of most permanent and productive coal seams. Though apparently of average purity, and of quite manageable dimensions, I do not include it at present in my estimate of the economically available beds of the Scranton estate. It has, however, been profitably mined at Dunmore, on the hill near Plane No. 6. It is there, as at Scranton, the second bed ascending. Two mine drifts, at different levels, penetrate the bed, and in these its thickness is from five and a half to six feet.

Coal C.—Next in the series is a coal called at Scranton the lower six-feet bed; and it is the lowest which has been opened as yet with a view to being mined. It crosses the valley of Roaring Creek at the Scranton Rolling Mills, but is not there wrought. Preparatory openings have been made in it a mile below the Scranton furnaces on the south side of the Lackawanna, where, like the other coals below it, it rests in a gentle northward dip, making it accessible for mining from the river valley. This coal has been, and is now, mined to some extent at Dunmore in the same hill of Plane No. 6, where the other subjacent beds are wrought near it, and in that locality it is about five feet thick. Near Scranton it rests on stigmaria shale, and is separated by six feet of that material from a band of coal, two feet in thickness, which does not everywhere follow it. Neither this coal seam nor those beneath it rise anywhere to the surface, even on the highest uplifted anticlinal ridges, or in the deepest denuded depressions of the coal basin, between these south-eastern exposures and their north-western lines of outcrop along the opposite margin of the valley. They therefore underlie every acre of the lands of the Scranton estate embraced within the coal field. I think this coal bed may fairly be estimated to contain 7,000 tons of good merchantable fuel per acre.

Coal D.—This valuable seam, called locally the eight-feet bed, separated from the preceding by about ninety feet of strata,



☞ See Report of Mr. Needham, under the title of "Coals and Collieries," in the latter part of this number.

rests on a bed of coarse fire-clay and stigmaria shale twelve feet in thickness. The main bed, fully eight feet thick, is overlaid on Roaring Creek by another seam often itself four feet in size; but this rider appears not to be always present. They are separated by a layer of shale varying from one to four feet in thickness. Coal is taken from the main seam on the north side of Roaring Creek above the Scranton furnaces. The bed has also been opened, and a mine commenced in it, at the base of the bluff or plateau on the Griffin farm, on the north side of the Lackawanna, one and a half miles south-west of Scranton. More centrally in the coal field, this seam is lifted high above the water level of the plain of the Lackawanna, on both flanks of the Dunmore anticlinal. Descending with a gentle north dip from its southern outcrop, and making its first basin in the valley of Roaring Creek, just above the level of the stream between the furnaces and rolling mills, it rises in the Scranton and Dunmore spur, arching under the surface near the first-named town, but coming out to the day, and thereby separating into two outcrops, with the eastward lifting of this saddle in its course towards Dunmore. In the vicinity of this latter village, it is the highest of the coals mined on the hill north-west of Plane No. 6. On the opposite, or north-western side of the Lackawanna valley, the outcrop of the coal bed may be seen on the Leggett's Gap road, near which it is also mined; and it has been opened in one or two other places, just at the foot of the mountain, along this border of the basin. In a section or transverse belt passing through Scranton, this seam nowhere rises out to the surface or water level of the Lackawanna valley, but maintains itself under cover, even on the backs of the anticlinal undulation, and this is apparently its position until we approach at least the meridian of the village of Providence. It therefore underlies, as do the coals below it, the whole coal field of the Scranton property, if we except merely the strip between its south-eastern outcrop and the conglomerate boundary, and also a narrow, wedge-shaped tract, between its two inner outcrops on the back of the Dunmore anticlinal spur. Estimating this excellent bed of coal as possessing, on an average, a six feet thickness of good fuel—and this much the mine at Roaring Creek seems to indicate, without counting upon anything from the rider or companion bed above it—each acre of the property embracing it will contain 10,000 tons.

Coal E.—Above the last-named important bed, at an interval of about eleven feet on Roaring Creek, there lies a smaller seam only two feet in thickness, and not capacious enough to be mined. It is immediately underlaid by the usual floor of stigmaria shale, which, in this instance, contains very large, irregularly spherical lumps of clay iron ore, or argillaceous carbonate of iron, scattered through it. This bed of shale is one of the chief horizons for this district of the nodular variety of iron ore so characteristic of the coal measures generally. The coal bed is not included in my estimate of the available mineral wealth of the basin.

Coal F.—This is called in the district the Big vein of Scranton, or the fourteen-feet coal. On Roaring Creek, it is separated from the small bed E below it, by from seven to twelve feet of black slate, shale, and micaceous shaly sandstone, the variable thickness and composition of which imply that the lesser coal may, in some localities, approach the greater so closely as to constitute a lower bench of this, and thus augment its thickness. At the furnaces, or Roaring Creek, where the large seam makes its most southern flat and gentle basin, just at the water level of the stream, its size is about twelve feet, and its yield of good coal is not more than seven and a half feet; but at the base of the hill of the Griffin farm, near the edge of the Lackawanna, its thickness is almost fifteen feet, and the newly-opened mine there promises to produce from this some ten or twelve feet of excellent marketable coal. North of Scranton, where the anticlinal next north of the main Dunmore axis brings it to the surface on Pine Brook, it is successfully mined from the water level gently upward towards the south in the Sandbank mine; and here the bed is of its average thickness of fourteen feet, and yields of good coal, some benches of which are of very superior quality, a thickness of eleven feet. This seam is mined to a limited extent at Leggett's Gap, on a gentle south dip, in the ravine below the railroad. It is there twelve feet in thickness. We thus see that it spreads widely underneath the Scranton section of the basin. It is, however, like all the coals, lifted and depressed in the undulations which traverse the coal field, and is even brought to the surface and washed off from the higher crests of one or two of the anticlinals. Thus the Dunmore, or main Scranton axis, lifts it out into two outcrops, the northern one ranging eastward from the Odd Fellows' Hall at Scranton towards Dunmore. Spreading largely under the long, gentle northern slope of the Dunmore anticlinal ridge, it seems to reapproach the surface, and even to crop out above its base, eastward of Scranton, by a second upward wave, the same with that of the arch on the Lackawanna, west of the town. After being thus brought easily accessible for mining, it reenters the hill a little lower down, basins gently, and again reappears on a fourth outcrop on Pine Brook at the Sandbank mine. Then, a little further, it spans flatly its third undulation, and goes beneath the flats of the Lackawanna, on the Sweatland meadows, and makes a very wide basin, with only one quite gentle anticlinal wave in it, which barely brings up to the surface the coal H, two coals above this, and leaves this larger bed at a depth still of nearly one hundred and thirty feet in the shallowest parts of this its main central trough. From this description it must appear that a large portion of the Scranton coal estate is underlaid by this important coal seam. From twelve to fifteen thousand tons per acre of all the lands underlaid by this bed of coal, may be fairly counted upon as its net product in merchantable fuel. A more detailed examination than it has yet received is required to determine with precision the number of acres which it occupies.

Coal G.—Between fifty-five and sixty feet above the preceding, lies the coal often called at Scranton the upper six-feet bed. It rests on clay shale, and is overlaid by micaceous sandstone.

[To be continued.]

ART. II.—THE HARTFORD COUNTY MINING COMPANY'S PROPERTY AT BRISTOL, CT.—REPORT BY CHAS. SAML. RICHARDSON, ESQ., MINING ENGINEER, MARCH 18, 1854.

ABOUT midway up the mountain, at the head of a valley, is situated the above mine. The stratum is gneiss rock and mica slate, alternating in regular parallels; their general bearing is 7° 30′ north-east. The dip of the gneiss may be said to be almost vertical, but the mica slate inclines to the south-west, at an angle varying from 30° to 65° with the horizon. In the immediate vicinity of the mine are some very peculiar geological formations, some of which will, in all probability, influence the metalliferous characteristics of the lode. In the absence of any plan of the sett, it would be difficult to convey a perfect knowledge of the various stratas as they bear upon the minerals inclosed within them, but the following few sketches may give a general outline of their relative positions:—

THE MAIN LODE

Was discovered by the outcrop of a mass of gozzan, friable quartz, and decomposed felspar. The shaft was pitched out to cut this lode at about twenty fathoms, but the dip being flatter than was anticipated, the shaft went through the lode at fifty-six feet from the surface. At ten fathoms deep a cross-cut was driven out, and again went through the lode thirteen feet from the shaft; this cross-cut was extended forty-three feet altogether, where a small vein about ten inches thick was intersected, and a level driven on its course sixteen feet to the southward and eight feet to the northward; also another short cross-cut into what might, under usual circumstances, be supposed to be the country, but which, in the case before us, I shall denominate differently. What I have named as being cut in the shaft as the lode, is nothing more than a vein of flucan, about four feet

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thick, dipping easterly at an angle of 45°, with a traverse of 48° north-east. This flucan course is the foot-wall of the lode, or, in other words, it is the boundary between the lode and the country on the lower side, the country itself forming the foot-wall of the lode. At the present shallow depth, it is irregular in every respect, and it will not get settled yet for several fathoms in depth. The vein that has been intersected is of a very promising character; it contains flucan, mundic, soft spar, and copper, and appears to be increasing in mineral as it goes down. For sinking and driving, the strata is of the very best and cheapest kind, as it will stand without timber, and is highly congenial for the production of rich copper ore. The bearing of this vein is 7° 30′ north-east, and forms a caunter with the flucan course. If the cross-cut is extended, several more of these small veins or droppers will be cut, each differing in their bearing and inclination; the ground will continue the same until the country is intersected, which will be found to be a blackish gneiss, striped with quartz. This, then, is the width of the mineral channel from which will proceed the lode.

As regards the deposition of the minerals, they may be looked for at the junction of all veins, where they intersect each other, but more particularly so when they fall into the flucan, as in the instance of the vein shown in the plan, which, at eighty feet north-easterly, will intersect it unless heaved from its present course by a slide or splice. Should it hold on, it will make either a bunch of copper or mundic near the flucan, and, in all probability, go down with it. The section of the shaft (fig. 2) shows the inclination of the droppers in the shaft, the flucan, and the first vein. The droppers are now gone down with the flucan, which, if examined ten feet deeper, I am almost certain will be found to be much mineralized.

THE MINERAL CHANNEL.

Having just intimated that the lode will proceed from a run of ground below the flucan course, we will now examine geologically the causes that lead to such an inference. In the first place, we find the strata, at and around the point where the flucan course has been discovered, to be much decomposed. The medium of this decomposition is sulphur, which, by being exposed to the influence of the atmosphere, and a wet strata, destroys the color and texture of the stone lying above it. The greenish tint in the stone is caused by the infiltration of water holding copper in solution, and proceeds from the lode by springs, or from masses of copper deposited in a more elevated part of the country. We find the strata more highly mineralized near the flucan than we do towards the higher grounds; it is very natural it should be so. A reference to fig. 3, which gives a transverse section of the valley across the mineral channel, shows that the said channel is in a strata of mica slate, bounded by gneiss rocks, which stand near by, vertically on either side. The dip of the mica slate is towards the north, which intersects the flucan at its lowest extremity; therefore, whatever minerals may be contained in the mica slate, or flow into it from other parts of the sett from the gneiss rocks above, it is very natural to suppose must all flow into or through the flucan or ground near it; hence its being so highly mineralized.

THE MAIN LODE.

This, of course, has not been discovered, neither will it be until a depth is obtained level with the bed of the river in the valley below, at which point the mineral veins will become concentrated, the strata assume a more regular and defined form, the country become settled, and the numerous small veins and droppers will have fallen into each other. Then the flucan will form the foot-wall, and the black gneiss the hanging wall, and what is here now outlined as a mineral channel will become the main lode of the mine, which will have a bearing of about 25° north-east. The shareholders of this adventure must not be disheartened at my saying it will probably be forty or fifty fathoms in depth before a regular lode-bearing ore is found, for there is every reason to anticipate that the mine will be returning ore regularly every month when the ground is opened twenty fathoms deeper. In fact, I am almost positive such will be the case, the country being so congenial for making ore shallow. If we judge by analogy on this point, we need not go out of the township to harmonize such an assumption. The Great Bristol copper mine is situated in exactly such a formation, and, in many respects, is identical in its geological features to this mine. The Great Bristol has for many years been returning immense quantities of rich copper above the flucan; and it has been recently discovered that the flucan itself is so highly mineralized near the junctions of the small veins, that it will amply repay for working, which, with the veins, and the ore-bearing gray and black gneiss that lie above the flucan, there is now between the forty-feet level and surface already discovered, above $500,000 worth of rich copper ore. If this property was situated in the county of Cornwall, in England, we should not think of its becoming a productive mine at less than sixty or seventy fathoms in depth; but, in this country, the rocks being older, or rather having for a longer period been exposed to the disintegration of the atmosphere, the metallic compound of the lodes lies nearer the surface. About the centre of the sett is a somewhat singular formation, viz., a mass of granite lying upon the slate and mica. This is a phenomenon for the geologists to speculate upon—how the primary should lie on the secondary formation; but as my report relates only to minerals, I shall at

FIGURE 3


Mica Slate
Gneiss
Great
Water Course
Mineral Channel
Decomposed Slate
Mica Slate
Gneiss

FIGURE 4


Logging Rock of
Sand Stone 10 Tons weight
Granite
Gneiss
Mica Slate

present make no further comment on it than the following sketch, fig. 4, will show.

MINING OPERATIONS.

The present engine shaft is not put down in the right place. It has gone through the flucan, or assumed line of the lode, and the deeper it is sunk the further will it get away from the point of usefulness. I should advise the sinking of a new engine shaft at such a distance as to take the lode at the fifty-fathom level, and as the ground is easy for sinking, the cost is not a matter of consideration. On this new shaft a small engine (steam) should be immediately erected. I do not consider the water will be very quick; therefore a nine-inch lift of pumps is all that will be required for a long time. I consider, however, that it is absolutely necessary that the Company should have a proper plan made of their property, and their works laid out in a systematic manner. They would then be able to see what is best to be done, and the way to go about it. Careful estimates should also be made of the cost, so that the Company may be prepared to meet the exigencies of the case. I consider the mine well worthy of a trial; and if due prudence is exercised in the development of the mineral, it promises very fair to result in a profitable adventure.

ART. III.—THE LEAD VEINS OF WISCONSIN.*

IN determining the value of a metalliferous district, the first point to be settled is the mode in which the ores occur. Deposits of metallic ores are divided into two classes: First, those which occur in beds, bunches, or veins of limited extent, usually called contemporaneous deposits. Second, the veins which are defined to be "the mineral contents of fissures having indefinite length and depth." The former are local and irregular, with no constancy of direction, and never extend from one rock to another. The latter, on the contrary, extend vertically to great but unknown depths, and traversing every variety of strata. They may often be traced for many miles in a horizontal direction, pursuing the same general course throughout, and retaining their productiveness, subject only to transient interruptions. They are inclosed between walls of rock, separated from their contained substances by a distinct line of demarkation. The first class of deposits often gives promise of a large yield, but fail when pursued for a length of time. Millions of dollars have

* From the first Annual Report on the Geological Survey of the State of Wisconsin, by Edward Daniels, State Geologist.

been wasted in prosecuting mining operations upon such deposits, which seemed to give evidence of exhaustless stores of ore. The experience of the past has taught the necessity of great care in the selection of mining ground; and while it has proved the danger of adventures in those isolated and limited deposits, however rich at first, it has equally established the safety of liberal investments in the exploration of true metallic veins. All mines of the globe, distinguished for permanent value, belong to this latter class. To this class also may be referred most of the deposits of ore in the lead district of Wisconsin. They generally present the characters of true veins, and are therefore to be treated and relied upon as such. This will be evident, if we examine the general phenomena which they present.

BEARING OF THE LEAD MINES.

The most general direction of the productive veins is east and west. The variation is usually from three to twenty degrees south of east; sometimes, however, it is north of east. Local variations often occur in the general bearing of the lode, but in most cases, if pursued, it will be found to resume its original course. An average of one hundred and twenty-three observations upon lodes having an east and west direction, gives a mean variation of eleven degrees from the meridian line.

Another system of veins, of less frequent occurrence, are termed norths and souths. These vary from true north and south, so that the mean of forty observations is fourteen degrees. In many cases these have a direction nearly N. N.E. Still another class are called quarterings. They intersect the easts and wests at an angle of about forty-five degrees, and are often known as "ten o'clock ranges." Besides these, there are strings and branches apparently flying off from the main ranges, and having every conceivable direction. In a few instances, productive veins (probably by a succession of throws) assume a curved or crescent form, and are hence called "horse-shoe ranges." The easts and wests have probably yielded nine-tenths of all the ore raised in the district, and must be regarded as the characteristic or principal veins.

HORIZONTAL EXTENT OF VEINS.

Many of these veins are of great length. Several of them have been traced three or four miles, pursuing their general course with such constancy that, when once struck, the compass may be used to discover their location at a great distance. The "Heath-Cock range," in the town of Lindon, has been worked for nearly a mile continuously, and its extent for three miles ascertained by occasional shafts which have been sunk upon it. The "Long Range," at Potosi, and the "Great Blackleg," in town 1, range 3 east, have each been worked a mile in length.

The breadth of the veins varies from a few inches to fifty feet or more.

VERTICAL EXTENT OF THE VEINS.

The depth to which the lead veins penetrate, is altogether the most important feature connected with them in a practical point of view. For obvious reasons, it is also the most difficult to be ascertained, as it can be known only by following them into the profound depths of the earth. The deepest shafts yet sunk in the lead mines have penetrated only to the depth of 175 feet. Few even reach 100 feet, and most of the shafts range from ten to sixty feet. Shallow as these workings are, they have nevertheless revealed many important facts, tending strongly to establish the continuity of the veins to much greater depths. Every practical miner, or owner of mineral lands, is deeply interested in having this question answered, viz.: Do the lead veins continue downwards through the succeeding beds of rock, and carry in their lower portions sufficient ore to justify the increased expense of exploration? To answer this question, so far as could be done, has been made a leading object in the work of the past season. The gray limestone has already been mentioned as the principal surface rock of the lead district. This is the great lead-bearing rock of the mines. It has been supposed by many that the surface rock always carried the ore; and the opinion has been strengthened by the fact, that when the veins are followed to the blue limestone below, they uniformly dwindle and cease to be of workable value. Discoveries of working veins were occasionally reported to me as having been made in the blue limestone, but upon examination I have found them to be located in the lower beds of the gray limestone, which, from their bluish cast, are often mistaken for that rock. Mr. Owen also observed this interruption of the veins at the junction of the blue limestone with the gray, and remarks, "that no discoveries of any value have been made below the blue limestone." It is a general law of metallic veins that they are affected by the character of the rock through which they pass. If they have been very productive in one rock, in passing into another, they usually become unproductive, or of no workable value. Mr. Westgrath Foster, in his treatise upon the British Strata, mentions numerous instances of these interruptions. In the mines of Cornwall, the veins, in descending, are sometimes cut off at a change of strata, and, after remaining barren for hundreds of feet, again resume their productiveness. In such cases, the vein is often followed for great distances through the barren ground, the practical miner looking with confidence to a resumption of its productiveness when a favorable change of rock is encountered; and the result generally proves the adventure to be judicious.

By all analogy, if the deposits of ore in our lead district are true veins, traversing rocks similarly various, and cut off in the same way, we ought to expect a renewal of their productiveness. That such is really the fact, I hope to be able to prove by the results of long-continued and careful observation. The veins, cut off by the blue limestone, resume again in the buff-colored rock, as might be expected according to the law just mentioned. Such had long been my conjecture, as the ore in the descending veins generally continued strong until at or just below the point of junction of the gray and blue limestone, where it suddenly dwindled, or became dispersed in small cubes throughout the adjacent rock. The deposits of ore in this lower lead-bearing rock have been worked in a few localities only. At Mineral Point, Dodgeville, Blue Mounds, and some other places, these deposits have been reached. At these points, owing to the dip of the rocks, and the wearing away of overlying beds, the buff-colored limestone is found near the surface, and hence easily accessible for mining purposes. Deposits in this rock are known as the "glass rock openings." The glass rock consists of the lower layers of the blue limestone, and is the cap-rock of the openings below. The miners seem in no case to have been conscious of their true geological position, in working these openings. This has been owing, in some measure, to the fact, that, in the vicinity of veins, the rocks are often so changed as nearly to obliterate their usual characters. In such cases, very careful observation, and some knowledge of the general geology, is requisite to intelligent exploration. The buff-colored limestone everywhere underlies the lead district, its depth varying with the altitude. From the erroneous impression that no ore exists beneath the blue limestone, the veins have generally been abandoned when that rock was known to be reached. Hence the lower openings have been discovered only when the rock approached the surface.

The richness of these openings, so far as they have been worked, justifies the conclusion that they will be found equally productive with those of the gray limestone.

The veins which have thus resumed their productiveness are again cut off by the bed of sandstone. Not the slightest trace of lead, zinc, or copper has ever been found in this rock; and so extensively is it exposed at the surface, that were it metalliferous, the fact could hardly have escaped observation. In the succeeding rock we might reasonably expect a favorable change. It is the lower magnesian limestone. Its texture is well adapted to the reception of ores, and its position (being nearer the igneous rocks) is a circumstance favorable to productiveness. From these facts, and from the discovery of small quantities of ore in this rock at its outcrop, Mr. Owen conjectured that the lower magnesian limestone would be found to contain lead ore in workable quantities. During the past season, special attention has been directed to that formation, and discoveries have been made which strengthen that conjecture into certainty. The depth at which this rock lies over most of the region where the lead-producing forces are known to have operated, render the investigation exceedingly difficult. In the northern portion of the district, along the Mississippi, Wisconsin, and their tributaries, the lower magnesian rock has an extensive exposure. Along this exposure, numerous occurrences of lead, in small quantities, have been observed; and, in one instance, a very important discovery of ore has been made. This is located upon section 32, town 7, range 1 east. A branch of Blue River has here worn through the upper rocks, and left a terrace of this limestone, rising about twenty feet above the bottom of the valley. During the last season, float ore was discovered in the valley, which was traced to this terrace of rock; shafts were sunk, and the existence of heavy bodies of ore was proved. The ore is found in large masses, sometimes weighing 400 or 500 pounds. It is generally in openings, surrounded by clay, but is sometimes scattered in crystals among the flints which abound there. The locality is near Franklin and Centreville, where heavy lodes have been worked in the gray limestone. Some ten or twelve miners were at work at this spot when I visited it. Nearly forty shafts had been sunk, and ore discovered in most of them. Probably 200,000 pounds of ore have been raised from these diggings during the season. The ground is very favorably located for proving the veins to any extent, and it is to be hoped that a mine will be opened here on a scale sufficiently extensive to secure this result.

After these discoveries, I can hardly regard it a matter of doubt that the veins continue downward into the lower magnesian limestone, and may be profitably worked in that rock. The addition to the lead-bearing ground of the buff-colored and lower magnesian limestones is one of incalculable value, and one which, if properly understood and appreciated, will give a new impetus to the mining interest of the lead region. Even where these rocks are at the greatest distance from the surface, their depth is slight as compared with that to which mines are worked with profit in other countries. I know of no reason why similar results may not be expected here.

Having thus endeavored to state the evidence bearing upon the vertical extent of the lead veins to greater depths than have yet been worked, I will now mention some of the leading features by which they are characterized.

GROUPING OF THE VEINS.

A vein is very rarely alone, but is usually associated with several others. Among these one is more productive than the rest, and is designated the "champion lode." On either side of this smaller veins are grouped, like subordinates around their chieftain. This group is known as a "gangue" of veins. Several of these gangues are generally found near each other, and form together what is called "the body of mineral." This assemblage of veins is bounded on every side by spaces which are apparently barren. In passing over the lead region, one will notice that the mining operations are all concentrated at a few points. Between these stretch broad expanses, broken only here and there by a solitary prospect-hole. It is important to know whether these spaces are really barren ground, or are only waiting the hand of enterprise to develop their mineral wealth. It is most in accordance with the past history of mining, and the known laws which govern the distribution of metallic ores, to suppose that they are collected into groups, as they appear to be, and not equally dispersed over the whole district. It is by no means probable, however, that all the spaces apparently barren are really so. On the contrary, we may reasonably expect that rich discoveries will yet be made upon these unexplored grounds. Several experienced miners remarked to me, that the bodies of mineral seem to have a north-easterly direction; or, as one of them expressed it, "seemed to throw around towards the north-east." Dr. Percival, the distinguished scholar and geologist, whom I had the pleasure of meeting in the mines, remarked a similarity in their shape to the crescent form of the trap ranges, which he had observed while conducting the geological survey of Connecticut. In the disposition of the individual members of the gangue of veins, we observe a very regular alternation, each being placed at nearly the same distance from every other. The gangues are also about the same distance apart. We thus have a serial order in the arrangement of these veins, giving us, first, the individual vein; second, the gangues into which the veins are combined, at a parallel equidistance; third, the group including those gangues connected by their cross-courses into a great net-work of ore, called "the body of mineral." The relation of these veins to each other is a matter of great interest, both in a practical and scientific point of view, and every pains should be taken to collect facts bearing upon it.

POSITION OF THE LEAD VEINS.

The veins of this district present almost every variety of position, but they may be included in two classes, viz., the perpendicular and horizontal. The perpendicular vein consists of a fissure, having a direction vertical, or slightly inclined. It pursues its way downward by a succession of throws, which give it a zig-zag course very similar to its mode of horizontal extension. Its breadth varies from a mere seam to a hundred feet. Sometimes it is entirely obliterated for a short distance, being crossed by a tabular mass of rock, called the "cap-rock." Upon sinking through this, an expansion of the fissure occurs, called an "opening." These openings are usually filled with clay, loose rocks, and massive ore. Occasionally, however, they are empty, or partially so, forming caves, whose walls are hung with stalactites. The best examples of vertical veins occur in the south-west portion of the district. At Fairplay, and across the Mississippi, at Dubuque, these veins have yielded prodigious quantities of ore. The caves here are noted for the rare beauty of their spars. In some instances they are partly under water, forming subterranean lakes, into which boats have been lowered and voyages taken a hundred feet below the surface. In these caves the ore is generally found attached to the roof and sides, or scattered through the clay which covers the floor. It is rare to find a continuous sheet of ore in these veins. After sinking through the opening, the walls come together again, or the veins become "pinched," as the miners express it, and yield little or no ore. The miner, however, still continues his work, knowing, by past experience, that another opening will soon succeed to repay his toil. In many of these caves, the ore occurs partially imbedded in the wall-rock on either side, in small flat openings, or pockets, forming isolated masses. These masses are sometimes of great size, weighing occasionally from 50,000 to 100,000 pounds. Good examples of these broken sheets may be found at Benton, Potosi, Hazel Green, and Shullsburg.

The second class of veins consists of flat sheets, continuous for great distances, and running between the strata, parallel to their plane of stratification. Occasionally, however, they incline downwards or upwards for a few feet, but their dip is very irregular. These flat sheets have been very productive in many localities. Good examples occur at Mineral Point, Dodgeville, Linden, Messersmith's, and Blue Mounds. They are usually connected, both above and below, with vertical veins. Both these classes seem to have a special geological position. Thus the perpendicular veins, with large openings and caves, are nearly confined to the gray limestone. The middle and lower beds carry flat openings and flat sheets, while flat sheets alone are found in the buff-colored limestone.

"Chunk mineral," "float mineral," and "patch mineral," are broken sheets which have been left by the decomposition of the rock which once inclosed them, and are now found in the loose material of the surface.

VEIN-STONES.

In the perpendicular veins, the ore is usually unaccompanied by any of those substances known as vein-stones. The flat sheets, however, are usually associated with some mineral substance, which is the matrix of ore. The most common of these substances are tiff, black-jack, dry-bone, iron pyrites, ochre, barytes. These accompany the lode, either singly or combined, in varying quantities—sometimes filling the entire vein, even, and taking the place of the ore, and at other times entirely absent, or very slightly developed. The arrangement of these substances is often in parallel layers, called combs. In such cases the succession is quite irregular. The ore is sometimes upon one side of the vein, and the vein-stone upon the other; or it runs between the layers of its matrix, dividing often into several branches. In other cases, the ore and vein-stone are mingled in one mass, requiring the process of roasting and stamping to separate them. The vein-stones present often a great practical difficulty to the working of mines by their irregular distribution. In some instances, veins have been followed for a distance, and yielded pure ore; but suddenly a vein-stone set in, which enlarged until it "eat out the ore," as the miners express it, and the matrix alone remained. This horizontal alternation of the ore and its matrix has ruined the prospect of many a miner; and in veins thus affected, great caution and sound judgment are required. The vein is quite sure to yield pure ore again at some point ahead, but the most profitable method of reaching it depends upon various circumstances. In many cases where this substitution of the vein-stone occurs, the ore is found dispersed through the adjacent rocks in small cubes along the line of the barren portion of the vein. These cubes are often very abundant, and are called "dice mineral." Instances of this character may be found at Mineral Point, Shullsburg, Wingville, Crow Branch Diggings, &c.

It is difficult to determine which of the substances spoken of above is the most favorable indication of a good lode. Heavy deposits of ore have been found with all of them, or entirely free from any associates, and there is probably no necessary connection between either of them and the barrenness or productiveness of the veins which they accompany.

I have thus far endeavored to point out the leading characteristics of the lead veins of Wisconsin. I have confined myself to facts, without attempting to account for or explain them. I have endeavored to keep all theories out of view while making observations in the field, the primary object being to find out what is, rather than how came it to be. Both these inquiries are apposite and important, but the first must always be answered fully and truthfully before a reliable answer can be given to the second. The first, too, is of pressing importance, and its answer replete with practical results, while the latter has only an indirect bearing upon the economical value of the mines. If the miner is familiar with the rocks amid which he is operating, the laws which govern the veins, and the most frugal method of extracting the mineral wealth from those repositories in which nature has stored it, he has knowledge of far greater value than any abstract theory, however satisfactory. With this view, it has been my first object to collect such facts as would illustrate the character and extent of the mineral resources of the lead district, and stimulate their development in the highest possible degree. Still, the origin of these veins is a matter of great interest, and ought not to be entirely omitted in this report. I shall therefore present those theories which have been most generally accepted, to explain the formation of metallic veins. Thus every observer will have before his mind what others have concluded upon this subject, and be enabled to decide for himself how far these views harmonize with the facts of which he is personally cognizant.

FORMATION OF VEINS.

The filling of mineral veins is one of the most difficult subjects in the whole range of geological studies. The more careful the investigation, the more fully aware is the student of the difficulties to be overcome. It is now quite generally admitted among geologists, that several processes have been active in supplying veins with their metallic contents. There are four theories, each of which has been sustained by high authority, and all of which are undoubtedly true in their practical applications. First, the crevices or fissures are supposed to have been formed, and mineral matter, dissolved in water, to have been filtered into them from above. This theory was maintained by Werner, but it probably applies to very few cases of veins. Second, the metallic ores are supposed to have been melted and injected into the rocks by subterranean forces, similar to those concerned in the protrusion of lavas through volcanic craters. Many veins have undoubtedly been filled, as they may often be traced to a mass of rock which has once been lava. Of this kind are the tin and copper lodes of Cornwall, England. This theory was first taught by Hutton, and has been very widely adopted. Third. Another theory is that of sublimation, or the introduction of the metals in the state of heated vapor, which, upon cooling, condensed and formed veins. It is a well-known fact that metals can be vaporized by heat, and that when in this state they naturally ascend, and condense upon cooling. Crystals of galena, specular iron ore, and other metals, are thus formed in the laboratory, in the flues of furnaces, and the craters of modern volcanoes. Similar processes have no doubt been operative in all periods of the earth's history, and must have produced similar results. Fourth, electro-chemical action is supposed to have been exerted, causing a segregation of metallic particles, and thus forming veins. The superior productiveness of the east and west veins is accounted for by the greater facility with which the segregation could take place from north to south, on account of a coincidence between the local and general currents of electricity. It is supposed that by this action constant decompositions, recompositions, and transmissions are being effected. A wide variety of opinion exists among practical miners upon this subject. All these theories have their advocates, each basing his opinion upon the special and local facts which he has observed. The theory of formation from water is stoutly maintained by many who have seen the ore pendent from the roof of caves, associated with stalactites, which are known to have had such an origin. But it is quite certain that this opinion is incorrect. The insolubility of galena in water, its crystalline character, and arrangement in veins, are all incompatible with such a supposition. If we take any one of the other theories mentioned, it fails to explain all the phenomena presented; but each receives support from some of the peculiarities which these veins exhibit.

It is not improbable, therefore, that each of these processes has been in some degree instrumental in producing and arranging these deposits of ore. They may have acted cotemporaneously, or successively, or in both methods.

In the lower deposits, generally arranged in flat sheets, we often find evidences of a highly heated condition of their contents. The rocks inclosing the vein are often harder and more crystalline than those at a distance. The ore and its vein-stone are sometimes intimately combined, resembling in texture the coarse granites and other rocks of igneous origin. In some parts of such veins a segregating force seems to have acted, separating these ingredients, or some one of them, into layers precisely resembling the veins of segregation so often seen in the igneous rocks. Almost every grade of texture may be observed among these vein-stones, as among different beds of granite, sienite, and porphyry. These are entirely confined to the lower deposits, so far as my observation extends. The perpendicular veins carry pure ore, as before mentioned. This ore is attached to the roof and side-walls of their cavernous openings, but is rarely found in place upon the floor of the caves. If we suppose the fissures to have been open, and the ore injected into them, such an arrangement could not have taken place. The fissure would be either completely filled, in such an event, or its lower part only occupied by the ore. It is far more in accordance with the phenomenon to believe that the perpendicular veins were filled by the process of sublimation. The heat, which perhaps melted the lower flat sheets, might be sufficient to vaporize a portion of the galena, which, passing upwards into the vertical fissures, would condense and arrange itself in their upper portions, as we find it now. The absence of vein-stones in these veins is accounted for by this theory, as the lead ore would be volatilized and carried upward at a much lower temperature than its associates.

Another interesting evidence of vaporization is the occurrence of the casts of fossils, formed by the introduction of galena into the cavities of shells, corals, &c. The tubes of delicate corals, sometimes scarcely larger than a hair, are occasionally found filled with the ore; and also the stems of encrinites. I have also a specimen of crystallized galena, which has been formed in and around a mass of fossil shells that have evidently been first worn by water to mere comb. The ore had then been introduced among these delicate remains, and received the impressions of its constituent shells. Evidently, in these instances, the galena must have been in a state of very minute division, and endowed with perfect freedom of motion—conditions which could only be realized by its vaporization. In the absence of sufficient data to warrant a conclusive opinion, I have stated the prevailing theories, and such application of them as seemed most in harmony with facts. From the desultory and irregular manner in which the mines have been worked, it is very difficult to collect facts upon the most intricate points presented in these veins. The observations made may serve as a nucleus for future facts and discoveries, which, in due time, if faithfully gathered, will point out the true theory of their formation.

SURFACE INDICATION OF LEAD VEINS.

There are various indications of the presence of lead veins, all of which are more or less reliable. The general character of the ground is first noticed. A surface cut by frequent ravines, or presenting longitudinal depressions, is always preferred, as these indicate the existence of fissures in the rock below. The discovery of "float mineral," or, more properly, "shovel mineral," is reliable evidence that a vein exists at no great distance from which the scattered ore has been separated. It is usually found in valleys on the sides of slopes, or in beds of clay upon the level surface.

Scattered pieces of tiff, or vein-stones of any kind, are good indications of the same nature as that just mentioned. The growth of vegetation in a linear direction is also relied upon, as pointing out the location of a crevice which may hold "mineral." Certain plants, which thrive best in deep soil, choose such locations as furnish the greatest depth of soft ground. Along the line of the veins, their deep-reaching radicals meet with no obstruction. Hence, lines of rank vegetation often form a prominent object among the surrounding growth, and mark the location of fissures in the rocks beneath. A notion prevails very widely that a certain plant, known as the "masonic" or "lead weed," grows only where its roots are fed by lead ore. This plant is noted for the depth to which its radicals are known to pierce. They are often found from forty to sixty feet below the surface. It is therefore usually found growing over crevices, where its subterranean proclivities can be indulged without restraint. This indication is said to have been learned from the Indians, who used it long before the lead veins of this district were known to the whites. These are the ordinary tangible evidences upon which the miner relies in "prospecting." They are founded upon the well-known relation of things, and experience has proved their genuineness. Certain other processes of discovery are practised by some. The use of various forms of the "divining rod" is the most common of these. From its cheapness and simplicity, it is within the reach of all, though it refuses to exert its enchantment except in favored hands. An instrument called a "tinkembob," much more expensive, but also said to be more reliable, is occasionally met with. As these methods of discovery are entirely arbitrary in their character, and have no reference to the truths of mining science, they are beyond the jurisdiction of my present investigations, and, in the absence of all positive knowledge, I cannot venture an opinion upon their practical value to the explorer.

In prospecting, a general knowledge of geology would be of great service to the practical miner.

Untold thousands of money, and long years of toil, have been wasted for the want of such knowledge. The lead region is covered with "prospect shafts," sunk where the veriest tyro in geology would have pronounced an unconditional negative upon the hope of "striking a lead." The adventurous swarms of "prospectors," who sweep over the mines during the excitement of first discovery, left few of the surface veins unopened. Hence, prospecting is now attended with great risks, and requires superior sagacity and extensive knowledge for its successful prosecution.

WORKING OF THE LEAD VEINS.

It is quite certain that the existence of lead ore had been known to the Indians long previous to the commencement of mining by the whites. Their ancient works still remain to attest the fact. These consist of shallow diggings, and wide furnaces in which the ore was smelted. The natural sagacity of the Indians made them successful prospectors; but, destitute of tools, or skill in operating, they seem to have made slow progress in proving their discoveries. Their working consisted mainly in picking over the soft clays of the surface, or the larger crevices, with hatchets or rude sharp sticks. When their shafts became a few feet deep, ladders were made by cutting off the branches of small trees, about a foot from the trunk. Upon these the squaws, who performed all the labor of mining, descended and ascended, carrying in bags and baskets all the ore which they obtained. These rude ladders were occasionally found among the old "Indian diggings." In some cases, they ran levels a short distance into the sides of the hills, upon veins which they had discovered, using mats and blankets as sleds to draw out the rubbish. Where the vein entered the solid rock, they made fire upon it, and when heated, poured on water, by which it was cracked, and rendered easy of removal. Their metallurgy was equally rude and simple. A rude hopper was built of stones, usually upon the side of a ravine. Into this the ore was thrown, and a fire kindled beneath. When melted, it was run off into a hole dug for its reception.

Such rude attempts at mining seem to have been made previous to any acquaintance with the whites. Later, however, the French traders furnished the Indians with tools, and instructed them further in the art of mining. They also purchased their ores, and gave them in exchange such articles as they required. This stimulated them to farther exertion, so that from 1816 to 1820, considerable quantities of ore were raised by them, which was sold to the traders, and found its way to St. Louis. American mining commenced about 1820, but no considerable amount of ore was raised until about 1827. The lead region then began to attract popular attention. A few bold pioneers were already in the mines, and, amid all the perils of Indian warfare, remained. As soon as the war closed, they recommenced their mining with renewed vigor. The fame of their discoveries went abroad, and brought to the mines thousands of adventurers, who swept over every hill and valley in search of the mineral treasures they were reported to hold. Brilliant discoveries were made, and splendid fortunes acquired. The ore lying near the surface was of course first found, and requiring little skill to secure it, mining was exceedingly simple. No machinery was needed for draining, and no large outlay of capital was required to insure returns. Under such circumstances, no regular or systematic mining could be expected. Every man was a prospector, and preferred breaking ground for a new lead to working for wages, or moderate returns in ground already proved. During the twelve years from 1830 to 1842, machinery was hardly thought of. It was the period of excitement and discovery which always attends the opening of a new mining district. Since that time very few new discoveries have been made, and the work has been mostly confined to old lodes. With few exceptions, even now, the mines are very ineffectually worked. The shafts have been sunk with no view to permanence. Drifts are run off from them wherever indications of ore appear. If the ground is soft, they are supported by temporary cribbing. The rubbish and ore are raised by a common windlass, in wooden tubs called "kibbles." The digging generally ceases at the water line. If, however, the vein is strong enough to warrant it, a lifting-pump, worked by horses or oxen, is put in. In a few instances only, steam-power has been used in working pumps; but from the incapacity of the engines, or injudicious management, it has failed to be profitable.

During the present season, two engine pumps have been started under more favorable auspices—one at Potosi, by Mr. Lewis, and the other at Fairplay, by the American Mining Company. Both these parties have ample means at their disposal, and are determined to make a fair experiment. Water-power has been used in one or two instances, and might be profitably employed in numerous localities. With these exceptions, all the labor of the mines is performed either by hand or horse-power.

Art. IV.—WEST COLUMBIA MINING AND MANUFACTURING COMPANY OF VIRGINIA.—THEIR PROPERTY, OPERATIONS, ETC.

This is the title of a coal mining company which has been very quietly and successfully in operation during the last year, upon the banks of the Ohio river. Their enterprise appears to be of a most respectable character, and in its results aims to control the Western coal market. Although in operation only a year, they have declared two dividends from profits alone. They are confined to the profits entirely for their dividends, by the statute of Virginia, under which their charter is obtained. It may not be amiss to notice this statute for a moment, as it is one the adoption of which in some other States would greatly serve to cut short that practice of paying dividends out of capital sometimes resorted to, and which can never be a part of any legitimate business. The statute is nearly in the words of one of the by-laws of this Company, to wit:—

> Dividends of so much of the profits of the Company as shall appear to the Directors advisable, shall be declared semi-annually by the Board during the months of February and August, out of the profits of the half year ending February first and August first, and the same shall be paid to the stockholders, in the city of New York, upon demand, or to their legal representatives, at any time after the expiration of ten days after the dividend has been declared; but said dividend shall in no case exceed the amount of net profit which shall have accrued to the Company, and if any dividend is declared which shall impair the capital stock, the Director or Directors consenting thereto shall be liable in their individual capacity to said Company for the amount of capital so divided; and every Director present shall be held as consenting thereto, unless he shall forthwith enter his protest upon the records, and give public notice to the stockholders of the declaring of such dividend.

We are not aware that any stock of this Company has ever found its way into the stock market, or that it will do so, and we have therefore examined the particulars relative to the property and operations of the Company with more interest, and especially as it promises rapidly to become an important mining enterprise in the Western States. We shall notice it under both its mining and commercial aspects. The quality and abundance of mineral possessed by the Company, with the facilities of mining, may constitute the one, while the circumstances of its market compose the other.

The location of the property is perhaps its most striking feature as a coal mine. In this respect, it is unusually eligible. It is upon the great bend of the Ohio river, which extends from Letart Falls down to the mouth of the Kanawha, in the county of Mason, Virginia. It is two hundred and three miles above Cincinnati, and two miles below the towns of Coalport and Pomeroy, Ohio. The main seam of coal is found in the river bluff which approaches within fifty yards of the water's edge, and is found in the bluff at such a convenient height, say forty to sixty feet above high-water mark, that the coal can be dropped, in cars over a railway of about seventy yards in length from the mouth of the mine, into flat-boats, barges, and on floats, with no extra handling or expense. The facilities for mining and the character of the coal are set forth with considerable fullness in the first annual report of the Company, from which we improve the opportunity to extract so much as shall serve for the reader's information:—

The railroads which are constructed at the several points on the river's front, are built with a double track, and so arranged that the empty cars are drawn up to the mouth of the mines by the descending loaded cars. The cost of one of these railroads, with complete equipments, is about $800. These circumstances are certainly the most favorable for cheap and convenient handling, a circumstance of such decisive importance, in respect to so bulky and weighty an article as coal. The height of our main coal seam above high-water mark, prevents any possibility of submersion from the river. The bluff referred to, and the ridges which intersect our back lands, are remarkably dry and free from springs; and the dip of the coal being at the rate of about forty feet to the mile, is sufficient to carry off the small quantity of water which seaps in, so that in the important matter of *drainage* we are subjected to neither expense nor inconvenience. The *dip* of the coal is remarkably *uniform* over our entire tract, being at about the rate above mentioned, and falling off in an easterly direction, with a very gradual slope, varying but slightly from the horizontal. The equally important matter of *ventilation* is also conveniently and perfectly secured. These mines are wholly exempt from *fire* damp, as well as *choke* damp, as they are all driven upon an elevated adit level, *shafting being in no case resorted to.* The *roofing* is also excellent, consisting of the usual top slate, varying from six inches to two and a half feet, immediately over which lies a stratum of *solid sandstone one hundred feet in thickness.* This not only gives us a dry roof, but diminishes to the greatest possible extent the expense, often so considerable, of keeping up the roof, and greatly promotes the safety of the workmen, as the main entries can be made almost entirely secure from the possibility of accident by blasting down the slate up to the sandstone. This course we have uniformly adopted. No fatal accident has occurred at the mines during the past half year. The *floor* is of hard slate, which holds the props firmly without their being forced into it by the superincumbent weight, or "squeezing," as termed by the miners. All of the entries thus far driven show a perfect continuity of the seam, with *no faults,* and very slight variation in the thickness of the coal, except a gradual enlargement from the river front, where it is five feet in thickness, at the Laurel Cliff entries above the town of West Columbia, and the Rock House entries below the town, where it is four and a half feet thick, back to the entries opened on the rear tracts, at a distance of about one mile from the river, where the seam, by its gradual enlargement, has attained a thickness of six and a quarter feet. The coal is, therefore, at all points of the property, of sufficient thickness to be worked to advantage.

The quality of our coal is similar to that of the well known Pomeroy coal, which has been mined for a series of years, and is highly esteemed in the Cincinnati and other markets where it has been introduced. The West Columbia vein being a continuation of the same vein which is worked at Pomeroy, produces coal of a quality similar in all respects, unless it be that the *Rock House* coal, obtained from the lower part of the Company's lands, being the farthest removed from the Pomeroy or Coal Port mines, yields a quality of coal preferred by many for family use, while the coal mined at the Laurel Cliff entries is found in all respects similar to the best article provided for steamboats at Coal Port. The quality of our coal is, therefore, all that we could wish in its adaptation to the leading requisitions of the market, to wit: for domestic use, generation of steam, and other manufacturing purposes.*

The property of the Company has been extended until it now comprises a frontage on the Ohio of three miles, and embraces all the available locations for mining and shipment on the Virginia side, making an area of two thousand and fifteen acres. A company, well known at the West, owns and controls all similar locations with an equal frontage on the Ohio side of the river. The Columbia Company estimate their available coal in the main vein as exceeding two hundred and fifty million bushels.

The Company attach considerable importance to their freedom from risk of competition. This is a weighty consideration in a commercial view; and to those who are not familiar with the course of the Western coal market, we present these views for their information. They say:—

Our advantage, in this important respect, is most decided and unequivocal. This may be matter of surprise to some who merely infer that there are numerous favorable locations for mining coal at the West, from the well-known extent of the Western coal basins.

* In the analysis, portions about equal in quantity were taken from the several lumps brought for the purpose, these were pulverized and intimately mixed in the manner which is called "sampling," in order to have the result, not of a selected specimen, but of an average. Of this mixture, 100 grains were taken for analysis, and the following is the result:—

	Grains.
1. Hygrometric water, dried out by a heat of 212 degrees	4.32
2. Volatile matter, expelled by a red heat	35.73*
3. Coke remaining after the heat	59.95
4. Combustible matter contained in the coke	54.24*
5. Incombustible matter or ashes	5.71
6. Whole combustible matter, fixed and volatile	89.97*
7. Incombustible matter, composed of water and ashes	10.03
	100.00

The quantity of ashes is so small as to indicate rather unusual purity. The best cannel coal usually contains three per cent. of ashes, and our common coal more than six per cent. The ashes are of a light dove-color, as by specimen No. 5.

JOHN LOCKE.

P. S.—We distilled 50 grains of your coal, at a red heat, and obtained 35.7 cubic inches of coal gas, with the usual quantity of coal tar. 100 grains would yield 71.4 cubic inches of gas, and a cubic foot of the solid coal (83 lbs.) would yield, at the same rate, 240 cubic feet of gas.

This error is adverted to by Professor Mather, Principal Geologist of the State of Ohio, in his second Annual Report, as follows, to wit: "The impression is too common among our citizens, that as coal and limestone occur on the upper and lower Ohio in several places, and on the Mississippi above the Ohio, that these useful substances are common over the whole Western country. This is far from being the case. The lower Mississippi Valley is to be supplied with coal from the coal regions of the upper Ohio river, in Ohio, Kentucky, Virginia, and Pennsylvania; from the lower Ohio coal basins on the Green and Wabash rivers, and from the coal formation of Illinois and Missouri. These coal basins embrace, it is believed, all the accessible coal of the Valley of the Mississippi, except the coal formation far up the Arkansas river, in the western part of Arkansas, and in the Indian country west of it."

The lands of this Company are located upon the outcrop of the great Allegheny coal field, where its lowest series crosses the Ohio river. There are several veins of the same series, showing themselves a few miles below us, but they are of an unimportant character, excepting the Hanging Rock vein. This attains to a workable thickness of three and a half feet, but is located at a distance of six miles from the river, and being mined in moderate quantities, is consumed almost wholly on the spot, in the manufacture of iron. This vein at the lowest edge of the series, with the West Columbia and Pomeroy main seam, comprise (with several intermediate smaller veins) the *lowest group* or series of out-crops of the great Allegheny coal field. The general range of this outcrop is from north-eastern Ohio and north-western Pennsylvania, in a south-westerly direction, across the State of Ohio, leaving about four-fifths of the State west of the outcrop, and crossing the Ohio from West Columbia to Hanging Rock. These points are distant from each other, upon an east and west line, about twenty miles.

Four-fifths of the State of Ohio, lying west of this outcrop, is then wholly destitute of any coal deposits. In like manner, there is no coal to be found on the Ohio river, from its intersection by the outcrop of this lower series, for a distance of 475 miles, to wit, at Cannelton, Indiana and Hawsville, Kentucky, which are located 272 miles below Cincinnati, and 122 below Louisville. This immense interior district, south as well as north of the Ohio, together with a course of nearly 500 miles of the Ohio river below us, is dependent wholly upon the mines of the upper Ohio for their supply, which no location can so conveniently or cheaply furnish as our own. The Cannelton and Hawsville mines are located on the upper limit of the Indiana coal field, referred to above, by Professor Mather, as the coal basin of the Green and Wabash rivers, at the point where it crosses the Ohio river, and passes down into south-western Kentucky.

From the dividing line of the States of Ohio and Indiana, the rocky strata are found to dip in opposite directions. In Indiana they slope to the west, and in Ohio they slope to the east. This general arrangement of the strata was ascertained by examination at numerous points, by Dr. Owen, of Indiana, and Dr. Locke, of Ohio. The carboniferous strata of each State conform to this general dip, and the intermediate district between Cannelton, Indiana, and Hanging Rock, Ohio, consists chiefly of a continuous limestone formation or stratum of great thickness, (estimated by geologists at one thousand feet and upwards,) which appears to have been protruded by an upheaving force, through the superincumbent strata, so as to cause them to slope off in opposite directions, as above described. This limestone region, lying below the mineral district, forms the basis of the great agricultural wealth of the States of Ohio, Indiana, and of Northern Kentucky. This district forms the convenient and natural market for the various mineral productions of the country above it.

About West Columbia, there is, however, no coal found, on either side of the river, for a distance of two hundred miles, to Wheeling, Virginia. The coal mined at that point is of an inferior quality, and though extensively used on the spot for manufacturing purposes, cannot be shipped with advantage so long as the markets below are supplied with a better article. Above Wheeling, coal veins are occasionally worked along the river for local use. At Pittsburg, ninety-six miles above Wheeling, there are numerous mines. Their product is chiefly consumed in the city and its vicinity, for manufacturing and other purposes. Above Pittsburg a superior article of coal is mined, termed the "*Youghiogheny*" coal, from the name of the river upon which it is found, being a tributary of the Monongahela, which, by its confluence with the Allegheny at Pittsburg, forms the Ohio. Before the introduction of the Pomeroy coal, the city of Cincinnati obtained its chief supply (by shipment upwards of six hundred miles) from the Youghiogheny mines of Pennsylvania.

Upon the rivers Hocking, Muskingum, Guyandotte, Sandy, and Kanawha, being tributaries of the upper Ohio, coal is to be found, but at points so remote from their mouths, the chief openings being located at a distance of seventy to one hundred miles up these smaller streams, that their limited product, and still more limited delivery in the general market on the Ohio, can never interfere with our operations.

So far as relates to competition by railway, that which can arise by the connection of Cincinnati with some point on the Western outcrop of the Alleghany bed is such as to render the freight alone greater than the entire cost of mining and sending to market the coal of the Columbia Company.

The business of the first half year paid a current profit somewhat exceeding three cents per bushel of coal. The demand has been rapidly on the increase, and the Company estimate that at a profit of one and a half cent, their main vein will yield $3,191,814.

The contract system adopted by the Company in mining their coal is worthy of notice:—

At a certain date annually the Company fixes, by selection from its men, upon a certain number of contractors corresponding with the number of rooms to be worked. These contractors, having each the control of a room or "chamber" with a breast of coal 50 feet in width, and capable of accommodating several additional diggers, are the only parties under this system employed directly by the Company. They have the privilege of working their respective rooms to the best advantage. The contractor is in effect entitled to this control during good behavior, or so long as he may be annually selected by the Company for his skill and faithfulness. He gets the established price per ton for all the coal that is turned out from his room. If he employs four men, five days' work is allowed for the room, and fifteen tons is considered its fair average daily yield. The contractor makes a profit, of course, from his subordinates; for it becomes his interest to bring in raw labor to do the bulk of the work, which does not require his mining skill and experience. This he gives from time to time, thus converting common laborers into skilful miners for the future use of the Company. With this process the contractor is well satisfied on account of the extra profit; for he can hire common laborers at low rates. The subordinates, with whom the Company in the outset has nothing to do, becoming in time good miners, are liable to be selected as contractors. This system keeps all parties on good behavior, while, by a suitable division of labor, the capacity of skilful workmen is greatly economized and effectively directed. The contractor starts the borings for his men, oversees all their work, keeps the room in safe condition, and digs himself, when he has opportunity. The workmen dig the coal, load it into cars, deliver it at the main entry, and *learn the business.*

This the Board considers to be the most effective system of work, combining also important incidental advantages, and they are therefore adopting it at the West Columbia mines. The increased production resulting from the employment of more miners will be material. Our rooms thus far opened have, to be sure, a breast of but 30 feet of coal; but this will admit of three diggers working to advantage, with the requisite shovellers and haulers. It may fairly be supposed that the adoption of this plan in the 150 rooms now available, would at least double their production upon the present system; and, by adopting this course, there need be no delay in bringing in additional diggers; for they can all get employment under the contractors. It may again be considered a moderate calculation that the contractor and his two diggers would turn out from each room 240 bushels per diem, which would make from the 150 rooms now opened, 36,000 bushels, or 1380 tons per diem, which shows what would be the efficiency of such a system carried fully into operation.

While the Board will take the means of steadily approximating this result and continue to open off new rooms to be thus worked, it is not considered requisite that anything like this rate of production should be *immediately* attained to enable the Company to satisfy all reasonable expectations. All the rooms now opened, and being opened, will be worked. The following moderate estimate of the product of coal for the half year ending 31st July, 1854, is accordingly submitted, viz.:—

Average 150 diggers at 80 bushels each, or 12,000 bushels daily, at 20 working days allowed per month, is average monthly yield,	240,000 bushels.
For six months, ...	1,440,000 "

But there are other mineral treasures in this property too important to be passed over without notice. Some of them are even now yielding a revenue to the Company. The manufacture of salt is carried on extensively by them. One furnace, somewhat defective in construction, has been in operation some months. These defects they are gradually removing, and at the same time are constructing an additional furnace. The product of the first furnace, after a few improvements, is estimated at 120 barrels of 8 legal bushels (50 lbs.) per day. That of the other is estimated at 100 barrels per day. The entire product which may be manufactured during 1854 has been sold to the Kanawha Salt Company at 19 cents per bushel, delivered at the furnaces, which is a profit to the Columbia Company of 10 cents per bushel.

The process of salt-making followed at West Columbia is precisely that which has been in use for many years at the Kanawha salines. The brine has the same chemical composition, or with but slight difference. The quality of the salt made is the same, and its value the same at Cincinnati and other markets of the West, all of which are mainly supplied from these sources, including Pomeroy, Ohio.

A careful analysis was made of considerable quantities of the brine by the State Assayist of Massachusetts, Prof. A. A. Hayes, of Boston, whose report is quite extensive and valuable; so much so, indeed, that we here insert it entire:—

REPORT ON THE BRINE AND BITTERN OF THE WEST COLUMBIA MINING AND MANUFACTURING COMPANY, AS THE RESULTS OF CHEMICAL ANALYSES.

The brine presents no unusual physical character when first exposed to air, but after some hours a yellowish brown flocculent deposit takes place—

due to the presence of a minute quantity of crenate of oxide of iron. This ochrey matter may be traced into the salt, formed from the brine by a rapid evaporation, while the bittern is free from it entirely.

The substances present are common salt, chlorides of calcium and magnesium, sulphate of soda, bromide, and iodide of magnesium, crenate of oxides of iron and manganese. Potash was detected in the salt, besides a minute quantity of alumina.

At the temperature of 60 degrees Fahrenheit, one gallon of this water weighs 61 947 grains, and has the specific gravity 1.06125, compared with water 1.00000.

One gallon of this water afforded :—

	Grains.
Pure water	57,027.40
Chloride of sodium (common salt) . . .	4,054.69
" magnesium (bittern)	254.06
" calcium (mur. lime)	531.21
Sulphate of soda (Glauber's salts) . . .	42.50
Crenate of iron and manganese	16.61
	61,926.47
Loss	20.53
Total	61,947.00

Bromine, idoine, and organized organic matter are also indicated.

One gallon of this water, slowly evaporated and the residue dried without decomposition, afforded 5429 grains of saline matter.

One gallon will afford of *dry, pure* common salt, 2867.9 grains, or 6$\frac{9}{16}$ ounces, avoirdupois, besides that remaining in the bittern.

It will be observed that the proportion of chloride of calcium is more than twice as large as that of the chloride of magnesium, while in the sea-water brine, chloride of magnesium, quite free from chloride of calcium, is found. There are not many salt springs known where the lime compound forms so large a part of the saline matter, and the perfect purification of the salt is attended by unusual difficulties.

The suggestions which have arisen during the analytical trials, have reference to the more economical manufacture of the salt, and the subsequent purification, briefly as follows: — As the brine, when freshly pumped, contains about 8¾ per cent. of saline matter, it is in the right condition to be treated as in Europe, by the process of "graduation," by which more than half the water would be evaporated without fuel, and a transparent, clean brine, of about 18 per cent. salt, would be obtained. A suitable graduation would thus allow the pans to do double the present work for the same capacity. Graduation would require the raising of the brine to a higher level than the pans, and the erection of houses, or mere shed roofs for protection from storms.

Without entering into details, the general plans of the German salt-works (Knapp's Applied Chem. Vol. I.) might be applied with modifications adapted to climate changes.

By the process of graduation, there is not solely a great saving of fuel, but all depositions and changes in the brine take place before the boiling commences, hence the pans are less subject to injury, aside from a greatly increased production. The plan also insures a regular production of a particular grade of salt, which, once fixed upon, may be always obtained.

Under the present plans the salt is largely mixed with the bittern, which being more abundant than is usual, is also more deliquescent and injurious. An economical method for removing this can be easily put in practice. This contamination is excessively soluble in water, and is contained in the planes formed on the crystals in layers. To remove it by means of water would cause the solution of a part of the salt itself, but if the liquor used for washing is at first a saturated solution of purified salt, a substitution would take place, salt would be deposited on the crystals, rendering them more solid, and the bittern would pass away. A saturated solution of salt would of course dissolve no more; it may be used freely without loss of salt therefore. The trials made here were perfectly successful, and the salt on exposure did not become moist, while the fluid which passed away was nearly pure bittern.

To carry out on a large scale this plan of washing, the store-houses might be divided so as to form bins of three or four hundred bushels content each. The floor, made tight by means of coal-tar and lime-mortar, should slope, with a narrow border to lead the bittern into a receptacle. At the lowest point the side should leave an interstice between it and the bottom, through which the fluid would drain. Above the tops of the bins the solution of salt already saturated would flow in troughs and be dispersed by means of an ordinary showering rose over the whole surface, in quantity determined beforehand by trial. The salt could thus be left twenty-four hours, or longer, to drain, when it would be marketable, and would rather lose weight by drying, than attract moisture on exposure.

The rapidity and certainty of this plan render it important; its complete efficiency will, in a measure, depend on the form and size of the crystal of salt manufactured. On this point too much attention can not be given, for not only is the marketable value of the salt affected by the kind of crystal, but its application is restricted within narrow limits, unless a clean, large crystal is produced. The "keeping" qualities of salt in packing meat really depend more on the form and size of the crystal, than on its chemical purity; although, as a general remark, the coarser and harder the crystal, the greater the purity of the salt. As the coarse crystals are never obtained by a rapid crystallization, whenever it becomes necessary to produce that description of salt extensive arrangements must be made to increase the surface of the receptacles for boiled brine, and slow evaporation must be permitted.

It will be observed that the plan for purifying does not call for twice handling of the salt; it calls for perhaps twenty-four to forty-eight hours lapse of time in the storage only. The salt liquor for washing is obtained by letting water remain on an excess of salt, with frequent agitation. The solution should be saturated fully, that it may deposit its salt rapidly, as it passes among the crystals in removing the bittern. This plan is equally applicable to fine-grained salt, such as table salt, and should be resorted to as a means of partial or complete purification in all cases.

Bittern.—The sample as received was of a pale, yellowish tint, an oily consistency, and had a specific gravity of 1,3875.

By evaporation a few crystals of salt were obtained, but they re-dissolved on exposure of the fluid. Practically, therefore, this bittern contains no salt which can be separated, and may be considered as a solution of hydrochlorate of lime and hydrochlorate of magnesia, with hydrobromate and hydroiodate of these bases.

In an economical view, its value is dependent on the presence of the hydrobromates and the magnesia contained in it. The separation of the bromine from the hydrobromates is now an important business, and the best method as adapted to this bittern has been sought for. This would be more simple if bromine alone were present, but as it occurs with iodine, and both as compounds in the bittern, an indirect mode must be adopted. Another body, ammonia, is also present in this bittern, which must be decomposed before bromine or iodine can be separated.

The bittern, contained in wooden vessels, must first be mixed with a clear solution of common bleaching powder, when an effervescence will ensue, and a very offensive odor will be emitted, due to the decomposition of ammonia. When this ceases, the liquor must be saturated with chlorine, either prepared apart, or by the action of muriatic acid added to the fluid, upon finely-powdered manganese oxide mixed with it, and the whole heated. In the sample sent here there is very little iodine, and I found that the fluid might be mixed with a clear solution of bleaching powder, placed in a leaden vessel, which could be heated, and on adding muriatic acid and applying heat, the vapors of bromine rose freely, and were condensed in common oil of vitriol kept cold.

A large vat or tub lined with lead, having a head or cover, with a pipe leading into a leaden vessel of oil of vitriol, would be required, and the heat can best be applied within by a leaden steam-pipe coiled in the vessel. A solution of bleaching powder is to be added, until about two per cent. of chlorine is present; the addition of two per cent. of muriatic acid will then decompose the hydrobromate and color the fluid. By heating the mass, the vapors which rise will be condensed in the oil of vitriol, from which fluid bromine will be produced, and can be decanted or drawn from below and washed in water.

More specific directions will be forwarded whenever this manufacture is to be introduced. Respectfully, etc.

In connection with the above there are inserted in this report assays of iron ores and limestone, which present quite satisfactory results.

For the purposes of transportation the Company has in use 50 flat-boats, with a capacity of 6,000 to 10,000 bushels each, in which the coal is floated from the mines to Cincinnati and other intermediate ports.

These boats are provided with oars and sweeps, and manned with 4 men each, besides the pilot. They generally go lashed in pairs, with one pilot to a pair. These flat-boats are of a very light construction for the transportation of so heavy an article as coal; and, being controlled only by hand power, there is a considerable risk of loss from the violence of the current in high water, snags in low water, ice, and high winds. This risk is indeed small from West Columbia to Cincinnati, compared with that which is encountered by the Pittsburg and Monongahela boats, which make a voyage of 500 to 600 miles or more.

It has been the purpose to use substantial barges for getting the coal to market, so as to reduce to an unimportant minimum the risk of loss on the river. The barges are substantially built of 4-inch stuff for the siding, while the flat-boat sides are but one inch in thickness. The barges are 100 to 130 feet long, by 18 to 20 feet broad, and 7 feet deep. They contain about 10,000 bushels. There are now 16 of these barges. These barges are for towing by the Company's steam tow-boats expressly fitted up for this use, and for towing back the empty barges to the mines.

The Company say:—

The increased production from the mines renders it indispensable, however, that we should be provided with another tow-boat of good power and light draught, so as to be thoroughly efficient at the lowest stage of navigation. The Board is about closing a negotiation for such a boat, as well as for securing several additional barges for immediate use.

These two boats being kept constantly plying between West Columbia and Cincinnati can clear out the coal as fast as mined during the spring and summer, and until after the usual August rise. Upon the resumption of navigation for larger boats in November, a third tow-boat will be necessary in order to place the meeting of our contracts for the winter of 1854–5 beyond contingency. This boat, as it is not immediately wanted, will be built by the Company during the summer instead of being bought; thus enabling us to combine in her model and outfit all the qualities suitable for the purpose

At the three railways for loading, now in use, we can keep the two tow-boats constantly supplied with loaded barges during the spring and summer, as 4,000 bushels per diem can be loaded at each railway. The new railways projected at Laurel Cliff, and at the foot of Loring and Johnson streets, will be completed, with entries open for the delivery of coal, by the time the third tow-boat is finished.

In addition to these facilities for a rapid and efficient transportation of our coal to market, the Board has authorized the construction of a number of small, light-draught barges or floats, capable of containing 3,000 to 4,000 bushels each, as an important facility for getting down coal in tow of a light-draught steamer at the *lowest stages of navigation* in September and October.

It is not requisite to seek any market below Cincinnati, and no arrangements for transportation below that point are therefore needed. With 26 to 30 barges there will be a sufficiency, allowing six loads constantly going down stream, six empty barges with flats being towed up, as many more for reloading at the mines and unloading at Cincinnati or other ports of destination.

Loaded barges can be safely moored for any requisite period along the shore below the Rock House entries, or at the Company's depot on the Kentucky shore, 4 miles above Cincinnati, or at our Cincinnati wharves.

No means for transportation of the salt manufactured by the Company are now needed, as under existing contracts it is all taken by the buyers at the furnaces—they providing their own means of transportation. It is, however, probable that the Company will get a part of this carrying business on its tow-boats, so far as the salt made at West Columbia is destined for *Cincinnati*, and intermediate markets; and, at any future time, this mode of transportation can be adopted by the Company, if it is thought best to deliver our salt for sale in the general market.

From the report respecting sales, the Company have more orders than they can supply. The aggregate quantity deliverable, under all the contracts entered into, is limited for the present by a vote of the Board to 150,000 bushels per month, as it is deemed important to accumulate a full stock in the Cincinnati yards before the next winter.

The Company's wholesale prices vary from 7 to 8½ cents, depending on the stipulations respecting delivery and other circumstances.

We must take leave of this subject by an extract from the report relative to the dividends, that *sine qua non* of all enterprises. In doing so, we cannot refrain from expressing a regret that there is so much valuable and interesting information in these extensive documents which we have been obliged to pass over without even a notice or allusion to it:—

The first semi-annual dividend, declared and paid in August, 1858, was computed upon the capital stock of $600,000 under the act incorporating the West Columbia Mining and Manufacturing Company. The rate of the dividend, you will recollect, was 3 per cent. The association with us of the Cincinnati and West Columbia Mining and Manufacturing Company has increased the amount of the issue of capital stock certificates to $842,000; and it is upon this aggregate issue that the second semi-annual dividend, being at the rate of 5 per cent., has been declared and paid.

For the purpose of equalization, Eastern stockholders are paid in the

Treasurer's sight checks on New York; while Western stockholders are paid in current funds at Cincinnati, adding 1 per cent., being the current rate of exchange on New York. The terms of our by-laws require that each dividend shall be paid in New York, which is thus virtually done.

The consolidation of the two Companies is practically complete; yet the formal act of the Legislature is requisite before the new issue of certificates is made covering the aggregate capital of $1,000,000.

All future dividends will be computed upon the entire capital of $1,000,000; and the rate of our progress in the development of the property justifies the belief entertained by the Board that the third semi-annual dividend payable in August next, will be 6 per cent. upon the entire capital of $1,000,000. The magnitude and steadiness of the demand for our products, together with the trifling competition to which we can be subjected, and the efficiency of our plan of operations, justify this expectation. Nor do we believe that any circumstance or impediment can seriously impair our ability to secure for the Company the most favorable results which have at any time been anticipated.

By reference to the last semi-annual Report, pp. 20, 21, and 22, it will be seen that when our mining and manufacturing operations are rendered completely efficient in all respects (limiting the business, however, to coal and salt), we look for such a rate of profits as will enable the Board to divide 10 per cent. half-yearly. The business of the Company will continue to be developed with such care and energy as to steadily approximate this result, which, as an ultimatum of profit from the property, will doubtless be satisfactory.

The Report of the Superintendent of operations, and that of the Treasurer, are given entire in these documents; also much information relative to the coal supply to Cincinnati, and an abstract of the title of the Company. Respecting the demand in Cincinnati, it is said, "In 1825 the iron manufactures had got fairly under way, and needed coal, but there was no private consumption. In 1835, the Pomroys had got their mines in operation, and coal began to be used in private families. In 1845–6, about 2,500,000 bushels were consumed. In 1851–2, about 6,000,000 were consumed at and around Cincinnati. In 1854, the demand will require not less than ten million bushels. Considering that Cincinnati is increasing at the rate of twelve per cent. per annum, and that the consumption of coal (in consequence of increased consumption, commerce, and distribution by lines of transportation,) is really increasing much faster than that ratio, the demand for coal in 1859 will not be less than twenty million bushels."

Art. V.—THE RUDISEL GOLD AND COPPER MINE OF NORTH CAROLINA.*—By Stephen P. Leeds, Geologist.

The Rudisel Mine is immediately contiguous to the town of Charlotte, Mecklenberg county, North Carolina, the north-east line of the property adjoining the town lots.

* A Report upon the Reid Mine, and also further remarks upon the Rudisel Mine, will be inserted in the June Number of this Magazine.

It is situated upon a hill, near the centre of the property, about one hundred feet in elevation, which rises somewhat abruptly, and is intersected by the vein, which passes entirely through it.

The tract holds an extent of ninety acres; some forty acres, being that portion which lies next the town, is nearly level; the remaining fifty acres comprise that section which is situated upon the hill and immediately around it.

The geological formation of this tract is the same as that of all the gold-bearing strata of this rich region—a chloritic or talcose slate, reposing upon granitic rock, and intersected by veins of ferruginous quartz, carrying valuable working quantities of gold, terminating in yellow sulphuret of copper highly charged with gold.

The course of the vein is North 80° East, by South 80° West; the dip, or underlie, is 45° West. It varies in width from three to four feet, and extends over half a mile. With the exception of that portion of it which occupies the face of the hill, and the immediate summit, it has never been worked. This unopened part of the vein is destined to afford as great returns as any point of it which has been explored, if any reliance may be placed upon an unbroken continuation of the same favorable outcrops over its full length. There is also another vein running parallel with the main vein, forty yards west of it, across the whole tract. The main vein is a continuation of the mineral lead of the Bush Hill and Charlotte Mines on the north course of the lode, and on the south it continues into the Wilson Mines. It cannot be possible, with such rich extremities, and a proven rich centre, that the unopened part of the vein on this tract can be otherwise than extremely valuable.

The vein can be worked down to any depth; and, as the formation is uniformly regular, it is highly probable that the main and the west vein unite at the depth of some five hundred or six hundred feet. If this hypothesis is confirmed—and there are many indications to believe it eventually will be—the yield of ore at this junction will be beyond the bounds of computation. Two such veins uniting at that depth must give results such as are but seldom found. The indications alluded to are the continuous contiguity of the veins, the slight variation of dip, and the absence of the upheaval of the granitic rock beyond the hill on the course of the veins. There are some minor facts, unimportant in themselves, yet held in connection with the main evidence, which tend to strengthen this conviction—such as those peculiar mineral characteristics, which, like individual features, ever appertain to every mine; the proportionate admixture of vein and gangue-stone, and others, valueless separately, but powerful in combination.

The branch or stream, from the mine to Bissel's pond, has been worked over some two or three times, producing a very liberal supply of gold each time, affording rich wages to the workmen engaged in the search. This branch passes at the foot of the abrupt face of the hill, and has received its gold from the gradual wearing down of the hill through a long series of years.

The line of this tract lies for about half a mile on the borders of the railroad, and the turnpike passes through the same portion of it, in that part which approximates the town, rendering about forty acres highly desirable for building lots, which are already in demand and sought after. It would be a matter of consideration whether it would be most profitable to sell now, or retain the property for a still further advance in value. That it must eventually attain an increased valuation is highly certain.

Capt. Penman, who had charge of the mine some fifteen years since, drove a level from the hollow to the mine, about one hundred and fifty feet on the course of lode in west vein. A cross-cut was opened east from the level, and, upon reaching the main vein, cut into it four feet, and drove on it, each way taking out ore, the vein keeping four feet wide. On the north end, he followed on until the surface was nearly reached, then sunk a shaft on west side of vein down to water, and worked out ore on back of lode. At the south end, he drove on Chevalier's old working, which had been worked down to depth of eighty feet. He cleaned out this old engine shaft, and put in a column of pumps, but could not free it from water, the feeder being too strong, and the engines too old and not in good working order, the boilers leaking badly. At this point of operations the mine was abandoned, for want of means to drive forward, and it has not been worked since, except such surface work as has been carried on by the rough and imperfect means of the resident miners in this vicinity, who have operated solely on their own account and responsibility, realizing from two to ten dollars per day each man.

At the floor of the Chevalier's shaft, when the work was abandoned, the ore was exceedingly rich, carrying a four-feet vein of yellow sulphuret of copper richly charged with gold. The above facts are mentioned to show that the vein has been fully proved.

It is at this point that operations could be very profitably renewed. The ore can be readily reached by suitable machinery, and a large amount of ore raised from a very early date after the re-opening of the mine.

When in operation, this was considered one of the first quality of mines in this State, and was regarded as being equal to the Copp's Mine.

JOURNAL OF MINING LAWS AND ORGANIZATIONS.

THE JOINT STOCK LAW OF THE STATE OF CONNECTICUT.

Title 3, Chap. XIV. *of Revised Stat.*, 1849.

Sec. 195. All corporations organized and established under the provisions of this chapter, shall be capable to sue and be sued, plead and be impleaded, answer and be answered unto, appear and prosecute to final judgment in any court or elsewhere; to have a common seal, and to alter the same at pleasure; to elect in such manner as they shall determine all necessary officers; to fix their compensations and define their duties; to order and establish by-laws for the government and regulation of their affairs, and to alter and repeal the same; and to employ all such agents, mechanics and other laborers, as they shall think proper.

Sec. 196 Any number of persons not less than three, who, by articles of agreement in writing, have associated or shall associate, according to the provisions of this chapter, under any name assumed by them for the purpose of engaging in and carrying on any kind of manufacturing, mechanical, mining, or quarrying business, or any other lawful business, and who shall comply with the provisions of this chapter, shall, with their successors and assigns, constitute a body politic and corporate under the name assumed by them in their articles of association.

Sec. 197. The amount of the capital stock in every such corporation shall be fixed and limited by the stockholders in their articles of association, and shall in no case be less than four thousand dollars, nor more than three hundred thousand dollars, and shall be divided into shares of twenty-five dollars each.

Sec. 198. The purpose for which every such corporation shall be established, shall be distinctly and definitely specified by the stockholders in their articles of association; and it shall not be lawful for said corporation to direct its operations or appropriate its funds to any other purpose

Sec. 199 When any number of persons shall have associated according to the provisions of this chapter, any two of them may call the first meeting of the corporation at such time and place as they may appoint, by giving notice thereof in any one or more newspapers, published in the county in which said corporation is to be established, or in any adjoining county, at least fifteen days before the time appointed for such meeting.

Sec. 200 The stock, property, affairs, and business of every such corporation shall be under the care of, and shall be managed by, not less than three directors, who shall be chosen annually by the stockholders, at such time and place as shall be provided by the by-laws of said corporation, and who shall be stockholders, and shall hold their offices for one year, and until others shall be chosen in their stead.

Sec. 201. Every such corporation shall, by their said name, have power to acquire and hold all such lands, tenements, and hereditaments, and all such property of every kind as shall be necessary for the purposes of said corporation, and such other lands, tenements, and hereditaments, as shall be taken in payment of, or as security for, debts due to such corporation, and to manage and dispose of the same at pleasure.

Sec. 202. The directors of every such corporation shall choose one of their number to be president, and shall also choose a secretary and treasurer, and such officers as the by-laws of the corporation shall prescribe, who shall hold their offices until others shall be chosen in their stead

Sec. 203. The directors may call in the subscription of the capital stock of such corporation by instalments, in such proportion and at such times and places as they shall think proper, by giving such notice thereof as the by-laws shall prescribe; and in case any stockholder shall neglect or refuse payment of any such instalment for the space of sixty days after the same shall become due and payable, and after he shall have been notified thereof, the stock of such negligent stockholder shall be sold by the directors, at public auction, giving at least thirty days' notice thereof in some newspaper published in the county where the business of such corporation is transacted, or in an adjoining county, and the proceeds of such sale shall be first applied in payment of the instalment called for, and the expenses attending the call, and the residue shall be refunded to the owner thereof; and such sale shall entitle the purchaser to all the rights of a stockholder, to the extent of the shares so bought.

Sec. 204. A majority of the directors of every such corporation, convened according to the by-laws, shall constitute a quorum for the transaction of business; and a majority of the stockholders present at any legal meeting shall be capable of transacting the business of that meeting, and at all meetings of such stockholders, each share shall entitle the holder thereof to one vote.

Sec. 205. The directors of every such corporation, for the time being, shall have power to fill any vacancy which may happen in their board by death, resignation, or otherwise, for the current year.

Sec. 206. If it shall so happen that an election of directors in any such corporation shall not take place at the annual meeting thereof, in any year, such corporation shall not thereby be dissolved, but an election may be had at any time within one year, to be fixed upon, and notice thereof to be given, by the directors.

Sec. 207. The books of every such corporation containing their accounts, shall at all reasonable times be open for the inspection of any of the stockholders, and as often as once in each year, a statement of the accounts of such corporation shall be made by order of the directors.

Sec. 208. Every such corporation may increase its capital stock, and the number of shares therein, at any meeting of the stockholders specially warned for that purpose, provided that the amount so increased shall not exceed the amount authorized by the provisions of this chapter.

Sec. 209. The stock of every such corporation shall be deemed personal property, and be transferred only on the books of such corporation in such form as the directors shall prescribe; and such corporation shall at all times have a lien upon all the stock or property of its members invested therein for all debts due from them to such corporation.

Sec. 210. Before any corporation formed and established by virtue of the provisions of this chapter shall commence business, the president and directors thereof shall cause their articles of association to be published at full length in two newspapers, published in the county in which such corporation is located, or in an adjoining county; and shall also make a certificate of the purposes for which such corporation is formed, the amount of their capital stock, the amount actually paid in, and the names of their stockholders, and the number of shares by each respectively owned; which certificate shall be signed by the president and a majority of the directors, and deposited with the secretary of this State, and a duplicate thereof with the town clerk of the town in which such corporation is to transact its business; and said secretary and said town clerk shall respectively record the same in books to be kept by them for that purpose; and within thirty days after the payment of any instalment called for by the directors of such corporation, a certificate thereof shall be made, signed, deposited, and recorded as aforesaid.

Sec. 211. If any such corporation shall increase its capital stock as before provided, the president and directors shall, within thirty days thereafter, make a certificate thereof, which shall be signed, deposited, and recorded, as in the preceding section is provided.

Sec. 212. Every such corporation shall annually in the month of January, or of July, make a certificate containing the amount of their capital actually paid in, the amount of their debts and credits at the time of the making of such certificate, as nearly as the same can be ascertained, with the name of each stockholder, and the number of shares held by him at the date of such certificate, which certificate shall be signed by the president and secretary of said company, and deposited with the town clerk of the town in which such corporation transact their business; and whenever any stockholder shall transfer his stock in any such corporation, a certificate of such transfer shall forthwith be deposited with the town clerk as aforesaid, who shall note the time of said deposit, and record it at full length in a book to be kept by him for that purpose; and no transfer of stock shall be valid as against any creditor of such stockholder until such certificate has been so deposited; and all certificates of transfers of stock made pursuant to the provisions of this section shall be valid without being verified by the oath or affirmation of the person subscribing the same.

Sec. 213. The certificates required by the three preceding sections, except certificates of transfers of stock, shall be made under oath or affirmation of the person subscribing the same; and if any person shall as to any material facts knowingly swear or affirm falsely, he shall be deemed guilty of perjury, and be punished accordingly.

Sec. 214. If the capital stock of any such corporation shall be withdrawn and refunded to the stockholders, before the payment of all the debts of the corporation for which said stock would have been liable, the stockholders shall be liable to any such creditor of such corporation, in an action founded on this statute, to the amount of the sum refunded to them respectively as aforesaid; provided always, that if any such stockholder shall be compelled by any such action to pay the debts of any creditor, or any part thereof, he shall have the right, by bill in equity, to call upon all the stockholders to whom any part of said stock has been refunded, to contribute their proportional part of the sum paid by him as aforesaid.

Sec. 215. If the directors of any such corporation shall declare and pay a dividend when the corporation is insolvent, or any dividend the payment of which would render it insolvent, knowing such corporation to be insolvent, or that such dividend would render it so, the directors assenting thereunto shall be jointly and severally liable in an action, founded on this statute, for all debts due from such corporation at the time of such dividend.

Sec. 216. If the president, directors, or secretary of any such corporation shall intentionally neglect or refuse to comply with the provisions of, and to perform the duties required of them respectively by the 210th, 211th, and 212th sections of this act, such of them so neglecting, shall jointly and severally be liable in an action founded on this statute, for all debts of such corporation contracted during the period of any such neglect and refusal.

Sec. 217. If any corporation, organized and established under authority of this chapter, shall violate any of its provisions, and shall thereby become insolvent, the directors ordering or assenting to such violation shall jointly and severally be liable in an action founded on this statute, for all debts contracted after such violation as aforesaid.

Sec. 218. The General Assembly may at any time, for just cause, rescind the powers of any corporation created pursuant to the provisions of this chapter, and prescribe such mode as may be necessary or expedient for the settlement of its affairs.

DECISION OF THE COMMISSIONER OF PATENTS.

Interference between Burrows, Wetherell and Jones.

So far as two of the present parties are concerned (in relation to each other), this case has before been considered by the Office, but such was then the state of the evidence that neither party seemed entitled to the patent for the subject-matter of that controversy—both parties desiring permission to take further testimony, and another competitor presenting himself, a second interference was declared and another trial given.

As between Burrows and Wetherell some new facts and circumstances have been brought out which will aid in fixing priority.

In the decision given on the previous occasion, it was stated that Burrows could not be entitled to a patent because he had not shown that he had ever been successful, and no course was pointed out in the testimony by which the cause of his want of success could be now avoided. The same difficulty exists still. After having his attention called to that point, and after a full opportunity of supplying any defect in the previous testimony, no sufficient directions can be gathered from Burrows' testimony for successfully making white oxide of zinc, and Burrows has now left the country.

The circumstances which more than any other seemed to stand in the way of Wetherell's patent on the former occasion was the fact sworn to by Pepper, that Wetherell had offered Burrows that he would pay the expenses if the latter would take the proper steps for securing a patent, and give him (Wetherell) one-eighth part of the interest therein. This amounted to an admission of Wetherell that Burrows had then carried his discoveries very nearly, if not quite, to the point of patentability. Had that point been attained, although Wetherell might have made great improvement on the process used by Burrows, the latter would have been entitled to the principal patent.

But I am now of the opinion that Burrows had not carried his invention to the point of patentability.

In the first place, his experiments were founded in error, and although he who unexpectedly makes a discovery is just as much entitled to a patent as though he had been guided by calculations founded on the most unerring principles of science, yet, if in groping in the dark he fails to find that which he seeks—even although he should stumble over it—his contiguity to the object of his search is not to be regarded in the same light as though all his movements had been guided by intelligence, and his failure to obtain complete success was attributable to other causes than a want of knowledge.

In the second place, the fact that a second opportunity was given to Burrows to supply the defects of his former testimony, without any favorable result, adds to the presumption against him, while the fact of his being in California or Australia renders it probable that he had abandoned his supposed discovery.

But finally, it appears from the testimony of Isaac W. Barnum that Wetherell had stated that Burrows could not succeed, and that when he was satisfied, and abandoned his undertaking, he (Wetherell) would make something out of it. A similar statement will be found in some other portion of the testimony.

These are statements of Wetherell called out by the counsel for Burrows, and consequently legal testimony as against Burrows. As such they tend to show failure and abandonment on the part of Burrows.

If then, Burrows failed to make a patentable invention, no matter how near he came to it, and no matter what was the cause of his failure, his experiment will not stand in the way of Wetherell's patent. And it matters not in this view of the case whether Wetherell availed himself of the result of the experiments made by Burrows, nor even whether those experiments first suggested to him (Wetherell) the very discovery which he afterwards made. He who finally really makes the actual discovery is entitled to the patent. As between Burrows and Wetherell, therefore, priority will be awarded to the latter. The contest will therefore be between Wetherell and Jones.

There is no doubt of Jones having first used a furnace similar to that adopted by Wetherell for the purpose of making oxide of zinc directly from the ore. His original purpose was not to make zinc paint, but to facilitate the manufacture of the metallic zinc itself. He states himself, in a communication addressed to the Office, the object he had in view. The iron in the zinc ore served as a flux to the material of which the retorts used in the reduction of zinc ore were composed. This soon ruined those retorts. To obviate this difficulty, he sought to separate the zinc from the iron ore, and this was the end for which he instituted his experiments.

The fact of his having such a purpose would not prejudice his rights if he had *made a discovery*, though it differed ever so much from that he was seeking. But after a careful examination of the testimony, there does not seem any good reason to conclude that he can fairly be considered as having made the substantial discovery which is the subject-matter of the present controversy.

True, he may in some instances have succeeded in obtaining the white oxide of zinc in an imperfect state, directly from the ore, by the use of a furnace very similar to that finally used by Wetherell, but still he was not successful. He never discovered the precise mode of process by which the reduction of the ores shall take place without the slagging, which is wholly incompatible with any idea of success.

Even Farrington, his main witness, seemed to regard the experiment as a failure. The testimony clearly shows that Jones himself so regarded it.

Richard Jones states, that having suggested the placing of the fuel and zinc in contiguity, he was assured by S. T. Jones that it would slag, as they had frequently found by experiment, and that from the whole tenor of his conduct and conversation, it was evident that he regarded the experiments as failures. This was after he seemed to have ceased experimenting on that subject.

Nathan Bartlett states, that about the 1st of October, 1852, he heard Jones, Farrington, and Curtis state that they had tried the same plan as Wetherell in High-street, Newark, and *abandoned it as impracticable.*

These statements were followed up by facts quite as unequivocal. The furnaces, after many trials, were abandoned, and other modes of managing the zinc ore were adopted.

Jones never fairly attained success, and he undoubtedly abandoned his experiments and all the fruits thereof, and there is no probability that he would ever have recommenced them, or that the world would ever have been benefited by the discovery of this process, had there been no other discoverer but him.

Although Jones, therefore, approached very near this discovery, I see no reason to conclude that he ever fairly attained it, and am therefore compelled to conclude that Wetherell was the prior inventor within the fair meaning of the law. A patent will therefore be allowed him, unless an appeal be taken from this decision within thirty days from this date, Dec. 14, 1853.

CHAS. MASON, *Commissioner.*

TRANSFER OF MINING PROPERTY UNDER THE COMMON LAW.—BY WILL.*

It will make no difference if the objects of the testator's bounty are directed to take absolutely or in succession for limited interests, with remainders over. As the testator has not thought proper to direct a sale, the law presumes that he intended his property to be enjoyed in the actual condition in which it is left by him. The ordinary principles of law, which will be presently mentioned, and which arise from the propriety of avoiding risk in winding up the affairs of a testator, or of making adequate provision for persons successively interested in the subject of devise, are, therefore, deprived of their operation.

It remains only to consider, therefore, the consequences resulting from a devise of mines, when they form, or are directed to form, personal property, and are not the subjects of a specific devise, or of any special directions.

The law imposes upon an executor and administrator the duty, and affords him the power, of collecting the assets and distributing the effects of a testator; generally speaking, they have the complete control over the personal property of the deceased. It is their duty to perform their trust in a manner most advantageous to the estate. When mines, therefore, have been vested

* Continued from p. 400, Vol. II.

in an executor without any special directions with respect to them, or pass to the administrator by operation of law, these personal representatives will have full power to dispose of them, without reference to the fact of their being classed amongst property of a perishable and uncertain nature. It has been held, indeed, that direct acts of abuse, misapplication of assets, fraudulent or neglectful mismanagement of the estate, will charge them with the consequences of a *devastavit*, and will render them personally liable. But courts of equity have always been extremely liberal in defining the duties of an executor or administrator, and cautious in rendering them liable upon slight grounds. There does not appear to be any reason for concluding that a personal representative is obliged, under such circumstances, to dispose of the mining property of the deceased, although he would certainly be liable for consequences induced by carrying on, or concurring in carrying on, mining stipulations in an unreasonable or neglectful course of mismanagement. It has been seen that mining is a kind of trade, though it would be impossible to establish any complete analogy to ordinary trading. Now the personal representatives of a deceased owner have, in general, no authority to carry on his business. And with respect to the public, they will become personally liable on failure of assets to all debts contracted in connection with it since the death of the owner.

It may be observed, however, that in cases of distant contract by the deceased, the representatives will be bound to carry on a business. This sometimes happens in cases of partnership.

Such would appear to be the situation of an executor, when the mines are destined to devolve immeditely for the benefit of persons taking permanent interests in the funds. But if, on the other hand, they are to form a property, or part of a fund, limited first to tenants for life, and then to persons in remainder, it may be clearly deduced from the cases on this subject, not only that a tenant for life may call upon the executor or administrator to convert the property into the 3 per cent. consols, but that they will be personally liable for the consequences if they do not so convert it. For it might otherwise happen that the persons in remainder could derive no benefit from the devise, by the entire exhaustion of the profits and property during the enjoyment of the tenant for life.

This principle of the courts of equity is of such universal application, that it is contained in every decree under such circumstances, with respect to any wearing out funds, or any fund in which the tenant for life might have an advantage over those in remainder. It applies to all the public funds, except those invariably selected by the courts for the investment of mines, viz., the per cent. consols.

In a late case of importance, a testator gave the residue of his personal estate to trustees, with directions for them to convert and invest the proceeds in government or real securities, of which they were to stand possessed, upon trust for a tenant for life, with remainder over. The trustees permitted a share which the testator had in an Indian loan, bearing interest at £10 per cent., to remain for several years unconverted, and paid, during that time, the whole of the interest to the tenant for life. The loan was afterwards paid off, and the money was invested in the 3 per cents., at a time the funds were so low, that the amount of stock purchased was considerably greater than if the conversion had taken place at the end of a year from the testator's death. It was held by Lord Gifford, that the tenant for life was not entitled to the actual interest which the money yielded on the Indian security, but only to the dividends of so much 3 per cent. stock as would have been purchased with it at the end of a year from the testator's death; that the trustees ought to be charged with the whole of the stock actually purchased, and all the sums actually received, and that they ought to be allowed in their discharge as payments to the tenant for life, not the sums actually paid to her, but only a sum equal to what she would have received for dividends, if the money had been transferred from the Indian security, and invested in the 3 per cents., at the end of a year from the testator's death. Lord Lyndhurst, on appeal, confirmed this judgment.

The same principle will equally apply, when there is no express direction in the testator's will for the conversion of his personal estate; for it has been held, that what the court would decree, it will expect from an executor.

VENEZUELA MINING LAW.

Rich silver and gold mines having been discovered at Carupano, Duaca, and Yuruario, in Venezuela, the Congress of the Republic, which met in January last, has been discussing a law to protect the mining interest and to promote the working of the mines. The law has passed the Senate, and had then received two readings in the House without opposition. The following are the particulars embraced in it: —

The Executive is empowered to give grants of mines to persons applying to work them.

This grant insures the property of the miner for ever to the grantee, and from that moment the mine can be transferred or conveyed to any other real estate, not being subject to forfeiture for any cause, but held as any other property.

The mine can be sold or disposed of in parts, or in any other manner, without any further consent from the government.

Those who are now in possession of mines by concessions or declarations given previous to the passage of this law, will be full proprietors without any further formalities after the day of the promulgation of the law, no previous report, measurements of lands, or other preliminary steps, being necessary.

The miners and other persons employed, and common laborers at the mines, are free from any military service, and all municipal taxes or services.

The yield of mines worked in Venezuela will be free for twenty years from all duties or taxation, national or municipal, which time is to be reckoned from the day this law is published. This exemption includes the toll paid on the roads.

No import duties will be exacted on machinery, tools, apparatus, or any other utensils, imported for the working of mines.

Proprietors of mines who should establish in Venezuela melting furnaces to work and separate the metals from their ores, will receive from the Executive three miles of land contiguous to the mine, or in any other place they should prefer, that they might establish on them the necessary offices and buildings.

The gold and silver, the product of the mines worked in Venezuela, will only pay when coined, as mint duty, five per cent. for the gold, and two and a half per cent. for the silver; no other duty is ever to be exacted.

FOREST MINING COMPANY.

Stephen Ball, President; Horatio Bigelow, Secretary and Treasurer; Robert R. Livingston, Mining Agent; C. M. Sanderson, Clerk; Stephen Ball, William Heywood, E. D. Brigham, Charles Scudder, G. Winthrop Coffin, Augustus Coburn, Directors; John Simpkins, Transfer Agent in New York.

ISABELLA COPPER COMPANY.

Isabella Copper Company, of Polk county, Tennessee. The Directors are Isaac Otis, of the Atlantic Bank, Alexander Hamilton, William Hickson, John Stanton, and Lyman W. Gilbert. Mr. L. W. Gilbert, President; and Henry Adams, Treasurer and Secretary.

WEST COLUMBIA MINING AND MANUFACTURING COMPANY.

W. B. Robbins, President; S. E. Mack, Secretary and Treasurer; H. Vanbergen, S. E. Mack, J. H. Wilby, Cincinnati, O.; J. R. Payson, W. B. Robbins, Covington, Ky.; Thos. A. Dexter, Boston, Mass.; E. A. Johnson, New York; H. E. Robins, Elisha Colt, Hartford, Conn., Board of Directors; Elisha Mack, Superintendent; H. Vanbergen, Agent; R. H. Rickey, Engineer.

HAVERSTRAW MINING AND IRON COMPANY.

D. O. Kellogg, President; Thomas A. Brown, Secretary; Wm. A. Furrald, Treasurer; D. O. Kellogg, Thomas A. Brown, Henry Mills, George Newell, Wm. A. Furrald, all of New York, Directors.

LINDSAY GOLD COMPANY.

The officers elected last week are, S. G. Davis, President; H. Schoonmaker, Samuel Smith, Thomas C. Durant, J. L. Colby, F. Osgood, and W. W. Palmer, Directors.

MELVILLE GOLD COMPANY.

The officers are, J. C. Mallory, President; Gordon Burnham, Treasurer; and D. W. Ingersoll, Secretary. The Directors are Gordon Burnham, J. C. Mallory, Gerard Crane, J. N. Wyckoff, and D. W. Ingersoll, of N. Y.; Col. J. B. Morgan, of Va.; and J. A. Johnston, of N. H.

THE BRECKENRIDGE CANNEL COAL COMPANY.

James W. John, President; Charles T. Pierson, Vice President; John Thompson, Treasurer; Samuel F. Headley, Secretary; Luther W. Badger, Assistant Secretary. Directors: John Thompson, James W. Johnson, Charles T. Pierson, Samuel F. Headley, Joseph M. Brown, George W. Hite, Abel Bennet, Jr.

HARTFORD COUNTY MINING COMPANY.

J. Burrows Hyde, President; H. H. Sheldon, Treasurer; A. S. Jerome, Secretary. Directors: Edward Langdon, Southington, Conn.; Edwin O. Goodwin, Bristol, Conn.; A. S. Jerome, New York; Elisha B. Pratt, Boston, Mass.; J. Burrows Hyde, New York; L. W. Coe, Irenus Adkins.

COMMERCIAL ASPECT OF THE MINING INTEREST.

New York, *April 22d*, 1864.

The market for the past month has been one of unusual dullness, and every stock on the list has fallen off materially. This has been particularly the case with *North Carolina*, which, after the failure of Mr. Borneo to furnish the results so confidently promised from his experiments to extract silver from their ore, fell rapidly to 2¾, where it now stands. Many believers in this fiction have, no doubt, paid dearly for their credulity. We now expect to see the Company go vigorously to work and develop the resources of their mine and send their copper rapidly forward to market, so that the stockholders may have some tangible evidence of their long promised dividends.

In *Pennsylvania and Lehigh* and *Ulster* stocks, the prices have been very stationary, although the accounts from both Companies were never better. Those of the latter are said to be exceedingly encouraging.

McCullough stock has fallen off considerably from the point at which it stood at our last issue. The stock has heretofore been in few hands, and the price has been easily maintained. The disposal, however, of comparatively few shares, has caused the price to fall off from 7¼ to 5¾, at which figure it now stands. This price is even high for a stock which has never paid a dividend, being ¾ above par. *Lindsay* has also fallen off considerably, and from the quantity of stock offered upon the market seems destined to go lower. It is said to be a good mine, and its friends predict that it will prove as productive as McCullough, but the price at which it is selling bears no sort of comparison. The price of *Deep River* is constantly receding, the stock being daily offered at 25 cts. per share, with no better bid than 10 cts. *Gold Hill* continues to pay its dividend of two per cent. every sixty days, but the great fault in the organization of these Companies has been, as we stated at the commencement of our Magazine, their large nominal capital. The profits are reaped principally by the projectors, and the stockholders who come in later have to wait a long while before they receive any dividend, if ever. In addition to this, the first pressure in the money market shows their emptiness, and they fall very rapidly to something like their real value. The only stock on the list which has maintained its price without fluctuation, is *Phœnix Gold.* The President, who has recently returned from the mine, gives a most flattering account of its condition and prospects. With its present machinery it is making over $50 per day, above all expenses, and in six weeks' time, with the addition of the new machinery they will put up, there will be a net profit of $150 per diem. This, upon a capital of only $300,000, will be a very handsome return, and upon the present price of the stock will pay well.

In *Lake Superior Stocks* there has been nothing doing in this market, and therefore we have scarce any remark to make upon them. In the Boston market they have fallen, but not more in proportion than other stocks.

The desire manifested, more extensively now than at any time before, as we have opportunities of knowing, by all those classes of the community who have surplus funds, to invest them in mining property, renders it needless for us to set forth its superior inducements. It becomes more particularly our duty to allude at times to "operations," as they are called, by which fictitious Companies are got up, the unwary deceived, and discredit thrown upon even those enterprises which in the highest degree merit the public confidence. What the public cannot too constantly bear in mind is, that it is neither a spacious office luxuriously furnished and located in the very heart of business, nor a splendidly got-up certificate of stock bearing on its face the number of millions of capital in the Company, all paid up, nor an elaborate calculation of the amounts of the *expected* profits, nor the beautiful specimens to which attention may be called, that necessarily constitutes a good mining enterprise, one that may be relied upon to make handsome returns during a lifetime, and to remain a valuable property to heirs.

Fluctuations to April 22d, 1854, in the different Mining Stocks sold at the New York Stock Exchange and Mining Boards, showing their Highest and Lowest Points, and the Date, with the Market Value on April 22d, Gain or Loss from March 20th, and number of Shares sold of each.

Name of Stock.	Shares.	Par.	Highest Sales.	Day Mon.	Lowest Sales.	Day Mon.	Value Apr. 22.	From Feb. 20. Gain.	From Feb. 20. Loss.	Shares Sold.
Algomah Copper	90,000	25	—	—	—	—	—	—	—	—
Alleghany Coal	—	—	10½	10	—	—	11	—	—	200
American White Zinc	—	—	1¾	20	1	14	1½	8	—	1,730
Brookline Lead	—	—	4½	7	—	—	—	—	—	800
Buckingham Gold	100,000	5	—	—	—	—	—	—	—	—
Caledonia Coal	—	—	—	—	—	—	—	—	—	—
Charlotte Copper	—	—	—	—	—	—	—	—	—	—
Chatham Cobalt	100,000	5	—	—	—	—	—	—	—	—
Conrad Hill Gold	—	—	—	—	—	—	—	—	—	—
Copper Falls Copper	10,000	—	—	—	—	—	—	—	—	—
Cumberland Coal	50,000	100	31	3	25½	18	27	—	5½	67,900
Dauphin and Susquehanna Coal	22,000	50	—	—	—	—	—	—	—	—
Dauphin and Susquehanna 7 per cent. Bonds	—	—	—	—	—	—	—	—	—	—
Dolly Hyde Copper	—	—	—	—	—	—	—	—	—	—
Douglas Houghton Copper	—	—	—	—	—	—	—	—	—	—
F[illegible] Coal and Copper	100,000	5	1½	8	—	—	1½	—	½	1,700
Gardiner Crusher	—	—	—	—	—	—	—	—	—	—
Gardiner Gold	400,000	5	2½	14	2½	3	2½	½	—	7,800
Gold Hill	200,000	5	3¾	31	3½	13	3½	—	½	11,320
Hiwassee Copper	—	—	5¾	12	5½	8	5½	½	—	600
Isle Royale Copper	12,000	10	—	—	—	—	—	—	—	—
Lindsay Gold	100,000	10	75c.	18	65	[illegible]	75	½	—	8,000
McCulloch Gold & Copper	200,000	5	7½	[illegible]	5½	21	6	—	2	5,550
Manitou Copper	20,000	3	—	—	—	—	—	—	—	—
Minera Mining Co.	100,000	10	—	—	—	—	—	—	—	—
Middletown Silver Lead	—	—	—	—	—	—	—	—	—	—
Montgomery Zinc	80,000	12½	—	—	—	—	—	—	—	—
National Copper	10,000	25	—	—	—	—	—	—	—	—
N[illegible] Copper	—	—	—	—	—	—	—	—	—	—
New Creek Coal	200,000	[illegible]	—	—	—	—	—	—	—	—
New Jersey Zinc	96,000	12½	9½	28	7½	10	7½	—	2½	14,137
North American Copper	10,000	—	—	—	—	—	—	—	—	—
North Carolina Copper	100,000	5	4½	8	2½	21	2½	—	1½	18,000
Ohio Land & Marble	—	—	—	—	—	—	—	—	—	—
Parker Vein Coal	80,000	100	7½	31	6	18	6½	—	½	60,755
Passaic Mining & Manufacturing Co.	—	—	—	—	—	—	—	—	—	—
Pennsylvania Coal	[illegible]	50	105½	21	101	18	105	—	2	4,037
Pennsylvania & Lehigh Zinc	100,000	10	3	10	2½	17	2½	—	½	7,650
Phœnix Mining and Manufacturing Co.	20,000	100	5	18	4½	18	4½	—	1	550
Phœnix Gold	100,000	5	80	10	70	6	½	—	[illegible]	1,450
Potomac Copper	100,000	10	3½	14	[illegible]	11	2½	—	—	4,800
Potosi Lead	200,000	5	½	[illegible]	—	—	½	—	—	600
Randolph	—	—	—	—	—	—	—	—	—	—
Ripley Copper	40,000	12½	—	—	—	—	—	—	—	—
Rockland	—	—	—	—	—	—	—	—	—	—
Rocky Bar Gold	—	—	40c.	6	—	—	40	—	10c.	10
Rutherford Gold	—	—	1½	7	1	—	1½	—	½	200
Toltec Copper	20,000	25	9½	15	—	—	—	—	—	200
Ulster Lead	100,000	5	1½	3	1½	11	1½	½	—	13,100
Vandenberg Gold & Copper	—	—	—	—	—	—	—	—	—	—
Winthrop Copper	20,000	25	—	—	—	—	—	—	—	—

NOTE.—There has been no sale of the stocks of those Companies opposite to which the above table is blank. Our reports in a former Number furnish the amount of the last sales.

BOSTON MINING SHARE MARKET.

BOSTON, April 20th, 1854.

Since our last, the money market has been quite stringent, which, together with the general want of confidence in the future, has caused much stock to be pressed on the market for sale, and consequently a serious reduction in prices. The amount of stock sold for a month past has not been very large, but the sales have generally been forced, on a dull market, and buyers were not anxious to purchase where the chances were favorable for a still farther decline. The "bears," who sell "short," for a fall, are always active when the aspect of the market is in any degree "blue," and are interested in breaking down prices in order to buy in at a large profit. These influences brought to bear on an inactive market, with a tightness in money, cannot fail to reduce the market value of nearly all stocks offered for sale. This state of things must, naturally, have an end, and prices find their level, and, unless we are greatly deceived, this point has already been reached. The present extremely low rates, in comparison with previous quotations, will be very sure to bring in a new class of buyers, and cause an improvement in prices in several of those stocks which have been most seriously depressed, especially where the development of the mine has insured the permanent success of the enterprise.

We have frequently spoken in terms of high praise of the Lake Superior mines, and do not see any cause to retract one word of that already written, but, on the contrary, every month adds to the previous good tidings of success. Our remarks are almost exclusively confined to the Companies operating in the region of Lake Superior, because it is there where Boston capital is largely invested, and not from any desire to keep out of view other mines in different sections of the country. No other mining stocks are regularly dealt in here, and we presume there is not half a dozen situated elsewhere, any portion of which is owned by Boston capital.

The details of the month are possessed of little general interest, and present one story of dullness and depression. *Copper Falls* has declined from 59½ to 51, partly in consequence of a $5 per share assessment, but more on account of the bad state of the market, and the efforts of the "bears" to depress the price. The mine never was in a better condition, and it is the belief of the Treasurer that no more assessments will be needed, while a dividend is quite sure to be forthcoming within 1855, and perhaps in the early part of that year. The annual report will be shortly issued to the stockholders, and will be very full in its details of operations at the mine, besides giving valuable information in respect to mining interests generally. *Toltec* has fallen from 11 to 9, which is certainly a very low figure for the stock. After the $1 per share assessment is paid May 1st, we look for a handsome improvement in this stock, which is one of the cheapest on the list. The last news from the mine was very flattering, but its influence could not keep up the market value of the shares, under such a general desire to sell all stocks, as has existed for several weeks. *Algomah* has been depressed from 4 to 3½, but it is firm at the latter figure, and is particularly cheap, promising, as it does, better than most any of the new mines. *Forest* fell from 13¼ to 10½, but has since reacted to 11, and no stock is pressed for sale at this figure. The destruction, by fire, of the Company's saw-mill and mineral-house adjoining, will cause a pecuniary loss of $4,000 to $5,000, besides retarding the operations of the Company, but active measures will be at once adopted to prevent as little delay as possible. The Directors, in consultation with the Agent of the mine, Mr. Livingston, (who was in this city at the time of the accident,) have decided, that as the present engine, if repaired, is of inadequate power to perform the work which would soon be required from the increasing yield of the mine, that it would be better to dispose of it, and replace it by one of greater power.

The saw-mill will not be rebuilt, and in place of it, it is proposed to send up a portable machine for sawing on an improved plan, which will be competent to supply the wants of the mine with lumber.

The Agent of the mine is of the opinion that if an engine was furnished forthwith, that, by the month of July, he could again be at work with capacity to manufacture a much greater amount of copper than heretofore. Upon a review of the consequences of this accident, the Board of Directors find, that, although it is one of temporary loss, ultimately it is likely to prove an actual benefit to the Company, by replacing the loss with improved machinery and apparatus commensurate to the increasing development of the mine.

The Forest mine is looking remarkably well, and notwithstanding the above accident, the Agent feels confident of shipping 100 tons of copper during the season. The annual report of the Company has just been issued, and will give encouragement to the shareholders who have held their stock through all its various changes.

The following assessments have been laid since our last, one of which, the *National*, has already been paid in :—

COMPANIES.	AMOUNT PER SHARE.	WHEN PAYABLE.	WHERE PAYABLE.
National . .	$1.00	April 1.	Pittsburg, Pa.
Isle Royale .	1.00	May 1.	Washington, D. C.
Toltec . .	1.00	" 1.	Boston.
Shawmut . .	0.50	" 1.	"
N. Western .	2.00	" 1.	Pittsburg, Pa.
Copper Falls .	5.00	" 6.	Boston.

Stockholders of the *Isle Royale* in this vicinity can pay their assessment to Messrs. Head and Perkins, the transfer agents, in this city. Isle Royale has gradually declined from $22\frac{3}{4}$ to $19\frac{1}{4}$, but will be very likely to react after the 1st of May. The success of the mine never promised better. *National* is dull of sale at 25, assessment paid, but the mine is looking remarkably well, and a demand for a few hundred shares would put the price to 30 very readily. *N. Western* has not sold in this market for several months, and there is no particular demand for the stock. Sixteen is offered for some small lots, and about 18 is asked. The prospects of the mine are very encouraging, a "mass" of above 4,000 lbs. having been taken out lately, and several others are in sight. It promises to become a first-class mine at no distant day.

Pittsburg (Cliff) is offered at 140 without purchasers, although that price is very low for the stock, and the mine has long since been placed above doubt as to its successful development. *Minnesota* is but little inquired for, and a few shares are offered at 170. There is no amount of stock on the market, however, and it is generally held for investment. *North American* is offered at 75, and little doing in the stock. It is not probable that this Company will need any further assessments ($21.50 now paid in), and they may make a small dividend at the close of this year, or reserve their surplus for a larger one in connection with next year's business.

Of the low-priced Companies, *Ripley* has fallen from 3⅞ to 2½, and may be considered cheap at that price, as the stock is unassessable with $2 per share paid in. *Webster* has declined to 1½, *Winthrop* 2½, *Shawmut* 1½, *Phœnix* 9 asked, *Native* 2½ asked, *Manitou* ½ bid, *Fulton* 1¼, *Glen* 1¼, and *Dana* 1½. *Bohemian* is dull of sale at 4, as also *Adventure* at 2½, *Bay State* 1¼, *Boston* 1¼, *Ridge* 4 asked, and *Manassas* (a Virginia mine) cannot be sold at any price. *Star* sells at 6, and no amount of stock could be had at that price. The mine is looking remarkably well, and the stock is held by parties who are not obliged to "realize" in these dry times. *Norwich* has not sold of late, and $11 is about the price, but if the stock was forced it would not bring that figure, and a demand for a few hundred shares would cause an advance above it.

The *Copper Falls Company* have purchased a quarter section of land between the Copper Falls and Winthrop Mines for $8,100, and through which the famous "Hill Vein" is said to run.

BOSTON MINING SHARE LIST.

Fluctuations for March, 1854, in thirty-one different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their Highest and Lowest Points and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

Mining Stocks, Boston.	Nominal Capital.	Shares.	Par	Paid in Apr. 20.	Highest Sales.	Day Mon.	Lowest Sales.	Day Mon.	Value Mar. 31.	From Feb. 28. Gain.	From Feb. 28. Loss.	Shares sold in March.	Value Apr. 15.
Adventure, *Copper*.	$250,000	10,000	25	$11.00	—	—	—	—	9	—	1	No sale.	8
Algomah	500,000	20,000	20	1.37½	4½	1	3¾	23	4¼	—	½	6,625	3¼
Bay State	500,000	20,000	25	‡2.00	—	—	—	—	1¾	—	½	No sale.	1½
Bohemian	250,000	16,666	15	4.44	5½	15	5	20	4½	—	1	1,100	†3¾
Boston	500,000	20,000	25	‡2.00	—	—	—	—	1	0	0	No sale.	1
Copper Falls	500,000	10,000	50	13.00	62	9	57	31	57	—	3	356	51
Dana	500,000	20,000	25	1.02½	2½	15	2	2	1½	—	½	550	1½
Forest	200,000	10,000	20	15.00	13½	9	12	23	13	—	1	2,175	11
Fulton	500,000	100,000	5	‡2.00	1½	18	1¼	8	1¼	—	¼	4,975	1¼
Glen	500,000	20,000	25	‡2.00	—	—	—	—	1¼	—	½	No sale.	1¼
Isle Royale	120,000	12,000	10	7.00	24†	14	20½	4	†22½	½	—	1,111	19½
Mason, *Sandstone*.	400,000	40,000	10	‡8.00	75	2	60	23	50	—	½	500	50
Manassas, *Mining*	1,000,000	100,000	10	‡3.00	—	—	—	—	½	0	0	No sale.	½
Manitou, *Copper*.	100,000	10,000	5	1.25	—	—	—	—	½	—	½	No sale.	½
Minnesota	800,000	8,000	100	93.00	180	10	175	4	175	0	0	17	170
National	250,000	10,000	25	8.00	30	7	30	18	28	—	2	140	†25
Native	250,000	10,000	25	4.25	—	—	—	—	3	0	0	No sale.	3
North American	500,000	10,000	50	21.50	75	3	75	3	75	0	0	15	70
Norwich	100,000	20,000	5	4.50	—	—	—	—	12	0	0	No sale.	11
North Western	300,000	9,000	33⅓	12.67	—	—	—	—	16	0	0	No sale.	16
Phoenix	300,000	10,000	30	6.00	10	4	9	20	9	—	½	381	8½
Pittsburg, (*Cliff*)	....	6,000	—	18.50	145½	17	143½	9	144½	½	—	28	140
Ridge	. . .	10,000	—	6.50	—	—	—	—	4½	—	1	No sale.	3
Ripley	500,000	40,000	12½	‡2.00	3 15/16	1	3¼	24	3½	—	½	2,668	2½
Shawmut	500,000	20,000	25	2.50	*1½	28	*1½	29	1½	—	½	100	1½
Star	500,000	20,000	25	8.50	7	1	6½	6	6½	—	½	85	6
Summit	500,000	40,000	12½	‡5.00	—	—	—	—	5	0	0	No sale.	5
Toltec	500,000	20,000	25	4.00	11½	3	10½	24	10½	—	1½	8,645	8½
Winthrop	500,000	20,000	25	.75	3	14	2½	2	2½	½	—	2,042	2½
Webster	200,000	40,000	5	‡2.00	2 1/16	4	1½	27	1½	—	½	483	1½
W. Castleton, *Slate*.	1,000,000	50,000	20	‡6.00	—	—	—	—	6½	½	—	No sale.	6½

* The sale of Shawmut was "buyer 30," and the only one for the month.

‡ These are fully paid stock, not assessable. † Assessment paid.

We have changed the amount paid in on North Western to $12.67, and North American $21.50, which are now officially correct. 25 shares Nebraska Copper Mining Co. were sold March 4th at $¼, and 80 shares Rockland, March 13th, at 11½, which, with the table above, comprises all the public sales in this market for March.

NEW YORK METAL MARKET.

COPPER.

South American . . per lb.	29c	a	—
U. S. Soft Ingot . . .	32	a	—
Sheathing	31½	a	32
Braziers'	35	a	—
Yellow metal	26	a	—
Ingot	32	a	—
Tubing	45	a	—

IRON.

Iron ores, magnetic and hematite . . . per ton.	$3	a	6
Iron Bars, American hammered	92	a	95
Do. American refined . .	100	a	—
Do. Superior brands . .	—	a	100
Do. English common . .	75	a	77½
Do. do. best . . .	—	a	97½
Do. Swedes refined . .	95	a	100
Do. Norway bars, fork & NIFK brands	102½	a	104
Russian	86	a	94
Do. Sheet American per lb.	6¼	a	—
Do. do. English, No. 1 to 20	4¼	a	—
do. 21 to 24	5¼	a	—
do. 25 to 28	5¾	a	—
Do. do. Russian . . .	13¾	a	—
Iron Sheet, English, Damaged	6¼	a	6
Do. Galvanized . . .	$10½	a	14
Do. R.R. bars by contract p. ton	—	a	50
Do. Pig American red short .	36	a	40
Do. White Charcoal for found.	36	a	45
Do. do. do. for mal. cast.	45	a	50
Do. for car wheels . . .	45	a	50
Do. Scotch, for cash . .	35	a	—

New York, *April 21st*, 1854.

LEAD.

Galena Pig, as per quantity .	7	a	7¼
Spanish	6¾	a	6¾
Sheet	7	a	7¼
Pipe	7¾	a	—
Old Scrap	—	a	6¼

SPELTER.

Spelter, as per quantity . .	6	a	7
Do. in slabs	6	a	6¼
Do. Sheet	8¾	a	9¼

TIN.

Block Banca	—	a	34
Do. Straits	—	a	33
Do. Spanish	—	a	30
Do. Bars	—	a	34

LONDON METAL MARKET.

MARCH 31, 1854.

The *London Mining Journal* gives the following quotations, to which we add the duty *ad valorem*, United States Currency, rate of freights, and Foreign Exchange.

ENGLISH IRON.

Duty 30 per cent. ad valorem.

Bar and bolt *a* . . . per ton.	£9	10	0	$45 98
* In Wales *a*	8	10	0	41 14
* In Liverpool *a*	9	10	0	45 98
* In Staffordshire *a* . . .	10	10	0	50 82
Sheets, single *a*	12	10	0	60 50
" double *a*	14	0	0	67 76
Hoop *a*	11	15	0	56 87
Nail rod, round *a*	11	0	0	53 24
" square *a*	10	10	0	50 82
Rails (Wales) *b*	8	0	0	38 72
" (Staffordshire) *b* . . .	8	10	0	41 14
Railway Chairs Clyde *b* . . .	5	17	6	28 44
Pig, No. 1, Clyde *b*	3	14	0	17 95
3-5ths No. 1, and 2-5ths No. 3 . .	3	14	0	17 95
No. 1 in Wales *c*	4	10	0	21 78
Scotch Pig No. 1 in London . . .	5	0	0	24 20
Stirling's Non-laminating or Hardened Surface Rails . . . . £9 to	9	2	0	43 56 / 44 05
Cold-blast, No. 1 Foundry . . . £5 10s. to	6	10	0	26 62 / 31 46
Charcoal bars	14	10	0	70 18
Stirling's Patent Toughened Pigs, Glasgow . . .	3	12	6	17 39
Ditto. Wales £4	4	5	0	20 57

FOREIGN IRON *d*.

Duty 30 per cent. ad valorem.

Swedish . . . . . per ton.	£12	0	0	$58 08
Russian CCND	17	0	0	82 28
Indian Charcoal Pigs in London . . .	6	0	0	29 04

FOREIGN STEEL *a*.

Duty 15 per cent. ad valorem.

		£	s.	d.	$	c.
Swedish keg, nominal	per ton.	£16	0	0	$77	44
Ditto faggot		—	—	—	—	—

SPELTER *c*.

Duty, in pigs, bars, and plates, 5; sheets, 15 per cent. ad valorem.

			$	c.
On the spot	per ton.	£00 0 to 23 10 0	$113	76
To arrive		00 0 to 23 10 0	113	76

ZINC.

Duty 15 per cent. ad valorem.

		£	s.	d.	$	c.
In sheets *d*	per ton.	£32	0	0	$154	08

ENGLISH COPPER.

Duty: bolt and braziers', 20; pig, bar, and old, 5 per cent. ad valorem; Sheathing FREE.

		£	s.	d.	$	c.
Tile 14 to 28 lbs, *a*	per ton.	£126	0	0	$609	84
Tough cake *a*		126	0	0	609	84
Sheathing for ships 14 by 48, and bolts *a*	per lb.	0	1	2		26½
Sheet *a*	"	0	1	2		29½
Bottoms *a*	"	0	1	3		30½
Old *a*	"	—	—	—		—
Yellow Metal *a*	"	0	1	0		24
Wetterstedt's Pat. Met.	per cwt.	2	0	0	9	68

ENGLISH LEAD *a*.

Duty 20 per cent. ad valorem.

		£	s.	d.	$	c.
Pig	per ton.	£25	0	0	$121	00
Sheets		25	10	0	123	44

FOREIGN LEAD *a*.

Duty 20 per cent. ad valorem.

		£	s.	d.	$	c.
Spanish in bond	per ton.	£23	10	0	$113	76

[redacted]

Duty 5 per cent. ad valorem.

		£	s.	d.	$	c.
Block	per cwt.	£6	10	0	$31	46
Ingots	"					
Bar	"	6	11	0	31	70
Refined	"					

FOREIGN TIN.

Duty 5 per cent. ad valorem.

		£	s.	d.	$	c.
Banca	per cwt.	£6	10	0	$31	46
Straits [uncertified]	"	6	2	0	29	50

TIN PLATES.

Duty 15 per cent. ad valorem.

		£	s.	d.	$	c.
IC Charcoal	per box.	£1	12	0	$7	75
IX Ditto	"	1	18	0	9	20
IC Coke	"	1	7	6	6	66
IX Ditto	"	1	13	6	8	07
Canada Plates *a* ton	"	16	0	0	47	44
Quicksilver *f*	per lb.	0	2	4		57

Terms—*a* 2½ per cent. dis.; *b*, net; *c*, 3 ditto; *d*, 1½ per cent. dis.; *e*, 2 ditto; *f*, 1½ ditto, delivered in Liverpool 10*s*. per ton less.—† Discount 5 per cent.

* Delivered in Liverpool 10*s*. ($2.42) per ton less.

EXCHANGE, New York, March 21, 1854.—Rates are ranging from 9½c. to 9⅝c. premium in favor of London.

FREIGHTS at Liverpool are about 20*s*. 0*d*. ($4.84) per ton for iron in pig or bars.

JOURNAL OF GOLD MINING OPERATIONS.

CALIFORNIA GOLD FIELDS.

Mining operations since the commencement of the last half of winter to the date of the latest arrival, have been carried on with more than usual vigor and success. No new features are presented, nor scarcely anything worthy of note, except some facts which may convey a better idea of the operations than the mere general statement that they have been quite successful. A few of those we here present: —

LUMPS FOUND.

The extensive aqueduct of the Tuolumne County Water Company is now full to overflowing with water, and all that now is necessary to lay the foundation to a fortune, or otherwise, is to "pitch in."

During the week, many large and beautiful specimens have been taken out; some of which may be seen at the banking house of James Mills & Co.

The "Maine Boys" are now doing extremely well, taking out sometimes as high as thirteen ounces per day.

On Monday, at Bensonville, Messrs. Chase & Co. found a specimen weighing ten and a half ounces, and worth about $175.

At Bensonville, on Thursday, Messrs. Hamilton & Co. found a lump weighing seven and a half ounces. Their claim averages from thirty to forty ounces per week.

On Gold Hill, Messrs. H. A. Stearns & Co. took out a piece weighing thirteen ounces, the same day, and have since taken out several large and valuable pieces. The twenty-four-ounce piece is the handsomest specimen that we ever saw. The day before it was found, the owners made great exertions to sell the claim for the small sum of $30.

Leavitt, Woodley, & Co., at Summit Pass, found a fine lump last week, weighing twenty-nine ounces.

Kibbie & Co., at Santiago, took out of their claim a twelve-ounce piece this week.

Messrs. McIntyre & Co., on the Flat, washed out, on Wednesday evening, nearly eight ounces of gold.

We have heard of many other good strikes during the week, that we cannot now call to mind.

In one of the tunnel claims at Chip's Diggings, Nevada, a quartz boulder, estimated to weigh four tons, was discovered. A vein of gold passes entirely through the boulder, which is expected to yield from $8,000 to $20,000.

A block of gold-bearing quartz, weighing one hundred and ninety-three pounds, was found within a few hundred yards of Mariposa recently. The *Chronicle* says: "It is one of the most beautiful specimens we have ever seen. There are various estimates as to the value of this lump, ranging from $500 to $10,000.

The *Mariposa Chronicle* says: — From the head of this Creek, as far down as Mormon Bay, the miners are doing well. We have the average of fourteen different claims, and it amounts to $13.50 per day to the man. Some miners working on small ravines leading into the main creek near the head, are making from $40 to $50 per day to the man.

Sonora Creek Tunnel and Mining Company, from November 19, 1853, to February 18, 1854, eight hands took out a little over five hundred ounces. The greatest quantity of gold taken out in one day was three pounds. The largest lump found weighs nineteen ounces. Under the stump, which was the exact centre of the corporation, a lump was found weighing ten ounces. There are one hundred and eighty-nine shares in the company, and the nett dividend to each share has been $83 24.

QUARTZ CRUSHING.

The *Grass Valley Telegraph* gives the following notice of quartz crushing by machinery in California:—" There have been many speculations in the mines of capitalists and others, with regard to failures in quartz operations, both in Grass Valley and elsewhere: and in almost every instance the failures that have taken place have either been attributed to the lack of richness in gold-bearing quartz, to the mismanagement of the directors, or lastly, to the imperfection of machinery. As to the first, it is now an undisputed fact that quartz is to be found in abundance, sufficiently rich to pay, with proper management, a handsome dividend. As to the second objection, it can only be remedied where it actually exists, either by experience or change of directory. But in such instances of complaint we believe, as a general thing, the capitalist has actually been more to blame than the directors, and from this fact, not having a perfect understanding of the expenses for the completion of such an enterprise, they allow a debt to hang over the establishment, though trivial in comparison, yet sufficiently great under the existing rate per cent., to keep the concern in a state of constant embarrassment; and all because the timid stockholders begin to fear it is a losing game, and they abandon it just at a time when a very little additional capital would place the business operations in a healthy and profitable condition for making money. This brings us to the last objection, which is the imperfection of machinery; and in this they seem to forget that their own fears are the cause of the imperfection; for, fearing a failure, they neglect furnishing the necessary amount of capital for the completion and perfection of the said machinery; and thus, as we have said above, they frequently cause a failure, when a very little extra funds, in comparison, would complete the whole, and render the business profitable. A week or two since, one of the directors of the Empire Mill, furnished us with the following interesting statement concerning the business operations of their company, which, by the bye, will, even under existing circumstances, show that they are doing a good and profitable business. This mill, the Empire, with only eight stampers, and at twelve hours per day, has crushed 1,500 tons of quartz in four months, making a yield of $54,000. Cost of raising, hauling, and crushing, $22,000, leaving a nett profit of $33,000 on four months' operations! Now, an investment of $50,000 would have bought every ledge, at that time, from which the rock was crushed. Had those ledges been owned by a mill, there would have been at least four times the work done in the same time, and instead of eight stampers running twelve hours per day, there would have been twice that number running twenty-four hours per day, and consequently there would have been four times the work accomplished in the four months stated. The inference is very plain, as well as a very natural one. An investment of $50,000 would have produced a yield of four times $54,000. This multiplied would be $216,000. Now multiply the amount of expenses by four, which would be more than a fair estimate, and you have $88,000. Subtract this from the gross proceeds, which is $216,000, and you have remaining for stockholders a nett profit of $128,000 for four months' labor in crushing. This is a fair estimate, and may be relied on as such. Now, suppose, on the contrary, this establishment was in debt, both for mill and ledges, the interest for borrowed money would be sufficiently great to keep the establishment in a constant state of embarrassment; and on account of a difficulty at times to borrow money, the business operations might be clogged, suspended, or entirely broken up, and the report would be noised abroad that quartz-crushing was a losing game, when the truth would be, that the stockholders, through incapability or fear, have effected their own ruin, in the very face of success, by withholding a little additional capital."

CHEROKEE FLAT.

A correspondent of the *Stockton Journal* writes thus of some diggings on Cherokee Flat:—

The secret is at last out concerning the rich claim on Cherokee Flat. This claim is, without doubt, the richest ever discovered in California. Its history is this:—About two months ago, a party of men, French and Italians, were seen making their way through the dark, each carrying a small sack. This created a suspicion among some of the miners, and the following night they were closely watched, and it was ascertained that they were carrying dirt from a hole about a quarter of a mile distant, and secreting it under the beds in their tent. In the day time they worked, sinking their shaft, and in answer to questions asked, replied that they 'hadn't got down yet;' and no one had an opportunity of seeing the dirt that was carried away. The discoverers being foreigners, they were fearful of letting the Americans know their success. However, a few were permitted to examine the richness of the claim. It proves to be a vein of decomposed quartz, the richest (as far as prospected,) certainly that has ever been discovered. The vein is found about three feet below the surface, and is about two inches wide, and widens as it goes down.

It has been prospected to the depth of twenty-one feet, and is found six inches wide at that depth, (water preventing going any deeper.) From one pan of clay and quartz taken out at the top, six ounces of fine dust was obtained. Subsequently *forty-seven ounces* were washed from another pan. Gold is to be plainly seen with the naked eye, mixed with clay and quartz, throughout the whole vein, a depth of seventeen or eighteen feet. From three hundred pounds of the clay and rotten quartz which compose the vein, *twenty-eight pounds* of pure gold was taken, after being worked through a Mexican mill or arasta—a very imperfect mode of saving the gold—making the extraordinary yield of more than $2 50 to the pound of quartz. The best average yield of the great Bear Valley mine was sixty cents to the pound. This vein, as yet, is only prospected. It has the appearance of running through a long range of quartz hills, and will be doubtless struck upon in different places, miles distant from the first discovery. There are thousands of different stories concerning this vein. Some, that $10,000 was taken out in one day; others, that $50,000 was refused for the claim, etc., but this statement is substantially correct. As to selling the claim, $3,000 was offered and refused for one-eighth. There are eight shares in the claim, and eight hundred feet are claimed and recorded for quartz mining purposes.

PROFITS OF COMPANIES.

The following particulars, though not quite so recent as some which have been received, will show the results of work to several companies located in the rich district of Grass Valley during the most favorable part of the season:—

On M'Clintock's ranch, the old Virginia Company are averaging thirteen ounces per day. A portion of this company are engaged in washing over tailings, and from these, they save from eight to ten dollars per day to the hand.

Pike Flat.—On the upper portion of this Flat, Bryden & Co. are working to good advantage; their savings amount to ten dollars per day to the hand.

Buena Vista Ranch.—These diggings have been, and still are very extensive. The average yield is certain at sixteen dollars per day to the share. This is quite a large company, and so far as we can learn, is doing a very fine business.

The claims on Pike Flat, below M'Clintock's ranch, are paying extremely well; last week they washed out over $400. This company have washed out during the last five months over seven hundred ounces of gold dust, making the handsome income of something like $400 per month to the share.

Woodpecker Diggings.—They have taken out as high as seventy dollars to the hand in one day's work. Their average yield amounts to about thirty dollars to the hand per day, and one sluice at these diggings has produced as high as three hundred dollars in two days' washing.

More of the Round Tent Diggings.—We have been shown a most beautiful specimen of pure gold from those diggings, taken out on Saturday, the 11th inst., weighing seven ounces one pennyweight.

The result of another company's work for one week, two men, were thirteen and a quarter ounces, and the lowest week's work for those two gentlemen, were three ounces eleven pennyweights.

At *Ureka Slide*, they are also doing a *cash* business. One company that we have heard of are taking out an average of two hundred dollars per day.

There are some very extensive works going on in this slide. One company, we understand, are sinking a shaft on the top of the hill, in order to effect which they are running a tunnel some three hundred feet in length, and about one hundred feet in depth, in order to make a drain to facilitate the working of the shaft. It is confidently believed, that this entire hill is immensely rich in its gold deposits, and we doubt not that a fair prospect will make some "golden" revelations to the weary miner.

SHAFT SINKING.

A shaft has been sunk in Weaverville, Trinity County, five feet in diameter, and over seven hundred feet deep. The diggers of it have gone through the top bed rock of granite, layers of cobble stones, sand, quartz, cement, etc. At the depth of one hundred and fifty feet, the water became very troublesome; after getting below the spring, at the depth of two hundred and twenty feet, the air became so foul, that a small clay furnace, with a long hose attached was placed at the mouth of the well, which has been constantly purified since by the fire in the furnace. There has been no blasting, though boulders of twenty feet in thickness have been penetrated. The gold has been found in all the stratas and in the rock. It is thought the shaft will be sunk four or five hundred feet deeper before the lower bed rock is struck.

THE AUSTRALIAN GOLD FIELDS.

We continue the Reports of the yield of the gold fields in Victoria from the date to which it was brought up on pages 188 and 190, Vol. II. MINING MAGAZINE:—

AMOUNT OF GOLD RECEIVED AT MELBOURNE PER ESCORT.

	1852.	1853.
August . . .	314,195 ozs. . .	206,370 ozs.
September . .	307,262 " . .	203,495 "
October . .	277,574 " . .	202,491 "

AMOUNT OF GOLD SHIPPED.

	1852.	1853.
August . . .	172,091 " . .	127,728 ozs.
September . .	161,139 " . .	101,349 "
October . . .	248,397 " . .	358,178 "

Whether the effects of the winter are still felt in the gold returns, and there are fewer accumulations in reserve at the diggings, or whether the late semi-political agitation among the miners has produced the same result as the bad season, by suspending work, is not quite clear, but certain it is that on three of the principal gold-fields of Victoria a diminution in the quantity raised can be noted, even compared with the returns of the same month last year, when the population on them was less in number. It may be also that as deep sinking becomes more general, there will be periods of less production to be made up when the deposit is reached at last. It is a disputed point which of the two systems is the more profitable, deep sinking or surfacing. A problem has still to be solved in the southern gold-fields—that of the richness, or the reverse, of what are called the "second bottoms." Hitherto the miners have generally stopped at a certain strata, of a kind of white or pipe-clay, which was considered the sign that the limit of the gold deposited downward had been reached. Lately, more adventurous parties have gone deeper, and pierced to the granite rock, under the clay, which really appears to be the true bottom, as in some few cases the success of the exeriment was something fabulous. The celebrated "Jeweller's shop" belonged to this class, but here again fortune proved herself as capricious as ever; a few feet to the right or left made all the difference between a return of pounds, or even hundred weights, and a total blank. The return of the gold from New South Wales for the month of October is only 5,995 ozs., against 100,000 ozs. raised in the same period at Mount Alexander. The monthly return of the produce of the Victoria gold-fields, to the end of October, gives the following result:—Ballarat, 35,163 ozs.; the Ovens, 9,729; M'Ivor, 6,210; Mount Alexander, 105,068—156,166 ozs.

The returns from Ballarat for October, as compared with that of the same month last year, give an increase of 7,481 ozs.; and although the return from Mount Alexander is still so large, yet, compared with the yield of October, 1852, it shows a decrease of no less than 232,426 ozs. The total yield of the Victoria gold-fields in October, las year, was 365, 172 ozs., against 156, 172 ozs. in October, 1853, being a decrease of 209,006 ozs. Ballarat being the only improving gold field. The Ballarat Mines were yielding extensively, as shown by the following returns of the receipts at Geelong by Government escort during each month of the year:—

	ozs.	dwts.		ozs.	dwts.
January	14,922	0	July	18,240	0
February	16,391	0	August	28,559	0
March	18,365	0	September	49 993	10
April	28,074	0	October	49,993	0
May	12,808	0			
June	17,246	0	Total	399,659	10

which, at 80s. per oz., gives a sum of 1,598,636*l*.

Another gold region has been discovered, about 100 miles north of the Burra Burra Mines, supposed in the neighborhood of mount Arden, and which was reported as likely to surpass the Melbourne fields for richness and wealth. The gold found in the new ground is represented also of a finer quality than any other yet turned up. The Sydney *Gold Circular* states that the Turon diggings were very quiet at the date of the latest intelligence, the dry weather being anxiously expected. The number of licenses issued in October had been upwards of 1000. There was an increase of miners at Tambaroora, and a large quantity of gold was offered for sale thence. The escorts brought in on the 2d. Nov.—from Bathurst, 72 ozs.; Sofala, 666 ozs.; Tambaroora, 67 ozs; Meroo, 256 ozs.; Braidwood, 183 ozs.; Major's Creek, 156 ozs.; and the Sydney Gold Escort Company from the Ovens, 5,225 ozs.—making a total of 6,626 ozs., value about 24,000*l*.

Melbourne, Saturday, Dec. 17.—Hitherto Melbourne received nearly all the produce of the gold fields, with the exception of Ballarat, which is considered as more properly belonging to Geelong, and from that field receives weekly a small share. Now, in return, Geelong has begun to share with Melbourne part of the produce of the other gold-fields, along with our neighbors from

Sydney and Adelaide. Among so many claimants for the digger's gold he will at least be benefitted by the competition.

The quantity of gold from Bendigo shows a slight increase over last week, while from Ballarat a decrease has taken place. M'Ivor and Goulburn remain the same.

The escorts brought from—	ounces.
Mount Alexander and Bendigo	24,858
Ballarat, Including Geelong	7,281
McIvor and Goulburn	1,895
	33,135
Gold shipped from Victoria in 1853	2,356,938
Per Admiral to London	45,951
Per Anna Henderson to Calcutta	360
Per Sydney to London	51,803
	2,454,658
Or 102 tons 5 cwt. 2 qrs. 4 lbs. 4 oz. at 75s.	£9,204,945.

Sydney, Dec. 10.—Advices from Braidwood show an improvement in this quarter which is highly satisfactory. About 500 licenses were issued for the month of November, and the ordinary earnings per man are estimated at from 15*s.* to 20*s.* per day. There are many instances of much greater success than this, and some few of considerable takings. The diggings on the Buffalo range, near the Ovens, have proved to be situated on the River Buckland, about fifty miles south of Spring creek. There are a great many miners at work on the spot, with varied fortune. On the Ovens itself operations in rich and promising ground continue much impeded by the superabundance of water. So much is this the case, that a conviction is gaining ground that nothing short of the application of steam power will suffice for drainage of the claims sufficient to allow of their effectual working. There is a rumor of fresh discoveries near Albury, but we have no grounds for saying more at present.

The arrival of gold this week has been per escort:—

	ounces.
From Sofala	415
Tambaroora	190
Meroo	200
Braidwood	205
Hanging Rock	1,078
Per Sydney Gold Escort Company:—	
From Ovens	4,854
Per mail during November	1,090
Total	8,027
Value about	£80,000

GEOLOGY OF THE AUSTRALIAN GOLD FIELDS.*

Quartz Veins.—The sedimentary rocks are traversed by numerous veins of quartz, about 3 feet wide, of unknown length, in some districts descending to an unknown depth, in others not more than three or four feet deep. These veins or dykes run N. and S., or N. N. E. and S. S. W., and always make an acute angle with the laminæ of the slates. They seem to be the original matrix of all the gold found in the valleys and creeks. The quartz is often intersected by many joints and narrow fissures, filled with a red ferruginous earth, in which particles of gold are disseminated. Gold is also found implanted in the quartz itself, and attached to the sides of its cavities. These auriferous veins were discovered and wrought before the alluvial gold deposits or "Diggings;" and as they were worked with profit by the rude means at the command of the untrained diggers, they would doubtless well repay those who operate

* Continued from page 422, vol. ii.

upon them with all the appliances of modern European mining, so soon as the existing social excitement shall have subsided and wages have fallen from their present extravagant height. The first gold-working in the colony was on a quartz vein running through one of the trappean plains so common in this country. The auriferous quartz is not milk-white, but has a delicate yellowish color, and waxy lustre. That which is much broken and fissured appears richer than the more hard and solid. Sometimes large boulders of quartz are found deep beneath the surface, in the midst of auriferous clay; but it is remarkable that in such cases the quartz boulders rarely or never contain gold, however rich the clay it lies in may be.

These quartz veins appear, as already said, to be the original seat and matrix of the gold. The slate rocks having undergone continual degradation during the lapse of ages, the quartz veins also have suffered decay and disintegration when their enclosing walls no longer existed; the joints and fissures in the veins of course aiding the destructive process. Hence the gold disseminated in their mass became liberated, and, together with the materials of the quartz veins and slate rocks, were washed down into the gullies and creeks, where the latter formed the beds of clay, gravel, etc., now found in these depressions; whilst the particles, grains, and nuggets (or pepites) of the precious metal by their own weight descended to the lowest of the permeable beds, and into the chinks and cavities of the slate rocks beneath, forming the "pockets" of the mine.

Mode in which the gold is deposited.—Occasionally the gold grains are seen strewn on the top of the soil. Sometimes they lie 80 feet beneath the surface, and may also be met with in other localities at every intermediate depth. The "Diggings" may however be conveniently classed into two divisions: first, "Surface Workings;" second, "Pit" or "Hole Workings." In the first the gold is either found lying on the surface or (much more commonly) is diffused through the gravelly soil to the depth of six or twelve inches, beneath which is usually a stiff red clay containing little or no gold. These deposits are commonly on the sides and crests of hills adjoining rich gullies. The second or deeper class of workings consists of pits or "holes" from three or four to twenty-five or even thirty feet deep. In these deposits the gold is almost always imbedded in a stiff clay. When any spot is rich on the surface no gold will be found immediately beneath, and *vice versa* when rich below it will yield nothing on the surface.

These deeper or pit workings are of three kinds:—

1. In the channel of an auriferous creek, at points where the stream is impeded by bars of vertical slates traversing the valley, gold is often found by sinking through the alluvial mud and earth down to the rocky channel beneath. Here the gold is lodged in a gray clay, which fills the chinks and fissures of the slate rock whence the miners extract it by means of knives, spoons, shears, or any other tool they can meet with. Where the bed of the stream expands into an alluvial flat, the auriferous deposit will also increase in width. Such was the first-worked "Golden Point" of Mount Alexander, a local expansion of the bed of Forest creek. If it should happen that the existing creek has left its original channel, the run of the gold deposit then quits the modern creek and follows its ancient channel. These workings in the beds of creeks are commonly from three to ten feet deep. They were the first undertaken at Mount Alexander. The deposits are richest at points where the stream has been impeded in its course, either by frequent sinuosities or by being crossed by a bar of slate as already mentioned.

2. A second kind of deep auriferous deposit is met with in the dry gullies which descend from the higher ranges to the main valleys, generally with a gentle inclination, from a quarter of a mile to a mile in length. These gullies in some spots are narrowed by the converging hills and sometimes expand into open slopes or flats. Here the gold is commonly found, at from ten to twenty feet beneath the surface, in a reddish or yellowish clay, lying either upon the

fundamental rocks, in the chinks of the vertical slate, or else upon a thick tenacious white or yellow clay, known by the miners as "pipe clay." This is sometimes of unknown depth, and sometimes passes imperceptibly into the vertical laminæ or soft micaceous slate. In some of these gullies there is a continuous line of workings half a mile in length. The richest deposit is always found in what appears to be the *ancient channel* or bed of the gully, where the opposite slopes of the rocky gully meet deep beneath the overlying strata of gravel and clay. The breadth of the area which yields gold is usually not more than a few feet, rarely if ever more than a few yards. The superior strata clearly owe their origin to running water. They differ much in composition in different localities. They may be hard or soft—may consist of tenacious clay or of sandy gravel. When first turned up they almost always are of some bright hue of red, yellow, or white; but this soon fades away on exposure to the air. It is remarkable, that these gullies are, with scarcely an exception, on the south side only of the valley.

3. The third kind of deep workings are those on the sides and crests of the low rounded hills or acclivities at the sides of the auriferous gullies. It often happens that the width of an auriferous gully is contracted before it falls into the main valley by spurs from the lateral hills, which, protruding from either side, form a kind of gateway to the gully. In such localities the gold deposit was found to continue across the gully up to the foot of these enclosing hills, and thence up their sides to the rounded crest, where the rich field commonly ceases. In the gully below, the gold-bearing deposit may be at a considerable depth. At the crest of the hill it will also be deep; but intermediately, at the foot of the hill, the "holes" will be perhaps only two or three feet deep, or the gold may in this intervening space be scattered in the surface gravel; so that a section through the hill and gully below would exhibit the gold deposit.

The alluvial strata on the sides and tops of these hills have a general conformity to the present surface, but are extremely irregular, so that two pits, a few yards apart, may present two totally different sections; as though the beds had been deposited by means of strong conflicting eddies and currents. They consist sometimes of stiff red and yellow clays, like those in the gullies; but there also frequently occur beds of a very hard reddish concrete, composed of quartz and slate pebbles. At Ballarat large boulders of quartz, two or three feet in diameter, were found imbedded in the auriferous clays, and, more rarely, detached masses of a conglomerate of fragments of lava, trap, and quartz, imbedding rounded pieces of gold. At these workings the rich "pockets" of gold were commonly associated with a bluish clay, running in irregular veins and patches. So rich was this clay, that 9 lbs. weight of gold have been taken from a single tin-dishful of it, about fourteen inches in diameter and five or six inches deep.

Enormous amounts of gold have been taken from some of these rounded alluvial hills. The yield, however, is not so uniform as in the gullies; a rich spot and a barren may often lie close together. In these deposits, as in those of the dry gullies, the gold is usually imbedded in red or yellow clays, lying immediately on the fundamental slates, or on the "pipe clay." When the gold-yielding clay lies on the rock, small lumps or nuggets of gold will sometimes slip down between the vertical slates.

In conclusion, the methods of separating the gold from the gravels and clays are the same as those used elsewhere in New South Wales and California, and vary of course according to the means at the command of the miners.*

* Besides the Ballarat and Mount Alexander gold-fields, "diggings" have been opened at Mount Blackwood and on the Moorabool River, near Ballarat, on the Plenty and Yarra Yarra Rivers, N. E. of Melbourne, on the Mitta Mitta River and Lake Omeo, in the N. E. part of the Colony, as well as at several points along the eastern portion of the boundary-line between Victoria and New South Wales.

ROCKY BAR MINING COMPANY.

The Report of this Company contains some points which are worthy of notice, and are also important as relating to its proceedings. We extract so much as is of permanent interest.

The present Board of Directors, on assuming office in February, 1853, and examining the accounts and position of the Company, at once discovered that it was needful to raise means to discharge the obligations of the Company, and to carry on the works, and they estimated that it would require at least $50,000 to effect this. Acting under the Seventeenth Article of Association, which was the only mode open to them, they levied an assessment of five per cent. on the capital stock, which, had all the stockholders paid up, would have realized the required amount. The assessment was paid on 146,540 shares, and realized the sum of $36,635, leaving 53,460 shares unpaid on, and which have, therefore, under the same article, been declared as forfeited to the Company. This provision of assessment, and forfeiture of non-payment, is in exact conformity with the mining customs of California, and also of the working of mines in England, under the cost book system, which has prevailed in Cornwall for centuries, and is the only system by which the vitality of a mining company can be insured. Any resort to mortgage, or other indebtedness, only ends in embarrassment. The only plan successfully to carry on a mine, is for the parties interested to estimate the chances, and make up their minds to carry on or abandon the works, at successive periods, according to the prospects that present themselves. It is alike the duty of the directors and stockholders, to see that no debt is allowed to be formed against the Company, as provided in the Sixth Article of Association.

A reference to the accounts herewith presented, will show the existing condition of affairs, and the receipts and payments from all sources, since the date of the last Report, up to the 31st December, 1853.

From these accounts, it will be seen that the available means of the Company are again exhausted, and if the undertaking is to be carried on, it will require more means to be raised. The Directors have given this matter their most serious attention, and being fully satisfied, from the very full and unvarnished statements of the present agent, Mr. Seyton, that the undertaking, with adequate capital, can be conducted to a most successful issue, they have determined (February 1st) on levying another assessment of five per cent.* on the capital stock, equal to twenty-five cents per share on the present $5 shares, which, if paid up in full, will realize the sum of $36,635, which they have every reason to believe will put the Company in full working order, and realize the most sanguine expectations of all concerned.

This outlay is required by the necessity of driving the adit level to the vein on Massachusetts Hill, in order properly to open and drain the mine, and to effect needful alterations in the machinery, which experience proves to be required.

We do not regard it as necessary to describe the particulars of the work, &c., done last year. They can be seen in general in the accounts annexed. On page 427 of Vol. II. will be found extracts from recent reports of the Superintendent, showing what the Company is at present doing.

STOCK.

Dr.		Cr.	
To 200,000 shares of $5 each, .	$1,000,000 00	By 146,540 shares issued to holders at $5, . . .	$732,700 00
		" 53,460 shares forfeited to Company for non-payment of assessment, . . .	267,300 00
200,000	$1,000,000 00	200,000	$1,000,000 00

* At the meeting of the stockholders this assessment was reduced to three per cent. on the capital stock.

CAPITAL ACCOUNT.

Dr.		Cr.	
To Amount rendered, as per last report, to February 5,	$975,004 87	By Stock,	$1,000,000 00
" Am't rendered from Feb. 5 to Dec. 30,		" Assessment of 5 per cent. levied 3d February,	36,685 00
" Materials, salaries and labor expended on mining and machinery at Gold Hill, as per account rendered by William Whitney	10,890 75		
" do. do. do. do. as per account rendered by Jas. Delavan,	7,249 58		
" do. do. do. do. as per account rendered by C. S. Seyton	2,509 25		
" Office expenses and advertising,	1,771 26		
" Settlement with old stockholders,	655 00		
" Interest,	447 46		
" Stock held by Company forfeited,	37,500 00		
	$1,035,869 07		
Less materials resold,	1,897 84		
	$1,033,971 83		
" Balance,	2,663 17		
	$1,036,685 00		$1,036,685 00

REVENUE ACCOUNT.

To purchase of Gold Hill claims charged to this account,	$2,000 00	By Balance, as per last report,	$2,093 60
" Rock, labor, &c.,	2,562 71	" Cash for gold sold from January 19th to March 8, proceeds of rock from Gold Hill,	1,268 56
" Wood,	1,468 75	" Quartz sold,	226 00
" Sundry expenses,	138 25	" 2½ months rent of mill to West Mariposa Company,	1,000 00
		" Wood sold,	80 00
		" Balance,	1,511 55
	$6,169 71		$6,169 71

BALANCE DECEMBER 31st, 1858.

To Revenue,	$1,511 55	By Capital,	$2,663 17
" Suspense,	141 49	" Loan,	860 00
" C. S. Seyton,	255 66		
" G. S. Fitch,	1,614 07		
	$3,523 17		$3,523 17

THE RITNER GOLD MINE.

This mine is situated in Rowan county, North Carolina, about five miles from Salisbury and nearly eight miles from the celebrated Gold Hill Mine. From the Report of Mr. Stephen P. Leeds, Geologist, we have the following facts:—

This mine is located in the same mineral belt as that which embraces the Gold Hill Mine, but the vein is not parallel with the strike of the rocks of this rich mineral tract, but cuts them at an oblique angle and consequently assumes the position of a cross vein.

This feature is favorable, for it is a well established fact, that cross veins are usually more rich in mineral qualifications than any other.

The course of the vein bears West 40° North by East 40° South. It carries a position approaching closely to a vertical one, varying in fact but one or two degrees from a peculiar line. From the general character of the mineral veins on the eastern slope of the Appalachian chain, there is but little doubt but that this vein will assume a vertical range when it shall have been opened to a depth of from one to two hundred feet. Those veins holding a vertical position have never yet been known to fail.

It is a bold and remarkably well defined vein, averaging about six feet in width, and extending three-quarters of a mile on this property.

The gangue-stone is compact, massive quartz, semi-transparent, and of the character known among mining men as "lively quartz," a term used in contradistinction to that dead and non-metalliferous quartz, which so frequently pervades mineral regions. The vein is highly charged with sulphuret of iron or iron pyrites, which in many points has undergone a chemical decomposition, while the larger portion of the mineral is still in its original character, a bright white pyrite. Some traces of copper ore are manifest at different portions of the vein, and it is not improbable that when operations at this mine shall have been prosecuted to a greater depth, an increased quantity of this metal will be procured. The presence in the vein of such ample quantities of iron pyrites is a strong indication that such will ultimately be the result. In the mines of Europe, the "backs" of pyrites are ever hailed with great satisfaction by those working out the ores, and so far as the experience of practical men in our own country has advanced, the facts have corroborated the opinion stated above.

The gold is disseminated throughout the pyritous portion of the vein in very minute particles, but showing under the panning process a yield varying from a value of fifty cents to two and a half dollars per bushel. The cavernous or honey-combed quartz also carries a considerable quantity of gold, and in the pan shows a rich return; and by taking the average product of the different qualities of ore, the vein would reach about seventy-five to eighty cents per bushel.

The fineness of the gold is shown by the Mint certificates, which places its value at ninety-three cents per dwt. The variation between this value and the value of absolutely pure gold is caused by an intermixture of silver; this feature pervades all the gold found in this portion of the United States; sometimes being so great as to reduce the value from some mines to as low a figure as seventy-three cents per dwt. Gold absolutely pure is considered at the Mint to maintain a value of 103.333 cents per dwt., while the standard value of gold coin of the United States is 93½ cents per dwt.

That ore is generally considered of a very fair character which will yield gold that is worth 93 cents per dwt.

The vein has been proved nearly over the whole extent on the property, by costeaning at various points upon its course, and has been reached at all places where trial has been made, at a depth varying from five feet to a surface outcrop.

Three shafts have been carried down upon the vein to the depth of twenty-five or thirty feet, and at that depth the vein maintains a uniform character.

Three hundred tons of ore are now raised to the surface, which, estimated at sixteen bushels to the ton, at a valuation of seventy-five cents per bushel, would give a value of three thousand and six hundred dollars, for the ore now raised and ready for milling.

From the favorable nature of the location of this vein, each hand employed upon the ore bed ought to be enabled to raise two tons of ore per day. This ore taken from the vein will give at least as full a quantity of gold as that which has already been extracted, and the probabilities are that the yield will be better as the vein has improved in richness so far as it has been deepened.

No machinery has yet been placed upon this property, with the exception of the simple rocker, in common use throughout this gold region; and with this primitive process the expenses of working the vein, and the erection of a house and stables, have been paid for, which includes the raising of the ore mentioned above.

If copper should be reached at a depth of from sixty to one hundred and twenty feet, which is the average depth at which in copper-bearing veins in this region it manifests itself, this will be a very valuable mine. The present value of twenty per cent. ore, is ninety dollars per ton; and the gold obtained from this mine, will not only pay the cost of raising the copper on the surface, but will also pay a valuable profit on the working expenses, thus placing the copper ore in a condition to be shipped from the mine free of cost.

A never failing stream of water affords a full supply necessary for washing ore and for all purposes of the mine. Nearly the entire portion of the vein is still unbroken, and affords the favorable position of virgin ground, which on mining properties is ever a desirable point to attain.

There is an abundant supply of timber on this tract, for all uses appertaining to the mine, either for fuel or building purposes. This tract embraces about one hundred acres, which is so plotted as to cover the greatest possible extent of the vein. Much of the land is in a good state of cultivation, and, for raising the necessary provisions to be consumed at the mine, is a valuable acquisition to those operating on the mine.

The Central North Carolina Railroad will pass, when completed, within five miles of this mine, and will render this point easy of access; it will be finished beyond this point in the course of the ensuing summer. From all the indications evident on this property, there can be no doubt entertained but that this is a permanent vein, and that it contains an unfailing supply of valuable ore.

GOLD IN ENGLAND.

The excitement which has been created in England relative to the existence of gold in large quantities, has awakened an active investigation of the subject in all its bearings. Among other results, not the least important to us, is the information elicited respecting its extraction and amalgamation. Various writers have offered their views upon these operations in the public press. Some of these will be found not uninteresting to our readers. One writer thus proposes—

TO TEST ORES FOR GOLD.

Finding there is such a rage for gold throughout the United Kingdom, with almost every kind of lode, and rock, too, producing gold, with wonderful inventions of costly patents for its extraction, has induced me to give the miner and others, who may be inclined to make trials on their iron, mundic, gossan, etc., the following, when they can make the experiment themselves at their own mine with certainty; I, therefore, give the instructions to the best of my knowledge. First, bruise the ore, or stone, to be operated upon to a fine powder: put two gallons of this (or more, as your means of operation at hand may be,) into a jar containing three or four gallons, with a quart of boiling water, adding a little nitric acid, and, say, half a pound of quicksilver; shake it well for ten minutes, then nearly fill the jar with hot water, and move it about, rolling the jar a few times every three or four hours, as may be convenient, during, say, twenty-four hours. At the end of that time run it into an iron trough, or boiler; then turn a small stream of water into this vessel, keeping it well stirred, so that the water may carry away the earthy matter. When reduced to a small quantity put it in a basin, then pass it from one basin to another—the quicksilver running out, there will be seen some sand remaining behind in the basin; this wash into a vessel: at each time you pass the quicksilver from one to the other, there will remain some sand, or earthy matter. Continue this until you get the quicksilver clean from dirt; you have then the gold, native silver, and native copper, if any, incorporated with the quicksilver; examine the last portion which is washed each time from the basins, to see if any of the quicksilver has escaped. This done, take a piece of chamois leather, put it over a basin in a trough-shape, run the quicksilver on the leather, then draw up the outer portion of it into one hand, with the other squeeze the quicksilver until no more will pass through; what is left in the leather is the amalgam: then take this amalgam and put it on a bright fire-shovel on a clear fire, the quicksilver will evaporate, when you will see in an instant the metal—if gold, it will be gold color; if silver, a silver color, etc. The quicksilver that escapes through the leather will be saturated with a small portion of the metal; therefore, to make the experiment perfect, re-distil this quicksilver, the sediment will be the same as what you have collected in the leather before; the real value can then only be ascertained in the same manner as the various kinds of gold dust are known.

Some may ask, why put in the acid? This is to quicken the process; greasy, soapy, or many other substances do sometimes, to my knowledge, coat over the particles of gold, and prevent them from adhering to the quicksilver, which greatly retards the process; but if you can give it time this caution is not required, as the friction caused by the long-continued motion will effect its object.

I will now suppose that you are about to act on half a ton of fine ore, which is on a larger scale. Make a cask—say, six feet long, and four feet diameter—to be of equal dimensions from end to end. In the centre, on the inside, place three or four rows of iron teeth, in the shape of a handsaw, but larger in the teeth: fix the cask in a frame, and cause it to rotate on its axis by hand with the ore, water, and quicksilver—say, for a day, in such case the acid is not required. You can carry on the experiment on a larger scale by washing away the earthy matter when taken out, and clear up after you have done five, ten, or fifty tons. There are hundreds of miners in Cornwall who have seen the washing up of the silver and gold amalgam in Columbia, Mexico, Chili, and the Brazils, and plenty of engineers who are well able to construct machinery to reduce the stone to powder, as required. Then why should we Cornishmen be deterred, or be behind in satisfying ourselves if there is not sufficient gold to pay in our iron ores, mundic, gossan, etc?

However, to go on with my subject, as proposed, I will give you this crude way to test the quicksilver. Have a sugar-loaf-shaped copper vessel made—say, eight to ten inches in height, and six to eight in diameter; have a trough, plate-glass or china-ware I would prefer, but if not at hand one sufficient to stand the heat, take an iron one, in which you put the quicksilver: underneath this place, have a perforated plate, such as an old stamps grate; place this on the end (upright) of a tile, or any other pipe, sunk in the ground, say, two or three feet, so as to keep out the cold air; under this pipe place a basin of cold water, you have then all the necessary apparatus required for the operation. Next, put them all in their proper places; first, the basin of water, on which must stand the pipe, which should come to about the level of the ground, on the top of this pipe place your perforated iron, in which you must put your trough-shaped vessel, containing the quicksilver: put a small piece of iron, or any other substance, between your perforated plate and the one which contains the quicksilver, so as not to cover too many of the holes. This done, place your sugar-loaf-shaped cap, or cover, over the quicksilver. The next step is to put this on a slow fire, made with turf-ashes, coke, or coal; this operation will take several hours. As the quicksilver is heated, the evaporation will condense on the inside of the vessel, and run down in drops into the water; when the whole of the quicksilver is evaporated, the sediment, if any, is the remainder of the metal sought for.

I have thus described such a simple plan as will ascertain sufficiently correctly if any of the amalgam should have escaped in the quicksilver; but, for general purposes, this method is not necessary.

Another writer thus speaks of the defects in the process of amalgamation:—

Mercury may yield an amalgam when squeezed through a wash-leather, and yet have varied quantities of gold in solution. In some instances I have found scarcely a trace, and by recent experiments I have found it varying up to as high as nearly eight grains in one pound of mercury: such being the case, it will be easy to see what gross errors we may be led into, when ores are experimented upon in the manner I first witnessed; as, for instance, take an ore containing no gold, but native copper, or silver, and crush it with sixteen pounds of mercury, which is the usual quantity employed in every experiment. This mercury is capable of filtration; but having, let me suppose, been used for crushing several ores, it is highly saturated with gold, on completing the experiment, the mercury would give a solid amalgam, which might contain all, or nearly all, the gold originally in the sixteen pounds of mercury, the result more or less depending on the amount of copper or silver in the ore. Again, if this mercury, just robbed of its gold, were to be next used upon an auriferous ore, it would appropriate to itself a quantity of gold; and suppose in this last case, a small quantity was only operated upon, a return of no gold might be made, whereas it might, nevertheless, contain a respectable quantity.

Where the experiments are very large, this error will not be of so very much importance, but when small quantities have been tested, and the results calculated into tons, it will not, in the most remote degree, give a notion of the real quantity of gold in the ores; and I have no hesitation in saying that ores now reported to contain two ounces to the ton will be found to contain scarcely a trace of gold, while others, said to contain more, may be found to give a respectable yield. I have made experiments with all the metals likely to occur in ores, in what is termed their native state, upon mercury containing gold in solution, but leaving no insoluble amalgam when squeezed in a wash-leather, and I find that they all, more or less, and some more rapidly than others, rob the mercury of its gold, and give an insoluble amalgam with the gold. This would further urge the necessity of fresh mercury being used in every experiment.

My opinion has been asked by some chemists, as to the plan of assaying the bulk of mercury from which the insoluble amalgam has been removed, and from the assay calculating the amount of gold in the whole of the mercury. I do not, as far as my experience goes, consider this at all so truthful as distilling the mercury with very great care, using a high rectification, and putting a layer of three or four inches deep of iron scales on the top. The distillation should cease before the solid amalgam is left alone, and removed along with some of the mercury, treated in an appropriate vessel with nitric acid of proper strength, the gold gathered and afterwards cupelled. The silver is in the nitric acid solution estimated. The distilled mercury may be assayed for gold, and the amount, if any, added to the gold already obtained. The system of heating an amalgam of gold and mercury upon an iron plate, or shovel, or, indeed, as carefully as you may do it, is wrong, gold being dissipated.

The foregoing remarks are not intended to apply to the practical working of obtaining the gold from mercury, but are simply precautions in testing ores, to determine, as near as may be, the amount of gold capable of being worked out by means of the crushing-machines. The experiment cannot be made with too great care, and will prevent, perhaps, great unnecessary outlay for machines to work the gold out of ores where the gold does not exist, or exists in such a small quantity as not to warrant the expense, and might, in some cases, prevent the gold from being passed over, where it may be found in valuable quantities, sufficient to warrant the operation of these machines.

Another writer offers the following observations on the conditions under which gold is found while discussing the question of

THE ABUNDANCE OF GOLD IN BRITAIN.

Those who express an opinion that gold will not be found in sufficient abundance in this country to yield profitable results, appear to me to be guided entirely in their conclusions of the different stratification in which they state the gold is diffused in foreign countries to what exists in England; this appears to be their main, if not sole, argument. They maintain that the circumstances are entirely different, and that consequently the results must correspond.

Now, I believe that the matrix of the gold found in Australia and California is principally quartz, and that gold frequently exists in considerable richness in connection with iron. There is no doubt whatever of their being large quartz veins in this country, principally of that decomposed and ferruginous character termed gossan; and it is upon samples of such lodes that the trials have chiefly been made.

While, however, I hold these opinions as to certain cases, which are by no means confined to those I have alluded to, I regret to think that much deception will be attempted upon the public, and the utmost caution will have to be exercised in embarking in British gold mining. Before investing his money, every one should be well satisfied as to the *extent* of the gold-bearing rocks in the particular mine or locality it is intended to operate in, and not be led away by simple assays, or trials by machines, however dazzling they may thus appear. If a sample of a few pounds weight produce 2 or 3 grs. of gold, it is very easy to calculate upon paper how much it would be per ton, and how much profit could be raised upon 1000 tons per month (if they have it), but the whole question will depend upon the *quantity* of the auriferous mineral which can be obtained. I would here merely add that as ½ oz. of gold per ton will yield large profits, higher per centages will, of course, give proportionate results; while the friable nature of the gossans will, in their case, render the pulverizing a much easier and economical operation than the same can be performed upon the hard and tough quartz of most foreign gold mines.

Another fact of importance I wish to refer to as connected with gold in England, is the existence of that metal in copper, and even in tin ores, but chiefly in the former. In some of the experiments which have been tried on copper ores there have been rich results. This is a matter which deserves the serious attention of the miner. At present, in selling copper ores, the samples are assayed for that metal only, both by the seller and the buyer; nothing is known of the other components of the ore, and when it is remembered that the average produce of the Cornish copper ores is only 8 per cent., one cannot help thinking that it would be worth while to ascertain of what the remaining 92 per cent. is composed, or, at all events, assay it for some other metal or metals as well as copper. Lead ores are always assayed for silver, and in many cases more than 50 per cent. of the price obtained is for the latter.

A considerable number of experiments have also been made on iron pyrites, commonly called mundic, which is very abundant in many lodes in Cornwall and Devon, and in some cases holding down to a great depth, the general results of which have been a highly profitable per centage of gold; but as the mundic usually contains a good deal of arsenic, which damages the quicksilver, and injures the gold, it will be necessary to roast it previous to being operated upon. In doing this, however, the arsenic itself, as well as the sulphur (another of the chief component parts of the mundic) might be saved, and then the gold could be extracted without difficulty. An important fact may here be stated. The gold found in this country is very pure, in most cases above the standard, thus rendering the process of amalgamation much easier than in the greater number of the foreign gold mines, where the precious metal is not so fine. At the St. John del Rey Mines, in Brazil, the quartz contains an average of 1 oz. per ton, but partly owing to the comparatively rude mode of working, and the cause just stated, only ½ oz. is obtained, although with this a profit of 50,000*l.* per annum is made.

Recurring to the arguments made use of, regarding the dissimilarity of circumstances under which gold is found in other countries and in England, I would further remark that I know not why there should be a fixed and unalterable law for gold, when there are so many unaccountable differences in the laws affecting the existence of other metals, such as copper and lead, not only between foreign countries and England, but even between different localities of this country itself. Copper lodes are found rich in granite, in elvan, and in killas, or clay-slate; and in the case of the well-known Ecton Mines in Staffordshire, in limestone; and in Cornwall and Devon all copper lodes run east and west, while the Burra Burra lode in Australia, the Kaw-aw lode in New Zealand (both celebrated for their richness), and I believe all other copper lodes in those countries, run north by east and south by west. The Burra Burra lode is imbedded in limestone and the Kaw-aw lode in quartz; in fact, the richest copper mine in the world is in quite a different stratification from any copper mine in Cornwall and Devon, and it cannot be said that there are no productive and profitable copper mines in those counties. In Wales the lodes of the most profitable lead mines run east and west, in Cornwall they run north and south, and there is one in Devon which runs east and west.

EXTRACTION OF GOLD BY ZINC.

Zinc, like lead and tin, forms with mercury an amalgam which strains through the leather even when the proportion of zinc is considerable. On mixing this fluid amalgam with mercury containing gold, which has passed through the same leather, and immediately re-straining, a solid amalgam of gold and zinc, with silver and copper, if present, remains; whilst any excess of zinc again runs through with the mercury. From this fact, as well as from the completeness of the separation, it appears that the extraction of the gold by zinc is to be ascribed, not merely to a change in the composition of the amalgam, and consequent substitution of another metal for a part of the gold in solution, but to the known affinity of zinc for gold and silver, joined to a peculiar property it possesses of forming, in combination with these and some other metals, an insoluble amalgam.

JOURNAL OF COPPER MINING OPERATIONS.

ENGLISH EXPORTS OF COPPER.

From a return just made by the House of Commons of the imports and exports of metals for the year ended 5th Jan., 1853, it appears that the total import of copper ore was 37,818 tons; regulus, 5226 tons; unwrought, 2188 tons; old copper, 968 tons; rods, bars, etc., 2993 tons; plates and coin, 23 tons; and copper manufactures to the value of 19,234*l.* 10*s.* 6*d.* Of the unwrought copper 1098 tons were from Chili, 628 from South Australia, and 225 tons from Russia. The principal copper ore was from Cuba, Chili, and South Australia; and the largest portion of bars, rods, and ingots was from Russia. The total amount of British copper exported was 16,936 tons; and foreign, 15,099 tons. The amount of tin imported was 2372 tons, of which 1571 were retained for home consumption: the duty amounted to 9438*l.* Zinc imported, 18,505 tons; oxide of ditto, 788 tons: exported, 1305 tons British, and 5948 foreign. We shall give the returns entire in our next Number.

MINNESOTA MINING COMPANY.

The annual report of the Minnesota Company has just been published. It is very full in its statement of the business of the last year. Our readers will find the following extracts full of interesting facts relative to this highly successful mine:—

PRODUCT OF MINERAL FOR 1853.

The amount of mineral raised from the mine for the year ending 31st December last, was a fraction over 520 tons; but at that date there were also several large masses, estimated at 200 to 250 tons more in the aggregate, thrown down in the several drifts, and in process of being cut up, but which could not be accomplished in time to be included in the year's returns, as only the mineral actually raised to the surface and *weighed off*, is reported monthly by the agent. It will thus be seen, that the aggregate of mineral obtained, including the amount not raised to the surface on the 31st December, was nearly 800 tons; and which, could it all have been realized, would have shown a large increase of production over the previous year, and exceeded the estimate in our last report.

We should doubtless have raised and shipped a considerable part of these masses within the year, but for an accident to our new hoisting and pumping engine, sent up in the fall of 1852, which was cast away on Lake Superior, and only partially recovered last spring, some portions being entirely lost, and their replacement from below being necessarily a work of time, and causing much delay in getting it into operation. In the mean time the rock and water in various parts of the mine had accumulated beyond the power of our horse-machinery to keep free, and seriously impeded the process of stoping, and cutting up the large masses as fast as thrown down. The engine was finally got into successful operation in September last, working the three principal shafts, and performing in the most satisfactory manner. At the latest accounts, the accumulation in the drifts had been nearly removed; and thenceforward, no doubt the superior facilities thus afforded for hoisting and pumping will enable us to keep the mine free from rock and water, and raise the heavy masses as fast as they can be cut up into pieces of manageable size.

RECEIPTS AND PROCEEDS OF MINERAL.

The preparations made by our agent at the mine, during the winter of 1852–3, for insuring the shipment of all our mineral up to the close of the ensuing navigation season (as noticed in last year's report), together with the services of a fine new schooner of 140 tons, purchased last spring, and taken across the portage at Saut Ste. Marie into Lake Superior, enabled our accumulated stock of mineral to come forward at an early period of the season, and placed our ingot copper in market some weeks in advance of any previous year. The subsequent product of the summer and fall was also shipped as fast as raised, until the latter part of the season, when the water again became too low in the Ontonagon River to admit of boating it down, and continued so to the close of the Lake navigation in November; so that about 80 to 100 tons were again unavoidably left over at the landing.

The mineral forwarded from the mine and delivered at the smelting works at Detroit during the past season, amounted to 745 tons of masses, barrel, and stamp-work; the whole of which (with the exception of a mass of 5,072 lbs. brought to this city, and placed on exhibition at the Crystal Palace) was smelted at Detroit, and yielded 1,070,561 lbs. of ingot copper—being a fraction over 72 per cent., or about 2 per cent. less than the mineral of the previous year. This deficiency in yield arises simply from the larger proportion of barrel and stamp-work shipped during the season, as compared with mass copper, which, as before shown, could not be cut up and raised in time to come forward; and not from any falling off in the general average per centage of our mineral, which we continue to estimate, as heretofore, at a standard of 75 per cent.

From the copper received, we had to deliver 312,887 lbs. in completion of previous contracts, at much less than the then market price, and the balance of 757,674 lbs. was sold at rates varying from 28 to 30 cents per lb. In addition to this however, your Directors, in order to give the stockholders the benefit of the entire season's production, to which they were justly entitled, disposed of 150,000 lbs. more, being the estimated yield of the mineral left over as before stated, to be delivered in this city the ensuing season, and payment for which was received in advance towards the contemplated dividend. The average price therefore realized for our whole gross sales of 1,220,561 lbs., amounting to $339,719 63, was about 28 cents per lb.—being an average of nearly 7 cents per lb. on the sales of the previous year, but less than estimated in our last year's report, the price of copper having in the mean time receded in the market contrary to general expectation, although an advance has since taken place, which appears likely to be sustained through the coming season.

MINERAL ON HAND AT THE MINE.

The quantity of mineral on hand at the mine on 1st January last, and also (according to our average monthly estimate for the year) on the first of the present month, will appear from the following statement:—

Amount of mineral on hand at mines, Jan. 1st, 1853, as per last year's report	398 tons.
Do. raised from the mine in 1853, as per monthly returns .	520 "
	918 "
Do. shipped from the mines in 1853, . . .	745 "
Do. on hand, January 1st, 1854, ...	165 "
Do. estimated product of January and February, 1854, at 60 tons per month, ...	120 "
Do. on hand, March 1st, 1854, ...	288 tons.

From this amount is to be deducted the 100 tons left over at the landing at the close of navigation, and which has been sold in advance, as before mentioned, leaving a balance of 188 tons on hand on the 1st inst., toward the aggregate production and available resources of the present year.

EXPENDITURES FOR THE YEAR.

The whole amount of expenditures for the past year in the several departments of the Company's business, have been as follows, viz.:—

For Wages	$61,011 02
" Supplies	47,541 72
" General expenses, including interest, commissions, insurance, state taxes, salaries, etc.	20,522 14
" Freights and charges	17,199 45
" Smelting account	12,057 84
" Personal property	7,572 96
" Real estate	1,543 88
" Office rent and expenses, New York . . .	495 88
	$165,244 84

The amount of "wages" and "supplies" as above, represents the actual expenses at the mine, chargeable on the *production* of mineral—being an average of over $9,000 per month. The present advanced rates of wages, and increased price of provisions and other supplies, will raise the cost for the current year to about $10,000 per month. The next three items are much larger than last year, though proportionately less—consisting mainly of charges on the transportation, conversion, and sales of 745 tons of mineral, against 813 tons the previous year—or about 15 per cent. on the gross amount of sales.

TREASURER'S ACCOUNT.

The Treasurer's cash-account and vouchers have been duly audited and certified by the Committee on Accounts, and show his receipts and disbursements for the past year, and the balance of cash and bills receivable remaining in his hands on the 1st inst., to have been as follows :—

RECEIPTS.

To Cash balance on hand, March 1st, 1853 . . .		$964 52
" Bills and debts receivable		6,435 61
" Sales of copper for 1853		339,717 63
" Bills payable discounted		31,602 91
		$378,522 67
Total amount of receipts		378,522 67

DISBURSEMENTS.

By bills and debts payable (outstanding March 1, 1853, ...	$82,588 78	
" Agent's drafts and sundry accounts as per vouchers No. 1 to 522 . . .	168,115 52	
" Dividend paid stockholders, at $30 per share	90,000 00	
		$335,704 30
Balance on hand in cash and bills receivable, March 1, 1854		$43,118 37

It will thus be seen, that after paying off our heavy indebtedness of the previous year, and a cash dividend of $90,000 to stockholders, the treasury is still left in an easy condition, showing an ample balance on hand to meet all existing liabilities—a state of things highly satisfactory to your Directors, and which they hope will always be maintained hereafter.

PROPERTY AT THE MINES.

The accounts and vouchers of the Company's agent and superintendent have been received and passed, showing the amount of our indebtedness for wages, and the balance of cash on hand on the 1st January last, together with the usual inventory of personal property and supplies, and the estimated value of the surface improvements at the same date, as thus exhibited :—

Personal property, consisting of steam-engines and machinery, tools, vessels, boats, cattle, household furniture, etc., etc. .	$45,370 00
Supplies on hand, at cost and charges	42,964 00
Real estate (or surface) improvements, consisting of cleared lands, roads, buildings, docks, etc., ...	28,112 00
Cash on hand	3,436 25
	120,434 25
Deduct amount due for wages	32,482 28
Surplus	$86,601 97

This statement shows a large amount of property at the mines, over and above our indebtedness for wages—all of which is paid for, and worth more than its cost to the Company for their current business purposes.

The value of our real estate, as represented by the Minnesota Mine itself, and its prospects of permanent productiveness, your Directors estimated in their last year's report at not then less than one million of dollars, and certainly the further developments made by the new shafts and drifts that have been opened during the past year, leave no room to doubt the justness of that estimate, or to question the fact of its increased and still increasing value at the present time.

RESOURCES AND LIABILITIES.

From the balance-sheet of the past year, and from our estimates of production and expenditure up to the first of the present month, the outstanding liabilities and available resources of the Company, and its financial condition and prospects at that date, are shown to be as follows, viz. :—

RESOURCES.

Mineral on hand, March 1, 1854—188 tons at 75 per cent. yield, is 282,000 lbs. net, at 27½c. per lb.		$77,750 00
Supplies on hand at the mines		42 956 00
Bills and debts receivable, New York		47,721 74
Mass copper and silver on hand "		1,910 48
Cash on hand, "		7,684 11
Do. " at the mines		3,436 25
		$181,418 58

LIABILITIES.

Bills payable outstanding	$46,282 99	
Wages due at mines, Jan. 1,	39,832 28	
Do. estimated for Jan. and Feb.	20,000 00	
		$106,115 27
Surplus		$75,303 31

From this exhibit of the Company's affairs, the stockholders will perceive with satisfaction, that a considerable surplus already appears in our favor towards a dividend for the present year; to which the net profits of 8 months' further production (that is, to the close of the ensuing season) even at a moderate calculation both as to quantity and price, will doubtless add sufficient to realize our reasonable expectations, and sustain the character of the Minnesota as a dividend-paying mine.

GENERAL IMPROVEMENTS AT THE MINE.

During the past year we have added to the real estate of the Company by the purchase of 720 acres of desirable agricultural and wood lands, conveniently situated in our immediate vicinity—making the whole extent of the Company's property 2,085 acres. Several additional buildings have been erected, and a large boarding and several new dwelling-houses are now in progress, to accommodate an increased force this spring. Other extensive surface improvements have been made in the opening of roads, clearing of land for cultivation, etc., and the large quantity of hay, oats, and vegetables reported still on hand on the 31st December, prove the last year's crop must have been abundant. The population of our village has increased from 312 persons last year, to 371 at present; of whom 280 are men and boys employed in various capacities at the mine, and 91 women and children—all sustained by the Company's operations.

The extent of ground opened in the mine during the past year, has been very considerable. Three additional shafts have been sunk (numbered 5, 6, and 7), and two additional levels opened to some extent—so that our works now in process consist of 7 main shafts, and 5 levels or drifts. The former have been sunk, in the aggregate, 170 feet—making 1,480 feet in all. The latter have been opened 2,781 feet, making the whole length of drifts 5,926 feet. The deepest shaft (No. 2) is 327 feet; the longest level (No. 1) 1,346 feet. In all these openings the show of mineral is such as to give every confidence in the permanent and increasingly productive character of the mine.

ESTIMATED PRODUCT FOR 1854.

From the *data* thus furnished, and considering the amount of copper now thrown down and in sight at the mine, as well as the improved facilities for raising it to the surface, we think a yield of 700 to 800 tons for the year may not unreasonably be expected. How far a possible decline in the market, and a probable advance in wages, may reduce the net profits of the season, of course we cannot say—but leaving sufficient margin for these contingencies, and studiously avoiding, as they have done in the foregoing statements, all exaggeration either in language or estimate, your Directors feel satisfied that they may safely and sincerely congratulate the stockholders on the favorable prospects of the ensuing year.

AGATE HARBOR MINING REGION.

Agate Harbor is situated on Point Keweenaw, Lake Superior, about six miles from Eagle Harbor. It is one of the best harbors on the south shore of the Lake, being perfectly safe and easy of access, with sufficient water to admit the largest class of vessels and steamers. It is the name both of the harbor and of the village located on the shore, and which promises to be a place of no ordinary importance. Along the shore the land rises rapidly in a steep ridge almost mountainous. The veins of copper worked by the various mining companies can be traced with more or less distinctness beyond this ridge, and even into the waters of the Lake. It is in this neighborhood that quite a number of important mining companies are at work with highly favorable prospects.

Agate Harbor Mining Company.—The property of this Company is located about a mile from Agate Harbor, and is described as the north half and south-west quarter of section five; north-west quarter of section eight; north half of section seven, and south half of section six, in township fifty-eight N. of range 27, W.; all of section one, N., half of section 12, township 58, N., range 30, W.; and contains 2,200 acres. From the report of Mr. Wm. H. Stevens we have gathered the following particulars respecting the mines in this property:—

The northern portion of this location is bounded by a belt of conglomerate crossing east and west, composed of pebbles of sandstone and broken fragments of trappean rocks, and underlies to the north at an angle of about 50°. To the south of this, and underlying it, are several alternating belts of sand and trap rocks, varying in width from 10 to 30 feet. Still south of these alternating belts lies the great northern metalliferous range of rock which includes the whole southern portion of this location for over one mile in width, and underlies the sand and alternating bounds of trappean rocks to the north. It is upon this range that the celebrated Copper Falls, Phœnix, Humboldt, and Clark Mines are being opened.

Upon this property are four large and well-defined veins bearing native copper.

Vein No. 1 is situated upon and crosses section 1, from near the quarter part on the north line to within 40 rods of the south-east corner, from thence across the N. W. quarter of section 12, and thence across section 7, a distance of 1¼ miles. The vein will average between three and four feet in width at the different points where it has been opened by cross-cuttings at the surface. There are numerous ancient pits supposed to have been made by some ancient race of miners. At several points we attempted to clear them of the rubbish and see what the appearance of the vein is in depth; several of them were sunk upon to the depths of from 10 to 20 feet. At one point we sunk 82 feet and came to an ancient level, where a man can pass back and forth over 20 feet between the walls of the vein. All of this ancient work has been done in a good and well-defined vein—one of sufficient width to work without breaking either wall at the points cleared out. It varies from 3 to 5 feet in width, and contains native copper. We have traced the vein by these pits over one-fourth of a mile in a continuous line, where they are plainly marked; the indentations (at some points) before they were cleared out, were from 4 to 10 feet deep.

At the above mentioned depths we came to a large pool of water that fills the old mine up to a certain level, and were compelled to suspend working until we get up machinery to hoist, or drive a level to drain the mine.

The length of adit to get 450 feet back would be about three-fourths of a mile, but it would be driven all the way upon the vein; and where the vein is

opened it is wide enough to drive between the walls without breaking either of them. Each of the four veins referred to have the same geological position, and can be opened by an adit in the same manner.

Many of the most profitable mines in the country have been worked extensively by some ancient race of people, some 1,000 or 1,500 years ago, and no doubt a large amount of copper was taken from the country. I am of opinion these excavations were made by the same hands, and they were mining for copper.

We next commenced explorations further south, and have traced and opened this vein at several points for over one-half mile, by cross-cuttings at the surface, and at each point found it to contain fine particles of native copper, with good smooth and well-defined walls varying in width from 2 to 5 feet, with all the leading features of the productive mines in this mineral region.

Vein No. 2 is situated about 60 rods east of No. 1, and has the same bearings and dip, exhibiting all the leading features of a good mine, varying in width from 2 to 4 feet, and has smooth and perfect walls, and is of the same material and character as other good and profitable mines in the country. It has been opened at several points, by cross-cuttings at the surface, for 3,000 feet in length, and at each point fine copper is found disseminated through the matrix. Both No. 1 and 2 veins are strong and well marked, and can be traced from 2 to 3 miles across the different formations without difficulty; and at every point opened, the evidences are as strong that they will make good dividend-paying mines as in any now worked on the south shore of Lake Superior.

Vein No. 3 is situated about one-half mile east of No. 2, and the fourth vein about one-half mile east of No. 3. These veins have been opened at two points, and are true veins of good width, and contain copper, and in every particular compare well with the productive mines on Point Keweenaw.

There are other veins, I have no doubt, of equal promise, that can be opened at a trifling expense.

There are about eighty acres of land under cultivation, which will produce all the vegetables and hay required at present for the Company's use.

From the harbor to the mine it is a regular ascending grade of about three hundred feet. A road can be constructed by following the valley of Agate River at a very moderate expense. A good plank road can be constructed at an expense not exceeding three thousand dollars per mile.

The property belonging to the Company is heavily timbered, with maple, pine, oak, birch, cedar, and spruce, which is well adapted to building purposes, and indispensable for mining uses. Agate River crosses the location, and affords in the dryest seasons a column of water two and a half feet in depth, with a current from 6 to 8 miles per hour, sufficient for all mining purposes, sawing lumber, and stamping and washing the metal.

For the following particulars respecting the Native Copper, Kelliher, Continental, and Mandan Mines, we are indebted to Mr. Stevens:—

The Native Copper Company are situated upon section 11. Their mine has been opened by shafts and open cuttings over 2,000 feet in length. The vein varies in width from 1 to 6 feet. The main shafts are near 200 feet deep, and levels have been driven several hundred feet upon the vein. It is well defined by good and perfect walls, and contains some small mass, barrel and stamp copper. There are 25 acres of land cleared and cultivated, and 6 good buildings, with shaft houses, whims, etc., requisite to prosecute mining operations with advantage, erected.

Kelliher.—Location half mile east, has two large and well-defined veins that have been traced from 2 to 3,000 feet in length by cross-cuttings at the surface. They are composed of calcareous spar, laumonite, and chlorite, with fine copper disseminated through it, and have good and well-defined walls, and all the leading features of other good mines in the district.

Continental Mining Company.—Situated on section 9, township 58, range 29, commenced work last October, and have opened one vein that is from 3 to 8 feet in width, well charged with fine copper, barrel work, and some small masses of pure copper.

This vein has been traced some 3 miles in length by open cuttings at the surface. There are three large and well-defined veins, composed of much the same chemical ingredients, all carrying copper, that cross this location, and have been traced and opened on the Washington Mining Company lands lying and adjoining on the north, for over one mile in length, from thence to the shore of Lake Superior, and at each point opened they are large, well defined, and carry copper.

The Mandan Mining Company have opened and traced a very promising vein, varying from 1 to 3 feet, having good and well-defined walls, with copper disseminated through it.

It has been traced some three miles in length, and at each part shows all the leading features of a good and profitable mine.

WM. H. STEVENS.

NEW YORK, *April 20th*, 1854.

Washington Mine.—A letter from the Superintendent thus describes the state of operations at this mine; the location of which is stated on page 431, Vol. II.:—

In shaft No. 1 (which we are now working), for the last ten feet the rock and lode has been much disturbed, but it has taken a change decidedly for the better; the lode and rock have become more compact, and the vein much more regular, and much better charged with copper. Our shaft at present is down 50 feet, contracted for 17 feet more, making 67 feet from the surface. When finished, will drift as far as necessary, and cross-cut to prove, at this depth, two other veins which are lying within thirty feet. We have now lying upon the surface some tons of very rich barrel and stamp work, which we are daily increasing. I have upon this section five different veins opened, and but one of the number has been worked. I also know of two others which I will open as soon as the season will admit.

North Western Mine.—The last annual report of this Company contains the following statement of the state of the mine:—

Adit level driven 155 feet, vein 2¾ feet rich barrel and stamp.
10 fath. " " 373 " " 20 inches " "
20 " " " 430 " " 8 " at present and poor.
Shaft No. 3 sunk 58 " " 8 " " "
Winze C " 38 " " 2½ feet in mass and barrel.

Driven and sunk 1064 "
Stope in 10 fath. level, south of shaft No. 2, 15½ fath. poor.
" " " " " winze A, 33½ fath 2½ feet.
Stope in 10 fath. level, north of " " 22½ fath. 3 feet.
Stope in 20 fath. level south of shaft No. 2, 11½ fath. 1 foot.
" " " " " winze B, 28½ " 2½ feet
" in adit " " shaft No. 2, 86½ " 4 feet.

Stoped . . . 196¾ fathoms.

On page 484, Vol. II., will be found an account of the working force in January last. A correspondent who has more recently visited the mine sends us the following report respecting it:—

The North Western looks very well, (better than since its opening). Mr. Slawson, the agent, has struck a splendid mass in the south part of the mine, and is now turning out a better quality of vein matter and stamp stuff than he ever before lifted to the surface. He was working all the fall off the main lode on a branch vein, but drifted west 60 feet, struck the main lode, and now the North Western is of the first order. A letter from Mr. Slawson says:

It is steadily improving; never looked as well as now, working 95 men in all. I have two good masses in sight, and am taking out a good deal of barrel work, and the stamp work is very rich. We are working eight head of stamps; shall have eight more at work in March; when they are all at work shall be able to turn out twelve tons of copper per month from them.

The Meadow Mine.—The Meadow Mine has a vein, upon which the Company are prosecuting their works, more promising than any new concern in the country. Two shafts, three hundred feet apart, have been carried down on the course of the lode, and an adit driven up a distance of three hundred and twenty feet on the vein. In the adit drift, which is about 40 feet under the surface at the shaft, the vein is about two feet big, in which two masses are now exposed, with the appearance of being large, and in all other parts of the mine the vein is full of barrel copper. The present force is thirty men, and its locality is one and a half miles from the village of Eagle River.

EAGLE RIVER DISTRICT.

North American Mine.—This mine was last noted on page 314, Vol. II. A correspondent writes in the following glowing terms of this mine:—

I went into the North American mine yesterday with Capt. Paull, with my eyes about me and plenty of time, it being the measuring day. The shipments were, for this last summer, at or about 214 tons, barrel and mass copper, being a large amount for the second year's opening of a vein; better was not done by the Cliff, or Minnesota, the only mines which now rank with this. The amount of copper on the dock ready for shipment and in the mineral yard is over 60 tons, being in masses of the purest copper ever sent through the St. Marie's River, of more portable size and convenient shape for transportation than any ever shipped from the Lake. There lie now in the mine, blasted down, cutting, and drawing out of the shaft, in pure mass, over 150 tons. *This is so.* Going down to No. 1 level and stopes above, we were struck with the cavern where the large mass was deposited, being a space of some 20 by 30 and 10 feet. I went north in this level as far as the supposed boundary of the Cliff and North American; here the vein is very rich, full of masses; just at the termination of the level is the end of a mass that looks too tempting to leave; the whole vein at this point is full of copper in mass. We went south of shaft, and all doubt of the vein not continuing good south was dispelled, for here it continues to show mass copper all over. We went to second level (20 fathoms) north, very rich. One mass is exposed now at one end and two sides that may be another mammoth. As it is now exposed it is ten inches in thickness, six feet high, and on the inner side east wall 8 feet, with no appearance of terminus. Went south to the first winze, and here the lode is being blasted down of the best barrel and stamp work in the country; vein 2 feet wide, regular and beautiful. Still farther south we saw three fine masses taken from level. At the south end of level they have struck another large mass. This mass is now 38 feet uncovered, and still not at the end, being now in length greater than the big mass of July, which weighed over *two hundred* tons. This mass, lying as it does in the extreme end of the level No. 2 south, proves an amount of copper very great. The level is not yet holed to cross-cut shaft No. 2, but every day the last blast is expected.

The whole vein is unmistakable, and one that will not run out. It is thought that this Company will make a shipment of 500 tons this next summer. I have exaggerated nothing here, and am not in the least interested, but am glad to inform you of its fine condition.

Fulton Mine.—The report of the Superintendent of this mine will be found on page 193, Vol. II. The following are later accounts from this mine:—

I have been through the Fulton Mine, and find it to exhibit evidences of richness much more encouraging than I had anticipated from what I had heard of the mine.

The vein is about one foot in thickness, carrying very fine stamp work and much barrel copper; and from it a few days since a mass estimated at 1,800 or 2,000 lbs. was taken.

The prospects of this Company are encouraging. The system and neatness manifested in the surface improvements here are worthy of imitation.

From A. B. Wood, under date Feb. 27, 1854:—I have examined the Fulton Mine—it is looking better than ever. The vein is 1½ to 2 feet wide, rich in stamp work, besides the mass and barrel work, which is abundant. I saw considerable barrel work in the pile, besides 20 barrels lately put up; I saw several masses in the mine, and a number that have been taken out, one of which weighed 2,000 lbs.

PORTAGE LAKE DISTRICT.

Isle Royale.—Since our last mention of this mine on page 318, Vol. II., the following facts have been reported:—

The stopes in Nos. 2 and 5 shafts continue very rich indeed. The drift in the lower level is decidedly rich. We are raising considerable copper for the work we are doing. When we commence stoping down the lode in good earnest, then will be the time when we can report on the amount raised weekly or monthly.

Sheldon Mine.—The Superintendent writes the following particulars, which continues the progress of operations from page 430, Vol. II.:—

The Sheldon Mine is looking exceedingly well. We are sinking two shafts, and both of them are carrying copper. In sinking on the Isle Royale vein, we got under it, consequently we had to drift to find it again, and we have now found the foot wall, and the lode is full of copper. The shaft on the Portage vein is looking well, and we are taking out copper in almost every shot. We have one mass of copper in the shaft, or rather in the side of it. I cannot tell how far it extends, not having blasted around it yet, but I feel confident it is of good size. I think this is doing well for three months' work.

COPPER HARBOR DISTRICT.

The Star Mine.—The following statement furnishes some particulars additional to those on page 484, Vol. II.:—

The vein is very regular, and walls as smooth as the most fastidious could desire. The mine looks well, the vein being of the same value as from the openings, and in some places better. No. 1 shaft is now something over 70 feet in depth, and in the drift from this shaft the vein is two feet wide, rich with copper. In the top adit the vein is six feet wide between two good walls, four feet of which is very rich, and the balance of the vein matter is composed of indurated clay.

Shaft No. 2 has been commenced, and the vein is filled with shot copper. From all appearances this shaft will yield the copper in masses.

In the bottom drift the vein is three feet wide. A magnificent show. Solid with vein-stone. More than enough copper is being taken out to pay the cost. The work goes on rapidly, and is done in a proper manner, the shafts and levels being of good size, and the timbering of good quality and well set. A few months will prove its value as a mine, without doubt.

Manitou Mine.—This mine was last mentioned on page 488, Vol. II. The Superintendent thus reports progress:—

The No. 1 vein has been driven this month 13½ feet. The vein is still improving, becoming strongly impregnated with copper. It is 2½ feet wide, and gaining strength as we advance on it. The winze is also down 18½ feet more this month; total depth 36½ feet (two months' work); vein three feet wide; good stamp work, though sometimes disordered in consequence of a floor of amygdaloid, which we think we have passed nearly through. Some portions are richly impregnated with copper. The wall now is nearly perpendicular. No. 3 drift on same vein has been driven this month 40 feet. We have not yet got all the vein, but think we shall soon have it all.

MINING LOCATIONS IN UPPER CANADA.

We publish below the recent public notice of the Commissioner of Crown Lands relative to the conditions on which mineral lands can be located on the Canada side of Lakes Huron and Superior, and along the Ste. Marie River. The conditions of purchase are much more favorable than they have been heretofore, and now by paying down £25, or $100, a person can locate 400 acres, and can have two years, and to the full expiration of that term, to pay the balance of the purchase money, which is altogether *one dollar and fifty cents per acre.*

CROWN LANDS DEPARTMENT,
Quebec, 22d September, 1850.

His Excellency the Administrator of the government, by order in Council has been pleased to direct that on payment into the hands of the Commissioner of Crown Lands, of the sum of twenty-five pounds, that officer be permitted to issue a license to any individual, authorizing him to explore on any unconceded lands within the limits of any such county or section of country as he may desire to be inserted, situated within the boundaries of Upper Canada, for copper, tin, lead, iron, marble, gypsum, earths or minerals, such license to remain in force for a period of two years, and to authorize the individual in whose favor it is issued to take possession of a tract not exceeding four hundred acres, and not already occupied by any other person, such tract to be in the proportion of forty chains front, by one hundred chains in depth; the license holder to report his discovery and selection accurately by letter and by map within six months from the issue of his license, accompanied by an affidavit made by himself and some other credible person, proving that no counter occupation or working exists.

And at the expiration of the said term of two years, during which the license shall have force, he shall complete a purchase, paying the consideration money in one sum, at the rate of seven shillings and sixpence per acre, or failing to do so, he shall be regarded as having abandoned such right to purchase.

BRISTOL MINES, CONNECTICUT.

On page 434, Vol. II., an error occurred in the notice of the Bristol Mines, in Connecticut, which we wish to correct. Those who are familiar with the operations of the press, know that with the utmost care accidents will happen. In this case it consisted in adding to the article a few lines relating to another mine. The article, as follows, is correct:—

This extraordinary rich copper mine, which has been worked some ten years, and returned in that time above $200,000 worth of the finest ore, is now being surveyed and valued by Mr. C. S. Richardson, who is to prepare a perfect set of geological plans and sections of the property. It may be remembered that this mine was always considered to be a mere deposit, but, from some circumstances that have recently transpired, there are grounds to believe a contrary result will be arrived at. We learn that a powerful pumping water-wheel is in course of erection, and will shortly be set to work. The produce of the mine is now paying a profit of about $1,400 per month, and when the new machinery is completed, it is anticipated the mine will pay remunerative dividends on the capital expended for many years to come.

AMERICAN MINING COMPANY.—REPORTS FROM THE MINES.

Norwich Mine.—[Extracts of letters from A. C. Davis, Agent.]—January 29, 1854. "Shaft B is 42 feet below adit level. In the bottom there is a large mass in sight. We have a favorable change in 3d level east. The ground much better for breaking, with a good lode of barrel and stamp work. In the 3d level west, we are going ahead finely, with a good lode of barrel and stamp work. Stopes Nos. 1, 2, and 3, in the back of 3d level west, are turning out a fine lot of barrel and stamp work, but no masses. The 2d level west is looking well, and turning out considerable copper. So are the stopes in back of this level. The mine looks encouraging in every respect. I am in hopes to get shaft B down 70 feet, and levels started from east and west, before warm weather. This shaft has shown mass copper from the start."

February 27, 1854.—"The mine is gradually improving. We took out one mass from shaft B that is good for thirty hundred of copper when dressed."

March 14, 1854.—"We had steam on our engine on Saturday last, for the first time. The mine is the same as when I wrote you last. There is quite a mass in stope No. 1, 3d level east. Two batteries of stamps are nearly completed."

Windsor Mine.—[Extracts of letters from D. Plumer, Agent, and A. C. Davis.]—January 11, 1854.—"The Windsor has got a splendid show in their adit, some 450 feet south of the vein they are working. I think I never saw a finer show at the surface."

January 22, 1854.—"This mine has improved very much since my last. There is a large mass in the winze. The 2d level from shaft No. 2, west, is now carrying a good lode of stamp work. The drift east from shaft No. 1 looks well. The big adit is going ahead finely, and is now about 150 feet in all. Where we first struck the rock, we cut a vein, carrying a good deal of copper, and it appears to be very regular. In the end of the drift, now about 25 feet north of the first vein before mentioned, we have cut what appears to be another lode, carrying copper. Should we find either of these two veins worth working, we can hardly estimate their value, lying as they do so far south of the vein we are now working, and in a settled country. The Windsor, as it looks now, will compare with most any of the mines in this vicinity, and it may be ahead of them all yet."

February 18, 1854.—"The Windsor Mine is looking very well. The mass that I advised you of in my last I have not yet taken down. Shaft No 2 is now down 20 feet below the small level, and looks very well. The adit is progressing finely. It is now in about 190 feet."

March 14, 1854.—"The Windsor Mine continues looking well, and they are getting along finely with their adit."

Sharon Mine.—[Extracts of letters from Agents.]—January 11, 1854.—"The Sharon shaft is down 70 feet, and the lode looks well."

January 20, 1854.—"The Sharon south vein is looking very encouragingly, as is also the middle vein. Shaft No. 1, south vein, is now down 8 feet, with the finest lode of coarse stamp work I ever saw. Shaft No. 1, middle vein, is down 65 feet, with a good lode of stamp and barrel work. All things at Sharon are moving along as well as they can do."

February 7, 1854.—"The shaft on the north vein is now down 80 feet, and we have commenced drifting on it east and west. On the south vein the lode is large, and very rich in good stamp work. The copper varies in size, from the finest particles to nuggets of an ounce in weight. This vein resembles the Norwich, and is presumed unhesitatingly to be the Norwich vein."

February 28, 1854.—"There is in the north vein nothing new. The south vein still looks more promising than ever. Indeed, the show at this mine is all that we could wish."

March 14, 1854.—"The south vein is looking as well as any one could wish."

Derby Mine.—[Extracts of letters from Agents S. S. Robinson and A. C. Davis.]—January 10, 1854.—"The north vein is growing stronger in copper, and improving in appearance otherwise."

January 27, 1854.—"We are still sinking on the south vein, and have now, I think, a regular foot-wall. The shaft on the north vein still looks promising."

February 7, 1854.—"The ground in the north vein is now softer, and carrying more epidote and spar in place of quartz, and is still carrying fine copper."

February 28, 1854.—"The Derby mine shows no particular alteration since my last, except carrying a little more copper in the south vein. This vein is still composed of the same soft promising character of vein-stone."

Jamestown Mine, Wis.—[Letter from Wm. Warner, General Agent, dated April 12, 1854.]—The engine and pumps were put into operation on the 26th of September last. They have already sunk the water forty feet. The pumps lower the water for over one-fourth of a mile from the engine-shaft, and drain eleven mineral ranges. Seven shafts are being sunk, four of which have reached the ore. 165,144 lbs. of ore have been raised up to the 8th inst., and sold on the ground for $5,796.98. A large portion of the work has been expended on fixtures, and in opening the mine. A discovery of large and rich mineral has just been made in the engine range.

Three whims have recently been erected, and the general appearance and prospects of the mine are encouraging.

Cabarrus Mine.—The reports from this mine are to April 14. The engine and machinery have been shipped, and, by contract with the manufacturers, is to be put up at the mine by the 25th of May. A large force of carpenters are engaged putting up the buildings for the machinery, and they are expected to be ready by the time the engine and machinery arrive at the mine. From present appearances, the mill, with the engine and machinery, will be in complete operation early in the month of June. From the perfection of the machinery, and the abundance of ore, rich in gold and copper, it is confidently expected this mine will equal in productiveness any mine in the south.

San Augustine Mine.—[Extracts of letters from H. P. Chamberlin, Agent.]—January 15, 1854.—"We never looked more promising at this mine than at present. At one blast, on Thursday, we threw down a ton of fine gray and blue ore; and it is as good now ahead as then."

January 31, 1854.—"The western part of the lode, lying to the south and west of the main shaft, has been commenced upon, and has thus far yielded a rich return of green and gray copper. In the winze, we have raised a constant supply of fine yellow ore. To-day, after having undermined a large mass of spar, we blasted it down, turning out a most beautiful quantity as well as quality of yellow copper.

"We have shipped during the past month 87,737 lbs. of ore, 15,500 lbs. of which were of a very superior quality."

February 28, 1854.—"This has been a month of the best realization since I have had charge of the mine. The lode in the winze has equalled my highest expectations, and has yielded a fine quantity and quality of the choicest yellow ore. We have raised from the winze alone, this month, twenty-five tons of rich copper. On the south of the main shaft, at ten fathoms, we have opened in some splendid gray ore."

March 31, 1854.—"The mine this month has fully equalled the yield for the previous one. South and west of the main shaft, the drifts have given a good produce of gray copper and malachite. The drift in the winze has also given a rich return of yellow copper. I am waiting with much anxiety the arrival of the engine and machinery for dressing the ore, and hope then to make the largest shipment of copper ever sent from Bayaturo."

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

SILVER COINAGE.

The coinage of silver at the United States Mint in Philadelphia, for January, February, and March, 1854, has been as follows:—

	Jan. and Feb.	March.	Total.
Half dollars . . .	$341,000 00	$116,000 00	$457,000 00
Quarters . . .	609,000 00	566,000 00	1,177,000 00
Dimes . . .	117,000 00	18,000 00	135,000 00
Total silver .	$1,067,000 00	$700,000 00	$1,767,000 00

The deposits of silver for the first quarter of 1853 and 1854, were:—

	Jan.	Feb.	March.	Total.
1853 . . .	$14,000	$18,000	$70,000	$87,000
1854 . . .	108,000	1,166,000	147,500	1,421,500

COST OF THE MINT.

A Report from the Director of the Mint to the Secretary of the Treasury contains a statement showing the total receipts, as well as the total expenses, of the Mint, and the net cost or gain as the result for each year since 1847:—

	Total Expenses.	Total Receipts.			
1848	. $61,938 07	$17,796 19	Net cost for	1848	. $44,141 88
1849	. 82,732 66	80,871 24	"	1849	. 58,861 82
1850	. 245,077 88	173,791 84	"	1850	. 71,285 64
1851	. 410,906 28	330,089 46	"	1851	. 90,814 77
1852	. 371,296 64	330,589 25	"	1852	. 40,707 39
1853	. 427,643 99	530,064 95	Net profit for	1853	. 102,420 96

ASSAY OF MICHIPICOTEN ISLAND ORE.

The Lake Superior Silver Mining Company have received the following analysis of a lot of ore sent to England for assay:—

The two casks of copper and silver have been crushed and assayed for A. J. Smith, Esq., Secretary of the Lake Superior Silver Company, to whom the ore belongs, and it contains 552 ozs. of fine silver to the ton of twenty cwt. of ore, and sixteen and a half per cwt. of pure copper.

A letter says:—

Assay Office, No. 79 Hatton Garden,
London, Nov 5th, 1853.

The price of fine silver is about $1.85 per oz. (and the premium besides.)

VALUE OF LEAD MINES OF WISCONSIN, IN REGARD TO EXTENSIVE MINING OPERATIONS.

The preliminary Report of Professor Edward Daniels, "On the Geology of Wisconsin," is rich in information relative to the lead mines within the limits of that State. The remarks on the commercial value of the mines will be interesting to all readers; indeed, the entire report is a work of more than ordinary merit, and is of permanent value.

In opening an extensive mine, a large expenditure must be made before any return can be realized, it is therefore important to calculate closely beforehand the conditions required to render this preliminary investment a profitable adventure. This involves several considerations, each of which must have its due weight in determining the value of a mining locality.

First—The character of the metalliferous deposits.

Second—Extent of unworked ground, where discoveries of ore may reasonably be expected.

Third—Character of the ground.

Fourth—Facilities for drainage.

Fifth—Proximity to fuel, market, etc.

Let us now see how the lead region of Wisconsin will abide the test of these conditions.

First—Character of the deposits. I have already shown that most of them are true veins, and may be relied upon as such in extensive mining operations.

Second—Extent of unworked ground. It has also been shown that the works thus far have merely been superficial. The deposits of the surface-rock even have only been exhausted in a few cases, while those of the lower rocks have but just been discovered. All the mining thus far done could be put upon six sections of land. Veins are everywhere pointed out which have been abandoned, though still yielding richly, for want of machinery to remove the water, or from the occurrence of a temporary "pinch" which cut off the ore. The constant discovery of veins incidentally while digging wells, cellars, etc., proves conclusively that a vast addition to the known mineral ground may be looked for in this direction; while the unexplored deposits of the buff-colored and lower magnesian limestones offer a fresh and promising field to mining enterprise. From those rich storehouses of ore, generations to come will draw their supplies and leave them yet unexhausted.

Third—Character of the ground. This is eminently favorable. The veins intersect only limestones, sandstones, and shales. No injections of trap or granite occur here, which so often ruin the prospect of the miner elsewhere. The rocks have been very slightly disturbed, hence faults or shifts of the strata, throwing the veins out of their natural position, are rare. The ground is frequently so open that nothing but the pick and gad are required for excavating it.

Fourth—Facility of drainage. As most mineral veins run into the water at a short distance from the surface, it is important to know with what facility this element can be removed. This will depend upon the structure of the rocks and the conformation of the surface. Near many of the lodes, the surface is intersected by deep ravines and valleys, on either side of which the lead-bearing rocks are piled. In such cases, drainage by level can be very easily effected. This method of drainage has advantages over every other where it can be used. As the veins are arranged in gangues, parallel to each other, a level may be run so as to cut them all in its course, and thus prove the ground at the same time it relieves it of water. Such a level, judiciously located, and perseveringly driven, could not fail to enrich its owners. Numerous localities might be selected, where, by running a level one mile, from twenty to fifty veins would be cut through and drained. A few levels only have been undertaken. That of Mr. Champion at New Diggings is the most extensive, and has been eminently profitable. Mr. Looney's level, near Benton, has been driven nine hundred feet, and paid well. M'Coy's level, near Shullsburg, is also a good investment. These are only beginnings, but they prove what may be done in this direction.

In Europe, these levels are often driven for many miles, at an expense of from five to twenty dollars per fathom. One of these levels, at the Gwennap mines in Cornwall, is twenty-six miles in length.

The lead mines of this district can also be readily drained by pumps of moderate capacity. The lead-bearing rock is traversed by vertical seams, filled with a tough clay impervious to water. By this means, the water which it holds is divided into separate basins, or great natural cisterns, each independent of every other. Thus, a pump may be put upon any one of these, and unwater the ground within its limits, while those adjacent are not affected.

Were it not for this beautiful economy of nature, no pump could be found of sufficient power to lower the level of these subterranean waters. This structure also explains the fact, that the water is often found twenty or thirty feet higher upon one vein than upon another a few rods distant. In some cases, the basins are so small that forty feet of water has been raised by a pump of three-horse power. In other cases, fifty-horse power would be required to effect a thorough drainage.

Fifth.—Location in respect to fuel, market, etc. The lead district as a whole is abundantly supplied with fuel, though in some few localities wood has to be brought from a distance. The dense forests of its river valleys, and the heavy bodies of oak and other timber which cover nearly one-third of its surface, promise a store of fuel amply sufficient for its future wants. The great coal field of Illinois is scarcely a hundred miles from its southern border. Lines of railway, traversing it from east to west, and from north to south, will soon connect it with those vast stores of combustible matter, and disperse the spoils of its own forests wherever the wants of industry may require them. It is thought that under these facilities for cheap transportation, coal may be afforded at $2 50 per ton. At this price, it could be safely used in those portions of the district where wood is least abundant. The completion of the railroads, now being rapidly constructed through this district, will give it, together with its proximity to the Mississippi, ready access, at every season of the year, to all the markets of the country.

I have thus endeavored to set forth the character of the lead mines of Wisconsin; the causes which have obstructed their development; and the inducements which they offer for extensive mining operations. It has been shown that the deposits of ore are true veins; and inexhaustible for centuries to come. That as yet they have been worked only in the most superficial manner; that the withdrawal of labor into other fields, the want of concentrated capital, and the prevalence of mistaken opinions as to their value, have all been operative in retarding their progress, and bringing their productiveness to a temporary decline. Yet even under these unfavorable circumstances, these mines yield annually nearly 30,000,000 lbs. of pure lead, or about one-half of all the lead produced in the United States. During the years 1845, 1846, and 1847, the entire lead mines, including the small portions of the district in Illinois and Iowa, produced annually about 54,000,000 lbs., of which two-thirds were from the Wisconsin mines. During the same years, the average annual yield of all the lead mines of Great Britain was 105,736,338 lbs. The yield of our lead district, therefore, exceeded one half of the total product of the British lead mines. Such a product of ore, with the same outlay of labor and capital, is altogether unprecedented in the whole history of mining.

During these years, lead became an important item in our foreign exports, while the import of this article sank to a mere trifle. This will be seen by consulting a few statistics from the records of trade. During 1845 and 1846, the imports and exports were as follows:—

Imports. lbs.	Receipts at New Orleans. lbs.	Exports. lbs.
7,995	54,980,000	16,928,746

In contrast with these figures, observe the same statistics for the last two years—1850 and 1851:—

	Imports. lbs.	Receipts at New Orleans. lbs.	Exports. lbs.
1850-51 .	43,490,000	22,750,000	227,448
1851-52 .	37,444,568	18,729,530	747,980

According to these figures, in the years 1845 and 1846, we not only supplied our home market with lead, but sent to foreign countries 16,000,000 lbs., while during 1850, 1851, and 1852, we have fallen so far short of supplying our home market, that we import annually 40,000,000 lbs. to make up the deficit. For this we send out of the country, annually, about $2,500,000 for a commodity which might be abundantly supplied at home. Two-thirds of this sum of money sent away to pay the miners of England, Germany, and Spain, ought to be laid out in the lead mines of Wisconsin, and would be, if these mines were worked to an extent at all commensurate with their inherent richness. It is obviously of the highest importance that an interest like this, second to no other in our State, should not be suffered to decline. At this period especially, when we are just setting up for ourselves, we need the avails of these natural resources with which a beneficent Providence has favored us. If our young State would become rich in acquired possessions, it must improve this fundamental capital. It should buy much, but sell more, and buy nothing abroad that it can get at home. What a transformation would the vast sums now sent abroad for lead accomplish, if distributed over our lead district, for which Nature has done so much, and art so little. What engines would pump its deepest mines! What mighty levels would be cut through the walls of its veined treasuries! What life would be infused into every branch of industrial effort! What cities would grow up as if by magic; and what evidences of wealth and prosperity would cover all the land! For such a consummation, a little fostering care only is now needed. The true value of these mines must be made known, and companies with ample capital must be found to work them. A Department of Mines, similar to the School of Mines in Great Britain, should be connected with the State University, where such scientific knowledge as is necessary for successful mining may be obtained.

Under the present high prices of lead, the mines are reviving, and it is to be hoped that no change of governmental policy will result in a reduction of these prices until they are again in a state of healthy activity.

MINERALOGY OF THE WISCONSIN LEAD REGION.

To the same source we are indebted for the following interesting and important particulars respecting the minerals of this lead district and the process by which some of them may be prepared for use:—

Under this head I will present a brief notice of the prominent minerals of the lead district, and the process by which those of them which are valuable may be prepared for use. For want of such accurate knowledge, mineral resources often remain unknown, or if known undeveloped and useless.

Sulphuret of Lead.—Galena.—This is the ore from which most of the lead of commerce is derived. It is of bluish gray color, with a shining metallic lustre, sometimes splendent. Cleavage generally perfect, cubic, occasionally found fibrous and granular. In many localities the crystals are very perfect and beautiful. They are generally cubes, called by the miners "cogs." These are sometimes elongated, so as to form right square prisms, or the edges and corners truncated, forming octahedrons, and dodecahedrons. The ore is generally reduced in blast furnaces, and the lead is run into moulds, forming bars of about 70 pounds weight, called "pigs." The average yield is about sixty-eight per cent.

Sulphate of Lead.—Anglesite.—This ore occurs in small quantities. It is generally found in crystals, nearly transparent, having a vitreous lustre and slight tinge of green. The galena is often studded thickly with these crystals, especially where it occurs in small cavities.

Carbonate of Lead.—This is known as "white mineral" among miners. It is found massive, having no metallic lustre or appearance. It is generally of a white or light gray color, but is sometimes colored darker. It fractures very much like a piece of compact limestone. It consists, chemically, of the oxide of lead, 83·46, carbonic acid, 16·54. It occurs with the galena, generally in soft ground. It is sometimes found in a pulverulent form, coating the galena, and known as "mineral ashes." It has resulted from the decomposition of that ore. It is valuable as an ore of lead. About 20,000 pounds were raised at "Brigham's mine" near the Blue Mounds, and small quantities have been found in many localities. It is sometimes confounded with sulphate of baryta, from which it can be distinguished in the manner I have described in treating of that mineral.

Carbonate of Zinc.—This ore has very little of the metallic character in its appearance. It is massive, assuming sometimes a stalactitic or mamillary form, with a spongious texture, like incrusted moss. It is popularly known as "dry-bone." Its color varies from white with a pearly lustre, to light brown and green. It occurs abundantly in veins, associated with galena, at Mineral Point, Dodgeville, Mifflin, Franklin, Platteville, Shullsburg, Hazel Green, and other places. It is the most valuable ore of zinc known.

Sulphuret of Zinc.—Blende.—This ore of zinc, known as "black-jack," is very common. It is generally massive; color, green, brown, or black, lustre, resinous. Frequently in crystals, disseminated through the vein-stone or the adjacent rock. Fine crystallized specimens are sometimes mistaken for tin ore. For chemical composition, see table of analyses. This ore has been used for the manufacture of metallic zinc, but it is so much inferior to the carbonate, or dry-bone, as to be used with profit only where that ore cannot be obtained. It may be ground and used as mineral paint.

Sulphuret of Copper.—This ore is usually of a brass yellow color. It resembles iron pyrites, but is distinguished from that mineral by being easily cut with a knife, and failing to strike fire with steel.

Carbonate of Copper.—Generally of a light green, gray, or blue color; earthy and massive fibres, with a silky lustre; sometimes crystallized regularly, with a vitreous lustre, and deep azure hue. In this last form it is often mistaken for crystals of colored quartz, and furnishes specimens of rare beauty. The carbonate and sulphuret of copper are generally combined. They occur in veins, usually perpendicular, in the lower beds of the gray limestone. They have been worked at Mineral Point, where they have yielded about 15,000,000 pounds of ore. Most of this was smelted in the vicinity, and gave from 15 to 20 per cent. of pure copper. No work has been done on these veins for several years, and it may be questioned whether present indications are sufficiently favorable to warrant an extensive outlay. A small vein, also, has been struck in the same rock at McKnight's copper diggings, section 8, town of Wayne, and copper ore has been found near Centreville. Indications of copper have also been observed in several other localities. But until further examinations be made, it is impossible to pronounce upon their value. No discovery of this ore has been made in the same vein with lead, so far as I am aware.

Iron. Brown Hematite.—A variety of this ore is found occasionally, forming the matrix of the lead; color, brownish yellow; structure fibrous, when broken presenting often a mamillary surface. It accompanies the vein in parallel bands with clay. When ground, this ore forms yellow ochre. Red ochre, known as iron rust, is often found in immense quantities in the veins. It is often followed as an indication of a "lead." Its origin can be traced to the decomposition of iron pyrites.

Sulphuret of Iron.—Iron Pyrites.—This mineral is found abundantly throughout the mines. It is the brilliant substance called sulphur or "mundic." It occurs in nearly every form known to the mineralogist, and furnishes specimens of unsurpassed beauty. Occasionally the galena is coated over with this substance. In some cases the rock near a vein seems to have been broken up, and pyrites introduced, cementing the mass together into a kind of breccia. The cavities are lined with octahedral crystals of a bronze color. This ore is often mistaken for gold, from which it is distinguished by not being malleable. The chemical composition of this ore is 55 parts of sulphur, 45 of iron. It is used for the manufacture of copperas, which is prepared from it by the simple process of leaching and evaporation. It is also used for the manufacture of alum, and sulphuric acid. The increasing demand for these articles confers a high importance upon this ore.

It decomposes very rapidly when exposed to the air. Where piles of it have been thrown out around the mouth of a shaft, the soluble copperas, formed from its decomposition, is often washed down by the ruins, and collected in the pools around, where it is left upon the evaporation of the water. In Mr. Looney's level, section 11, town of Benton, a most beautiful illustration of decomposition and recomposition occurs. A heavy vein of pyrites is here imbedded in very pure clay. The level has been cut through this, giving free access to the air. The ore has decomposed, forming copperas, which effloresces in delicate crystals upon the sides of the level. A portion of the sulphur has been left pure. Another portion, uniting with the oxygen of the atmosphere, formed sulphuric acid, which, uniting with the clay, produced the sulphate of alumina, or alum. All these substances may be seen here in the process of formation. Nothing can be more instructive to the naturalist, or more interesting to the reflecting mind, than the contemplation of these silent mutations of matter, constantly going on in the great laboratory of Nature, around and beneath us.

Sulphate of Lime.—Gypsum.—This substance has been found in only one locality. It occurs at Fairplay, about 60 feet below the surface, in veins traversing a bed of clay. It is white, with a fibrous texture and satin lustre. Owing to its great depth from the surface, the extent of the deposit cannot at present be ascertained. It is used as a mineral manure, under the name of "Plaster of Paris;" and also for taking casts, stereotyping, and as a cement. I believe this is the first discovery of gypsum yet made in the State, except in the drift.

Sulphate of Baryta.—This is the heavy spar of the miner. It is generally of a white or yellowish color, vitreous lustre, and so heavy as to be often mistaken for white lead ore. It has even been carried to the furnace and tried for lead; and upon failing to yield that metal, the report has been circulated that the "white mineral" has been tried and found worthless. It is however distinguished from that ore by a little care. It is softer than the carbonate of lead. It has a glassy lustre, while that is lustreless and earthy in appearance. The lead effervesces with acid; the baryta does not. This spar is ground and used as white paint, forming Venice white by combination with white lead. The article here is of good quality for such purpose, and is found in considerable quantities.

Water Lime.—Discoveries of this valuable substance have been made in several localities, which promise to be of value. But I am not prepared to report upon them until fuller examinations have been made. It is of great importance that good hydraulic cements sholud be furnished from the rocks of our own State, as we are now making heavy importations of this bulky article from abroad. Early and thorough attention will be devoted to an examination of all rocks which promise to be useful in this particular.

Building Stone.—The rocks of this portion of the State furnish excellent material for building purposes, but great care is required in making a selection. The different layers in the same quarry often vary much in their texture and composition, so that close discrimination is needed to obtain such as will weather alike. In this climate, where sudden freezes are so common after winter rains, if a rock is porous it can hardly escape destruction, however hard and compact it may appear, when taken from the quarry. The water insinuating itself into the minute pores, expands suddenly by freezing, and bursts it apart. When stone is to be selected for an edifice, of any considerable value, especially if designed for public purposes, every precaution should be taken to ascertain the real quality of the rock before it is used. For want of such care many of our public edifices in older states are only monuments of folly; and at this early juncture, while our cities are yet to be built, we may take the advantage of their experience.

ASSAYS OF WISCONSIN GALENA.

The following are the results of seven assays of Wisconsin galena, made by Dr. Augustus Hayes, the State Assayer of Massachusetts:—

No. 2 East and west vein from Brigham's, near Blue Mounds.—A clean mass of galena.

One assay ton (2,000 lbs.) of this galena, assayed for lead, afforded 1,600 lbs. The lead obtained, when assayed for silver, less 1 25-100 oz. silver.

No. 3. From a north and south vein, New Diggings.—Another variety of galena.

One assay ton, assayed for lead, afforded 1,628 lbs. The result for silver hardly differed from No. 2.

No. 4. From an east and west vein, New Diggings.—Another form of galena.

One assay ton, assayed for lead, afforded 1,580 lbs. The proportion of silver was the same as in 3.

No. 5. Fibrous galena, from Franklin, supposed to contain silver largely—A sample differing from the last in form.

One assay ton, assayed for lead, afforded 1,586 lbs. The proportion of silver was nearly the same as in No. 4.

No. 6. North and south vein, Potosi.—Sample differing in form from the last.

One assay ton afforded 1,680 lbs. lead. The result of the assay for silver was the same as in the other samples.

No. 7. East and west vein, Potosi.—Another variety of galena.

One assay ton afforded 1,600 lbs. of lead. This lead contained the same proportion of silver as the last.

No. 8. From a dry-bone sheet, Messersmith's, near Dodgeville.—This sample was somewhat mixed with foreign matter.

One assay ton afforded 1,520 lbs. of lead. The proportion of silver in the lead was the same as in the above.

The analytical trials here given were performed on samples of galena presenting different physical characters, and two of them had the color, form, and hardness of argentiferous galenas. The proportion of silver estimated on the yield of lead, is remarkably near the same in the different samples. The silver in this minute quantity seems to belong to the galena, whatever may be its form, and its detection and separation are not easily effected.

The percentage of lead afforded is that of an assay, and will serve as a guide in pointing out what returns should be obtained from smelting operations, as carefully conducted.

It will be seen that the ores, after being broken from gangue, should produce 1,600 lbs. of lead from 2,000 lbs. of ore, were the smelting processes perfect.

SILVER MINE IN GEORGIA.

A letter to the Augusta (Geo.) *Chronicle*, dated Gwinnett county, Geo., Feb. 14, contains the following statement. The *Chronicle* is a creditable journal:—

I take leave to inclose a small piece of silver ore, taken from a shaft now being sunk upon the lands of Mr T. J Waters, of this county. The mine was discovered by a gentleman, who said he derived his information from *a traditionary account*, handed down for many years, that, somewhere contiguous to the river Chattahooche, there was an old abandoned silver mine; and upon a close and careful examination, the pit, *apparently hastily filled up and abandoned*, was found Mr Waters immediately placed a number of hands at the control of this individual, and after several weeks' labor—having sunk a shaft forty feet in depth—a rich deposit of the inclosed ore was the result. From a lump of the size of the piece sent, which was subjected to a chemical analysis, pure silver to the value of half a dime was obtained. From various relics, such as old iron implements, commonly used by pioneers, silver drinking cups, etc., which have been accidentally found in various sections of this county, many intelligent persons are of opinion that the celebrated Spanish adventurer must have passed along here in his search for the mineral wealth of the New World. However that may be, the piece of ore sent is genuine. Mr. W. designs working it himself.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE FOR 1854.

	Tons.
Shipments from Richmond to close of week ending April 20	239,083
Same time last year	192,527
Increase	46,556
Amount sent by Reading Railroad to April 20	520,237
" " Schuylkill Canal	119,831
Total	640,068
To same period last year	494,461
Increase	155,606
Lehigh Coal shipments to April 18	34,084
Same time last year	41,418
Decrease	7,334

The Delaware and Hudson Company have not commenced active shipping operations yet. Their stock of coal at Rondout is reported as well nigh exhausted, and a productive season's business is anticipated.

The following contract prices for anthracite coal, delivered on board of vessels at Port Ewen and Rondout, have been established, from the opening of navigation on the Delaware and Hudson Canal, by the Delaware and Hudson and the Pennsylvania Coal Companies. The rates are per ton of 2,240 lbs.:—

	To July 1.		To Sept. 1.		After Sept. 1.	
	P. Co.	D. & H. Co.	P. Co.	D. & H. Co.	P. Co.	D. & H. Co.
Lump,	$4 25	$4 35	$4 35	$4 40	$4 45	$4 50
Steamboat,	4 10	4 45	4 50	4 55	4 60	4 65
Grate,	4 40	4 60	4 50	4 70	4 60	4 80
Range,	4 55	4 65	4 65	4 75	4 75	4 85
Nut or Stove,	4 55	4 75	4 65	4 85	4 75	4 95
Chesnut,	3 70	3 75	3 80	3 85	3 90	3 95

CUMBERLAND MINING OPERATIONS.

Mining operations are quite active in the Cumberland region, according to the following statement:—

It gratifies us to be able to state that the mining operations of this region are now characterized by great activity and zeal, both on the part of the companies and the men in their employment. Since the strike was happily brought to an end, there has been no lack of miners in the region. In fact, we are told that at many of the mines there are a greater number of applicants for employment than can find places for advantageous labor. There is some complaint of the want of cars, but this is probably in consequence of the long suspension of business, and the difficulty of bringing all the available power of the railroad into active service at so short a notice. In a short time the coal trade of the region will be re-established upon its former substantial basis.

PARKER VEIN COAL COMPANY.

The condition of this Company is understood to be as follows:—The steamships have been sold for $350,000, $50,000 have been paid on account, and for the balance they hold the bonds of the Steamship Company, secured by the ships sold. The Caledonia Mine has been sold to the company of that name for about $350,000, but as for want of transportation this new company has not yet been able to do much, they have not made any cash payment, and the Parker Vein does not transfer the property until the purchase money is paid or secured; total $700,000. Indebtedness of the Company about $700,000. They have issued besides, bonds to the amount of $100,000, but have not as yet made any use of them. Capital stock 30,000 shares, say $3 000,000. They have about 6,000 acres of coal land, 1,200 acres of which, on George Creek, are said to be worth at present $1,000 per acre, and it is estimated would be worth $1,500, if the Baltimore and Ohio Railroad could bring the coal to market. The remaining 4,800 acres at Barrelville, etc., are not so valuable, because they are not yet accessible, but will be as soon as the roads now building shall be completed. The Company contend that the future business of the Company depends entirely on the Baltimore and Ohio Railroad, whose double track is to be ready by July next. They could, they state, make contracts for any quantity of coal, but dare not do it as long as they are not sure of getting it to market. The Steamship Company is bound to carry their coal for less than for other companies.

CUMBERLAND COAL COMPANY.

The following circular has just been issued by the recently elected President of this Company, A. Mehaffey, to the stockholders:—

Sir:—Prior to my election to the presidency of this Company, I made a brief examination of its possessions in Maryland. Since that period I have devoted myself to the investigation of its affairs, and made myself more perfectly acquainted with the mines, roads, working materials, and the capacity of the Company to mine and transport coal to market in such quantities as to render your stock valuable and remunerative.

The inspection of the lands of the Company, its mines, roads, and machinery (all in perfect order), will fully justify me in expressing my most perfect confidence in the immense value of the property.

I also find the financial condition of the Company to be sound, with adequate means to carry on its business successfully.

The transportation power of the Company is ample—the demand for the product of your mines very great, at enhancing prices.

As misrepresentations and other means are used to unduly depress the value of your stock, and as these misrepresentations can only be met by investigation, I have deemed it my duty, as the guardian of the interests of the shareholders, to address you, and to invite you to call at the office of the Company and personally assure yourself of its flattering prospects by an investigation of its affairs.

THE NORTH BRANCH.

This is the name of a Company proposing to construct a railroad from Cumberland to Westernport, which will greatly facilitate the transportation of coal from that region. The facts of most importance respecting it are the following from the *Cumberland Journal*:—

The amount of stock is limited by the charter to one million of dollars, divided into shares of $100 each, the Company to be organized as soon as 5,000 shares are subscribed.

We have heretofore informed our readers that the Chesapeake and Ohio Canal Company have conferred to the North Branch Company its prior right of way to the bed and banks of the Potomac River from Cumberland to Westernport, and this transfer places the latter Company in possession not merely of the prior right of way, but of the only practicable site of a coal road on the Maryland bank of the Potomac River.

A full and complete survey of the route has been made by the distinguished civil engineer, Charles B. Fisk, Esq., which ascertains the distance to be 28 miles, and the plane of the road to be a continuous descent all the way, without any ascent whatever. The descent upon the whole length of the road averages 11 feet per mile, which is so distributed as to give to the first 7 miles from Westernport down to the river, an average descent of 19 feet per mile; and the remaining 21 miles an average descent of $7\frac{1}{7}$ feet per mile. The curvatures are generally favorable, and at no point objectionable.

It is very probable the Company will determine to construct a mine-car road, upon the plan recommended by Mr. Fisk, the cost of which, according to his estimate, will not exceed $500,000.

The importance of this road to the coal trade of Western Maryland, will be understood at once from the fact, that between the Chesapeake and Ohio Canal, at Cumberland, and Westernport, the heart of the coal region, there is now virtually no communication whatever. Thus the Companies on George's Creek, Savage River, and the upper North Branch, are without any other means of bringing their coal and other staples to market, than the Baltimore and Ohio Railroad, and it is well known this Company have refused to employ their work as a feeder to the canal. It is believed, therefore, that the construction of the North Branch road would at once more than double the transportation on the canal, and furnish an outlet to market for the whole Westernport region, which, until it is completed, must remain in a state of comparative inaction.

THE DELAWARE AND HUDSON COMPANY.

The profits of this Company during the last year were $830,972, equal to $11\frac{1}{2}$ per cent. on the capital stock of the Company. The coal shipped from Honesdale was 494,209 tons. The Pennsylvania Coal Company also shipped 512,777 tons. The season was 198 working days. The enlargement of the canal has been completed, and the enlarged boats have carried 106 to 140 tons. The sales of coal reached last year, $2,046,033; tolls, $378,479; profit as above stated, $830,972.

We are well assured that the recent increased tonnage facilities of this Company are totally inadequate to accommodate either the immediate or prospective demands of the trade of the Lackawanna region; and that parties anxious to open up new and valuable coal deposits in the vicinity of Scranton, have sought in vain to effect an arrangement with the Delaware and Hudson Company, for coal transporting facilities. It should be made compulsory on this Company to provide for the wants of the trade; or legislative privileges be conferred on other parties to do what this Company fails to do.—*Pottsville Register.*

THE BRECKENRIDGE CANNEL COAL.

The property containing this coal was examined by Messrs. B. Silliman, Jr., George D. Prentice, and Bryan R. Young, Commissioners appointed by the Governor of Kentucky under an Act of the Legislature of that State. Their report to the Governor contains both a description and valuation of the property. We take from it all the points of leading interest:—

SITUATION OF THE PROPERTY.

The lands embraced in the titles of the Breckenridge Cannel Coal Association, comprise about seven thousand acres. Of this about six thousand four hundred acres are within the southern coal field of Kentucky, and about five hundred acres just upon its margin, and known as the Tar and White Sulphur Springs. In addition, the Association holds thirty-four acres upon the bank of the Ohio, just below and immediately adjacent to the town of Cloverport. The distance from the Ohio River at Cloverport to the coal openings on this property, is about nine miles by the course of the railroad which is now in progress of construction by the Association, but, by the usually travelled road, it is somewhat less. The Tar Springs property is situated about midway between Cloverport and the coal openings. The course of the railway is over the property of the Association for the whole distance, save about three miles, where the right of way has been purchased. The landing at Cloverport is estimated one of the most favorable on the River Ohio.

GEOLOGICAL FEATURES.

The simplicity of this branch of the subject, so important in its bearings on the value of the property, enables us to dispose of it in a brief manner. The mountain limestone crops out near the saw-mill, and immediately above it follows the shales and sandstones of the coal measure. The dip of the rocks over the whole of this region is very gently and evenly to the south-west. The amount of this dip, as measured in the line of the coal openings, is about four inches in one hundred feet, or about twenty feet in the mile. This estimate has been confirmed by the level upon points more than a mile distant from each other. The *strike* of the beds (a line at right angles to the dip) is perfectly horizontal.

The importance of these facts, in reference to the drainage of the mines, will be apparent to any person familiar with coal mining, when it is added that the level of all the coal is above the little valleys, and into which the coal entries will open. Pumps will never be required to drain any portion of this estate. The order of succession uniformly observed in all well characterized coal fields is here noticed. Limestone, sandstone, shales, with nodular iron, and fire clay under the coal—these, with various minor beds differing in thickness or in mineral character, succeed each other. Three such repetitions, well marked, were noticed by our Commissioners, and probably others may exist. Three beds of coal were well made out. Two of these are worthy of notice, viz., the upper, or *cannel coal*, and the lower, or *bituminous coal.* These two beds are separated by at least one hundred feet of stratified deposits.

CANNEL COAL.

This bed constitutes the peculiar value of this coal property—it demands, therefore, careful attention.—It is now opened at fifteen places by adits or coal entries, driven from convenient points in the valleys of the several minor water-courses. Your Commissioners satisfied themselves, by tracing its outcrop, that this bed extends under a very large part of the entire territory of the Company. We feel that it is entirely within bounds to say that this coal measure underlies at least four thousand acres of the land owned by the Breckenridge Cannel Coal Association. Its thickness may be set down as three feet, for the whole territory, as estimated from all points now open. In some places it was considerably over three feet, and again somewhat less. We took the opinions of intelligent miners, and of experienced coal-viewers on this point, and our statement is the result of all our inquiries and observations. We do not include, in the thickness of this coal, about eight or ten inches of a bituminous shale under the coal. This shale is full of impressions of coal plants, and burns freely; it is easily mined by the pick, and its removal enables the miner to bring down large bodies of the cannel coal. The character of the cannel coal bed is remarkably uniform at all points, where we saw it; and we observed it in about twenty places in a circuit of eight or ten miles. It is covered by a well-disposed cover of sandstone, which forms a solid level roof, highly favorable to safe and economical mining; the under clay is of the usual character of the fire clay in coal measures, quite solid and hard when first opened, but on exposure to the air, it yields a soft, fat clay. In some of the openings a blue slate forms the floor, in which nodules of kidney and tile-stone iron of good quality are abundant. From what we saw in the entries already driven, and in the shale thrown out, we have no doubt that the smelting of iron may be added with advantage to the other resources of the Company. The character of this cannel coal is entirely peculiar and unlike any other coal with which your Commissioners are acquainted. We agree in calling it cannel coal, although it is in some important respects unlike the other known varieties of that coal. Its peculiarities are (1st.) The ease with which it ignites. (2d.) The power, volume and endurance of its combustion, and its freedom from snapping explosions. (3d.) Its wonderful strength in resisting blows, and the consequent entire absence of loss from transportation and repeated handling. (4th.) The small quantity of coke which it leaves, and the consequent abundance of cinders or half burned coal in its ashes. (5th.) Its resistance to atmospheric influences, frosts, rains, etc., by which all danger of slaking or falling to powder is avoided. Some of these peculiarities demand further notice.

Its easy combustion enables it to burn on the hearth of a common open fire-place, such as is used for the combustion of wood. A single small lump once ignited will continue to burn until it is all consumed; no shavings or paper are required to ignite it, a thin splinter of it burning easily from the touch of a match or candle flame. Its perfect combustion demands a full supply of air, and is attended with intense heat, and a most brilliant voluminous flame, like that from resin, and its endurance far exceeds any other bituminous coal which we have ever seen. The chemical analysis of this coal (below) gives the explanation of this remarkable peculiarity in the presence of not less than sixty per centum of volatile matter (gas), from the decomposition of the bituminous portion of the coal. Very few coals have been observed which approach this richness in gas, and still fewer which excel it. We give below, for comparison, the volatile matter, ash and carbon, in several coals which are well known :—

ANALYSIS OF THE BRECKENRIDGE CANNEL COAL.

Gas (volatile matter),	58.52	60.27
Carbon in coke	27.16	31.05
Ash	8.47	8.66
Water (Hygroscopic moisture)	.777	
	99.972	99.98

The amount of ash was separately determined by us on another sample of about twelve pounds weight, by combustion in a furnace proper for the purpose, the object being to obtain some approach to actual practice in the large way. The amount yielded by this trial was seven per cent., or about one and half per cent. less than in the above analysis. No separate examination was made for sulphur: sulphuret of iron (iron pyrites) is present in the Breckenridge cannel coal, in about the same amount as is usual in bituminous coal.

Comparison of various coals in respect to their relative amount of carbon (in the coke), volatile matter (gas), and ash in combustible residue.—The results are quoted from the well known work of Clegg on coal gas.

CANNEL OR BITUMINOUS COAL.	ANALYSIS IN 100 PARTS. Carbon.	Volatile matter or gas.	Ash.
Bog-head (a well-known Scotch gas coal)	9.25	69.	21.75
Cannel	39.43	50.57	4.00
Wigan	52.60	44.00	3.40
Bently estate, Staffordshire (10 yard coal)	54.05	42.70	3.25
Low Moor, Yorkshire (other bed)	67.06	32.19	.75
*Pittsburg coal (taken at Louisville)	64.72	32.95	2.31
Shippensville, Penn.	49.80	43.20	7.00
Midlothian coal, Richmond, Va.	53.01	35.25	10.47
Kanawha (Judge Bank)	55.55	41.55	2.60
Pictou, Nova Scotia	60.78	26.76	12.51
†Hillsboro', Albert coal	36.04	61.74	[illegible]
Asphaltum of Cuba (Chapapote)	34.97	63.00	2.03
Breckenridge coal (given above)	26.16	68.52	5.47

The Hillsboro' coal has been examined particularly by one of us. It resembles the Breckenridge coal in chemical composition, but is exceedingly unlike it in physical character and in general appearance, both, as will be seen, closely approaching the Cuba asphaltum in composition; but the latter is as unlike the two former as they are unlike each other, if regarded in view of their physical character.

It is this peculiarity (i. e., its remarkable amount of bituminous matter) of the Breckenridge cannel coal that fits it above all others in the Valley of the Mississippi for raising steam on our steamboats, for boiling sugar, for making illuminating gas, and for private use. Its strength and compactness make it a singularly clean coal to handle. It does not soil the fingers in the least, and may be used in the parlor without any inconvenience arising from dust or small particles, while the light of its combustion in the open grate is such as to render candles or other artificial light superfluous. Its ashes amount to about eight per cent., but being without cinder, and very dense, they will occasion no inconvenience. It is entirely free from slate inclosed in the mass of the coal, and abounds in impressions of coal plants. The group of properties which we have described is certainly very remarkable, and it might be asked whether there was nothing to be said against it. With a wish to discharge our duties faithfully, and to be entirely candid and truthful in our statements, we would reply, that this cannel coal is certainly not fitted for the purpose of the blacksmith, as it will not make a hollow fire; nor is it adapted for iron-smelting, as it makes very little coke. There are, however, other manufacturing purposes for which it is specially adapted—such as glass-making, and reverberatory furnaces, in which a voluminous flame is desirable. In several places, where we uncovered it for the first time, at the distance of a few inches under the surface, and even on the surface, we had the opportunity of observing that there was not the least decay or disintegration in it, but the angles stood out sharp and clean, without any visible change beyond a rusty discoloration of the outside. No better evidence could be desired of its capacity to resist atmospheric influences. The heaps of coal which have been exposed all winter, from the pits, present the same unchanged appearance. This coal is more like the material called *jet* than it is like common cannel coal: indeed, the term "Jet coal" would describe it more accurately than the name it bears. Like jet, it can be wrought into various delicate ornamental articles, which take a high polish. Its remarkable elasticity is worthy of notice. This coal is also strongly electrical by friction, in which particular it is matched only by the very remarkable coal from Hillsboro', in New Brunswick, before mentioned. Much more might be said on the character and peculiarities of this coal, but we fear lest we may weary your patience.

The bituminous coal, which occurs at a depth of nearly one hundred feet below the cannel coal, is a bed of four or five feet in thickness. We selected

* Analysis in Laboratory of Louisville University.
† Analysis, by Prof. Silliman.

specimens from the outcrop of this bed in Panther Creek, where the coal came out to the surface and has been washed by the high waters of that stream. With these we made a good fire on a farmer's hearth, and satisfied ourselves that it furnished a good dense coke, well suited for the purpose of the iron-furnace and the blacksmith. We venture the opinion, that this bed of coal is the same as that which is worked at Hawsville, on the Ohio, thirteen miles from the Breckenridge coal. This bed underlies the whole of the Company's lands, but as they do not propose at present to work it, and as it does not offer any characteristic peculiarities over other bituminous coals, we shall pass it without any further notice, except that its value may be considerable in connection with the nodular argillaceous iron abundantly associated with it.

COST OF MINING AND DELIVERY OF COAL.

We have made diligent inquiry on this point, and have taken the testimony of intelligent miners and others acquainted with the business. We believe the following estimate to be beyond the truth, but have preferred to state an extreme limit.

Cost of coal, delivered at Cloverport, per ton:—

Mining,	$1 00
Transportation,	0 30
Royalty,	0 20
Total amount per ton,	$1 50

It will be understood that, from the time the coal is placed in the coal cars by the miner, it is not handled again before its final delivery from the barges or boats, into which it falls by gravity.

The Company feel satisfied that the coal will net them $3 per ton, or that they can obtain for it at Cloverport $4.50 gross. From the testimony of several steamboat captains and owners, it appears that this coal can be delivered by the Company in New Orleans, by their own steam barges, at a cost within $1.20 per ton, and some estimates make it much less.

CONCLUSION.

Your Commissioners have experienced no small difficulty in arriving at a decision satisfactory to their own minds, with regard to the value which, by the terms of their appointment, they are required to fix upon the property. The terms require that the value shall be fixed at such a sum as in their opinion (i. e., the appraisers') will yield to the stockholders, under proper management, when all the works are complete, and the products of said mines are marketed, not less than twelve per cent. per annum upon said appraised valuation; any estimate upon the probable net avails of sale for a long term of years, (it may be a century,) is open to many weighty objections, which it is needless to recapitulate. All other modes of viewing the subject are also perhaps liable to serious objections; but after much reflection and consultation among ourselves, and with those who were able to advise in such matters, we have decided to adopt an exceedingly simple principle as the basis of our judgment. It is to estimate the value of the whole *cannel coal*, as it now lies in the ground, at such a "royalty" as in any probable fluctuation in human affairs must always remain within a reasonable probability of what can be obtained by letting out the whole field to be mined on contract. We have fixed this royalty at twenty cents per ton. The royalty paid in Pennsylvania this year for anthracite is sixty cents per ton, and it has never been less than twenty cents at any point open to market, as we are credibly informed. Every acre of the Breckenridge Cannel Coal Association's lands under this variety of coal, we estimate to contain five thousand tons of coal. This estimate is certainly within the truth; taking our own determination of its density (viz., 1,150) and assuming the vein to average only three feet, we estimate four thousand acres at least as being cannel coal. The *royalty* on this quantity (say twenty millions of tons) will amount at twenty cents per ton to the sum of four millions of dollars. This seems a startling aggregate. But we feel confident that our basis of estimate is sound and moderate, and that the judgment of reflecting persons will, in view of all the facts of this report, admit its moderation. Twelve per cent. upon this capital (the minimum which the act permits as the test of this estimate) will be four hundred and eighty thousand dollars per annum. Two hundred thousand tons of coal, sold at a profit of three dollars per ton, will yield a net profit of six hundred thousand dollars per annum. As it is generally agreed that three hundred thousand tons is a quantity much more likely to be sold, we will reduce our estimate of profit to two dollars per ton, and the net avails will still be the same, viz.: $600,000. Either of these estimates will meet the requirements of the act. We do not, therefore, hesitate to return *four* millions of dollars as the estimated value by our appraisement (under your commission) of the Breckenridge Cannel Coal Association property.

THE LACKAWANNA COAL REGION OF PENNSYLVANIA.

In connection with the Report of Prof. Rogers on the Lackawanna Coal Region, forming the leading article of this No., we here insert a report of Mr. B. Needham, Mining Engineer, to the President of the Lackawanna Railroad Company, which contains the results of later investigations than those of Prof. R., and which serve to present a more complete and entire view of the whole subject:—

We have procured some plain, strong machinery for our new slopes, superior to anything I saw in Schuylkill or the Lehigh, and are making preparations to put it up in readiness for the completion of the slopes.

Taking your letter up, in the order of information asked for, I would state, that since the explorations made by Professor Rogers, whom I accompanied to the various outcrops and openings, I have taken occasion to run a line of levels on the Griffen lot, for the purpose of making a transverse section, and have concluded the borings there going on, and happily find the coal much thicker there than its general average. I would refer you to my surveys and sections, with the estimates accompanying them, for particulars. The estimates are not overdrawn, after the deductions made; besides, I have since discovered another vein, three feet thick, between "A" and "B" of my last report. This is a good coal, belonging to the upper series of veins, and not included in Prof Rogers' reports. Leaving out those smaller veins, interesting only to the scientific, I will merely give you the general outlines of the size and quality of the workable seams on the Griffen lot. The first in the *descending* order is the "A" vein, 8 feet; the second, a three-feet vein; then "B," 4 feet, where it has been worked; "C," 5 feet, "D," 8 feet, and "E" 15 feet, making forty-three feet in six veins, all belonging to the upper series of free burning or steam coals. *All* these veins would be worked in Schuylkill, and can be worked here, but the smaller veins would cost more in proportion per ton for mining than the larger ones. Of the entire thickness of this upper series, twenty-one feet may be classed with the superior coals for generating steam, possessing great heating powers, a very active combustion, with rectangular fracture, suiting a condensed stowage for oceanic navigation—containing little earthy matter, and leaving a residuum of about 7 per cent. ashes. The lower series comprises five working veins, of a very dissimilar coal. The first of this second series, the "F" vein, varies from 6 feet to 8 feet 4 inches, pure coal, devoid of slate, of a semi-conchoidal fracture, and altogether one of the most splendid coals sent to market excelled only by a small vein of the Lehigh, three feet thick, known as the "clear vein," the heaviest and purest *known anthracite*. This vein will be mined and sent to market, for the first

VERTICAL SECTION OF THE GEOLOGICAL FORMATION,

Together with a classification of the workable veins, the quality, and an approximate estimate of the quantity on the Diamond Mine Tract.

	Feet.		Thick-ness		Tons.
Coal	2 ft.	H	3 ft.	Good quality. Covers only about 100 acres in the whole coal measures. A mere trace on this tract.	
Shales	40				
Nod. iron ore	2 6				
Coal	4	G	5	A soft, light, inferior Coal, only about one half merchantable. This vein covers 100 acres, and contains	306,000
Shales	25				
Coal	7	A	7	A light Coal structure, massive, columnar, fracture rectangular, Specific Gr. 1.33. Is a good steam Coal. Covers 150 acres, and contains	1,680,000
Sandstone & shales	60				
Coal	9	B	6	A light Coal structure, massive, columnar, fracture rectangular, Specific Gr. 1.25. Is a very superior steam Coal, ignites freely, produces three-fourths Lump Coal. This Coal will shorten the time from New York to Liverpool from 24 to 36 hours over any Coal which I saw in New York. Covers 200 acres, and contains	3,600,000
Shale	2				
Coal	1 3				
Sandstone	40				
Coal	6	C	6	A heavy compact Coal, fracture rectangular, Specific Gr. 1.30. A very superior Coal, ideal for Foundry Furnace, Smith, and Domestic use, and may on trial be found a good and durable steam Coal. None of this in any market. Covers 350 acres, and contains	5,580,000
Sandstone	60				
Coal smut					
Shale	5				
Coal	14	D	14	Heavy, compact, fracture semi conchoidal, Specific Gr. 1.42. Good for Foundry Furnace, and Domestic use. This is the top working vein in Pittston, (their large vein,) and is used to some extent for steam in New York. Covers 500 acres, and contains	9,600,000
Shale	4				
Nod. iron ore	1				
Shale	1 6				
Coal	6	E	9	Heavy, semi compact, fracture rectangular. Sp. Gr. 1.45. Similar to Vein "D." This is the Carbondale Coal, has been extensively used for many years in New York. Covers 510 acres, and contains	6,912,000
Sandstone & shales	20				
Coal	4	F	4	Heavy, compact, fracture rectangular, Specific Gr. not ascertained. A very good Coal for Domestic use. This is also the Carbondale Coal and well known in New York. Covers 500 acres, and contains	2,890,000
Shales	6				
Coal	1				
Shale	10				
Coal	1 6				
Fire clay					
Conglomerate					
					29,475,000
				Deduct for Mine supports, &c., 15 per cent.	4,421,700
				Total contents	25,053,300

TRANSVERSE SECTION

Of a portion of the Coal Lands belonging to the "Delaware, Lackawanna, and Western Railroad Company," known as the Griffin Lot.

VERTICAL SECTION OF THE GEOLOGICAL FORMATION,

Together with a classification of the workable veins, the quality, and an approximate estimate of the quantity on the Griffen Lot.

Buff-colored sandstone.

No.	Stratification. Descending order.	Thickness.	Coal.		Contents in Tons.
	Shales	114 ft.			
A	Coal	6	6 ft.	This Coal is of fair quality, and underlies 15 acres.	900,000
	Stigmaria shales				
	Micaceous sandstone and shales	50			
B	Coal	4	4	This Coal is very similar to above, and underlies 290 acres	1,400,000
	Nod. I. O. in stig. shales	6			
C	Coal	5	5	This Coal is very similar to above, and underlies 300 acres	2,000,000
	Nod. I. O. in B. S. shales	10	6		
D	Coal	8		This is a fine steam Coal, and underlies 300 acres	3,350,000
	Stigmaria shales				
	Micaceous sandstones	101			
E	Coal	15	14	This is the "Diamond Mine" Vein, "Thickened up." It underlies 330 acres	7,200,000
	Stig. shale, black band I. O.	6 in.			
	Micaceous sandstones	40			
F	Coal	8	8	This is a very superior Coal for Foundries, Furnaces, Smiths' and Domestic use, and underlies 237 acres	4,216,000
	Shales	44			
G	Coal	18	15	This is the "Pine Brook" Vein, "Thickened up," and underlies 237 acres.	9,105,600
	Stigmaria shales, and Nodular iron ore	26			
H	Coal	9	9	This is the "Furnace Vein," "Thickened up," and underlies 237 acres.	4,216,000
	Stigmaria shales, and Micaceous sandstones	20			
I	Coal	6	6	This is a fair quality of Coal, worked at Carbondale, and underlies 237 acres	[illegible]
	Stigmaria shales				
	Micaceous sandstones	65			
K	Coal	4	4	This is a fair quality of Coal, worked at Carbondale, and underlies 237 acres.	2,150,000
	Stigmaria shales	20			
	Shales				
L	Coal	3	3		35,750,000
	Stigmaria shales		84 ft.	Deduct for slate, coins waste and supports, 20 per cent.	7,150,040
	Conglomerate	70			31,000,160

time, this year from this coal field. We hope to be ready in time to mine and send to market this year about 40,000 tons of this coal

The next in the series is the big vein of Wilkesbarre and Pittston, varying from 9 to 18 feet. Thus, the "G" vein, with its usual slates, measures on the Griffen lot 18 feet 1 inch; is a good hard firm coal, rectangular fracture, well known in your city as the Pennsylvania Coal Company's. Then comes the "H" vein, a superior coal, very similar in hardness, fracture, and quality, to the "F" vein above mentioned, and is eight feet thick These three veins, alone, will produce, of good merchantable coal, on the Griffen lot, twenty-seven feet in thickness, equal to 34,560 tons per acre, after deducting 20 per cent. for mine waste and supports. The coal of the three above veins, "F," "G," and "H," are all of the hard variety of anthracites, excellent for foundry, furnace, and smithing purposes, and, with blowers, would answer well for steam purposes. I forgot to mention that the coals of the upper series are excellent steam-producing coals *without the aid of blowers.*

Next, and last in order, are the veins "I" and "K," six and four feet respectively in thickness. They are worked at Dunmore, by the Pennsylvania Coal Company, but are inferior in quality to the veins of "F," "G," and "H," although fair merchantable coals.

The same veins, from "B" downwards, cover more or less of the Tripp tract; and in my first estimate of total quantities, I have no alteration to make, except to make the deductions on those reported quantities equal to 20 per cent. for mine waste and supports. These include slate between the strata, stumps of pillars left in "*robbing back*," and coal dust. For variations in thickness, I would refer you to my section.

This whole mining region, above the mouth of the Lackawanna, consists of an irregular series of antichnal and synchnal axes, with small intermediate swells and depressions, and all running diagonally across the valley—thus requiring skill and judgment, in opening mines, of the most accurate kind, to avoid extra expense. But the whole formation being comparatively shallow, all the coals are easily accessible, particularly so when compared with the extremely disrupted formation of the Schuylkill region.

We are making rapid progress with our slopes, and shall reach the "F" vein in about forty-four days, being now only eighteen feet above it. Our machinery is in a state of forwardness, and will be ready to operate by the middle of May at No. 2, and by the 15th of June at No. 1.

I think you may safely calculate on 140,000 tons, and reasonably on 150,000 this year. As time to meet your request is limited to a couple of hours, I have thus hastily replied to the inquiries made, and have no time left to go into more minute details.*

IRON AND ZINC.

THE IRON INTERESTS OF THE UNITED STATES.

This is an important subject, upon which we do not propose to express our views in full at this time. It will be made the matter of an article in a future

* On page 577, I give you the result of my explorations on the "Tripp Tract." Wilkesbarre and Pittston have only the veins "D," "E," and "F," varying in thickness, vein "D" from 18 to 14 feet that is workable. Carbondale has only "E" and "F," none of which is equal to "A" and "B" for steam purposes. You will see great propriety in arranging your new works so as to keep "A" and "B" together, "C" by itself, and "D" and "E" will work well mixed. You will then be able to supply the various demands with such kinds of coal as are required for specific purposes, and enter the market prepared to successfully compete with our more Southern neighbors. I am, sir, very respectfully, yours, etc., B. NEEDHAM, *Min. Eng.*
To Col. Geo. W. Scranton, *Scranton.*

Number of this Magazine. We refer now to that portion of this interest which is affected by Congressional legislation. It would not be rude to say, that scarcely any subject is so little understood by those who form the staple of Congressmen, yet it is one of the most important and valuable interests of the country, and amid all the vacillating legislation with which it has been harassed, it has grown to no inconsiderable magnitude. Our object, however, is to notice some facts stated by the *Railway Times*, in reference to the proposition to give credit for duties on railroad iron, which would in the end be equivalent to abolishing the duty:—

In this country, likewise, we have iron ores and coal in such abundance, that if the mines were properly worked, we could supply the world for centuries, and still have an overplus in the crude state beyond human calculation. The country is yet young, and from the high price of labor and the want of experience we have been unable to work our mining riches with such facility as to compete with our transatlantic neighbors, who have greater means and experience. The consequence has been that we have been compelled to pay the foreign manufacturer a profit upon his labor and capital, and still pay a heavy amount for transportation. Once in a great while we have so adjusted the tariff that some efforts to manufacture our own iron would be crowned with partial success, when straightway down goes the tariff and in pours foreign iron in such quantities and at such prices that our manufacturers were compelled to stop their works and go into some other business. This game of battle-door and shuttle-cock with the iron manufacturing interests of the United States has been played for many years, and the foreign manufacturer so well understands his game, that it always ends to his advantage and to the disadvantage of this country. The price of iron, gauged by our necessities, is regulated by a league of foreign manufacturers, and they are determined to have a monoply of our market—to them the richest in the world. Let them understand that it is necessary to sell us at no profit for three or five years, to retain our market and prevent our own manufacturing progress, and they will do it. They have the combined wealth and power to compel others to follow their lead. If the duty on foreign iron should be repealed in the United States, the price in England would immediately advance to such a point as would pay the highest profit to the foreign manufacturer, and still prevent our forges and furnaces from going into operation.

The present tariff, aided by a most extraordinary consumption of iron in this country, has allowed of some increase of our own manufactures. We have begun in some little degree to get our works going again. Some of these are doing paying business, and should the present demand continue, and the tariff remain undisturbed, in a few years we should increase very considerably our home product, and so far make some progress in achieving a partial independence of the dictation of the foreign manufacturer. We could not do this with the present tariff, were we not aided by other circumstances of moment. It is well known that very large numbers of English iron workers have gone to the gold fields of Australia, and that consequently labor there is higher, and may continue so to be for some years. It would be wise for us at this juncture to take advantage of circumstances. Our national interest is pre-eminently the iron manufacture. Every State in the Union is interested in it. Let the country remember the history of the cotton manufacturers in this country and apply it to our iron interests. We now manufacture cotton cloth of almost every grade, and compete with those of England, even in her own markets. If we are wise we shall foster our iron manufacturers to just such an end.

IRON MANUFACTURE IN MISSOURI.

The following particulars respecting the manufacture of iron in the Iron

Mountain region of Missouri were prepared by H. T. Bailey, an iron master of St. Francis county, for the *Western* (monthly) *Journal*. They are entitled to implicit credit. Some further particulars respecting this iron region will be found on page 453, Vol. II., April No. :—

The Pilot Knob, Shepherd Mountain, and Iron Mountain are the principal deposits of iron now being worked. The Iron Mountain ore, is, for the manufacture of iron alone, one of the best in the United States, if there is another as good, for making wrought iron direct from the ore.

The Messrs. Prewett and Patterson, at Vallé Forge, situated twenty-five miles from Ste. Genevieve, on the plank-road leading to the Iron Mountain, have a forge now in operation, working six of the Catalan fires, making iron direct from the ore, and turning out from twenty to twenty-four tons of blooms per week; also four fires working from the pig made from the Iron Mountain ore, which is called the refined or *knobbled bloom*. This forge has been in operation since June, 1853, making at this time about forty tons per week.

The Madison Iron and Mining Company, at Pilot Knob, own the Pilot Knob, Shepherd Mountain, Bogy Ore Bank; also the Shut-in, Christy, Pratt and Russell Banks, all of which Banks are within six miles of the Pilot Knob, the Shepherd Mountain being only half a mile distant. The Shepherd, Bogy, Christy, and Shut-in ores are all of the first quality for making iron direct from the ore in the Catalan fire. That of the Shepherd Mountain is peculiarly adapted to the manufacture of steel, of all kinds; it is one of the most valuable ores in Missouri, and fully equal to the Denamora ores of Sweden, from which the best English cast steel is made. The Bogy and Christy ores partake of the same nature with the Shepherd Mountain ore, and are very valuable for *steel-iron*.

This Company have a forge of six Catalan fires, making iron direct from the ore, at Pilot Knob, capable of turning out 1,200 tons of blooms per year. It has been in operation for the last three years, and all its products have been used for steel, manufactured at Pittsburg, Pennsylvania. There are also large beds of hematite ore on the lands of this Company, which, taken with the Pilot Knob ore and worked in the blast furnace, will produce the best quality of pig iron. The property of the above Company is the most valuable of any for the manufacture of iron and steel in south-east Missouri, in consequence of the great variety of iron ores which are found on their lands.

They have also one blast furnace now in operation, and have made during the last six months, something over 1,000 tons of pig metal of first quality for foundry uses. They are now erecting another furnace of large size which will turn out 3,000 tons of metal annually.

The American Iron Mountain Company have two blast furnaces, running on cold blast, producing the last year 4,300 tons of pig metal. They are now building another furnace, which will be in operation in June next, to work on warm or hot blast. This furnace will make an addition of 2,500 tons to their annual production. They are also hauling to Ste. Genevieve, for shipment upon the Ohio river, to Cincinnati, Wheeling, and Pittsburg, a large amount of ore. Now, in the month of February, 1854, there are about twenty five teams engaged in hauling ore from the Iron Mountain region to the Mississippi river. The demand heretofore has been greater than the supply, on account of the want of teams. The average weight of loads hauled by the teams is about 5,000 lbs., and the distance about forty-two miles. The plank-road is completed all the way.

During the year 1853 about 1,200 tons of blooms were sent to Messrs. M'Kelvy and Blairs, and to Singer, Hartman & Co., of Pittsburg, to be converted by the former into cast-steel, and by the latter into plough and spring steel.

We would here add, that in the spring of 1848, Mr. E. Mead, of St. Louis, shipped metal from the Iron Mountain of Missouri, to England, and in the following spring received it back manufactured into razors and pocket and table cutlery by Jos. Rodgers & Sons, Sheffield, and it proved to be well adapted to the manufacture of fine steel cutlery.

We would also add, that within the year 1853, Messrs. Child, Pratt & Co., of St. Louis, shipped about ten tons of metal from the Iron Mountain ore to Messrs. Edwards, Morris & Co., and to Livingston, Roggen & Co., of Pittsburg, to be manufactured into lock-cases; and large quantities of Missouri iron lock-cases are imported from abroad, and are found to be superior to those made from any other iron.

We hope to obtain additional facts regarding the manufacture of Missouri iron, and present them soon with arguments in favor of concentrating millions of capital in the manufacture of Missouri iron at St. Louis.

THE MANUFACTURE OF IRON.

The question of the adaptedness of Ireland for the manufacture of iron, has recently occasioned some discussion in the English press, in the course of which many points of interest to the iron manufacture have been brought out. We have compressed them into such shape as to be most easily comprehended, from the pages of the London *Mining Journal*:—

MATERIALS REQUISITE.

The manufacture of iron requires a variety of materials, which it would be very expensive to bring together, did their sources lie at considerable distances; and hence the cost of the metal produced would be considerably higher, and thereby its extent of use and manufacture limited in proportion. These materials are iron ore, sandstone for the construction of the furnaces, limestone, necessary as a flux, fuel for the purposes of roasting and smelting, and water-power for the blast-furnaces.

But if the ore, the sandstone, the limestone, the fuel, and abundance of water-power, and cheap labor, do not conspire, the economic manufacture becomes impossible. By a beneficial arrangement of Providence, of which it is impossible to exaggerate the wisdom and the importance to mankind, these elements of profitable labor often co-exist within easy reach of each other.

IRON ORES.

The ores of iron that are actually employed as sources of metal are of three kinds—the anhydrous peroxide, or specular iron; the hydrous peroxide, including hematite and bog ore; and the carbonate of iron, to which the clay iron-stone of the coal formation belongs.

Of the first kind, which is the richest ore of iron that is known, containing 70 per cent. of metal, considerable quantities are found in the south of Ireland. Fine specimens have been produced from the Cosheen mines, at Skibbereen, and from the Glandore mines, in Carberry. It is there associated with ore of copper and of manganese, which, being of far greater value, the iron ore is disregarded.

The second kind of ore is of more practical importance, being probably the most extensively diffused of all the compounds of iron. It presents itself under a great variety of forms, according to the rocks with which it is associated, and the circumstances under which it has had its origin. When quite pure, the ore is a hydrate of the peroxide of iron, in which the oxide contains twice as much oxygen as the water, having iron, 60·0; oxygen, 25·6; water, 14·4 = 100·00.

Various forms of it support the majority of the iron furnaces of France and Germany. In England it is not employed except to bring up, by its richness of produce, the poorer ores of the coal districts to the standard at which their working becomes most easy. Two forms of it are common in Ireland; these are the brown nodular hematite, and the ochrey or bog iron ore.

The brown ore is found in abundance, associated with the beds of coal and fire-clay and the ordinary iron-stone, in the coal district of Tyrone. It is the variety termed popularly "eagle-stone," and forms globular masses, of a deep brown color, which are generally hollow, and contain a kernel of a lighter color than the exterior, with which however it agrees in constitution.

Specimens subjected to analysis yielded—Peroxide of iron, 80·79; water, 11·97; magnesia, 0·27; insoluble matter, 5·81; oxide of manganese, 1·16= 100·00. This ore should have given by appropriate treatment 57 per cent. of iron, or from 35 cwts. of ore a ton of iron. Although we do not know exactly the causes which led to these concretionary masses of hydrated oxide of iron, it is quite certain that these causes are now in operation, and that the production of considerable quantities of this material is actually going on. We find in almost every deep morass beds of it, sometimes a foot thick. It is hence called bog iron ore. This ore supported the majority of the iron furnaces formerly scattered over the surface of the country. It appears as a brownish clay, which dries to a mass, sometimes hard and dense, at others friable, and becomes much darker in color when it dries.

These bog iron ores are smelted with the greatest ease. They are at once very fusible, and easily reduced. They produce a metal which runs very thin, and congeals slowly, so that it is proper for the manufacture of cast-iron articles which do not require much strength. The Berlin ornaments, which, as specimens of casting, and as objects of art, excite so much admiration, are made of iron smelted from the bog iron of the waste morasses of the east of Prussia. But ores of a richer character, and yielding larger average quantities of pure metal, remain to be noticed. The clay iron-stone, which has become almost the exclusive source of iron to Great Britain, occurs in great abundance in the coal districts of Leinster and Connaught.

In quantity there is no doubt but that the iron-stone in the neighborhood of the river Arigna is practically inexhaustible. The quality is also of a most superior description, yielding unusually large amounts of pure metal; but to place this part of our statement in a striking point of view, we will exhibit in the following table the contents of the ores in metallic iron, compared with the produce of the best English, Scotch, and Welsh ores:—

One hundred parts of ores give of metal—

	Natural State.	Roasted.
Richest Arigna	42·3	61·4
Poorest	37·7	53·2
Average	40·0	58·2
Common Staffordshire	28·0	40·4
Richest	40·5	60·0
Ordinary Welsh	31·4	44·7
Richest	43·1	60·0
Ordinary Glasgow	31·6	45·8
Mushet's blackband (a Lanarkshire variety)	41·0	68·1
Average Kilkenny	38·7	55·3

There is hence no doubt but that the ores of Leinster and Connaught coal-fields equal, and even in average are superior to, those generally employed in Great Britain. The iron-stone of Kilkenny is but little inferior to that of Arigna, whilst the ores of Lough Allen attain a richness in iron only equalled by one of the Scotch varieties.

PEAT FUEL.

In this manner the numerous and waste tracts of bog in Ireland have given rise to the manufacture of peat fuel, which is pursued there to a great extent—it being a very ancient and considerable branch of industry. The total area of Ireland is 20,000,000 of acres; the total area of bog is estimated at 2,880,000 acres—nearly one-seventh of the entire surface of the island.

With this immense magazine of wealth at command, it is not too much to assume that the peat fields may become to Ireland what the great coal measures are to England, or the well-watered plains of Lancashire to the cotton-spinner—sources of industry, wealth, and public enterprise. Hence the great importance to her of the new patent for making solidified peat fuel.

ENGLISH AND RUSSIAN IRON.

The iron which is smelted by means of pit coal always preserves a degree of impurity of constitution, which reduces its strength, and deteriorates its structure; so that for the finer purposes of machinery, cutlery, and steel, England is indebted for much iron to Russia and Sweden, as in these countries, the smelting and refining being carried on by means of wood, the metal is obtained in absolute purity. Hence the great difference of price between the British and foreign iron, common bar being sold at £8 10*s.* per ton, whilst Swedish and Russian iron is at present worth from £12 to £16, according to quality. Now, we possess in Ireland, the ores, and the means of preparing these irons of superior quality, and of replacing, if not the very finest, at least the ordinary, sorts of Baltic iron. The elements necessary to produce such metal are ores of great purity, and vegetable fuel of a proper kind. The "vegetable fuel" is formed in the bogs. In England it can be easily understood that the manufacture of iron by turf is not thought worthy of notice, although several ironmasters use common cut turf mixed in the coal for making superior qualities of iron. On the Continent, however, where the promotion of native industry is, as it ought to be in Ireland, an object of primary importance, and where the limited development of the districts oblige them to economise every source of fuel, it has been not merely tried, but is extensively carried on at present in France, in Russia, and in Bavaria. We speak of the common turf, as cut by the peasantry, and madé into peat charcoal.

THE BLAST.

The blast in an iron smelting furnace is produced by powerful steam-engines, except where a great local facility of water-power obviates the necessity of steam. Water, however, can only be used when it can be depended upon in a constant and ample stream, even through a dry summer; as it is of the first importance that the blast of a furnace should not be withheld even for a few hours. Instances have been known of the whole contents of a furnace becoming one solid mass from having been cooled by the accidental stoppage of the blast.

For the purpose of the Irish smelter, water-power could in almost all cases be made available; while in the iron districts of South Wales and Staffordshire, steam, generated at a great cost, is the chief resource of the manufacturer. It has been calculated that Ireland possesses, distributed over the surface of the country, a water-power, capable of acting night and day, without interruption, from the beginning to the end of the year, estimated at the force of 3,227 horse power per foot of fall; or, for the entire average fall of 387 feet, amounting to 1,248,849 horse-power! But mechanical power is never thus unremittingly driven, and if we reduce this force to the year's work of 300 days, of 12 hours each, we find it to represent 3,038,865 horse-power.

VEGETABLE FUEL.

One writer very gravely advances the following facts in proof of the value of vegetable fuel:—

In Ireland, and also in the Highlands of Scotland, where peat is the only available fuel amongst the peasantry, it is a rare occurrence to meet with a cracked "pratie-pot" in the *former*, or a leaky "porridge-pot" in the latter country, and although these sole-cooking utensils are in daily use, they are frequently handed down from generation to generation, not only unimpaired but improved, instead of, as happens where coal is used, the worse for wear:

with the vegetable peat the metal appears to soften and refine, while with the mineral peat it becomes brittle, and deteriorates. Another point I would remark is, the purity of the steel in many of the old swords which were manufactured in Scotland centuries ago, with peat charred in a very primitive and rude manner, the remains of which coking apparatus are still to be found in some portion of the west Highlands; but charcoal so produced is of too loose a nature to admit of its profitable transit.

IRON SHIPPED FROM LAKE SUPERIOR IN 1858.

Sharon Iron Works, Marquette, 442 tons and 1,990 lbs. of blooms, 205 tons and 975 lbs. of ore.

Marquette Iron Works, 367 tons and 1,877 lbs. of blooms, 200 tons of ore.

Making in the whole, from both works, 809 tons and 1,877 lbs. of blooms; 405 tons and 975 lbs. of ore.

QUARRIES AND CLAYS.

SOAP STONE.

A correspondent of the *Journal of Commerce*, who seems to be well informed, writes that there is a fine quarry of this singular and useful material at Grafton, in the vicinity of Bellows Falls, Vermont. The mill where it is prepared for use and fitted for a finishing establishment in Boston, is at Cambridgeport, a small village near the line of Grafton. This quarry has been long known, as is seen from antiquated chimney pieces in the neighborhood, but was formerly worked upon a small scale, in part from the want of modern improvements in machinery, but chiefly from the expense of transportation to the distant market. That obstacle is now removed by the railroads. The freestone, as it is here called, has the "unctuous feel" of the mineralogist, and the cognomen *soap* better describes the striking resemblance of touch to that article, although the ease with which the material is cut and fitted for use makes the word *free* a proper and significant appellation. The spectator is at first both amused and surprised to see huge blocks of granite-looking stone cut into slabs by a saw such as he has seen in use only for wood. The teeth are not so sharp at the point, but with this exception, one might think the workmen had borrowed from a saw-mill the well-known and essential instrument for transforming logs into lumber. The soap stone contains no substance harder than itself, and it cuts under the common saw easier and faster than hard wood of the same dimensions. This I proved by experiment on a cubic piece, a part of which I carried away as a specimen of the quarry. The slabs are cut into various forms by circular saws, which, from their rapid motion, seem not to perform a very hard service; and the facility of working the material is no inconsiderable item of its value. From the various uses to which the soap stone is adapted, it must soon find a greater demand. In the ordeal of heat, it seems to be cousin german to asbestos, for it endures fire without warp or crack, even to a red or white heat, losing only now and then thin scales on the inner surface. Hence it is fitted and is used to answer the purpose of fire-brick in the lining of stoves and forges. It is susceptible of a moderate polish, and is now fashioned into chimney-pieces and ornamental work exposed to fire. Nay, more, it begins to take rank with household furniture, and is used for griddles, being found superior to iron, inasmuch as it need not be *greased* to give up the cakes, and does the work without the disagreeable odor arising from the same cooking upon iron. To what further and various uses the soap stone may be destined in this age of progress, I know not; but even this brief notice of so important a quarry, in its incipient working, may not be without interest to the public.

MISCELLANIES.

PROCEEDINGS OF THE LONDON GEOLOGICAL SOCIETY.

Professor E. Forbes, President, in the chair. The following communications were read:—"On Pipes and Furrows in Calcareous and Non-Calcareous Strata," by J. Trimmer, Esq. The author described the vertical, irregular, funnel-shaped, or cylindrical cavities in certain strata, known as pipes and sand galls, noticing the various forms they assume, the different strata besides the chalk in which they are found, the various deposits of the tertiary epoch with which they are filled, and the furrows with which their mouths are connected. A brief summary was then given of the evidence on which the author relies for proof of the formation of these remarkable cavities on the surface of strata by the mechanical action of water before the matter which fills them was deposited. The nearest existing analogies to which the author referred, are the effects of verticose currents of the water in breakers and on the shore, and the similar action of torrental rivers. The distribution of these pipes and furrows over large extents of country was explained by reference to the continued advance or retreat of the coast-line, with its wave and breaker action, throughout the tertiary era. The author also admits, to a certain extent, the solvent power of carbonic acid held in solution in water, percolating the strata along these cavities, as an agent in widening and deepening the pipes. The irregular stratification over the mouths of these cavities, the author considers to be an original condition of deposit upon an irregular surface, although subsidence of the matter with which the pipes are filled may frequently have taken place, in various degrees, from many causes. "On the Origin of the Sand and Gravel Pipes in the Chalk of the London Tertiary District," by J. Prestwich, Jr., Esq. After referring to the observations and researches of earlier writers on these peculiar cavities, the author proceeded to point out that the pipes occur wherever a stratum permeable to water overlies the chalk or other calcareous rock to any considerable extent; and, where the chalk and the superincumbent tertiaries formed an extensive tract of horizontal dry land, previously to the disturbances that broke up these rocks, and gave them their present varying inclinations, the atmospheric waters, more or less charged with carbonic acid, percolating freely through the superficial sandy beds, rested on the chalk until, by numerous furrows and pipes, it gradually dissolved passages to the lower level at which water would stand in the water-bearing beds of chalk, at some distance beneath the surface. The superincumbent sands or gravels, as the case may be, gradually subsided, more or less conformably, into the deepening cavity caused by the loss of the chalk in the funnel or pipe below. When the chalk and overlying tertiary beds were locally upheaved, shattered, and partially denuded, the newly made valley-courses gave exit in springs along their sides both to the water of the lower water-level and the water of the superficial sands and gravels; the sand-pipes becoming almost all deserted as water-channels, except in such local instances, perhaps, as are now seen where the existing "swallow-holes" in the gravel and sands above the chalk continue an analogous action.—*London Athenæum.*

MOUNT SAVAGE IRON COMPANY, MARYLAND.

We do not think the efforts of this Company to develop the mineral resources of Allegany County are sufficiently understood or appreciated. When the splendid works at Mount Savage were purchased by the present Company in 1847, their railroad was only nine miles in length. In a few years they extended it to Frostburg, a distance of five miles, for the accommodation of the coal trade, which previous to that time employed a horse road as far down as Mt. Savage. The construction of this extension alone cost the Company $110,000, with an additional sum of $72,000 for equipment, in locomotives, etc. But in addition to these expenditures they have, during the last few years, made a connection with the Chesapeake and Ohio Canal at Cumberland, which has cost them, for right of way, construction, and other improvements, $35,000 more. They have also been obliged almost entirely to reconstruct the road from Mt. Savage to Cumberland, at an expenditure of $133,000, including bridges, engine houses, etc., of which sum more than $40,000 have been spent at the Narrows, in cutting down the slope of the mountain and widening the road bed so as to permit the laying of three tracks. Two of these tracks are now completed, and the third is graded and is now being laid with iron.

Thus it will be seen that the Mt. Savage Iron Company have since 1847 expended not less than $300,000 in affording facilities for the coal trade of Allegany County. The Company mine no coal whatever, except for their own use, but carry to market the coal of the Frostburg Coal Company, the Borden Mining Company, the Allegany Mining Company, and the Parker Vein Company.

But not content with this, the Mt. Savage Company intend to push their enterprise further. They are now negotiating with Messrs. Aspinwall, Cunard and others, of the Ocean Steamship Company, who have lately purchased a very valuable coal property, in the George's Creek Valley, for the extension of the Mt. Savage road into that valley, so as to bring their coal to market by the Jennon's Run route. These negotiations bid fair to result in a satisfactory arrangement.

So much for the facilities for the coal trade afforded by the Mt. Savage Company. Of this regular business some idea may be formed from the fact that they employ more than 1,000 hands at their works, and consume in their various manufactures more than 75,000 tons of coal per annum.—*Cumberland Journal.*

MINING IN NORWAY.

The Finance Minister has just published the official quinquennial report, compiled by the several bergmesters, to be laid before the Diet (Storthing), which meets on the 1st proximo, of the progress of mining industry in that country.

From this report it appears that, on the average, the yearly profits from the Kongsberg Mines have been 32,860*l.* The total production of silver has been 126,692 marks 1 lod and 10 grains; the cost of raising this has been 74,877*l.*, which has realized 161,720*l.*, the number of persons employed being 869. Of copper from the different establishments—Alten, Roraas, Sebœ, Quænangen, and several smaller works—there have been produced about 567 tons annually, making in the whole 2,835 tons of cake and sheet copper; of this there have been exported 2,598 tons, and at the same time there has been imported manufactured copper of the weight of about 16 tons. The number of persons employed at Alten were 326; the produce 690 tons. The principal profit derived from these works is mainly owing to the introduction of the tribute system, and the reduction in the smelting charges, which now do not average more than 22*s.* per ton, although 9*s.* is paid for coals. The ores are of the average percentage of 5¼, and the cost of making a ton of fine copper is estimated at 16*l.* The lodes at Roraas, which mine has been established since 1644, have greatly fallen off: 1,745 tons were produced there, at a cost of 88,096*l.*, 401 individuals being employed. At Sebœ, with 125 men, the produce was 327 tons of copper, and the expenditure 16,850*l.* Several copper works have been only partially worked, and five abandoned, during the same period. In the previous five years, the total quantity of copper raised was 3,212 tons, thus making a difference, compared to 2,835 tons, of 377 tons. The fourteen iron works have produced, on an average, yearly, 7,228 tons pig iron, 2,864 tons castings, 4,786 tons bar-iron, 272 tons blooms, and 320 tons iron plates. A quantity of cannon, gas pipes, and rails, have arrived for the military and public works, and pig-iron has been exported principally from England, for the use of foundries established on different points of the coast.

The production of bar-iron has somewhat increased in the last five years, and a good market is found for it in North America; but both this and Swedish iron have formidable competitors in English iron for many purposes—this being offered at $37 per ton, while Norwegian iron a few years since realized from $95 to $105. In fact, the former is manufactured so cheap that, in spite of the heavy duties, it successfully competes with the native iron in Norway. The nail trade has somewhat fallen off, the total amount being estimated at about 190 tons, in 650 boxes, containing 40,000,000 of nails, many of them being of the smallest description. The production is not, however, adequate to the consumption, as, in addition to rails, castings, etc., there have been imported from England 768 tons of bar-iron, and from Sweden, 480 tons of the same material; and although the consumption of Norwegian iron has advanced slightly in Denmark, it has considerably retrograded in America. Owing to the introduction of the Nuremburg blue, the two cobalt works, Modum and Snarum, have experienced great difficulty of realizing their produce. The latter has been abandoned. In 1848, the proprietors of Modum had in London a stock of the value of 7,000*l*., which they found difficult to dispose of, and even then at a heavy loss. These works, though on a smaller scale, have since been carried on by Messrs. Goodhall and Reeves. At Snarum, 115 men were employed, and at Modum, 508. No cobalt is used in the kingdom. The product for the five years has been—smalts, 616,195 lbs.; oxide of cobalt, and refined cobalt, 20,686 lbs.; and zaffre, 288,713 lbs. Of this quantity 427,321 lbs. were exported to England, 55,083 lbs. to Hamburg, and 11,350 lbs. to Holland.

In the course of this period a Birmingham firm in Espedalen have mined for nickel. About 5,000 tons of ore were raised from six mines with 881 laborers and six superintendents; and in two years 370 tons of good nickel ore were shipped to England. The same parties have permission to erect a smelting works to obtain silver from lead and nickel ore. Hitherto this has not been done; and another English firm have taken the abandoned works at Konnerud, and in the year 1850 shipped to England about 35 tons of lead slag, containing copper and silver. The result has not been communicated to the department. The production of chromate of iron has likewise considerably diminished. About 670 tons of this mineral have been annually shipped to England; and it is feared, from the competition, that there will not be produced sufficient to supply the manufactory for chromate of potash which has been established in Drontheim since 1831. The average yearly supply to this has been about 450 tons, the cost of manufacture 6,000*l*., and production of chromate of potash 300,000 lbs.; about 70 men, besides superintendents, are employed. There are about 30 lime-kilns, some works for the extraction of steatite, mill-stones, and grindstones; but their production is all consumed in the country, and is very inconsiderable. The export of granite, which was principally taken to Hamburg after the fire which destroyed nearly half that city, has entirely ceased, and is now scarcely worth noticing, being only used for grave-stones and other trifling purposes. Several slate quarries have been opened, but these likewise have afforded no great results; and, on the whole, the mineral industry of Norway, with the exception of the silver mines of Kongsberg, the property of the State, must be considered to have decreased.

[NOTE.—In the above account, Norwegian money, weights, and measures, have been rendered into English, fractional parts being disregarded; consequently this is only a proximate statement.]—*London Journal.*

SAGINAW SALT SPRINGS.

It is not generally known that salt springs of a very fine quality are to be found in Saginaw county and vicinity, and little has been said on the subject by those to whom it is known. Those springs are not confined to one locality, but are found in several places interspersed through the county, and springs in the vicinity of Cass River, we are informed, extend some distance into the promising young county of Tuscola. We have at our office, a specimen of salt made from a spring situated some distance up the Titabawassa. A pint of this water, brought down by S. Gordon, Esq., a few days ago, has been reduced to salt and chemically analyzed by Dr. Plessner of Saginaw City. Sufficient chemical apparatus was not at hand to test it as thoroughly as might be desired, but the following result was arrived at, which the Doctor has placed in our possession.

The pint of water yielded 150 grains of salt of good taste, with no perceptible bitterness. It does not become wet by atmospheric influences. It is found to contain a very little iron, some glauber salts, sulphate of soda, and muriate of lime.

The present time is unfavorable to an experiment of this kind, it being strongly diluted by common water, yet it is said to be nearly as strong as sea water used for the manufacture of salt; by boring to a proper depth and shutting off other water, its strength will be much increased.

It is thought by boring to a certain depth, salt springs may be obtained in most places in the Saginaw Valley and on the tributaries of the Saginaw. This idea we understand is backed by good scientific authority, as is also the belief that some of these springs, when properly improved, are equal in quality to those of Salina. Capitalists might find a chance for an investment in these springs which would prove of greater value than but few anticipate.—*Saginaw Enterprise.*

PLATINOID METALS.

Platinum is associated with several other metals in the platinum sand which is found in some gold districts.—They have not been found as a distinct deposit in California, but have been observed in the United States Mint in the operations of assaying and parting. These associated metals are palladium, rhodium, iridium, and osmium, to which we must add the lately discovered metal, ruthenium. They have a sufficient resemblance to be classed together, and are obtained by a similar hydrometallurgic treatment. The grains of iridosmin, alluded to under gold, have been qualitatively examined and found to contain the new metal ruthenium, as was observed by Claus in relation to the iridosmin from other localities. Palladium has been observed, and at times in sufficient quantity to render the gold brittle. The quantities of platinoid metals found in the California gold are small, about 1½lb. of iridosmin having been obtained from about 25 tons of the gold, 3-100000, but the greater part has, of course, passed into the coin, the coarser grains only being left.—*By Prof. Booth in the transactions of the Smithsonian Institute.*

COPPER FALLS COMPANY.

The annual meeting of the stockholders in the Copper Falls Co. was held at the Treasurer's office, in this city, April 3, when the following list of Directors was unanimously re-elected:—J. W. Clarke, Philo S. Shelton, James Dana, E. T. Loring, of Boston; Saml. W. Hill, of Lake Superior. Horatio Bigelow was re-elected Secretary and Treasurer; and, at a subsequent meeting of the Directors, J. W. Clarke was re-elected President.

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THE

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THE

MINING MAGAZINE:

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Mines, Mining Operations, Metallurgy, &c. &c.

VOL. II.—JUNE, 1854.—No. VI.

ART. I.—NOTICE OF THE MINERALOGICAL COLLECTION IN THE CRYSTAL PALACE.

THE Mineralogical Department in the New York Exhibition was placed under the direction of Prof. Benjamin Silliman, Jr., about the middle of March, when it was expected that the Exhibition would be thrown open on the 1st of May. Prior to

* The present notice of the mineralogical collections of the Crystal Palace in New York was prepared for another purpose, but the writer is induced to publish it here in consequence of an erroneous and (no doubt, unintentionally) injurious article, on the same subject, which was published in the November (1853) Number of this Magazine. The article referred to happened never to have been seen by the writer until this day, or it would have been sooner noticed. Probably no one is more fully sensible of the many imperfections of that collection than the person under whose direction it was amassed. If any one "expected to find there a systematically arranged collection of all the minerals of our country, each one bearing its name upon it," etc., he was very unreasonable if he supposed that such a collection (which by the way never has been formed) could be brought together, with limited means and still more limited space, in the short time devoted to procuring the collection which was exhibited. The arrangement adopted (geographical) has many advantages, especially when the *resources of a country* are to be displayed by representative specimens. If possible to make it complete, it would be a picture or map equally geological and mineralogical of the country represented. It fails of course to give scientific satisfaction; but this was not the object. The cabinet was thrown open to the public in less than three weeks after the room was delivered by the mechanics. Of course it was impossible to make the arrangement of many thousand specimens *complete* in that time. As the writer was providentially detained by a protracted illness from assisting in the labor of opening and arranging the collections until this labor was far advanced, he feels no hesitation in saying that, both in amount of labor performed, and in the dispatch with which it was done, the exertions of his associate, Mr. Brush, have never been surpassed; and in this opinion he is supported by the judgment of all those who were cognizant of the facts and competent to make a judgment. As for the labelling of the specimens, it was impossible but that much time should be consumed upon any plan. But all the most interesting and important specimens had their names attached to cards, placed in front of each specimen, before the 10th of October, or within a fortnight after the

this time, the President of the Association had issued a circular to owners of cabinets of minerals, mine owners, etc.; and Mr. W. P. Blake, B. Ph., who had drawn up the circular, visited several portions of New York, Pennsylvania, Maryland, Virginia, etc., inviting the coöperation of proprietors, and exciting public attention to this important division of the Exhibition.

Professor Silliman decided, upon taking direction of this department, to adopt a geographical arrangement of the collections, as being at once most practicable, and likely to convey to the spectators more useful information respecting the distribution of those raw materials upon which so many of the branches of human industry are immediately dependent. It was plain that the preparation of this department at all, in the very brief period remaining, was impossible, and that even with a very considerable delay, the collections which could be made must necessarily be very incomplete. Fortunately for the completeness of the collection, it was early decided to place the cabinet in a part of the Machine Arcade, the construction of which was not complete so as to be accessible at all until late in August, and was not free from the interruptions of work-people until the 6th of September. Had this long delay been foreseen at the outset, the collections might have been rendered more complete from the remote sections of the United States, as it would have been practicable to have sent special agents to the most distant mining districts in the Eastern United States, to collect specimens. This system of sending special agents was adopted from the outset in all the Atlantic States, the Association having liberally placed means at the disposal of the Director to employ the services of gentlemen eminent in this department to act for the Association in the collection of facts and specimens illustrating the mineral resources and industry of the United States.*

room was thrown open to the public. It should be remembered that the very restricted space excluded nearly all geological specimens, and compelled the Director to confine his efforts almost exclusively to minerals. Had a full suite of rocks and fossils from all parts of the United States been procured, or even one as full in proportion as the minerals actually were, the whole Machine Arcade would not have served to accommodate them. It was the *economical* and *practical* that were chiefly sought to be made prominent; and it is believed that there were representative specimens from nearly every important mining district of the United States and Mexico. From many of our mining districts, the collection was far more complete than any other that has yet been made.

It is proper to add, that, in the Descriptive and Annotated Catalogue of the Exhibition, now in press by G. P. Putnam & Co., the minerals and ores of this collection are fully described in many cases, and the reader is referred to that publication for fuller information than can be given here.—B. S., Jr.

* It is well to say here, that the *only way* in which specimens were got at all, was by going or sending for them in person, or by special agents. Not one in a hundred of all the circulars of invitation addressed to mine owners and collectors ever received so much as an answer. One who has not himself attempted it, has any idea of the labor, delay, and vexation attendant upon

It is but justice to mention the gentlemen who kindly consented, often at the sacrifice of personal convenience, to perform this service.

Mr. William Phipps Blake, B. Ph., of New York, as before mentioned, visited the iron regions of Lake Champlain, and the phosphorite deposits of the same region; the zinc deposits of New Jersey, and of Bethlehem, Pennsylvania; the chrome and copper works at Baltimore, and a portion of the gold regions of Virginia. Subsequently (in company with J. D. Whitney, Esq.), Mr. Blake made a special journey to the copper regions of North Carolina, and that of the Haiwasse, in Tennessee. Mr. Blake's useful services were lost to the Association early in June, when he accompanied Lieutenant Williamson, as mineralogist, etc., to the military expedition under the command of that officer on the western coast of America.

Mr. Geo. J. Brush, B. Ph., in company with the Director, visited the lead and copper mines of Chester county, Pa., under the administration of Mr. Chas. M. Wheatley, and selected from the cabinet of that gentleman the remarkable and beautiful suites of specimens, Nos. 113, 114, 115, Class I., which formed so conspicuous an ornament in the Exhibition.

Mr. Brush also visited the cabinet of John Ehlers, Esq., of Hoboken, and selected the suite of Mexican silver ores (No. 234, Class I.) which that gentleman's long residence in Mexico had enabled him to collect from fourteen of the most remarkable of the Mexican mines.

Prof. W. S. Clarke, of Amherst, visited numerous persons and mines in Massachusetts, Rhode Island, and Vermont, inducing them to send in their contributions.

Dr. F. A. Genth, of Philadelphia, as a reference to the Hand Catalogue will show, extended his services for the Association over a very wide range of country, and with remarkable success. The cabinet is indebted to him for specimens from the mineral region of northern New York—of Maryland—of Virginia—of North Carolina, selected with great judgment and care; for suites illustrative of the metallurgic processes of the iron, lead, and copper smelting works of the same regions; and also for the assiduity and tact with which he induced the proprietors of valuable cabinets to loan from them to the Association such specimens as he selected, and often such as could be procured in no other way.

Prof. Oliver P. Hubbard, M. D., of Dartmouth College, New Hampshire, was commissioned to collect the minerals of New Hampshire most interesting in an industrial point of view, which he did.

the accumulation of such a collection. The most powerful of all inducements (self-interest) was wanting, in a majority of cases in this department, to tempt people to forward their specimens.

Mr. Ludwig Stadtmuller visited the iron regions of Connecticut, and the adjacent parts of New York; the copper, lead, and cobalt mines of Connecticut, and Northampton in Massachusetts—selecting and forwarding specimens from numerous proprietors, and some private cabinets. He also visited and collected the ores of the copper region of the Blue Ridge in Virginia, sixty miles from Alexandria, at Manassas Gap.

Dr. Charles M. Wetherill, of Philadelphia, was (with the concurrence of the Local Committee of Pennsylvania) commissioned to visit the coal and iron districts of Pennsylvania. His labors were, from the want of time, confined chiefly to the eastern districts of this most productive State. The Hand Catalogue shows that his success was remarkable—not less than fifty-four distinct iron furnaces being represented by selections of their ore, fuel, flux, slags, and manufactured products. A large collection of the most important and best known varieties of the anthracite coal of Pennsylvania, amounting to several hundred specimens, and accompanied by a schedule showing their position, composition, evaporating power, and other valuable statistics, was formed for the Association by Colonel Wetherill and Mr. Peale of Pottsville, and in connection with the iron products of the same region, forms a feature of permanent and peculiar interest in the Exhibition. The reader is referred to Dr. Wetherill's annotations in the Descriptive and Annotated Catalogue, for further information respecting these interesting collections.

By the co-operation of these gentlemen, with the active exertions of the Director, and the aid of many other collectors or proprietors, by letters, circulars, and personal influence, the collection was soon made with such a degree of fullness as to secure its success. To any person at all conversant with the labor and trials required to accumulate a mineralogical cabinet, it will not seem strange that important deficiencies should exist, in a collection which was formed in less than four months. It is to be remarked, however, in regard to the geographical arrangement, that many deficiencies which appear upon the Catalogue, were remedied by the species and representatives occurring in the miscellaneous private collections, numbering nearly two thousand specimens, which, with some exceptions, were not included in the general arrangement. Much of the beauty of the cabinet, and to the scientific mineralogist its greatest interest, arose from the liberality of various private collectors who so kindly loaned to the Association selections from whatever was most beautiful, rare, or valuable in their cabinets. The collectors who thus loaned their specimens, are Nos. 249 to 260 A of the Catalogue, besides which we may mention the silver and other ores of Chili (Nos. 226 and 227), from the Government of the United States and Lt. Gilliss: the great collection of California and Australian gold from Adams & Co. (213, Class I.); the Mexican silver ores of

Mr. Ehlers (No. 224, Class I.): the lead and silver ores of North Carolina, from Mr. Roswell King (No. 159, Class I.); the lead and copper ores of Chester and Montgomery counties, Pennsylvania, from Mr. Wheatley (Nos. 113, 114, 115, Class I.); the copper glance from Bristol, Conn., loaned from the Cabinet of Union College, Schenectady, N. Y.; besides numerous other examples of single specimens, often of the highest interest.

The States of Missouri and Michigan aided the exhibition of their mineral products by the appropriation of money to form collections. From the State of Missouri there was sent in an extensive suite of the ores of copper, lead, and iron, cobalt, and zinc, and specimens of coal, marble, glass-sands, soils, limestones, etc., in which that State is so productive. Portions of these collections were prepared in a very skilful manner, and did much credit to those by whom they were made. Among the most remarkable specimens from Missouri, were six masses of the specular and magnetic iron ores (weighing many tons), from the well known "Iron Mountain" and "Pilot Knob" of that State.

The State of Michigan exhibited a mass of native copper, cut from the lode of one the North American Mining Company's mines (No. 210, Class I.), weighing 6,300 pounds. This mass was cut into a rectangular form. Portions of the epidotic gangue or veinstone were adhered to the upper surface, but the sides were clean-cut surfaces of pure copper, upon one of which was engraved the locality and weight. Many other very large masses of copper were exhibited by different miners in the Lake Superior region, of which that from the Minnesota Mining Company weighed over 5,000 pounds. But we will not anticipate the annotations, which will appear in their appropriate place.

Among other specimens in the Yard, which were remarkable for their extraordinary size, may be mentioned particularly, the column of anthracite coal from the Great Coal Seam at Wilkesbarre. This column stood twenty-nine and a half feet high, on a base of four feet. This is probably the largest mass of anthracite coal ever seen in a single column, cut from one vertical thickness. The great column in London in 1851, from the Staffordshire Coal Field, was bituminous coal. The semi-bituminous coal masses from the Frostburg Coal Field in Maryland, exhibited by the Lonaconing Company, and by the Parker Vein Company, were also of monster size, and excited much attention.

Other remarkable specimens in the Yard, were the white statuary marble, two huge blocks, of many tons measurement, from Fairhaven, Rutland county, Vermont, (No. 8, Class I.) This marble is in color all that can be desired, but whether it has the texture to endure fine cutting, and strength to sustain delicate lines and ridges, yet remains, we believe, to be proved, nor does it appear that experiments have been made to test its resistance to crushing, and the crystallization of sulphate of soda. A perfect white marble in this country for statuary and architectural purposes, is certainly a great desideratum, and it is hoped that among the specimens exhibited from several localities in Vermont (see Nos. 10, 11, and 13, Class I.) it may be found.

A beautiful block of encrinital marble, of a fine red chocolate color, and taking a high polish, was exhibited, from the shores of Lake Champlain in New York, (No. 51,) and recommends itself for interior ornamental purposes.

An ornamental marble (28 A, Class I.), a verd-antique, of great beauty, was exhibited from a quarry long since opened near New Haven, in Connecticut (Milford). And another of similar character, but more highly colored by serpentine and chrome iron, was shown from Vermont.

Two masses of *cinnabar* from the New Almaden Mines, near San José, Alta California, (No. 219, A), weighing many hundred pounds, were remarkable for their great purity and size giving promise, from what we already know of the surprising extent of the deposits, of an inexhaustible supply of quicksilver, where it is much wanted, and at a point whence it can be easily supplied to the whole Pacific coast.

It was not surprising that nearly all visitors to the Mineralogical Cabinet, should be curious to see the gold of California, of which the world has heard so much of late years. Fortunately, the enlightened zeal of the well-known commercial and financial agents, Adams & Co., enabled this inquiry to be answered in the most satisfactory manner. Their collection from the California gold washings embraced not only several nuggets of a remarkable size and great variety of form and complexion, but it included ounce specimens from nearly every washing or place of any note, to the number of over two hundred. It was very curious and instructive to observe the characteristic differences which these samples of diluvial gold presented, both in color, form, and the size of the grains, a difference so marked and constant, as to guide the eye of an experienced person in deciding the origin of the samples. Among the larger specimens, were a few which were remarkable for the beauty of their crystalline structure. One large mass especially, containing about $900 in value, had its gold disposed in large and well-formed skeleton octahedra, joined in symmetrical forms by their apexes, the whole sustained on a gangue of clean quartz, and wonderfully well preserved from the wearing effects of water, usually so prominent in all nuggets.

A specimen of eight or ten ounces of *iridosmine*, so much valued for its hardness in pointing gold pens, was shown with the gold of Messrs. Adams & Co., being obtained as an insoluble residue at the Mint, in the process of refining the gold. It was easy to select from among the grains those which retained the hexagonal form and tin-white color belonging to this rare mineral. Including the ingots and coins, (all struck in California, and mostly by private assayers), the value of this collection of gold was declared at over $50,000. Among the specimens were a few of the Australian gold, which was noticeably more yellow, and bears a higher value than the California gold.

Among the most novel and interesting products from the north-western coast of America, which was sent to the Exhibition, was a chest containing a fine sample of *bituminous coal* (No. 219 D. Class I.), from Bellingham Bay, Puget's Sound, in the newly established territory of Washington. Captain D. Ottinger, U. S. Marine, who transmitted this specimen appears to have sent no data accompanying it, from which we can judge of its extent and position. In the absence, however, of more exact data, it may be interesting to record the statement lately made in one of the daily journals of San Francisco, that a cargo of this coal had just been received at that port, and was regarded as a most precious addition to the commercial resources of the whole Pacific coast. Although coal has been before noticed in Vancouver's Island, and at two or three points on the shores of California and of South America, it has been neither in quantity nor quality such as would satisfy the wants of a commercial steam marine upon the Pacific, the future importance of which is now so clearly indicated.

In scientific mineralogy the collection was, in the American Department, very complete, containing examples, and often the very finest that have been found, from nearly all the localities of the United States of any note. Without intending to enter into much detail, we may enumerate a few of the more remarkable in the order of the Catalogue.

From Maine, the three *crystals of green and red toumaline*, (No. 254. Class I.), discovered many years since at Paris, by Professor C. U. Shepard, and exhibited by him, are probably the most unique specimens of this species ever seen. The color is lively grass-green to ruby red, the opposite ends of one and the same crystal presenting these two colors; perfectly transparent in some parts, and again, filled with cracks. The crystals are nearly two inches in diameter, and before being cut, nearly three inches long, and terminated with the rhombic planes. Portions from these crystals have been cut, and form gems of rare beauty and value. These crystals were found loose in the soil, more than twenty-five years since, by the exhibitor.

The *mica plates*, from Grafton and South Ackworth, exhibited by George H. Ruggles of Boston, and J. and J. S. Bowers of Ackworth, are well known now the world over, for their size, clearness and strength. An important branch of industry has grown up from the employment of this mica to fill the openings in the doors of stoves for the combustion of anthracite. The mica of Grafton is remarkable for having compressed in its laminal crystals of black tourmaline, flattened in the longer axis, and often so thin as to permit the passage of light. Two specimens of these natural polarizers were shown among selections from the cabinet of Professor Silliman, Jr.

A mass of *smoky quartz* crystal, penetrated by delicate hair-like crystals of transparent red-brown rutile, was exhibited by Professor O. P. Hubbard. This appears to have been part of a larger crystal, and was picked up as a bowlder in New Hampshire. Its sides have been cut so as to illuminate the interior, which exhibits a sight of rare beauty, the dark, but perfectly transparent quartz, being everywhere interpenetrated with the countless fibrous crystals of rutile. Some of the rutile crystals project in points beyond the surface of the quartz, seeming to indicate that they were formed first across a cavity, and surrounded by the quartz in a state of solution at a later period. There is another similar specimen in the cabinet of a private collector in New York, which also came from New Hampshire, and is quite probably part of the same original mass.

The large crystals of pale-colored, smoky quartz, penetrated by rutile, which were found in great numbers a few years since in cutting for a railway in Waterbury, Vermont, were also represented in the collection among the specimens from the cabinets of W. S. Vaux of Philadelphia, and of B. Silliman, Jr., of New Haven.

The only example of *tin ore* in the United States is also from New Hampshire, town of Jackson, and specimens of the ore and metallic tin and bronze made from it were shown by their original discoverer, Dr. Charles T. Jackson of Boston. (No. 5, Class I.)

The crystallized *spodumene* from Norwich, Massachusetts, was one of the remarkable mineralogical novelties of the collection. This mineral was first observed in crystals at this locality, by Messrs. Hitchcock, Jr., and Hartwell, in 1850. The former of these gentlemen exhibited several very large crystals (No. 14, Class I.) of this spodumene, and Professor B. Silliman, Jr., showed the two most interesting forms which have hitherto been observed, one, the same figured in Dana's Mineralogy, 3d ed. p. 693, and another hemitroped on the plane M. The crystallized *allanite*, found with the spodumene at this locality, was also exhibited.

From Connecticut, the *copper glance* from the Bristol Copper Mine, was exhibited by the mine agent, Mr. H. H. Sheldon; but more remarkable examples of the same, were those from the cabinet of Union College, in Schenectady. These remarkable crystallized forms of glance copper are now well known by mineralogists, the world over, but such large and fine specimens were never before shown publicly.

From Haddam, in the same State, was shown one of the largest crystals of *columbite* ever found. It weighed over two and a half pounds, and is tabular in form from the extension of the plane M. Most of the lateral planes are preserved, while the lustre and metallic tarnish of the surface are well displayed. The same town also furnished two crystals of beryl, such as have been found only there, with the terminal plane, so perfect in surface and polish, that when one crystal is placed upon the other the exclusion of air is so complete, that the one crystal lifts the other. These terminal planes are of a transparent light green color, veneered, as it were, upon the summit of the prism, whose shaft is of a milky pale green color; the lateral planes are distinct, and strongly marked with rhombic lines. These specimens were also from the cabinet of Professor B. Silliman, Jr., and fine examples from the same planes were shown by Mr. Vaux and Messrs. Clay of Philadelphia.

The region of northern New York, including especially the counties of Jefferson, St. Lawrence, and Essex, has long been remarkable for the very fine crystallized minerals which it produces. It is believed that the collection of the species there found was more completely represented in the Crystal Palace, than ever before in any one cabinet. The selections from the cabinet of Hamilton College, by Professor O. Root, (No. 41,) that from the cabinet of Mr. Wilder, at Hoosick Falls, (No. 40,) that from the cabinet of Judge Dodge of Gouverneur, (No. 32,) and many unique specimens from the cabinets of Mr. Vaux and others, gave great beauty and completeness to this portion of the display. The species shown from this region were chiefly *apatite*, green hexagonal crystals in white limestones, two were over eight inches long, and one doubly terminated, and one fragment of a crystal, believed to be the largest individual of this species ever found, which measured eighteen inches in length, by over six inches in diameter, and when entire, was estimated to have weighed over fifty pounds; large and distinct crystals of *phlogopite* (one of the mica family); *calcite*, of rare form, size, and transparency; *zircon*, in large hair-brown transparent crystals; *tourmaline*, in highly complex forms of brown color; *fluor-spar*, in gigantic cubes; *celestine*, in clear blue crystals on *calc-spar*; *Millerite* (*sulphuret of nickel*), in capillary crystals; and among more common species, but remarkably well crystallized, may be named *galena*; *iron pyrites*, highly modified; *yellow copper*; *specular iron*, etc., etc.

From the region of Lake Champlain, a large mass of finely crystalline *graphite* (No. 46) is worthy of remark, from Ticonderoga; several large crystals of *allanite*, from Crown Point, both exhibited by Mr. W. P. Blake. The allanite is in crystals of unexampled size, and this hitherto rare mineral promises to be abundantly furnished by this locality.

The specimens of *sphene* and *scapolite*, from Lewis county, shown by Mr. Bourne, Mr. Vaux, Mr. Wilder, and others, are among the most memorable mineralogical products of New York, but are certainly surpassed in interest by the monster *spinels* of Monroe, Warwick, and other neighboring towns of Orange county, which have been brought to light by the exertions of Messrs. Horton and Jenkins, of Monroe. Some perfect and well modified black octahedra have been found, and were exhibited over 4 inches in diameter, and groups of a much larger size. The well known species *hornblende*, *Biotite*, and many others, for which this county is so celebrated, were also fully represented. These species were included in the selections from the cabinets already named.

The metallurgical resources of the State of New York were represented by the iron ores and furnace products from Orange county, etc., as may be seen more particularly by reference to the Catalogue. The lead region of St. Lawrence county has been again brought into notice, and the ores from several of the mines were collected, or sent in by their proprietors (see Nos. 30, 31). The "Ulster Mining Company" (No. 52) exhibited a notable mass of galena, specked with yellow copper (in the Yard), weighing several tons, and some showy specimens of the *yellow copper* of this mine, in huge well formed crystals, standing upon tables of large and transparent quartz crystals, were shown by Mr. Vaux and others.

As a whole, probably, the crystallized minerals from the State of New York, in this collection, were more remarkable than those from any other district, although in beauty they were inferior to the leads of Pennsylvania.

From New Jersey, the zinc ores of Sussex (Franklinite and *red oxide zinc*) are well known, and were abundantly represented. Some masses of the red oxide, shown by Mr. Blake, were of great purity, and the red corundum crystals, also from Sussex, shown by the same gentleman, are worthy of notice for their color and size. *Brucite*, (hydrate of magnesia,) from the well known locality of Hoboken, was shown by Mr. Stone, of Brooklyn, New York, (No. 60,) of unequalled size, being in veins three to four inches in thickness, and in masses weighing many pounds—perfectly pearly. The iron ores, pig, slags, from Andover and Easton, Pennsylvania, shown by Cooper & Hewitt, New York, were exceedingly creditable to the condition of this important branch of industry in New Jersey.

We have already adverted to the rich collections from the iron and coal districts of Pennsylvania, formed by Doctor Wetherill, and also to the unique suite of lead ores from Mr. Wheatley. Pennsylvania is favored beyond any of her sister states in mining resources, and has turned them to the most profitable account. There can be no doubt that the manufacturing industry of the Northern States is intimately, and almost vitally, dependent upon the anthracite coal furnished by Pennsylvania; we refer to the appropriate heads for the data of this important internal commerce.

The southern or south-eastern counties of Pennsylvania embrace a district of protogene rocks, which, beside the valuable veins of copper, and lead, and deposits of chrome iron, which they contain, furnish to the mineralogical collector some of the choicest ornaments of his cabinet. The *corundum* of Delaware and Chester counties, beside its mineralogical interest, has been found in masses sufficiently compact and abundant to dress into emery for manufacturing purposes, although it is doubtful whether the existence of the cleavage of the mineral is sufficiently obliterated to give it the requisite strength and toughness as a polishing agent. Specimens of this emery rock were exhibited by Mr. Seale, from Minersville (No. 120.) The *rutile*, which, like the crystallized corundum, is found loose in the soil, has a considerable commercial value, from its use in giving the yellowish gray tint to artificial teeth. The collection contained remarkably fine examples of this species, in large geniculated crystals of great perfection. We notice especially two crystals from the cabinet of Thomas A. Seale, of Minersville, which are esteemed the finest examples of this species in existence.

Nearly all the mineral species from the vicinity of Texas, in Lancaster county, and from some other localities in that neighborhood, owe their greenish color to the presence of oxide of *nickel*, which rare metal is found to the extent of over one and a half per centum in the chrome iron of Lancaster county. The effect of the carbonic acid and water of the atmosphere has been, in percolating the mineral, to dissolve out and deposit the nickel in the form of a beautiful emerald green, transparent crust, which is found lining fissures in the rock, and encrusting the masses of chrome iron. This beautiful species was recognized and described several years since by Professor Silliman, Jr. The general diffusion of nickel through this region is an interesting fact in Metallurgy, and connects itself with a statement made by the late Colonel Price Wetherill, of Philadelphia, to the writer, to the effect that nearly all the lead ores of Missouri contained an appreciable quality of nickel, associated with a trace of cobalt, so as to interfere seriously with the use of certain samples of litharge for the glass making art, from the color which these metallic oxides give to the material of the glass.

The district of Pennsylvania under consideration has been a rich field to the mineralogist, and has furnished a number of new species to his science within the last few years, e. g., emerald nickel, euphyllite, pennite, clinochrore, and others, which, although not new, are not elsewhere found in the United

States. In addition to these are found there a long list of more common species, often of rare beauty.

The specimens of cleavable feldspar, and of raw and washed clay (Nos. 119, 120,) from New Garden, and of fire-brick made from the same, require further investigation, with reference to the existence of Kaolin, which is clearly indicated by the extended beds of decomposed pegmatite, and other gneissic rocks rich in feldspar, in Chester county. Some allusion will be found to the interesting metallurgic relations of these rocks, in the Illustrated Record of the Crystal Palace, page 59.*

The crystalline slags from Easton, exhibited by Dr. Swift, and by Professor Silliman, have not yet received a chemical examination, such as they demand. Their beautiful distinctness as crystals, often transparent, produced by art, excites our admiration and invites an extended investigation into the circumstances of their origin. It is worthy of remark in this connection, upon the statement of Dr. Swift, that of two furnaces, in different sections of the same district, but supplied with the same materials and ores, the one produces crystalline, and the other amorphous slags. These furnaces are represented in the Exhibition by the proprietors, Messrs. Cooper & Hewitt, (No. 64.) Dr. Wetherill, in his researches among the slags of a great number of iron furnaces in Pennsylvania, found but few which furnished distinct crystals, and but one among them all that showed the red oxide of titanium (as it has been erroneously called) so common among the slags of some Welsh furnaces.

From Maryland, the products of greatest economical interest were the chrome ores and manufactured products, and the copper and cobalt ores of the Patapsco Company, as well as the copper ores from Carroll and Frederick counties, the iron ores, and the masses of coal before referred to.

The fine cleavable feldspar, from New Castle, Delaware (exhibited by Mr. J. Jones, No. 141), is well known from the use which has been made of it as a porcelain material.

The mineral products of Virginia were not very fully represented, but the collection contained from that State some things possessing a high interest, especially among the gold ores. Dr. Genth's collection contained one specimen of gold associated with telluret of bismuth (tetradymite), in which the gold presented a surface of the most perfect polish, being evidently the cast, or pseudomorph, in gold, of some other species (probably of spathic iron). The rare telluret of bismuth, from Commodore Stockton's mine in Louisa county, was fully represented. From Goochland and Buckingham counties were some ores of gold of a remarkable character, especially that from Garnet's Mine (No.

* Professor H. D. Rogers's Report, this Magazine, page 388, Vol. II.

142), which was associated with garnets. The heavy spar from Eldridge's Mine was remarkable for the form and finish of its crystals. *Gray copper* was observed for the first time in the United States by Dr. Genth, among the copper ores of Orange county.

The cannel coal from the Kanawha (in the Yard) was plainly a material of remarkable promise.

Weir's Cave, a well-known cavern in Virginia, celebrated for the beauty of its crystalline stalactites, was represented by a large mass of crystals of dogtooth spar, of a delicate yellow color, exhibited by Mr. Robert L. Cooke, of Bloomfield, New Jersey.

North Carolina.—The copper veins of this State have lately attracted much attention, and were fully represented by the collections of Mr. Blake and Dr. Genth, as well as by the larger specimens sent on by proprietors. The copper exists almost solely as yellow pyrites (double sulphuret of copper and iron), in veins of quartz. Dr. Genth states the interesting fact that, in all the cases in which he has examined this ore, it is auriferous: and the circumstance is well known, that nearly all, if not all, the North Carolina copper veins were formerly worked as gold veins. Above water-level, the decomposing influences of air, water, frost, etc., have removed the sulphurets, leaving the gold in the oxide of iron, or gossans. The same fact holds true in Virginia, that, in many mines, the gold has apparently run out in depth, being replaced by copper pyrites. The truth is, probably, in all these cases, that the quantity of gold is as great in depth as it was at the surface; but it is in a form not to be procured by washing and amalgamation, and in which it can only be obtained by a circuitous method, involving a furnace process. In North Carolina, the region productive in copper, etc., appears to be confined chiefly to the counties of Guildford and Mecklenburg.

The Washington Mine, in Davidson county, was very fully represented by specimens of argentiferous galena, bars of silver, and numerous crystallized salts of lead, particularly pyromorphite and cerucite (phosphates and carbonates). Mr. Roswell A. King, the former proprietor, deposited in the cabinet a large collection of the various products of this mine, obtained some years back, when it yielded superb specimens and made its name memorable with American collectors.

From the other Southern States the display of minerals was small, some of the States being wholly unrepresented. The massive black oxide of manganese, from Edgefield District, South Carolina, exhibited by Mr. Lane (No. 168), was remarkable for the large size of the blocks (seen in the Yard), and for its freedom from foreign associated minerals.

The gold from Mr. Dorn (No. 167), of Oakland Grove, in the same district, presents a peculiar example of the distribution of this metal in cavities filled with ochraceous matter in a talcose state, the common gangue of gold in the Atlantic gold region being quartz. The Gold Hill Mine, in North Carolina (No. 166), and some others represented in the Exhibition, are of the same class with Dorn's Mine, but none it is believed have proved equal to the latter in the value of its products in proportion to the extent of its workings.

The copper ores of the Hiwassee region, in Tennessee (Nos. 172, 173), were well represented by specimens collected by Mr. Blake, embracing the associated minerals and rocks. This deposit (for it is a mass conformable to the adjacent strata) offers a singular and interesting example of the fermentation on a large scale of magnetic pyrites, poor in copper, and the separation of the sulphuret of copper from the oxide of iron, resulting from the decomposition of the magnetic pyrites. This process is still in operation at the depth of eighty or ninety feet from the surface, where an accumulation of sulphuret of copper, a few feet in thickness, rests upon the bed of unchanged pyrites, while above is a loosely aggregated mass of oxide of iron (gossan), which forms the outcrop of the bed and is entirely free from copper. The temperature in the adits at the bottom of the shaft is said to be about 80°, and the odor of sulphydric acid very decided. The extent of this mass (which is intercalated between beds of gneissic rocks) is the most remarkable feature of the case, being, it is said, forty to fifty feet in width, and traced by exploration between two and three miles.*

FOREIGN COUNTRIES.

It was not to be expected that the representation of foreign minerals would be very full, but there were not wanting several very instructive and beautiful suites of minerals from several of the public institutions in Europe, and from private collectors or dealers.

From Great Britain there was no systematic collection. The Duke of Buccleuch sent a fine suite of argentiferous galena and its products, illustrating the various stages of the Pattinson process applied to the ores from Wanlock Head. The ingot of silver accompanying this suite was of the value of £100; and a similar series came from the "Mining Company of Ireland." "The Lowmoor Iron Company," Yorkshire, England, sent a remarkably fine suite of specimens, illustrating the manufacture of iron in all its stages (No. 15, Class XXII., Division B), the fullest and most instructive series of the sort that was exhibited.

The oolitic fossils sent by Robert Damon, of Dorset, and the huge crystal of heavy spar, with other minerals, from Mr. Cowper, of Alston, are worthy of commendation.

* Refer to the very able Report of J. D. Whitney, Esq., in this Magazine, page 144, Aug., 1853.

Saxony.—This ancient and almost hereditary seat of mining was admirably represented by a well-chosen suite of characteristic specimens, selected by authority of the Royal Saxon Mining College in Freiberg. It embraced the ores of silver, lead, antimony, copper, bismuth, and their associate minerals. The specimens were, many of them, large, showing the character of the entire vein from which they were taken; and these were selected from several of the best-known mines. As a suite calculated to convey accurate ideas to the student, with regard to the distribution and character of metallic veins, nothing could be better.

The Royal Bavarian Director-General of Mines, at Munich, also sent a large suite of specimens, both mineralogical and geological, illustrative of the mineral resources of that kingdom. Especially worthy of mention in this collection, was that part which embraced the rock-salt, gypsum, and anhydrite, from the saliferous region; and the whole series was put up and ticketed with characteristic German exact neatness.

The Directors of the Public Iron Depot, at Gottenburg, in Sweden, sent an instructive suite of the iron ores, pig, and bar iron of that kingdom, so long celebrated for its tough and valuable iron products.

The mineralogical portion of the foreign department was however chiefly indebted for its beauty and attractiveness, in the eyes of scientific mineralogists and collectors, to a brilliant suite of well-chosen crystallized minerals, selected from all the great mineral and mining districts of Europe by Dr. Augustus Krantz, of Bonn on the Rhine, who is well known as a dealer in minerals. This suite embraced specimens from Prussia, Saxony, the Hartz, Thuringia, Baden, Hanover, Nassau, Transylvania, Hungary, Bohemia, Tyrol, Switzerland, Italy, France, Scandinavia, and Russia. Many of the specimens were such as are rarely seen even in Europe in such fine condition, and the whole offered much pleasure to mineralogical collectors.

More useful, probably, because within the reach of young students and of teachers, were the select cabinets of well characterized minerals and rocks, designed for instruction. It is one proof of the utility of the Exhibition, that several of these latter collections were sold to students and teachers from those exhibited, the price being moderate and the specimens excellent.

Although fossils were not generally included in the collection, from want of space, a few were admitted; and among them we note, as particularly worthy of mention, the beautiful collection of fossils from Solenhofen, sent by Carl Haberlein (No. 246, b). Dr. Krantz also sent a choice selection of German fossils, including a fine head of ichthyosaurus communis, and many fine encrinites.

As an example of new gleanings in an old field, we may mention the mercury and copper ores—the former from Jano, in Tuscany, and the latter from near Volterra (Monte Catini)—sent by Messrs. Sloane, of Florence, English proprietors, who have lately developed these resources before dormant in the domain of the Grand Duke. The copper ores are both the yellow, variegated, and vitreous sulphurets, in massive blocks, accompanied by the copper made from them.

Illustrating new metallurgic processes, there were in the collection three suites of specimens worthy of special mention, viz.:—

1. The separation of gold from arsenical pyrites, by Plattner's method (243 a), by M. Guettler, of Reichenstein in Silesia. A specimen of the arsenical pyrites, containing 200 grains of gold in the ton; the same roasted, to expel arsenic: the residue, after treatment with chlorine; the colcothar, or fine red oxide of iron, saved in the process; and the button of gold, form the series of specimens. In Plattner's process, as conducted by M. Guettler, the roasted ore is treated by chlorine gas, whereby the gold and iron are rendered soluble in water, from which solution the gold is thrown down by sulphuretted hydrogen. The precipitation of the iron is prevented by the addition to the solution of a little chlorohydric acid. The gold is then collected, and fluxed as usual. This process is beyond doubt applicable to the refuse of many mines which contain often a little trace of gold, and, since its discovery, has been the means of opening some old mines in Europe which have been abandoned for centuries, e. g., this very mine of Reichenstein, which has been abandoned for 500 years. A plan of the works accompanied the suite.

2. The separation of silver from copper ores, in which it exists in small quantity, by the process of Mr Ziervogle, now of Pennsylvania. The copper-schists of Mansfeld, of Germany—the same which furnish the well-known fossil fish (*Palæoniscus freislebenii*)—have long been worked for copper, although containing not over 5 per cent. of ore. This copper is argentiferous, and the silver it contains was formerly separated by liquidation. By the present process, the details of which are kept secret by the discoverer, water is said to be the agent of separation. The suite of specimens exhibited consists of the schist, the same crushed and roasted, the roasted ore after lixivation with water, the same fused, two or three stages of the copper fusion, fine copper, and fine silver. In the absence of any data of a precise nature, we remark, that it is obvious that the silver to be removed by water must be in a soluble state, and that the result of the roasting must be the production of a soluble salt of silver, (sulphate?) which the water removes.

3. The reduction of oxide of iron by carbon in tubes, by the process of Mr. Renton, of Newark, a more detailed description

of which, by Mr. Wurtz, can be seen in the Annotated Catalogue under the proper head.

The geological maps of the English Ordnance Survey, sent out by order of Sir Henry De La Beche, were the most important contribution under the head of maps, plans, and sections. It is unnecessary to enlarge here upon the merits of these maps, which are everywhere regarded as models of accuracy and laborious research.

Such is a brief summary of some of the more salient and obvious points of interest in the mineralogical collection in the Crystal Palace in New York in 1853.

Art. II.—THE LACKAWANNA COAL BASIN: ITS GEOLOGY AND MINING RESOURCES AROUND SCRANTON, PENN.—No. 3. By Prof. Henry D. Rogers.*

On the south side of the coal field, this seam has its southern outcrop at the village of the operatives, just south of Roaring Creek, the valley of which stream it does not ascend eastward quite as far as the furnaces, but occupies this flat basin westward from thence along the Roaring Creek and Lackawanna as far as the synclinal structure extends, or to where the trough entirely flattens out. This state of things occurs east of the bluff hill of the Griffin farm, at the base of which this coal is entered by a drift preparatory to its being mined there. It is lifted out or washed away on the back of the main Scranton or Dunmore anticlinal, on the north dip of which it reenters the ground at the north base of the ridge, on which is seated the Odd Fellows' Hall. From this locality we may trace the line of outcrop eastward, obliquely ascending the north flank of the ridge towards Dunmore, but how far has not yet been determined. The next anticlinals to the north, which barely lift the underlying large or fourteen-feet bed to the surface, throw this seam out over a belt of some breadth, till it reenters the ground again on a north dip north of Pine Brook. In this position we may see it at the plank road bridge over the Lackawanna, and further eastward on the road between Dunmore and Providence. Opposite Scranton, and more to the westward, these anticlinals do not bring it to the surface, for it is, at the least, one hundred and ten feet below the bed of the Lackawanna in the highest part of the second undulation, at the arch of the coals I and K in the bluff by the river side a little west of the town. Between its line of outcrop, near Pine Brook and the northern margin of the basin, we have no evidence of its reappearance at the surface, though

* Continued from p. 490, Vol. II.

this northern side of the coal field is too much obscured by the general covering of drift gravel to enable us at present, in the absence of extensive mining there, to ascertain the undulations which may affect it. It is mined in Leggett's Gap, at the foot of the northern mountain limit of the basin, but this is to a very trivial extent at present. The bed of coal before us has not hitherto been mined on the Scranton lands, but merely opened and well proved preparatory to mining. Other larger and equally accessible seams have been entered and wrought in preference, as promising a larger product with a given amount of labor; and the yet incomplete condition of some of the outlets to market, prohibiting that active and general working of this coal field, for which, in many respects, it is admirably adapted, by the accessibility, the size, and the general excellent quality of its beds of anthracite, none but the very best beds are wrought. This coal seam may be safely estimated as capable of affording, of good coal, some five thousand tons per acre, for every acre it occupies on these estates.

Coal H.—This is the ten-feet seam, so called, and its prevailing thickness, wherever it has been mined, or even proved, in the Scranton coal field, justifies the title. Its position in the strata is about seventy feet higher than the bed G, above described. It reposes on a thick bed of clay shale, with rootlets of stigmaria, and is covered by a thinner layer of a more sandy variety of the same blue rock, containing beautifully preserved ferns, lepidodendra, etc. The comparatively shallow basin of Roaring Creek, between the southern edge of the whole coal field and the main Scranton anticlinal, does not retain any portion of this layer of coal, nor, of course, of any of those still higher than it in the series. To the westward of Scranton, however, this coal has its most southern outcrop in what may be regarded as the prolongation of this basin, in the bluff hill of the Griffin farm on the north side of the Lackawanna, where the synclinal flexure has flattened out and given place to only a very gentle general north dip. At Scranton, and eastward from it, the first outcrop is north of the ridge or main anticlinal undulation of the strata, somewhere under the deep covering of drift upon which the town is built. From this position the edge of this coal must curve round southward in advancing westward, until, lapping over the anticlinal which ranges under the town, it must bury itself under cover; thence to the westward, even on the back of the anticlinal. Thus, at the bluff on the west side of the Lackawanna, the coal I, or seven-feet seam, already spoken of as being there visible in a regular arch, is no more than about twenty-five feet above the water level, whereas the least space dividing it from the underlying coal H in this vicinity is not less than seventy-two feet, which places the coal we are now considering nearly fifty feet below the bed of the Lackawanna at this spot. The third anticlinal undulation, counting northward, or that which ranges just south of the brow of the table land of Hyde Park Village, and through the Sweatland meadows, south of the base of the same range of heights further east, brings this coal into view at the base of the hills, where they make a concave sweep. Lying at some depth below the surface, all along the north bank of the Lackawanna above the railroad bridge, where the next higher bed, the seven-feet seam, or coal I, is itself only at the water's edge in several places, it presently comes up to the level of the meadow, makes a gentle arch from a south to a very flat north dip, and goes under cover at the base of the line of hills bounding the meadow on the north-west. Here, at the western end of the low grounds, in the Sweatland mine, so called, the coal at a little distance north of its outcrop basins, but with an extremely gentle curve, and soon reascends again very gradually northward, outcropping on this last rise, by denudation, at the foot of the high grounds or margin of the flats, and presenting a long line of frontage towards the valley exceedingly favorable for mining. It is here that the Company has established one of its best collieries. From this line, the lower or valley outcrop slowly sweeps itself eastward and northward, rising very gradually forward in the direction of Leggett's Gap, crossing in its course the plank road a little west of the toll gate, and approaching the Leggett's Gap railroad somewhere near the long trussel work. Of the upper or final northern outcrop of this wide, gently sloping plate of the coal, of the northern side of the basin, almost nothing is at present known, so generally is the surface here concealed by drift. In my estimate of the aggregate thickness of good merchantable coal in the coal field, the average yield of the bed under consideration was set down at seven feet. This seam, the usual thickness of which is very nearly ten feet, contains more than the ordinary proportion of good fuel, and hitherto the colliers have usually extracted, I believe, nine feet of it for the market. One layer of it, amounting to sometimes one and a half feet of this thickness, is a rough but pure coal; and perhaps it has been injudicious to include this with the rest, which is a brilliant and excellent coal, of a large square fracture, and of great heating power. The area occupied by this coal seam on these estates, both beneath and above the water level of the Lackawanna flats, amounts itself to a noble coal field, but its precise extent in acres I am not prepared to report, in the absence of the requisite detailed surveys, and a special geographical map, defining the outcrops of the individual beds. Each acre may be fairly estimated to contain, of good coal, some twelve thousand tons.

Coal I and K.—The principal central outcrop of these beds, which are sometimes called at Scranton the upper seven-feet and five-feet seams, is in the southern face of the Hyde Park table-lands, or range of high grounds, about midway above their base. In this position they are seen on the road leading up the slope from the Lackawanna into the village of Hyde Park, and we may trace them eastward along the escarpment, following nearly the level of the Leggett's Gap Railroad, to near the intersection of this with the turnpike road leading to Providence. In this vicinity, the margin of the coal seams swings away more to the north, maintaining a course approximately parallel with that of the lower outcrop of coal H, but at a higher level in the hills and further to the north-west from the railroad. Only in one short part of their course do the outcrops lie below the railroad, and this is a little westward of the coal breaker of the mine connected with coal H, where a fault, or simple dislocation, to the extent of a few feet of vertical displacement, has cast down the strata from a level of a few feet above to one as much below the railroad track. Along this line of front, these coals present the same unusual facility of access for mining above the water level, which belongs to the valuable ten-feet bed beneath them, and from which they are here separated by about eighty-five or ninety feet of strata, a very gentle dip southward towards the valley, and a long ascending breast between the upper outcrops, offering all the conditions for an excellent colliery or collieries.

There is another much narrower basin of the coal I, and of the overlying seam, coal K, which are only some twenty feet apart. This occupies a more southern position in the valley. The middle of the trough ranges nearly with the course of the Lackawanna, past the railroad and carriage road bridges to the sudden elbow of the river, a few hundred yards west of the latter. Along this undulation, the coal I, or seven-feet bed, lies but a small depth below the level of the stream, and at a distance of a few hundred yards above, or east of the railroad bridge, it emerges from the water-level on both sides of the river, being on the north bank overlaid by the bed K, which has there been opened by a mine drift to a limited extent. This basin of these coals has on its southern side the second anticlinal, or that which passes under the gravel plain of the town of Scranton, and is exposed in the flat arch below the bend of the Lackawanna; and on its northern side it is bounded by the third axis, or that of the Sweatland meadow. The depressed arch just spoken of, lifts these coals over a space of a few hundred feet for a small height above the level of the stream, permitting them to be readily identified. Still further to the south-west, both of these seams of coal have been recognized and opened preparatory to mining in the hill on the Griffin farm overlooking the flats of the Lackawanna, and again in the ravine or dell which ascends through this plateau toward the turnpike road. In this vicinity, the coal

I measures nearly eight feet in thickness, while the bed K is apparently a little thinner than it is to the east of Hyde Park.

Coal L.—Above the coal K, there is generally, at a somewhat variable distance, averaging twelve feet on the Leggett's Gap Railroad, a thinner bed of coal, called L in our column, the size of which fluctuates from two to three and a half feet. This has nowhere been detected in sufficient thickness and purity to be profitably mined.

Workable beds of iron ore usually attend both of the last-named beds; these will be mentioned again under the head of the Iron Ores of the District.

As neither the bed I nor the bed K has hitherto been wrought on to an extent beyond a drift or two near the railroad east of Hyde Park, it is impossible to state from observation the positive average net yield of those seams in this vicinity. From the indications they present at their outcrops, and in the one or two accessible drifts already carried into them, it will be safe, I think, to estimate the capacity of the lower or seventh seam at not less than some 7,000 tons to each acre; while the upper bed, or coal K, may be set down as yielding in its best localities perhaps 4,000 tons for the same superficial measure.

Coal M.—This highest coal bed of the Scranton Series is to be met with on the Griffin farm, about a mile west of Hyde Park, where it outcrops a little way below the brow of the upper plateau, only a few hundred feet south of the turnpike road, with a very flat dip towards the north. This is the only spot in this belt of high ground where it has been opened or proved: and as the old drift here visible was made several years ago, and is at present inaccessible, I have no personal observation to guide me in regard to the thickness of the coal beyond the bench caused by its outcrop and the apparent size of the drift. From these, I see no reason to doubt the accuracy of the statements given by the farmers of the neighborhood, that, when the mine mouth was clear, the coal measured some eight feet in thickness. The extent of this upper bed within the property cannot be considerable, since only the higher parts and most synclinal or trough-like dipping summits of the table-land can contain it.

In reviewing the foregoing descriptions in detail of the coal seams comprised within the Scranton property, it will be seen that the general summary given in the earlier pages of this Report, to the effect that, in a depth of no more than four hundred feet of strata, the net thickness of coal available for market exceeds some thirty-five feet, is here abundantly confirmed. But to bring out in a clearer light the remarkable productiveness of this portion of the lower coal measures, as they present themselves near Scranton, I will assemble in a tabular form the actual least thicknesses of the several coals within this bulk of strata, their net thickness of good coal fit for market, and the computed yield of such coal per acre from each bed.

TABLE.

Coals.	Least thicknesses.	Good coal.	Yield of good coal per acre.
K.	5 feet.	3 feet.	4,000 tons.
L.	7 "	4½ "	7,000 "
H.	10 "	7½ "	12,000 "
G.	6 "	3 "	5,000 "
F.	12 "	9 "	15,000 "
D.	8 "	6 "	10,000 "
C.	6 "	4½ "	7,000 "
	54 feet.	37½ feet.	60,000 tons.

These totals hold good, of course, only for those portions of the coal field which are underlaid by all the seven coals enumerated. If we wish to aggregate the gross amount, the net amount, and the amount per acre, contained in the four middle beds, D, F, G, and H, which lie within a thickness of strata of two hundred feet, and spread beneath every acre of the coal field, excepting only a narrow belt along its southern border, we shall find, on summing up the columns of the table, that the least total thickness of these coals is thirty-six feet; their yield in thickness of good coal, upwards of twenty-five feet; and their productiveness per acre, the noble ratio of 42,000 tons.

THE WORKABLE IRON ORES OF THE VICINITY OF SCRANTON.

It has been already mentioned in an early part of this essay, that the umbral, or red shale formation of the upper part of the valley of Stafford Meadow Brook, includes a valuable layer or layers of a peculiar variety of iron ore, extensively smelted at the Scranton furnaces.

This belt of ore is known to range for a mile or more with the outcrop of the strata inclosing it; but to the eastward and westward of that space, it either thins away or becomes too poor in oxide of iron to be recognizable or worth pursuing. Thus, no traces of it are to be detected in the prolongation of its outcrop either in the upper valley of Spring Brook or in that of Roaring Brook at Cobb's Gap, and it seems to be restricted, or nearly so, to the lands of the Lackawanna Iron and Coal Company.

Its dip is with the strata, or towards the north, at an average angle of fifteen or twenty degrees, and its topographical position is the east and west, ranging on longitudinal valley between the two mountain ridges—that of the seral conglomerate and umbral sandstone on the north, and that of the Vespertine sandstone and conglomerate on the south. The geological situation of the ore is just above the upper layers of the latter formation, or among the lowest of the shales and fire-clay beds of the umbral series.

As exposed at the mines of the Lackawanna Iron and Coal Company on the Stafford Meadow Brook, the ore lies imbedded in a true fire-clay or soft clay shale, the average thickness of which is about six feet, while the ore for the most part is in two layers or courses—the lower one a continuous band, some eighteen inches thick, and the upper one a layer of flat balls or cakes, twelve inches or less in vertical diameter. Beneath this ore stratum is a buff-colored and greenish sandy shale, and supporting it, in turn, a gray compact sandstone, which I deem the upper bed of the great Vespertine or Lowest Carboniferous Series. Above the ore deposit reposes a bed of close-grained, gray, argillaceous, shaly sandstone, of an average thickness of thirty feet; and in the middle of this lies a band, one foot thick, of fire-clay, containing also scattered balls of iron ore. Over this sandstone occurs a mass of thirty feet of yellow and red shale, more characteristic of the ordinary red shale outside of the coal basins than any of the other subjacent members of this group of strata, which present indeed almost the maximum of deviation from the usual conditions of the umbral formation. The stratum embracing the iron ore abounds in the same delicate fossil rootlets, called stigmaria, which are so distinctive of the fire-clay beds that support the seams of coal.

The iron ore itself appears to be a concretionary deposit, collected from the imbedding fire-clay and overlying strata, at their outcrop. The oxide and carbonate of iron, of which it is composed, have been primarily diffused through these rocks, in part, perhaps, under the form of the sulphuret of iron, and subsequently gathered thus into sheets and layers of balls, by infiltration of the rain and other surface waters. In confirmation of this view of the origin of the ore, it appears that the deposit grows less rich in iron, wherever it is followed far into the hill, or is covered with tight overlying strata, as to have experienced a less than ordinary share of percolation from the surface. In these positions the ore is little else than a fire-clay, with a merely greater than usual impregnation of the oxide of iron.

The ore, as taken from near the outcrop of the beds where it is extensively mined by shallow drifts and by stripping, is a mottled dark green and red, sub-crystalline mixture of the carbonates of iron and lime, with the peroxide and protoxide of iron, and containing, besides, alumina and some silica. It is readily fusible, and holding a small amount of the carbonate of lime, it assists materially in fluxing the more refractory ores with which it is mingled in the furnaces. It is of very variable thickness, the proportions of its metallic iron ranging from twenty-five to forty-five per cent. It is impossible at present to make any exact quantitative estimate of the extent of this interesting iron ore along its line of outcrop, so irregular is the topography of the belt it occupies, and so variable are the circumstances which control the presence or absence of that degree of purity which is essential to its being profitably mined and smelted. But that it prevails in great abundance, must be obvious from the mere consideration of the long line of outcrop, the wide belt over which it is spread by its gentle dip, and the consequent thin covering under which it lies around the margins of the hills.

IRON ORES OF THE COAL MEASURES.

Ore of Coal E. Pursuing, as with the coal beds, the ascending order, the first bed of iron ore in the coal measures of the Scranton coal field is the layer of large nodules, or balls of clay, iron, stone, or argillaceous carbonate of iron, which underlies at an interval of a few feet the large coal seam, *F.* The most abundant deposit of these balls is in the stigmaria shale or fire clay immediately beneath the little coal bed, *E.* Here the masses, generally two or three feet in diameter, lie usually in a single course, the balls not being in contact, but sometimes two or three diameters asunder.

They are of a blue color, compact and excessively hard, and are of the structure of septaria, that is to say, they have been fissured from the centre outward by shrinkage, and the crevices filled with infiltrated crystalline quartz, brown spar, sulphuret of iron and sulphuret of zinc. Externally, they are of a light bluish gray color, and less rich in iron than within, and are marked with the rootlets of the stigmaria, traceable a short way below their surfaces, showing them to be true concretions. Iron made of this ore alone is remarkable for its great toughness and strength, and hence this variety is in much request for mixing with the other ores smelted at the Scranton Iron Works. The principal ore drifts in this layer are situated upon Roaring Creek, and are quite contiguous to the furnaces.

Black Band Ore of Coal F.—The next layer of ore is a course of compact anthracite *black band*, occurring in the black shale bed, which immediately underlies the great fourteen-feet seam of coal on the Lackawanna, west of Scranton. This ore is of a bluish black color, not very dense in texture, and is between four and five inches in thickness. Under certain circumstances of mining it might be economically wrought, and would prove a useful ore if mixed with the other varieties. The black band ores of the anthracite measures are, however, not to be confounded in their properties with the genuine black band of the bituminous coal fields, since these latter, by virtue of the bituminous matters which they contain, are much more likely than the former to purify themselves, in the process of roasting or of smelting, from any sulphur which they may contain. This ore contains much carbonaceous matter, and ought therefore to make a good iron after roasting. When reduced to powder it effervesces actively with *hydro-chloric acid*, which shows that it contains some carbonate of lime, another useful constituent tending to facilitate the smelting.

Nodular Ores of the Coal Seam K.—In the upper part of the coal measures, immediately beneath the coal bed K, and also under its rider L, there occur two beds of good nodular clay iron ore.

The balls which underlie the first named of these coals are irregularly scattered in a blue sandy shale, and unless where very favorably exposed for surface-stripping, are for the most part too coarse and lean in iron to repay the cost of collecting. Those which adjoin the little coal L, occur in its under-clay, a soft, argillaceous shale. They are in greatest abundance within seven feet of the coal bed, though some occur in a fire-clay next beneath this, reposing immediately on the coal seam K. These nodules are usually spheroidal in shape, and vary from the size of an egg to one foot in diameter. The quality of this ore is good, it being a tolerably pure, heavy and nearly homogeneous protocarbonate of iron. The balls weather of an ochreous brown color, and exfoliate in concentric scales of peroxide of iron, showing them to contain some carbonate of lime, and to be a little sandy. Under advantageous positions for mining, this ore, the abundance of which is very considerable, may be wrought, both by stripping and drifting, at a cost quite within the limits of economical production.

CHARACTER AND QUALITY OF THE SCRANTON COALS.

A series of systematically conducted chemical examinations, for which I have not found leisure, is needed to enable me to determine with perfect precision the constitution of the coals of the Scranton coal field, and the relations they bear to the coals of other districts of the anthracite region. But a careful study of their external physical stucture, and of their behavior under different circumstances of combustion and some approximate analysis, made with a view to the main question of their general purity, have supplied me with such satisfactory and positive results, as will, I trust, meet all the requirements of a preliminary description like the present.

As a group, these Scranton coals are to be classed with the free-burning, white ash anthracite, a very valuable variety, uniting the strength, or great *heating power* for which the true anthracites are preeminent, with that readiness of kindling and activity of combustion which distinguish the firmer semi-anthracites, and which the densest and hardest coals do not possess. Both in structure and composition the more ignitible of these coals hold a station apparently intermediate between the most compact anthracites nearly destitute of inflammable gases, and those more fissured and lighter varieties containing a notable amount of the carburetted hydrogen gases, and which I have elsewhere denominated the semi-anthracites.* While the dryest and densest anthracites include about three per cent. of their weight of inflammable gases, and the semi-anthracites some seven or eight per cent., these Lackawanna coals, on the verge, as it were, of the class of anthracites or flameless coals, possess an average as much as five per cent. of these free burning elements. And so, again, in respect to the structure of these coals. In the hardest and dryest anthracites, the beds are imperfectly and irregularly jointed, the fissures being few and wide apart; and on the other hand, in the semi-anthracites, these crevices are parallel and very close together, averaging two or three in an inch; but in this group of the less dense and quicker-kindling anthracites, the joints, though regular and parallel, are intermediate in degree of frequency, not occurring oftener than once in every two or three or four inches. As a large proportion of these natural fissures commence and end within the same band, they permit the coal to be hewed and transported in chunks as massive and as solid as need be desired, while they impart to the coal, when intentionally broken up, a prevalence of the square or cubical shape. This feature seems to be attended with at least two decided advantages: one is, that it assists materially the closer stowage of the fuel, an element of much importance in ocean navigation; and the other is, that it facilitates the kindling and ready burning of the coal, by the multiplicity and sharpness of the corners and edges exposed to the heat and the current of air during combustion.

In point of purity or freedom from earthy matter, these coals of the vicinity of Scranton will compare favorably with the beds of the corresponding lower white ash group of the Lackawanna and Wyoming basin generally, and indeed, with the better class of anthracites anywhere throughout the coal region. Analysis shows that the portions which are mined for transportation, contain not more than six or eight per cent. of ashes, and this, it is well known, is a low proportion for merchantable anthracite coals. The earthy residue of these coals, being of the kind called white ashes, consisting chiefly of silica and alumina, and containing but little alkali, lime, or oxide of iron, and being capable therefore of withstanding a high heat without melting, or more than softening into a spongy cinder, are exempt from the serious defect of producing the hard, stony clinker caused generally by the red ash, and often by the so-called gray ash anthracites.

The proportion of solid carbon—the amount of which in coals, from the best practical researches on fuel, must be accepted as very nearly the measure of their absolute heating strength—is,

* See an Essay on the combustible qualities of the semi-anthracites of the Shamokin coal field.

in the instance of these Scranton anthracites, about eighty-seven to eighty-eight per cent. of the whole mass, a ratio only about two per cent. less than distinguishes the dryest or least gaseous varieties in the Lehigh coal fields, while the difference is amply compensated for in the gain of this amount of ignitible, inflammable gases—hydrogen and carburetted hydrogen—which serve materially to increase the promptness of kindling, and rapidity of burning, or the total amount of heat evolved in a given time.

These Scranton coals, in their comparative purity or freedom from earthy matters, and large amount of carbon in their possession of a moderate density and some free inflammable gas, and in their square mode of fracture, combine in a high degree the three chief essential attributes of a superior fuel, namely, great absolute heating strength, quick ignitibility or activity of combustion, and the power of packing closely. Other coals may surpass them in some one of these qualifications to a small extent, but I doubt if, on a fair experimental comparison of properties, any will be found to combine a larger total of efficiency in all these several ways.

With a view to exhibit more distinctly the excellence of the class of free-burning white ash anthracites, such as these I have above described, I will conclude this essay with a condensed survey of the principal qualities essential to a good fuel for producing steam, or for domestic uses:—

1. It should possess great actual heating power.

2. As far as consistent with the foregoing, it should kindle quickly, and burn fast, generating the largest amount of heat in the shortest time.

3. Its earthy matter should be small in quantity, and difficult to fuse; it will thus make little clinker, demand but little raking of its fires, and undergo but little waste in consequence.

4. It should contain but little sulphur.

5. The volatile ingredients of the coal should be free inflammable gases, not bituminous matters forming smoke; and they ought to be barely abundant enough to assist rapidity of combustion, as the larger the proportion of fixed carbon, the greater seems the heating power.

6. They should not be too tender on the fire, nor yet too refractory; a certain tendency to fall to pieces spontaneously while burning, but not an over amount of this, is a great desideratum, as it confers activity and steadiness of combustion; too much of it impedes combustion by increasing the friction of the air passing through the fire.

7. The lower the temperature at which an anthracite will kindle and maintain itself burning, the more manageable, more active, and more economical will it prove.

8. The better a coal unites the tenacity necessary for economical transportation, with this medium amount of frangibility

on the fire, the larger the effective result of a given quantity, from the time it leaves the mine.

9. And the greater the aggregate of positive heating power, rapidity of combustion, and compactness of stowage compatibly assembled in a coal, the nearer does it approach the ideal standard of a perfect fuel.

Art. III.—THE PRODUCTION OF GOLD, PLATINUM, THE OXIDE OF TIN, &c., ON THE SURFACE OF THE PRIMARY ROCKS DURING DECOMPOSITION.*—By Evan Hopkins, C. E.

Gold, platina, and other metals not subject to oxidation, are principally found in the disintegrated surface of the metalliferous crystalline rocks, such as granites, porphyries, and their respective slates. These metallic productions depend entirely on the composition and structure of the rocks, and the chemical and mechanical conditions of the surface, causing oxidation, disintegration, and the consequent development and aggregation of the containing metals.

The superficial productions, of gold and platina especially, far exceed the product from veins, and are much purer in quality. Metals formed in mineral veins contain a large proportion of alloy, whereas those found in deposits are comparatively free from the baser metals, the latter being destroyed by the process of oxidation. The rocks containing the precious metals and the oxide of tin are much subject to superficial decomposition, and thus their metallic contents are liberated by a slow natural process. This action is more or less constant in every region on the face of the earth, but in variable degrees, according to local conditions, depending on the crystalline compounds and physical operations, confined to no age, nor to any particular zone, and totally independent of the character of the superincumbent fossiliferous beds which may be found in the districts.

I wish particularly to press this point on those who have a desire to study the subject, so that they may estimate the real value of the arguments which have been brought forward with reference to the alleged discovery of gold deposits in Australia, founded on palæozoic data, or predictions grounded on fossiliferous rocks. A knowledge of the meaning and leading bearings of fossils is very important in connection with sedimentary rocks, but it is totally unavailable in all questions connected with the primary rocks, and their containing metals and minerals. To state that "gold is deposited in the newest tertiaries, or in connection with palæozoic rocks," can have no definite meaning, and much less any practical bearing on the subject. The less primary

* *London Journal.*

series are covered with sedimentary rocks, the more easily their character can be determined; should they be the metalliferous, or auriferous variety (which can only be determined by mineralogical examination), and more or less decomposed and covered by their quartzose debris, we have reason to expect gold deposits. These superficial disintegrations are incessantly increasing the thickness of the sands, clays, and pebbles. This change is confined to no age, nor any given period in the history of the sedimentary rocks; neither do such accumulations inclose fossils, or any organic substance by which the fossil geologist can determine their metallic qualities. Every gold digger knows well that the description of fossiliferous rocks, with all the erudition on the organic remains and the consequence of the beds on one hand, and the hypothetical igneous rocks on the other, avail nothing, but rather tend to bewilder those who have not studied the primary rocks and their deposits in the field of operation. It is this misinterpretation of natural phenomena, and the consequent misapplication of the laws governing the products of the mineral kingdom, that have brought the science of geology into disrepute amongst miners and diggers. The auriferous clay and mica slates generally inclose nodules and veins of white and light red quartz. These gold quartz veins are exceedingly deceptive to the uninitiated, being frequently found glittering with gold at the surface, with occasional large masses in cavities, and large flakes in the joints and fractures; yet at a few fathoms in depth, in the compact quartz, they seldom produce sufficient gold to pay the cost of the mere blasting of the rock. Yet these quartz veins contain a small proportion of gold below, although invisible, which, when left to the natural processes of decomposition and internal metallic aggregation, produce rich superficial debris. A very interesting result, in connection with the superficial action and the liberation and aggregation of the precious metals from the containing rocks, may be seen at the roots of great trees when in immediate contact with quartzose bands. Huntsmen and herdsmen have been the discoverers of many of the silver mines in South America, especially in Chili and Peru, by detecting large masses of metallic silver attached to roots of trees, and sometimes growing in a somewhat aborescent form amongst the scrub. The same kind of discoveries have been made in gold regions not alone in South America, Veraguas, and California, but also in Victoria and New South Wales—large masses of gold have been found aggregated near the roots of large trees and strong grass, often in very singular forms, and evidently indicating the influence of the roots in the formation, and the amount of gold drawn out of the rock below. I particularly refer to those parts undisturbed by floods, where the gold is found *in situ*, and not to the accumulations of gold occasioned by masses of roots in valleys, and other mechanical obstacles to the running streams. The two effects are quite distinct. I have also seen gold formed on, and in the cavities of rocks, like small ferns, presenting all the appearance of vegetable or coral growth, with this distinction, that instead of the fibrous branches and leaves, the structure of the branches was of a crystalline character. Hence, with these facts before us, we cannot refuse to acknowledge the existence of this action in the minerals below, even though the effect produced may be so slow as not to be sensible during the life of an individual. The action of water, as has been elsewhere shown, is so much connected with that of oxygen, hydrogen, and carbonic acid, that it is scarcely possible to consider their effects apart in the crystalline rocks. Before we can duly understand how the precious metals become developed in masses near the roots of trees, we must know the general character and state of the rocks and soil *in situ*. All substances found in nature are capable of being held in aqueous solutions, and are often found in that state. Gold is held in a solution of caustic alkali, and sometimes saturating the quartz and the cleavage of the slate. Silver is kept in solution by sulphate of iron. Caustic potash is also the natural menstruum of silicious substances. The hornblende and clay slates contain as an ingredient protoxide of iron, and when they absorb the rain or surface moisture, this oxide combines with the oxygen of the water and liberates the hydrogen gas, which is a most active agent in the production of metals in rocks, as well as on the negative plate of an artificial battery. The above combined protoxide becomes thus a peroxide of iron, and thus converts the hard surfaces of these rocks into a friable brownish red soil, leaving at the bottom the substances unaffected by the changes. Rocks in general are more or less ferruginous, and the salts of iron lose their coherence on exposure to air, and crumble into powder by the absorption of oxygen. Thus the disintegration of most of the crystalline compounds is effected, owing to the ingredients being susceptible of entering into union with oxygen: the precious metals are gathered together, and the metallic sulphurets transformed into soluble sulphates. Nearly all the primary clay-slates consist of compounds of silica, alumina, potash, soda, iron, and often magnesia and protoxide of manganese, with the metals sparingly disseminated therein. Quartz decomposes by the continuous action of a weak solution of carbonic acid, and liberates its containing metals. The pipe-clay is a silicate of alumina, produced by the decomposition of the quartz and felspar, and the potash washed out. What is vulgarly called "burnt quartz," is a conglomerate of the debris cemented together by the solutions of the oxides of iron and silica. Indeed, all rocks containing silicates of alkaline bases, especially when ferruginous, are incapable of resisting the continued solvent action of carbonic acid dissolved in water, or the sucking action of the roots of trees supplied with carbonaceous matter in a moist state. Thus carbonate of soda is a most important substance to sprinkle in a poor soil to liberate the elements of the crystalline rock to feed the roots of plants: the required nourishment is thus absorbed from the soil, and the metals and other ingredients rejected by the roots are left behind, like indigestible substances. The metals in the primary rocks being more or less in a semi-fluid state, and combined with other elements, especially the alkalies, remain in that state until disturbed by neutralizing agents—*i. e.*, like the roots of plants, taking up the potash and leaving the gold behind at the points of separation, in masses, according to the richness of the ground and the amount of alkali taken up by the trunk. In the same manner the ferruginous rocks forming red caps on hills by the decomposition of the iron, are favorable for the liberation and development of the gold contained in auriferous slates. Hence the red hills are favorable localities to the gold digger. It is scarcely necessary to state that all the sands and clays, pure or mixed with minerals and metals, are the result of decomposition, and are subject to constant changes, and these changes not only perpetually liberate and develop the metals, but render the alkaline bases and silicates soluble, to provide food for the vegetable kingdom.

If we bruise, pulverize, and wash the most compact quartz in the auriferous slates, we may detect gold in an impalpable state; in fact, it is frequently found as a component part of this rock, imperceptibly disseminated therein. However, it is in the small fissures and vacuities of the oxidated portions that we find the grain and massive gold. The superficial parts, commonly called "burnt and rotten quartz," are the productive portions of quartz veins. Some quartz veins, impregnated with iron pyrites—the latter decomposed into the peroxide, and forming patches and cavities below the surface—do produce rich pockets of gold occasionally, but they are very rare, and never productive in quantity. The only gold veins worthy of notice, and capable of affording an average remunerative product, are the ferruginous or the auriferous pyrites, which are being worked with great profit in the Brazils and New Granada. The gold quartz veins seen in these colonies are similar in character to those examined in other countries; the product of gold depending entirely on the amount of the oxidating surfaces, including the cavities and joints. Some of them have been more or less wrought near Mount Alexander, and have produced, as usual, mere specimens; but their exploration in depth has been for very good reasons relinquished. The gold seeker finds it much more profitable to work in the superficial debris, and seek the superior productive masses found on the quartz under the debris, like those extraordinary metallic masses found at Balaarat.

A very interesting natural process of the development of gold from the granite may be observed in various portions of granitic ranges in auriferous districts. I have frequently examined, and watched this phenomenon in several parts of the Andes—particularly on the banks of the Rio Negro, and on the Isthmus of Panama. All the granites subject to decompose on the surface in spherical exfoliation show this effect in a remarkable manner. In examining a deep section of this kind of granite, we find the crystalline aggregation passing by an imperceptible gradation into a concretionary globular structure, and changing into the character of a coarse conglomerate on approaching the surface; the respective nucleus of each crystalline ball, or centre of attraction, becoming denser and harder than the parent rock by the gradual concentration of surrounding silica, like the formation of flints in chalk, or silicate of lime. During this process of transformation of the crystalline base we find the spherical nodules towards the surface getting gradually enveloped by a series of concentric exfoliations. In the divisions of these spheres an efflorescence of ferruginous mineral is formed, in which the gold becomes aggregated into grains. The above compact round crystalline balls are called by the natives of South America "madres," or the mothers of the gold, because they have found from experience that the debris of granite are not productive of gold without them. The stony nuclei, as well as the concentric exfolia, are completely deprived of their original auriferous contents by this process of internal aggregation. After these oxidated surfaces of the granites are brought down by the torrents, and washed away from the foot, or the ravines of the mountains, the gold washers must remove to other localities, or wait a few years until the slow process of nature supplies them with a fresh crop and accumulation, as they know that it would be in vain to penetrate into the hard rock to extract its metallic contents.

The granite rocks do not produce large masses of gold like the quartz and slate; the precious metal resulting from the decomposition of granites and porphyries is generally in small flakes and minute grains, and principally found in remunerative quantities in alluvial deposits, and seldom found *in situ* like the slaty rocks. We may have a familiar illustration of the above *modus operandi* going on in the mineral kingdom, by referring to the action of a plant, or the conducting power of the root in the soil. The seed, with its active principle, being the fixed point, causes activity in the surrounding moist elements: the plant increases in bulk, and becomes more powerful in proportion to its development, until the required elements are abstracted from the soil and demand replenishing for the growth. So it is with crystals—they cause local attraction of similar elements, and however slow and feeble this process may appear, yet it becomes by degrees very powerful from the combination of their respective cohesive forces, and especially if a solution of carbonic acid and iron be present. The different elements, after separation, will cause new combinations and arrangements till they arrive at a comparatively quiescent state; the whole of the metallic contents of the rocks in proximity being abstracted, stop further accumulations. This is the case in many metalliferous portions of the primary series; they become inert like exhausted soils, having all their nutritious elements drawn out. I have found granites, porphyries, and clay-slates, containing from 1 dwt. to 4 dwts. of gold per ton, without the least apparent trace of the metal to be seen by mere inspection. When these rocks decompose they necessarily liberate the metal, and this becomes aggregated at various points, or precipitated according to local conditions, as observed in all the gold deposits *in situ*. It may be well to remind the reader that gold is never mineralized, it is always found in its metallic state; therefore, gold *ores* or *minerals* are improper terms. However, it is frequently found mechanically combined with iron pyrites, and also alloyed with other metals.

I have already referred to the great purity of the gold found in superficial deposits, more especially in rocks like those of Victoria, which are comparatively barren of minerals; while the gold obtained from veins and in association with minerals is always considerably alloyed with silver and copper. It has been stated that this arises from the effects of superficial oxidation carrying away the baser metals during the process of aggregation. I shall now notice a very interesting fact respecting this action, observed by me for several years in some of the gold mines on the Andes. The auriferous pyrites in that region contains from 3 ozs. to 5 dwts. per ton, according to depth, the surface being always the richest. This pyrites is stamped into fine powder, and the gold extracted therefrom by washing and various mechanical means; the resulting product is a compound of gold and silver, two of the former and one of the latter, called electrum. This is the state in which all the gold is obtained from the mine direct. The residue of the washing is a fine pulverized pyrites, with all the *free* gold washed out; but by assay still indicating the same contents of gold, bulk for bulk, as the original mineral in its rough state. This product from the washing is laid aside in great heaps, which in a few months are decomposed, and *free gold becomes not only visible, but also in grains*, rendering it profitable for re-stamping and re-washing, until the entire heaps of pyrites are decomposed. Again, not alone is the gold thus gradually developed, but its quality is much purer than the first product, a large proportion of the silver having disappeared. This is easily explained. The pyrites (sulphuret of iron) soon decomposes when exposed to moisture and the heat of the sun, the sulphuret is converted into a sulphate which is soluble, and this solution dissolves the silver during the gradual aggregation of the golden particles. It is this action that has led the native gold-washers of South America to believe that the metal grew in the residue, as they always found that by preserving such refuse for a long time fresh crops of gold could be obtained, until the whole mass be consumed.

Such are a few of the instances brought forward to show that the products of the mineral kingdom are governed by laws as beautiful and as constant as those controlling the vegetable world; and we have only to study them, and imitate their operations, to improve and advance in an industrial progress, and objects of *bona fide* public utility. The products of the rocks depend on their quality and the intensity of the local chemical and mechanical actions, or the amount of disintegration on the surface. This subject is fully explained and illustrated in my work *On Geology and Magnetism*, and is much too comprehensive to enter into this brief outline.

Art. IV. DESCRIPTION OF THE GEOLOGY OF SCHUYLKILL CO., PENNSYLVANIA.—By P. W. Sheafer, late of the State Geological Survey of Pennsylvania.

The following pages lay no claim to originality. I have sought to present a few facts which, whilst they may interest a general reader, may not be unworthy of the attention of geologists who have not made a study of the coal formations. I hope that if any such honor this with a perusal, that, in view of the objects for which it is written and the want of time to devote to the subject, they may excuse the popular style of the composition and whatever else may appear as a defect.

The general course of the mountains and contained strata of Schuylkill county is from N. 70° E. to N. 80° E. The order of stratification is concisely exhibited upon the map: a few remarks may be added in further explanation. The numbers designating the several strata, are according to the classification of Professor Henry D. Rogers, adopted during his official explorations as State Geologist of Pennsylvania.

Formation No. IV., which constitutes the Kittatinny or Blue Mountain, and forms the southern boundary of the county, corresponds with the Oneida conglomerate of the New York geologists; it is the lowest stratum of the upper Silurian system; it reposes upon a massive slate formation about 6,000 feet in thickness, with which it dips conformably towards the north. This formation consists of heavy beds of a very hard quartzose conglomerate rock, overlaid by massive strata of sandstones differing

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in degree of coarseness: the finer-grained sandstones occupy the higher parts. The pebbles of the conglomerate are frequently large; the sandstones are silicious, of a hard, firm grain, and in color white or gray. As a general feature, this formation becomes heavier, coarser, and more various in its components as it stretches eastwardly. Its average thickness within the county is about 1,500 feet. The organic remains are not numerous; a species of the extinct marine plant *fucoides* occurs in this and the lower strata of the next succeeding beds. Another fossil, more rare, but more distinctive of this formation, is a species of *terebratula*, a small and very globose bivalve marine shell. The *fucoides* are found more abundant by pursuing the same range into the counties lying to the westward.

No. V., the next superior formation, consists of red and variegated sandstones and shales. The colors of the materials of this range become more striking and diverse in the counties lying to the westward: in that portion the stratum contains a valuable variety of calcareous iron ore, and the occurrence of calcareous shales is also much more frequent. The lower strata alternate with the upper layers of the subjacent white sandstones. They are of a dark, red color, and contain impressions of *fucoides*. The thickness of this stratum somewhat exceeds that of the previous one: it corresponds with the range known in New York as the Medina sandstone.

Formation No. VI. is a rather slaty, argillaceous blue limestone, traceable, probably, through the whole extent of the county: the stratum is somewhat mingled with the rock of the underlying sandstone. That portion of this seam which lies within the county is very light: on the western border it is not more than 20 or 30 feet thick, but grows heavier towards the east; it is much mixed with argillaceous matter, yet will yield a lime available for agricultural purposes. This bed corresponds with some of the layers of the Clinton group of the New York geologists, probably some of the upper beds of the Lower Helderberg limestones. In some of the counties to the eastward, a limestone occurs occupying a higher position, and much more massive; it is, however, analogous to that just described. The foregoing include all the rocks of the upper Silurian system observable in this county.

Formation No. VII. corresponds to the Oriskany sandstone of New York, the lowest of the Devonian system; it consists of a whitish or yellowish-white, highly silicious, coarse sandstone, sometimes slightly calcareous in its lower seams. In the southwestern part of the county, near Pine Grove, the rock is characterized by numerous pits, the casts of various species of marine shells, and other remains; these are sometimes marked with considerable distinctness. It is worthy of remark that this stratum, unlike the others in this respect, grows thicker as it stretches towards the south-west: its general course is along a steep ridge running parallel to the Blue Mountain, at a distance of two miles or less, but when near Port Clinton, on the Schuylkill, the ridge turns suddenly to the north-west, extending to within a short distance of Orwigsburg, where it turns sharply eastward and resumes its usual course in the south-eastern part of the county. The map shows how the previous formations accompany the one described. Some of the bands furnish good building stone, and the more silicious portions would doubtless supply a suitable material for the hearths and in-walls of furnaces. The thickness of this stratum within the county may be taken at about 500 feet.

Formation No. VIII. consists of various colored slates and sandstones: the lower strata are black slates, easily divisible and somewhat calcareous; the higher strata are composed of olive-colored, gray, and greenish slates, alternating with soft, gray argillaceous sandstones. In the lower beds, thin layers of limestone are also found. Fossils are abundant, trilobites and others, especially in the more calcareous lower portions. This formation is spread irregularly over a belt of territory from two to four miles in width; the middle of the southern border of this belt is sharply indented by the underlying strata, whilst on both the eastern and western extremities the next superior red shale formation appears in a long narrow strip. The northern border of this belt is extremely regular, being only indented on the bank of the Little Schuylkill river by the red shale. This stratum is probably destitute of iron ore in this county, but towards the south-west, beyond the Susquehanna, an excellent variety of iron ore is found in this range of strata. Some of the layers much resemble some of the slates of the coal formation, and as they contain sufficient carboniferous matter to make them capable of ignition at a high heat, they have sometimes been mistaken for indications of the coal-bearing rocks; nevertheless, they must lie at a depth of not less than 8000 feet below the lowest coal seams. Some very thin layers of impure limestone occur: one of these may be traced at intervals from the vicinity of Pine Grove, in the western part of the county, to the neighborhood of Orwigsburg, and so on to the Lehigh River, in Carbon county. These calcareous bands probably thicken out in the State of New York into the higher layers of the upper Heidelberg limestones. The water of this formation often contains saline matters, mostly sulphate of iron and alumina, or the carbonate of lime. The formation, like most of the rest, becomes heavier towards the east; the average thickness in the county may be about 1,500 feet.

Formation No. IX. answers to the Caatskill mountain group of New York, or old red sandstone. In Schuylkill county, the lower beds consist of red shales and argillaceous sandstones; the upper portions contain much silicious sandstone, varying in color from a reddish brown to a buff or gray. In consequence of the presence of mica, this rock has a tendency to split into strata of one or two inches in thickness. Some very good flags for paving have thus been supplied to Pottsville from the south side of Second Mountain. The thickness of the stratum is about 5,500 feet. We have now reached the highest layers of the Devonian system. Overlying the red sandstones, we find some red shales and argillaceous sandstones alternating with the former and analogous to them; we may estimate the thickness of these bands at 300 feet.

Formation No. X. is a massive series of coarse, hard, gray sandstones, containing some pebbles with interstratification of bluish or greenish slates; it is possible sometimes to ignite these slates; but the search for coal among these strata in Pennsylvania would be vain. The Second Mountain is composed of this formation. The numerous gaps of the water-courses afford good opportunities for observing the stratum at short intervals. The thickness of this formation at the gap of the Schuylkill River, below Pottsville, is 2,400 feet.

Formation No. XI. corresponds with the red shales and shaly sandstones of the carboniferous group of the New York geologists. The predominant character of this stratum is here an argillaceous red shale, alternating with red sandstone. In the lower beds are found some layers of compact red sandstone, or occasionally gray. In the middle portions of the formation the sandstones become softer and more argillaceous, without, however, entirely excluding the gray variety; at the same time, the red shale diminishes. Towards the top of the stratum we observe these rocks alternating with the coarse sandstones, and still coarser conglomerates of the superincumbent strata. This formation measures 2,950 feet in thickness at the gap of the Schuylkill River, near Pottsville. Some of the bands of this bed are quite calcareous, but can scarce be termed limestone; when most resembling limestone, they consist of small pebbles of that rock bedded in a highly calcareous cement; when calcined, this composition affords a lime passably adapted to purposes of agriculture. The calcareous pebbles, from their greater solubility, are apt to be removed by the action of the weather; thus, in exposed situations, the rocks are frequently covered with small indentations due to this cause. Calcareous bands occur in several parts of the county; they may be noticed north of Second Mountain, in the valley of Tumbling Run, near Mount Carbon; also upon Locust Creek, near the town of Tamaqua, in the eastern part of the county. This formation extends in an irregular band upon the north side of Broad Mountain, from the north-western part of the county, and occupies the whole of the extreme north-eastern extremity.

Within this band, between the Broad and Mahanoy mountains, the calcareous rock above described may be found still more nearly resembling limestone, and a little further west, beyond the limits of the county, it may almost claim to be designated as true limestone. These calcareous seams are often very thin: the heaviest of them does not exceed six feet in thickness.

Formation No. XII. consists of the rock known as the carboniferous conglomerate or millstone grit. This formation constitutes the true floor of the anthracite coal measures as well as of the bituminous. It is composed of a ponderous stratum of coarse silicious conglomerates, with alternating bands of white or light-colored sandstones, and occasionally thin beds of dark carbonaceous shale; it forms the Sharp Mountain to a considerable extent. This mountain is so termed from the extreme sharpness of its ridge, which often consists of only a few feet of conglomerate rock; the southern side of the mountain is composed of the red shale of No. XI. The conglomerates of Sharp Mountain, and consequently the overlying coal measures, have been so violently upheaved, that they exhibit a vertical, and often a south dip. In consequence of this, the coal strata are here much disturbed, and mining operations often precarious. The thickness of this stratum varies considerably: in the western part of the county it is about 800 feet, at Pottsville 1,031 feet, and at the eastern extremity of the county 1,400 feet; average thickness about 1,100 feet. The prevailing characteristic of this rock is a conglomerate consisting of white quartz pebbles, with a few interspersed ones from the sandstones, limestones, and slates of the Kittatinny Valley. In some places the lowest coal seams are in contact with the coarsest conglomerate beds of this formation. This rock is suitable for furnaces, for building bridge piers and heavy masonry, and other architectural purposes.

Formation No. XIII. consists of the anthracite coal measures, with their alternating beds of sandstones, conglomerates and shales; they compose the uppermost strata of that series of formations which, with a trifling exception, embraces the whole surface of Pennsylvania, and a large portion of all the territory of the United States, east of the Mississippi River. The total thickness of the ten strata we have described is upwards of 27,000 feet, or a little over five miles. This stupendous group, including the three formations not here described, is probably composed of the depositions of one vast ocean, extending through a period of unknown duration, commencing with the earliest marine animal and vegetable existence, and terminating with the productions of the latest coal beds.* Our limits will not permit even a superficial discussion of the probable order and nature of the phenomena of the formations, nor even a cursory glance at the present indications of the most obvious conclusions.

(To be continued.)

* Professor Rogers.

ART. V.—THE HAZELGREEN MINE, WISCONSIN. ITS GEOLOGICAL ASPECT.—BY DR. J. G. PERCIVAL.

SIR:—I have examined particularly the diggings included in the property of the Hazelgreen Mine, and now communicate to you the general result of my examination.

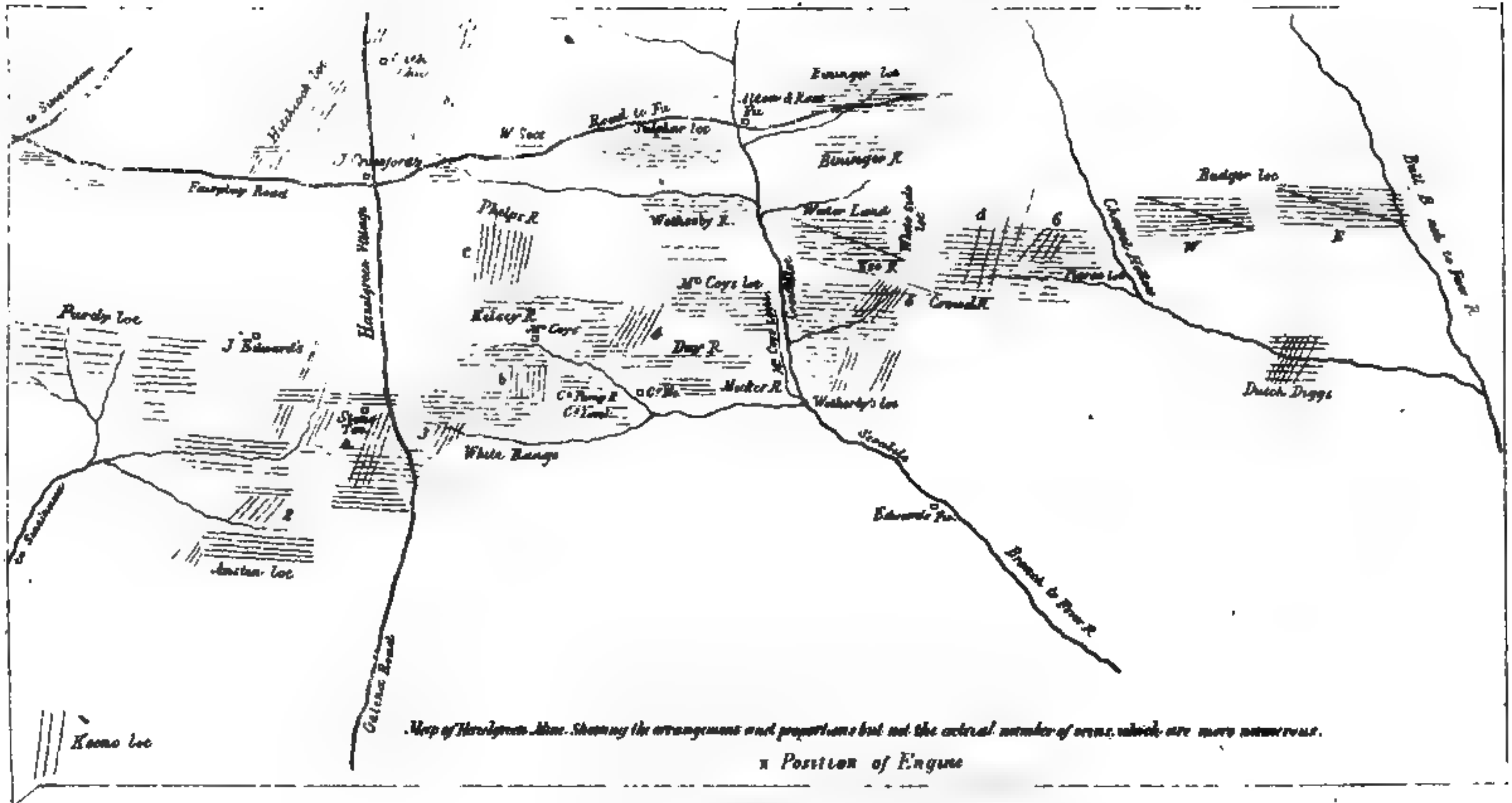
This mine is situated in the State of Wisconsin, on sections 24 and 25 in the town of Hazelgreen, Grant county, and section 30 in the town of Benton, Lafayette county. It embraces upwards of six hundred acres of land secured to the Company by perpetual leases.

It lies near the middle point of a series of ranges or veins, forming a mineral district, which extends, in its greatest length, in a general north-south direction, and in the widest and most productive part of that district. A number of similar parallel districts traverse the country from north to south, both east and west of it, and the most extensive and important diggings in each of those districts lie on an east-west line crossing the respective districts from west to east, at Dubuque, Fairplay (Jamestown Mine), Hazelgreen, Benton, New Diggings and Shullsburg; those of Hazelgreen being situated about at the middle point of this east-west series. They may thus be considered as occupying the centre of the southern part of the lead region, in which part only all the known mineral strata, from the upper arenaceous stratum of the upper magnesian to the lower magnesian inclusive, are present, and where of course the greatest downward extent of mineral may be expected. The superficial extent of the location, as occupied by veins, is unusually large, and the number of veins in the same extent, greater than in any other district I have examined. Indeed the surface of a large part of the property leased is quite covered with diggings, generally carried down to the water level; the number of shafts amounting to several hundred, and the veins being in many instances so near that the dirt from one is mixed with that from those adjoining. The statistics show an unusual productiveness, as ascertained by the accounts kept for a number of years. It will be thus seen that the supply of ore is no longer problematical, but a well ascertained fact. The veins are arranged with great regularity, and present a system of arrangement, the details of which are given on the accompanying map, and in a more particular descriptive report herewith communicated. The most important portion of the veins consists of a connected series of east-west ranges, extending in an E. N. E. direction across the district, by a series of shifts to the north as they proceed eastward, to the distance of about two miles, with a width of ½ to ¼ mile. These shifts mark so many groups of east-west ranges, connected by

N. E. quartering ranges, and crossed more or less by north-south sheets. The groups of east west ranges are composed of a smaller number of larger ranges, with wide openings, carrying large and massive mineral, and of a greater number of smaller sheet veins, and are crossed obliquely, particularly towards the east part, by a few large E. S. E. quartering ranges. The engine is proposed to be located at about the middle point of this series, in the valley of Scrabble branch, on the line of one of the largest east-west ranges, traversing the group next east of the branch (the Crowel range). Besides this connected series, there are a number of lateral groups of both east-west and north-south ranges, particularly on the north, which have proved equally productive with those in the line of the series. The most remarkable of these are two large groups of north-south sheets, west of the Scrabble branch, on nearly the same north-south line, and three groups of east-west ranges, one on the west side of the branch (the Sulphur lot), and two on the east side (the Whiteside and Bininger lots). All the above groups and ranges are considered as within the probable limits of drainage by the engine. From the extent of the ranges embraced in the mine, the great distance to which drainage is known to extend in that vicinity, and the consequent amount of water to be raised, although it is not apprehended that the water will be very strong, it is necessary that a large engine should be employed (say two hundred horse-power), and it is important in undertaking to work a mine so extensive, and which has been so largely productive, and where the prospects of deep mining are so encouraging, that means should be at once adopted of performing it in the most effectual manner.

This mine, as I have already observed, is situated in a district where all the mineral strata are present, presenting in the whole a depth of nearly seven hundred feet, through which the mineral may be expected to descend, and through about five hundred feet of which I have myself traced it downward. In all the strata within this extent, except the bed of sandstone, I have ascertained the existence of mineral openings, and in the whole series downward, of at least eleven distinct openings, connected more or less by continued vertical mineral-bearing fissures. For the details respecting the stratification, and general arrangement of the lead region, which I have examined extensively, I refer to my summary report already presented, and for those of the particular arrangement and description of the Hazelgreen Mine, to the accompanying map, as well as to my detailed descriptive report herewith communicated.

From reliable data it appears that the lands embraced in the Hazelgreen Mine and those contiguous have produced, from 1845 to 1851, upwards of 35,000,000 lbs. of lead ore above water, amounting at present prices to $1,400,000; much the greater proportion of which has been taken from that mine.



HAZEL-GREEN MINE.

Art. VI.—SLATE QUARRIES IN NEW YORK.—IMPORTANT DISCOVERY.

For some time past there has been a rumor that slate veins of workable qualities existed much nearer to New York than those in Vermont, or at Peach Bottom, in Pennsylvania. Since slate quarrying has been proved to be profitable, much attention has been drawn to the subject. Those who have been engaged in working the quarries in Vermont have also felt great inconvenience arising from the cost of transportation of their article to market. This was particularly the case with a gentleman of New York, Mr. Reed, who has been associated with others in the Vermont quarries. From a statement in the "Geology of the State of New York," in which Prof. Emmons speaks of slate veins traversing the country for many miles, Mr. Reed's attention was drawn to the subject, and last summer he commenced a tour of exploration, which resulted in his finding at Peekskill, forty miles up the Hudson river, a vein of slate of great extent. Knowing Mr. C. S. Richardson, the author of the paper on "The Slate Quarries of Vermont," published in this Magazine, Vol. II., page 271, they together made a visit of inspection to the property. Judging from the short note of Mr. R., which has come to hand just as this number of the Magazine goes to press, their visit to the quarries must have been highly satisfactory to all concerned.

At this late moment of publication, we are unable to state, in this number, more particulars respecting these quarries in our immediate neighborhood; but for the satisfaction of our readers, we append Mr. Richardson's brief note, hoping at the earliest moment to present all the facts on the subject:—

"*To the Editor of the Mining Magazine.*

"Sir:—In company yesterday with a Mr. Reed, I went up to Peekskill, to examine some slate quarries in that neighborhood. I was exceedingly pleased at what I saw. There is a vein of beautiful blue slate, more than 300 feet thick, on the property. It is evidently a true vein. Its bearing is 30° north-east, nearly vertical in its position, and finely laminated. Judging from its surface appearance, I am inclined to think it will prove a valuable property. It is most admirably situated for working, being by the side of the river, where vessels may come alongside the jetty and load the slate. It is an outcropping vein, consequently there are no deads to remove. I should think good roofing slate may be made before they are 20 feet deep in the vein below the road. On the top, there is evidence of a regular foot joint; and should the next foot joint be within 10 or 15 feet, and the heading joints regular, it will turn out a profitable investment to the owners. I will give you some further particulars on my next visit to New York. Time will not admit of my going into detail just at this time.

"Yours truly,

"C. S. RICHARDSON."

ART. VII.—NORTHAMPTON MINING DISTRICT, MASSACHUSETTS. —THE NORTHAMPTON MINE.—BY CHARLES SAMUEL RICHARDSON, CIVIL AND MINING ENGINEER, NEW YORK.—(CONCLUDED.)

THIS valuable property is situated north of the great cross course that intervenes between it and the Loudville Mines. The sett has an extent of more than three miles on the course of the main lode. Like many other mining properties in this State, very little has been effectively done to develop its mineral worth. The superficial observer, on visiting the mine, is greatly astonished at seeing such a large pile of splendid lead and copper ore on the surface, and is inclined to imagine that this certainly must be a rich mine. Well, perhaps he may be right; but if he grounds his opinion on specimens only, the chances are that he may be wrong. If he happens to be a person acquainted with mines, he will there observe, and particularly notice, the following mineral indications, which I give in the language of the miner, or otherwise—plain Cornish:

That there is one main champion lode running through the entire sett, imbedded in a stratum of coarse granite; it is from 6 to 12 feet thick, with an underlay of about one foot 3 inches per fathom. The lode contains a vein of silver lead, a vein of barytes and banded quartz. The matrix of the lode is of sedimentary rock, and is interspersed throughout with stones of yellow copper ore, mundic and blende. There is a surface gozzan, but not worthy of notice; it is full of vugs, and freely lets down the water. The spar is of the most congenial kind; its bearing is about 30° N. E., and dip south-easterly; friable spar is met with, and here, as usual, the lead carries a good per centage of silver. A shaft has been sunk about 12 fathoms on the course of the lode; at this depth the minerals are becoming more concentrated; there is, at least, 4 feet of good stamp work in the lump, with a fine shoot of ore holding down. An adit level is now being driven up from the valley to intersect the lode 15 fathoms from grass. It was commenced in the sandstone, which covers all the valley of the Connecticut, and is now getting into the granite; it has hitherto been very favorable for driving. Some droppers have been cut which contain mundic, and the country approaching the lode is strongly mineralized. Such is a condensed description of the lode. Opinions may vary: I say it is a copper lode, carrying lead on the back—that it is one of great promise, and at 50 fathoms deep will become very productive. The country is hard for sinking: but as the lode is large and productive, the expense of the engine shaft will not be much felt in the general expenditure. That it will take time to get down under the mineral every mining man is fully aware of; but when once the ground is opened, at every 10 fathom level at and above the 50, it will work at a fair profit for ages to come. The sett itself is large enough for six mines. I think it probable that a side lode will be discovered when the 50 fathom cross-cut is driven east. Should this prove to be the case, it will greatly add to the value of the mine. An attempt has been made to work the mine by horse-power, which is much to be regretted, as it must result in a total failure. The lode was sufficiently proved a long time since to warrant the erection of a first-class pumping engine, and this must be done if the mine is to be prosecuted for its minerals. It is now being worked by a very highly respectable New York Company, T. Andrews, Esq., President, with a paid-up capital said to be amply sufficient for the full requirements of the mine.

KINGSLEY BRIDGE MINE.

This sett is the intervening ground between the Northampton Mines on the north, and the Loudville Mines on the south. It has an extent of half a mile on the course of the great champion lode, and is in every respect identical with the Northampton Mine, excepting that there appears a greater proportion of copper in the lode. About two years since, a shaft was sunk five fathoms deep, and the lode opened, from whence was taken some tons of copper and lead ore, nearly up to the very surface; and although it must have been very gratifying to the owners to witness such splendid stones of copper ore at such an early working, it does not augur any advantage to the property in a mineral point of view. Rich surface lodes I always consider as a negative feature to the success of a mine; but here the outcrop of the ore can be accounted for very easily: it is in the immediate vicinity of the great cross-course, which runs through the sett. Mining operations must be commenced more to the south to work the sett to advantage; the engine shaft should be sunk at the most convenient point, to command an equal run of levels on the course of the lode. There are two other lodes known to exist in this property, but nothing as yet has been done upon them. I consider this a valuable property, and am inclined to think it will make a large quantity of ore above the 30 fathom level, and particularly near the junction of the two other lodes, and at the cross-course. The mine is the property of private parties in New York, who, I am informed, are desirous of having it worked. Like the other mines, it will require about $75,000 to efficiently open it and erect the necessary machinery. This now concludes my present notice of the mines in this district. If the information conveyed through the medium of the Magazine should result in either individual or general benefit to the mining community, I shall feel very happy in the knowledge thereof. In each article I have endeavored to be as concise as the nature of the case would admit of. A great deal could be written in extension; and some day abler pens may dilate on the same subject, for I am positively assured in my own mind the Northampton district is destined in time to become one of very great importance.

Art. VIII.—MINING: ITS EMBARRASSMENTS AND ITS RESULTS.

Mining in its nature is entitled to rank in the pursuits of society with agriculture and manufactures. It is one of those branches of industry whose products form the basis of the well-being and prosperity of mankind. Unlike either agriculture or commerce, it requires of those who pursue it a special education and experience, or the labor devoted to it may be fruitless. Except in its rude state, it is the offspring of intelligence and capital. Its progress beyond the mere gathering of the treasures which lay exposed at the surface has hitherto been slow and hazardous. Confined to certain districts, devoted to the extraction and manufacture of the more indispensable metals, it advanced as much from the necessities of society as the hopes of gain.

The embarrassments likely to befall such a pursuit, when taken up with a national spirit through such an extended country as the United States, can be neither few nor insignificant. Here little is known and little is developed of the mineral wealth which exists. Here agriculture and manufactures have yielded speedy returns, and the hope is that mining will be as speedily lucrative. From the nature of the case this should not be so. The time, labor, capital and perseverance, required to bring a mining enterprise into a profitable state, as a safe and general rule, is immensely greater than in any other pursuit. Indeed entire fortunes should be expended, as experience teaches, before the hope of remuneration is entertained. The great fact learned by England, France and Germany, especially, is, that mines, as a general rule do not become profitable until they are properly constructed and equipped. This, in the case of all legitimate enterprises, calls for no inconsiderable outlay of capital and patient persevering labor. In the language of one of our geologists upon this subject, "When you are certain of the character and extent of your lode, by the examination and report of competent scientific men, you had better put boldly into the ground fifty or a hundred thousand dollars in the construction of shafts and levels, than to waste a smaller amount in mere surface operations; and it will be better to throw away the product of these shafts and levels, than to undertake to pay dividends upon them." Such a course requires a degree of confidence and patience, which can scarcely be expected to exist except among a few individuals, in a country where mining is beginning to be extensively entered upon. Yet it prevails in the older countries of Europe, where mining is regarded as a legitimate pursuit, like agriculture and manufactures. There, more attention has been devoted to this pursuit, more generally diffused knowledge exists, and a larger experience has been obtained. Capital is invested with as much certainty of return as in any of the enterprises of the day. Even in Mexico, that proverbially unsettled and distracted country, which has had the wisdom to preserve her mining regulations unchanged and unquestioned, the right or share in a mine is a permanent and principal source of wealth to many of the richest families of the country. This feature is well understood by many mining companies in our midst. In such instances, the first object has been properly to construct the mine and equip it for future operations. In those instances where operations have been carried sufficiently far a handsome remuneration is already obtained; in others, the most flattering prospects are presented.

Another embarrassment heretofore to mining pursuits has arisen from a practice, by far too common both on the part of individuals and the public press, to speak of all mining stocks as among the "fancies," or, in other phrase, as a species of "kite-flying stock," when in fact some most substantial and valuable enterprises are thus subjected to suspicion or opprobrium. As an instance, coal mining thus far has been the most rapidly developed and quickly remunerative; yet who can call in question the substantial character of the large mass of these enterprises. But there is no reason why a colliery should be any more substantial than a properly constructed copper or lead or gold mine. No one will deny that speculative enterprises do exist, and have existed, in mining as in other pursuits, which have given occasion to unfavorable opinions with the public upon a pursuit in which so few were initiated. But it is doubtful if such has been the case to a greater degree than has occurred in any great branch of industry in its infancy. At all events, it is time these views should entirely cease, or the expression be regarded, as in truth it is, a sign of ignorance. If fancy enterprises exist, there are unequivocal marks by which they can be known and avoided.

Another embarrassment to legitimate mining has arisen from a defect in the legislation of the States, or from a neglect to enforce the provisions of the laws enacted. The general law of incorporation has been so based in many details, that a board of directors of a company, created under it, could represent their affairs to the public in a different aspect from that which in truth existed, or even withhold information respecting them from stockholders. Amendments to the general law, calculated to increase the confidence of capitalists, have recently been adopted in New York.* These laws, as they now stand, should be carried out, especially the publication of the capital, the amount paid in, and the debts of a company, as provided for.

The disposition to create a fictitious capital, far beyond the requisites of the enterprise, has seriously embarrassed many honest attempts at legitimate mining. This has been strikingly exposed during the past year, and the evil is already working out a remedy. In connection with this, may be classed the expenditure of too much money in the purchase of mines, which has served as a great drawback to the success of many recent enterprises, as well as some older ones. It discourages hope, and extinguishes expectation of gain, which is the great inducement with the public to invest money in mining pursuits. The commercial reputation of a mine may thus suffer, when the fault is entirely in the contracts made in relation to it. Mining may be said to be a pursuit which naturally tempts investment. It is the interest of every one, therefore, that it be so conducted both practically and commercially as to secure a well-placed confidence on the part of the public, and thus draw out investments from all classes and conditions of people.

The exorbitant prices which have been, and still are, demanded for mining property by the original proprietors, have been caused by a false idea that a mine was an illimitable treasure; whereas a mine might strictly be said to be valuable only so far as it was opened and equipped; and the amount of this value should be estimated with a due regard to the sum of money which had been judiciously expended upon it, due consideration being given to the natural conditions of each. Let this truth be fully appreciated, as it will yet come to be, and the person who has a mine upon his estate, and the capitalist who invests in it with the hope of good returns, will each be profited. The first amendment to the act of incorporation in New York, above noticed, was designed to apply to cases of this kind.

There is another view of this subject which should not be overlooked. What has mining already produced in this country to test its importance as a branch of social industry? It might be an indirect, but sufficient answer to this question to describe the rich and inexhaustible mineral treasures of almost every variety, which exist in various parts under circumstances perhaps more favorable than they were ever before seen. The results, however.

* See Vol. I., page 268, September, and Vol. II., page 642, June.

of mining operations here, although never carried on with a systematic and national spirit, are of the most promising character.

The mining of anthracite coal commenced about 1820. In that year the amount taken to market was 365 tons. In 1830 it had increased in Schuylkill county, Pennsylvania, to 89,984 tons; in Lehigh county, to 41,750 tons; and in Luzerne county, to 43,000 tons. In 1840, it reached in Schuylkill county, 452,291 tons; in Lehigh county, 225,318 tons; in Luzerne county, 148,470. In 1853, Schuylkill county sent to market 2,551,603; Lehigh county, 1,050,544; Luzerne county, 1,006,986. Other regions in the Pennsylvania coal district had also begun to send forward coal; so that the yield of the anthracite mines in 1853 amounted to 5 097,144 tons. To this should be added the semi-bituminous from the western end of the region, which swells the amount to 5,195,151 tons. The number of collieries in the Schuylkill last year was 113, at which the number of miners and laborers was 9,792, and the steam-power employed was equal to that of 42,426 men. The capital invested exceeds $6,000,000. At Pittsburg, in the western part of the State, the coal trade for 1853 is estimated as follows:—*Amount consumed in and about the city, 22,305,000 bushels; amount exported to other places, 14,403,921 bushels: total, 36,708,921 bushels. We have not at hand such statistics of the coal trade of the Western States as will enable us to make any precise statement.

The next important branch of coal mining in the Atlantic States is carried on at Cumberland, in Maryland. This has grown up from 1708 tons in 1842, to 533,980 tons in 1853. This is an increase of nearly 500 per cent. in twelve years. See the thousands of families dependent upon this kind of fuel for warmth in winter, and for culinary purposes, and the steam engines set in motion by it, and what imagination is sufficiently vivid to conceive the desolation which would ensue if we were forced back in an instant to the use of wood only for fuel.

Lead mining at the north-west has been conducted with little system or science from the earliest period. No precise data exist prior to 1823, in which year the produce was 335,130 pounds. It rose rapidly to 13,343,150 pounds in 1829, after which, for a period of eleven years, no statistics exist. In 1842 it had reached 31,353,630 pounds, selling at $2.24 per hundred pounds. From this point the yield has fluctuated, in some years exceeding 54,000,000, and in others, as 1853, declining as low as 29,806,980; but the price has, during this time, steadily advanced to $5.50 per hundred pounds. The actual value of the product at the place of shipment from 1842 to 1853, inclusive, was $16,657,988. There are, in addition, single mines of lead worked in different localities, the product of which for any period has not been made public.

* See page 213 of this Volume (February number).

All the silver produced in the United States thus far has been obtained from the sulphuret of lead. The means for its extraction are very limited, not more than two establishments at the utmost being in operation.

Within the last three years the working of copper mines has been commenced in some half dozen States, not including the Lake Superior region. Highly valuable products will soon come forward from some of these mines as a sort of first-fruits of scientific, systematic copper mining, in parts of the country where it had not before been attempted. The Lake Superior region can hardly be said to have been systematically entered upon for a much longer period, yet the shipments for the year 1853 exceeded 2,700 tons of copper ore, valued at more than a million dollars. There can be no question that this wonderfully rich region, if it had been located nearer the Atlantic coast, or with some greater advantages of climate, could undersell the whole world in the article of copper.

Iron mining and manufactures have probably advanced with more rapid strides since the census of 1850 than during any equal period previously. There are, however, no full statistics in relation to it in existence more recent than that census. It was upon this that the English Commissioners were obliged to rely in their Report on the New York Crystal Palace made to Parliament. The value of pig-iron made in the year 1850 was $12,748,777. The details on this subject are to be found in the pages of this Magazine.*

Gold mines are now extensively worked in Virginia, North Carolina, and somewhat in South Carolina and Georgia, as well as in California. In those of the Atlantic States, although very rudely worked upon the surface, some millions of dollars have been obtained. This product must be largely increased under the influence of the present scientific management. Of California it is not necessary to speak in this connection.

Mention might be made of the zinc ores, which are becoming quite profitable; the extensive quarries of every variety of stone, useful for ornament or for architectural purposes; the various rare and valuable minerals, the products of which are always costly and their manufacture more slowly undertaken; all of which are now engrossing a large share of the capital and the industry of the public. But sufficient has been said to show that the richest field for national enterprise, that which promises a steady yield of the most valuable and substantial returns, lies before us almost unoccupied and undeveloped.

* See page 88, etc., Vol. I.

JOURNAL OF MINING LAWS AND ORGANIZATIONS.

DANA MINING COMPANY.

At the annual meeting of the stockholders in this Company, held at the Treasurer's office, Boston, May 15, the old Board of Directors was unanimously elected for the ensuing year, viz:—

E. F. Brigham, J. A. B. Cutter, Stephen Ball, E. D. Brigham, H. Bigelow, of Boston; Samuel W. Hill, of Lake Superior.

At a subsequent meeting of the Directors, E. F. Brigham was elected President, and H. Bigelow Secretary and Treasurer.

FULTON MINING COMPANY.

At the adjourned annual meeting of the stockholders in this Company, held at the office in New York, the following officers were elected for the ensuing year:—

William F. Ladd, President; William F. Ladd, Joseph R. Taylor, W. D. Kennedy, Benjamin S. Hart, Alfred Douglas, of New York; Stephen Ball, of Boston, William H. Stevens, of Michigan, Trustees; Joseph R. Taylor, Treasurer; Israel Coe, Secretary.

WINTHROP MINING COMPANY.

The annual meeting of the stockholders in this Company was held at the Treasurer's office in Boston May 9th, when the following Board of Directors was unanimously elected for the ensuing year:—

E. P. Bullard, A. W. Spencer, G. Winthrop Coffin, H. Bigelow, E. D. Brigham, of Boston; Samuel W. Hill, of Lake Superior.

E. P. Bullard was re-elected President, and H. Bigelow Secretary and Treasurer, at a subsequent meeting of the Directors.

ALGOMAH COPPER COMPANY.

At the annual meeting of the stockholders in this Company, held at the office in Boston, May 1st, the following Board of Directors was unanimously elected:—

Charles D. Head, Stephen Ball, A. W. Spencer, William S. Thatcher, G. Winthrop Coffin, H. Bigelow, of Boston; Augustus Coburn, Ontonagon.

At a subsequent meeting of the Directors, Charles D. Head was re-elected President, and Horatio Bigelow Secretary and Treasurer.

GLEN MINING COMPANY.

At the annual meeting of the stockholders in this Company, held at the Treasurer's office on May 6th, and adjourned to May 15th, the following Board of Directors was unanimously elected:—

G. Winthrop Coffin, J. D. Farnsworth, Charles Scudder, William Heywood, H. Bigelow, of Boston; Robert R. Livingston, of Lake Superior.

At a subsequent meeting of the Directors, G. Winthrop Coffin was elected President, and H. Bigelow Secretary and Treasurer.

TOLTEC CONSOLIDATED MINING COMPANY.

At the annual meeting of the stockholders, held at the Company's office in Boston, May 10th, the following Board of Directors was unanimously elected:—

Charles D. Head, William S. Thatcher, A. W. Spencer, F. T. Loring, James M. Shute, Horatio Bigelow, of Boston; Augustus Coburn, Ontonagon.

At a subsequent meeting of the Directors, Charles D. Head was re-elected President, and Horatio Bigelow Secretary and Treasurer.

PHŒNIX GOLD COMPANY OF NORTH CAROLINA.

The annual meeting of stockholders in this Company, was held at their office on 2d May, when the following Directors were unanimously re-elected:—

John Stagg, D. B. Forster, J. G. Dudley, C. A. Secor, A. Douglas, A. Hamilton, H. Longenecker, F. Rider, J. Jacobson.

At a subsequent meeting of the Directors, John Stagg was unanimously re-elected President, D. B. Forster Vice President, and J. Jacobson Secretary and Treasurer.

GOLD HILL COMPANY.

At the annual meeting of the stockholders of the Gold Hill Mining Company, on the 9th May, the following gentlemen were elected Directors for the ensuing year, viz.:—

Isaac H. Smith, Thomas Williams, Jr., Henry W. Belcher, Amos M. Sackett, John P. Howard, of New York; William L. Beal, and James Fowler, of Boston; and Moses L. Holmes, of Gold Hill, North Carolina. Isaac H. Smith was re-elected President, and Augustus Brand Secretary.

MIDDLETOWN SILVER LEAD COMPANY.

Mr. William H. Stevens has been elected President of the Middletown Silver Lead Company. The Trustees are Robert Bayard, William S. Nicholas, Samuel Coit, Tucker Cutting, E. S. Monroe, E. Seely, William Coit, P. Strachan.

DAVIS COPPER COMPANY.

The officers of this Company are as follows:—Alexander Hamilton, President; Henry Adams, Treasurer; and with these, Wm. Hickok, Thos. J. Esterbrook, Lyman Gilbert, and John Stanton, Directors.

NEW JERSEY FRANKLINITE COMPANY.

The officers of this Company are as follows:—J. E. Curtis, President; Charles Thompson, Vice President; Geo. W. Savage, Secretary. Directors: Francis Alger, Boston; J. H. Holdane, S. T. Jones, New York; Archer Gifford, Newark, N. J.; James S. Green, Princeton, N. J.; Wm. C. Squier, Rahway; John Fowler, Franklin, N. J.

NEW YORK MINING SHARE BOARD.

The following gentlemen have been elected officers for the ensuing year of the Mining Board:—P. T. Mervin, President; B. H. Tallmadge, Vice President; Edw. Henriques, Treasurer; W. B. Warner, Secretary; E. A. Shipman, Roll Keeper.

SUPPLEMENT TO THE MINING LAW OF N. Y. STATE.

An act to amend an act entitled "An act to authorize the formation of corporations for manufacturing, mining, mechanical or chemical purposes," passed February [illegible] 1848. Passed [illegible]

The People of the State of New York, represented in Senate and Assembly, do enact as follows:—§ 1. Section twenty-seven of chapter forty, of the laws of eighteen hundred and forty-eight, entitled "An act to authorize the formation of corporations for manufacturing, mining, mechanical or chemical purposes," shall read as follows:

Whenever any person or persons owning fifteen per cent. of the capital stock of any company formed under the provisions of this act, shall present a written request to the treasurer thereof, that they desire a statement of the affairs of such company, it shall be the duty of such treasurer to make a statement of the assets of said company, under oath, embracing a particular account of all its details and liabilities in minute detail, and to deliver such statement to the person who presented the said written request to the treasurer, within twenty days after such presentation, and shall also at the same time, place and keep on file in his office for six months thereafter a copy of such statement, which shall at all times, during business hours, be exhibited to any stockholder of said company, demanding an examination thereof. Such treasurer, however, shall not be required to deliver such statement in the manner aforesaid, oftener than once in any six months. If such treasurer shall neglect or refuse to comply with any of the provisions of this act, he shall forfeit and pay to the person presenting said written request, the sum of fifty dollars, and the further sum of ten dollars for every twenty-four hours thereafter, until such statement shall be furnished, to be sued for and recovered in any court having cognizance thereof.

§ 2. This act shall take effect immediately.

COMMERCIAL ASPECT OF THE MINING INTEREST.

NEW YORK MINING SHARE MARKET.

New York, *May* 20, 1854.

There has been during the past month the usual amount of dullness, and we have therefore to record few transactions and scarce any change in prices. In fact, most of the present holders of mining stocks have invested in them at a much higher figure, and prefer to wait a favorable turn in affairs to realizing at present prices, unless absolutely forced. In some stocks their expectations will be realized, but in many which have seen the light during the past year we fear vitality has fled, and the amount paid for them may be written off to the dark side of profit and loss. In seasons of speculation there is always much chaff amongst the wheat, and many worthless schemes are passed off upon the credulous buyer, who is only induced to go in by the unfounded promises of large profits and exorbitant returns for his money. In investments in mining stocks, prudence and caution are as much, if not more necessary, than in any other concerns of life. Great discrimination should be exercised between all such companies as are got up to palm stock off upon the public, and such as are organized by reliable trusty men for the legitimate purpose of mining and producing returns to the stockholders. We are sorry to be compelled to record, that during the past year, some, whose character and connections should have placed them above such practices, have organized a number of companies for no other purpose than that of selling stock, and succeeded in doing so, as many unsuspecting buyers know to their cost. They are, however, too well known, to meet with much success in like operations for the future.

North Carolina stock has remained stationary between 2¼ and 2¾, at which figures there have been considerable transactions. In *Pennsylvania and*

Lehigh, there has been a complete reorganization. The concern has been taken out of the hands of the old parties, and been, with an entire new direction, placed under the General Mining Law of this State. The par value of the shares has also been altered, there being now 200,000 shares at $5 each, instead of 100,000 shares at $10 each, as formerly. The old stockholders receive share for share of the new stock, and 100,000 shares are retained in the treasury for use as the stockholders may direct. From all we can learn, the concern is now upon a solid and reliable footing. In *Ulster* and *McCullough*, there is no particular change to notice. In *Lindsay*, there has been a change of presidents, and an increase in the number of shares. Instead of 120,000 shares, at $10 each, there are now 150,000 shares, at $5 each, making the nominal capital $750,000, instead of $1,200,000, as formerly. Of the additional stock, 10,000 shares has been taken by the stockholders at 75 cents, and the balance is reserved for the wants of the mine, and to be disposed of as the Directors may decide.

Gold Hill does not rise, although the sixty day dividend of ten per cent continues, the next dividend of ten per cent. being payable on the 1st of June. We have nothing now to record in regard to *Phœnix Gold*; the price remains about 75 cents.

A new stock, called the *Georgia Gold Mine*, has been dealt in considerably lately at the Mining Board, and attempts made to inflate it, but it is yet too new and untried to be passed off upon the experienced. The President of Gold Hill Mine is at the head of it, but it will require more than his influence to put the stock off at any high figure until more is known about the real prospects of the mine.

Of the transactions in *Caledonia* and *Gardiner Gold Mine* we cannot say much, but the less said the better, as we do not believe one in ten of the reported sales are real. *Parker Vein* has become almost a complete wreck, and unless some of the parties who put it off successfully upon the public at 70, now come to its rescue, it will inevitably founder, and swallow up with it many of its trusting victims.

Hiwassee stock is now in much favor. Sales have been made privately as high as 6¾, and a dividend of 50 cents or $1 per share is promised in July next.

In Lake Superior stocks we have no transactions to record.

The *Neuvitas Copper Company* have very favorable reports from their mine in Cuba. Under date of April 27th, the Superintendent writes: —

"We have driven a level from our present depth at fifteen feet deeper than when Mr. May saw the ore taking out (54 feet), and on Tuesday cut the lode, the foot wall being ten feet south of the shaft. We are now taking out yellow ore; and as we break fairly into the vein, we can increase the amount daily for some days. I am speaking only of ore that requires no dressing. We have on the surface more than fifty tons that requires dressing, and I might add, that we are now just beginning to work, and the preparation of cleaning ores or prills, will be much greater than in the upper level. Before the sieves arrive, which we are expecting daily, we will have one hundred tons of ore ready for jigging."

Fluctuations to May 20th, 1854, in the different Mining Stocks sold at the New York Stock Exchange and Mining Boards, showing their Highest and Lowest Points, and the Date, with the Market Value at this date, Gain or Loss for the month, and number of Shares sold.

Name of Stock.	Shares.	Par.	Highest Sales.	Day Mo.	Lowest Sales.	Day Mo.	Value May 20.	From April 19. Gain	From April 19. Loss	Shares Sold.
Algomah Copper	20,000	25	—	—	—	—	—	—	—	—
Alleghany Coal	—	—	10¼	10	—	—	11	—	—	200
American White Zinc	—	—	1¼	20	1	14	⅞	3	¼	100
Brook Isle Lead	—	—	—	—	—	—	—	—	—	—
Buckingham Gold	100,000	5	—	—	—	—	—	—	—	—
Breckenridge Coal	—	—	100¼	9	100½	4	100	—	½	400
Caledonia Coal	—	—	4¾	11	4	4	4¼	—	¼	19,400
Charlotte Copper	—	—	—	—	—	—	—	—	—	—
Chatham Cobalt	100,000	5	—	—	—	—	—	—	—	—
Conrad Hill Gold	—	—	40c.	5	35	17	37½	—	2½	300
Copper Falls Copper	10,000	—	—	—	—	—	—	—	—	—
Cumberland Coal	50,000	100	33¼	15	26½	1	31¼	3½	5¼	56,435
Dauphin and Susquehanna Coal	22,000	50	20	10	—	—	20	—	—	100
Dauphin and Susquehanna 7 per cent. Bonds	—	—	—	—	—	—	—	—	—	—
Dolly Hyde Copper	—	—	5½	6	—	—	5	—	½	100
Duchess Silver	—	—	4	19	1¾	5	3	—	1	2,575
Douglas Houghton Copper	—	—	—	—	—	—	—	—	—	—
Flint Steel	—	—	5	5	—	—	5	—	—	76
Fulton Copper	100,000	5	1½	16	1¼	3	1¼	—	¼	9,850
Franklinite Scrip	—	—	4	16	—	—	4	—	—	200
Gardiner Crusher	—	—	¾	24	—	—	¾	—	—	500
Gardiner Gold	400,000	5	2½	11	2	1	2¼	¼	—	36,250
Gold Hill	200,000	5	3¾	16	3½	9	3½	½	¼	7,925
Hiwassee Copper	—	—	6	19	5½	25	6	¼	—	400
Isle Royale Copper	12,000	10	—	—	—	—	—	—	—	—
Lindsay Gold	100,000	10	75c.	23	50c.	6	75	¼	—	8,320
McCullough Gold & Copper	200,000	5	6	29	4	5	5¼	—	¼	11,424
Manitou Copper	20,000	5	—	—	—	—	—	—	—	—
Mineral Mining Co.	100,000	10	—	—	—	—	—	—	—	—
Middletown Silver Lead	—	—	—	—	—	—	—	—	—	—
Montgomery Zinc	50,000	12½	—	—	—	—	—	—	—	—
National Copper	10,000	25	—	—	—	—	—	—	—	—
Nouvitas Copper	—	—	—	—	—	—	—	—	—	—
New Creek Coal	200,000	10	2½	24	—	—	2½	—	—	100
New Jersey Zinc	96,000	12½	8¼	27	8	19	8	¼	—	2,775
North American Copper	10,000	—	—	—	—	—	—	—	—	—
North Carolina Copper	100,000	5	[illegible]	25	2	4	2¾	—	¼	24,930
Ohio Land & Marble	—	—	—	—	—	—	—	—	—	—
Parker Vein Coal	80,000	100	6½	24	4¼	10	4½	—	2½	56,775
Passaic Mining & Manufacturing Co.	—	—	—	—	—	—	—	—	—	—
Pennsylvania Coal	60,000	50	106	29	102½	8	104½	—	½	5,840
Pennsylvania & Lehigh Zinc	100,000	10	3½	20	2¾	8	3¼	¼	¼	6,700
Phœnix Mining and Manufacturing Co.	20,000	100	8	15	4½	18	8	—	—	100
Phœnix Gold	100,000	5	80c.	12	70c.	16	75c.	—	1½	8,375
Potomac Copper	100,000	10	3¾	20	2½	8	3¼	—	¼	6,970
Potosi Lead	200,000	5	55c.	27	—	—	50c.	—	¼	2,000
Randolph	—	—	—	—	—	—	—	—	—	—
Ripley Copper	40,000	12½	—	—	—	—	—	—	—	—
Rockland	—	—	—	—	—	—	—	—	—	—
Rocky Bar Gold	—	—	—	—	—	—	—	—	—	—
Rutherford Gold	—	—	¾	26	1	—	1	—	¼	100
Toltec Copper	20,000	25	—	—	—	—	—	—	—	—
Ulster Lead	100,000	5	1½	27	1¼	20	1¼	¼	¼	6,050
Vandenberg Gold & Copper	—	—	—	—	—	—	—	—	—	—
Winthrop Copper	20,000	25	—	—	—	—	—	—	—	—
Wyckoff Gold	—	—	4	29	3½	16	3¼	—	—	650

NOTE.—There has been no sale of the stocks of those Companies opposite to which the above table is blank. Our reports in a former Number furnish the amount of the last sales.

BOSTON MINING SHARE MARKET.

BOSTON, *May* 20, 1854.

The real prospects of the Lake Superior mining interests, as represented by success at the mines, will compare favorably with any previous period, and they are in fact steadily increasing in intrinsic value, whatever may be the current fluctuations of the different stocks. Various influences are brought to bear upon a stock, that shall raise or depress it, from time to time, as the case may be, without regard in the least degree to its true value, and *copper stocks* are not exempt from the general rule. A very easy state of the money market will often cause an upward turn in the stocks to a point much beyond their real nature, and, on the contrary, a stringency in money will have just the opposite effect. A combination of speculators frequently force up prices in order to realize a profit, and then sell out, when the stock is at liberty to take care of itself. The "bears," or parties who are supposed never to own any stock, will sell for a decline, and then use all their energies to depress prices, in order to buy in at a profit to meet their contracts. At the present time nearly all the mining stocks current in this market, have been greatly depressed in consequence of a very general apathy and want of confidence prevailing throughout the market for stocks of *all* descriptions. Many of the leading stocks have reached points which we do not hesitate to consider *cheap*, and a few months will prove it, or we are entirely mistaken as to the future yield of the mines themselves. We have no disposition to *puff up* this or that stock, but cannot help feeling that the resources of the Lake Superior mineral region are immense, and will pay a very handsome profit for working. Hence, we have confidence in the entire success of the leading mines now being operated, and believe that an investment in the stocks of different Companies judiciously selected, *cannot fail* to pay a very large profit. This will not come *immediately* into the pockets of the shareholders, but it is sure to be realized in due time, unless all indications of future success shall fail, and calculations based upon a solid foundation shall cease to be of value.

The latest advices from the gold mines of California are highly favorable. Larger lumps have been found than ever before, and there is not the most remote prospect of the mines giving out, as has been predicted by some of the would be "knowing ones." From New Mexico the accounts are also encouraging, old mines being re-opened, and new ones explored with success. From the Cape of Good Hope we have the important announcement of a discovery of gold. Should future advices fully sustain the previous accounts, it would not be surprising to see quite a rush of Yankees after the "dust."

The stock market has been very inactive for a month past, and *mining shares* have suffered in the general depression, which has seemed to pervade *all* classes of stocks without regard to their real value. The present season is usually one of speculation, but now there is an entire absence of it, and unless a reaction should occur within a month or six weeks, it will not be reasonable to anticipate any permanent activity until after the "dog days" shall have come and gone.

This rule can be but a general one, however, and the shares in any particular Company, the results of whose mining operations shall be very favorable, will form an exception.

Copper Falls is firm at 59 bid, with the $5 per share assessment paid, which is an advance of $3 per share within a month past. The last accounts from the mine are brilliant, and now that the Company have called in their *last assessment*, there is everything to encourage shareholders to keep their stock for future results. This Company have just issued a very valuable report, the leading points of which will be found in another part of this Magazine,* and we recommend every one interested in *copper mining* to give it an attentive perusal.

Since our last, *Forest* has been pressed down to $9 per share, but reacted immediately, and is now in demand at $11, with but little stock offered for sale.

Toltec has been hammered down to $8¼, assessment of $1 per share paid, which is the lowest point ever touched by the stock since it was first introduced here, as $3.25 per share has, in the mean time, been paid in. The stock is *cheap* at its present price, or no Lake Superior mining stock is worth having; and the man who now sells his Toltec, unless forced to do so, does not deserve to realize a profit on any stock he may purchase. Isle Royale has been much depressed in consequence of a dull market and a rapid succession of assessments, three of $1 per share, each having been called for since March 1st, including one due on the 10th of June next. The policy of making ample assessments for the necessary development of a mine is the true one, but there is always a class of shareholders who grumble at it, and *force* their stock on the market for sale. We have an excellent opinion of the *Isle Royale* mine, and feel confident that it will become a paying concern among the earliest of the mines, some two or three only being likely to pay a dividend before it.

Pittsburg has fallen to $137, though there is a better demand for the stock now, and $138 is offered, but no shares are for sale. For a stock permanently established as this is, and paying regular semi-annual dividends of $10 per share, at a price anything below $150 it is decidedly cheap.

Minnesota is occasionally sold at $170, but there is little stock in the market, and very few holders are willing to part with it. This Company made a dividend of $30 per share, as noted some months since, which was partly realized from the accumulations of copper in former years; but from a close analysis of the yearly product of the mine, we can see no reason why the Company should not continue to pay *at least* $20 annually to each shareholder. We consider this the *minimum* figure, and with the present increasing prospects of the Company, should not be at all surprised if they realized a much handsomer result. The small number of shares (3,000) in the Minnesota enables the Company to divide a large amount *per share*, having already, in their first dividend, paid back $8 per share more than had been assessed upon the stock. The Pittsburg has also but 6,000 shares, which is a favorable feature. Some of the new Companies have but 10,000 shares, though the most of them have 20,000, and a few 40,000, one only of the Lake Superior Companies (the Fulton) having 100,000. This latter number is altogether out of reason, and operates as a serious obstacle against the success of the concern, so far as the market value of its stock is concerned, and that is certainly an important feature, the Fulton now selling at $1 per share for $2 paid in. We think that parties here interested in mining are beginning to look into this matter of an excess of shares, with no little degree of attention; and from

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assurances made to us, the above views will very nearly, or quite, coincide with theirs. In conversation with a leading officer in one of the 40,000 share Companies, he freely admitted that 20,000 shares was enough for the profitable and judicious management of any mining enterprise, and he hoped that no new Companies would ever be organized with a greater number. We notice that several new *gold* Companies have lately come into the New York market with 300,000 (!) shares, enough surely to provide the "bulls" and "bears" of the Stock Exchange with sport for a twelvemonth.

Among the low-priced copper stocks, *Algomah* is a general favorite, and is thought to present features more favorable for success than most of the Companies at the same stage of development. They have the Toltec vein, which is undoubtedly an excellent one. *Ripley* has been depressed to $2¼, but is now in demand at $2¾, at which price the stock is considered cheap. The prospects of the mine are very fair now, with a good show for future success. *Winthrop* is in good demand at 2, and with the prevailing impression that the Company have the "Hill Vein" running through their lands, the stock must certainly be classed as altogether too low, and a very safe investment at the current rates. *Star* is in demand at $6, and the stock very seldom comes into the market for sale. There is little or no activity in the stock of the Companies not mentioned, and generally speaking, they are heavy at the quotations below, but not as much pressed for sale. We subjoin some facts of a commercial bearing respecting various Companies, and also a synopsis of their annual reports, which will give a general idea of their present position. Most of them are comparatively new, however, and therefore the mining details cannot be expected to amount to much at present.

The Algomah Copper Company was organized under the General Mining Law of Michigan, August 1, 1853. The capital is $500,000, divided into 20,000 shares, on which $1.37½ has been paid in, amounting to $27,500. The property of the Algomah *Mining* Company, which was organized in Eagle Harbor, June 6, 1851, was transferred to this Company, and consisted of the S. W. quarter of section 30, township 51, north of range 37 west, with some surface improvements of no great value. This quarter section adjoins the Toltec property, and has the veins of that Company *traversing its whole length*. The Algomah vein having been fully tested on the Toltec lands, there is little doubt but the mine will become a profitable one at a reasonable outlay.

In addition to the quarter section of mineral lands, the Company have between five and six hundred acres of timber land, which will be ample to supply the wants of the mine for lumber. An engine has been contracted for, with the necessary machinery for stamp works and a saw-mill, which will be forwarded to the mine before winter, to be put in operation another year.

The *Winthrop* Company was organized April 19, 1853, under the General Mining Law of Michigan, with a capital of $500,000, divided into 20,000 shares, at a par value of $25 per share. The territory comprises three quarter sections, or 480 acres, all of which is mineral land, constituting a tract one mile and a half from north to south, and half a mile in width, immediately adjoining the Copper Falls on the north, the famous "Hill Vein" of which is supposed to run through the property of the Winthrop. The mine is being thoroughly explored, preparatory to commencing operations in a systematic manner.

The Treasurer's report presents a balance of about $3,200, and in all probability an assessment of 50 cents per share will be called for by July 1st, for the purpose of testing the capacity of the mine as fast as possible. Thus far only 75 cents per share, or $15,000, has been paid in, and explorations have been made only to a moderate extent.

The Directors' report of the *Toltec Consolidated* was accepted, but it was voted not to present it to the stockholders in a printed form, the Agent's detailed report of operations at the mine not having been received.

The Toltec Consolidated Mining Company was organized April 6, 1853, and the mineral lands are situated in the south half of section 25, township 51, north of range 38 west. These two quarter sections previously comprised the Farm and Toltec Companies, but as the land adjoined, and the same vein was worked by both Companies, it was thought best to unite them, which was done at the time specified above. All the property was transferred to the Toltec Consolidated Company, and each stockholder in the old Companies received an equal number of shares in the new one.

Thus far the vein has opened well, and is from 18 inches to two feet in thickness, carrying good barrel and stamp copper. Ten tons of copper are now ready for shipment. A plank road is partially completed from the Ontonagon river to the Toltec lands, a distance of fourteen and a half miles, which will be of great advantage to the Company, enabling them to transport supplies to the mine and copper from it, at any season of the year, which cannot be done now except when the ground is covered with snow, thus placing them in equally as favorable a position as those Companies within a few miles of the Lake and using the common roads of the country.

The Treasurer's report presents a balance of $3,250 May 1, exclusive of the $1 per share assessment due that day. The whole amount now paid in is $5 per share, and probably an equal amount in addition will be required to bring the mine to a dividend paying point.

The territory of the *Glen* Company, amounting to 301½ acres, is comprised in the N. W. and S. W. quarters of section 31, township 50, N. of range 39 west, and mining work was commenced June, 1853.

The prospects of the Company are very fair for the amount of work done, and the Agent, Mr. Livingston, thinks the vein of sufficient promise to warrant its being vigorously worked. They have a railroad in the adit, which is found very convenient for facilitating the work of removing the stuff, and near the mouth of the adit is a stream of water sufficient for supplying a large number of stamp heads, a convenience of great value to this Company. The natural advantages of the mine are superior, and there is good encouragement for the stockholders to cause the work to be pressed forward with energy.

The location of the *Fulton* Company comprises 3,000 acres of mineral lands on the great Trap Range, and the mine promises well so far as its resources have been developed. Several masses have been found, some of them weighing 2,000 lbs. In February 80 men were employed, 40 of whom were miners, and the work is being pushed forward as rapidly as possible. The yield of copper is said to be great for the amount of work done, and the friends of the enterprise are sanguine of complete success, with a moderate expenditure, and at no very distant day.

The *Dana* Company was organized May 16, 1853, under the General Mining Law of Michigan, and the property comprises the east half of sections 24 and 25, in township 58, N. of range 31 W., and consists of mineral lands only, being one mile in length from north to south, and half a mile wide. There is sufficient timber on the land for the uses of the mine, with an excellent road to Eagle Harbor nearly four miles distant. The first operations upon a vein in the winter of 1853 were not successful, but the Agent, Mr. Hill, is now at work on a vein which he thinks gives good promise of being profitable. The last accounts from the mine were favorable, and the stockholders should take courage for the future.

The Treasurer's report presents a balance of $4,200, and assessments will be laid, from time to time, sufficient to raise the necessary funds for prosecuting the work of proving up the mine as fast as practicable.

BOSTON MINING SHARE LIST.

Fluctuations for April, 1854, in thirty-one different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their Highest and Lowest Prices, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

Mining Stocks, Boston.	Nominal Capital	Shares.	Par.	Paid in May 20.	Highest Sales.	Day Mon.	Lowest Sales.	Day Mon.	Value Apr. 29.	From Mar 31 Gain	From Mar 31 Loss	Shares sold in April	Value May 20.
Adventure, *Copper*	$250,000	10,000	25	$11.00	—	—	—	—	2	0	0	No sale.	2
Algomah	500,000	20,000	25	1.87½	4	7	3½	20	3½	—	½	1,620	3½
Bay State	500,000	20,000	25	‡2.00	—	—	—	—	1½	—	½	No sale.	1
Bohemian	250,000	16,666	15	4.44	—	—	—	—	3½	—	1	No sale.	3
Boston	500,000	20,000	25	‡3.00	—	—	—	—	1	0	0	No sale	1
Copper Falls	800,000	16,000	50	18.00	57	3	51	20	53½	—	4½	674	†69½
Dana	500,000	20,000	25	1.62½	1½	15	1½	15	1½	—	½	50	1½
Forest	200,000	10,000	20	13.06	13	3	10½	11	11	—	2	990	11
Fulton	500,000	100,000	5	‡1.60	1½	13	1½	17	1½	—	½	1,425	1½
[illegible]	500,000	20,000	25	‡3.00	—	—	—	—	1½	0	0	No sale.	1½
Isle Royale	120,000	12,000	10	3.00	22½	4	19	25	19	—	3½	544	†17½
[illegible], *Sandstone*	400,000	40,000	10	3.19½	75	1	42	11	50	0	0	1,450	†62½
[illegible], *Mining*	1,000,000	100,000	10	‡2.00	—	—	—	—	½	0	0	No sale.	½
[illegible] *Copper*	100,000	20,000	5	1.25	—	—	—	—	½	0	0	No sale	½
Minnesota	300,000	3,000	100	22.00	—	—	—	—	170	—	5	No sale.	178
National	250,000	10,000	25	3.00	†27½	6	†27½	8	†25	—	3	50	24
Norwich	250,000	10,000	25	4.25	—	—	—	—	9	0	0	No sale.	9
North American	400,000	10,000	50	21.50	—	—	—	—	75	0	0	No sale	75
[illegible]	100,000	20,000	5	4.50	—	—	—	—	10	—	1	No sale	10½
North Western	300,000	9,000	33⅓	14.67	—	—	—	—	16	—	9	No sale	†17
Phoenix	200,000	10,000	20	6.00	7	23	7	23	8	—	1	50	7½
Pittsburg (*Cliff*)		6,000	—	18.50	142½	11	137	22	137	—	7½	8	140
Ridge		10,000	—	6.50	—	—	—	—	5½	1	—	No sale	5½
[illegible]	500,000	40,000	12½	‡2.00	3½	5	2½	21	2½	—	½	1,650	2½
Shawmut	500,000	20,000	25	3.00	—	—	—	—	1½	—	½	No sale	†1½
Star	500,000	20,000	25	3.50	6	19	6	13	6	—	½	100	6
Summit	500,000	40,000	12½	‡5.00	—	—	—	—	5	0	0	No sale.	5
Toltec	500,000	20,000	25	5.00	10½	1	6½	22	8½	—	2	3,295	†8½
Winthrop	500,000	20,000	25	75	2½	10	2	28	2	—	½	400	2
Webster	200,000	40,000	5	‡2.00	1½	7	1½	15	1½	—	½	200	1½
W[illegible] *State*	1,000,000	50,000	20	‡6.00	—	—	—	—	8½	0	0	No sale.	8½

† Assessment paid. ‡ These are fully paid stock, not assessable.

200 shares N. J. Franklinite Scrip were sold April 11 at 8½ per share, and 100 shares Berkshire Glass Co. Apr. 12 at 8½ per share. 150 shares Parker Vein Coal Co. have been sold during the month, the highest each sale being 6½ on the 14th, and the lowest 6½ April 1[illegible].

NEW YORK METAL MARKET.

May 22d, 1854.

Antimony, by cask	per lb.	12½c
" by cask	"	14c
Babbitt, comp. metal	"	28c
Blooms, N. J. For.	per ton	$60
Crude from small scrap		45 to 50c

COPPER.

A. S. Pig	29c
U S. soft	31c
Sheathing	32c
Braziers	35c
Yellow M. Sheathing	26c
Bolt Copper	35c
Old Copper	28a29c

IRON.

Amer. Char. Pig	per ton	$40a50
For malleable castings	"	50a55
Car Wheel	"	45a50
Anth. and Char. for forge	"	38a42
Scotch Pig	"	40a42
American Ref. Bars	"	90a100
English "	"	98a55

Swedes Ref. Bars	per ton	$90a100
English Sheet, No. 1 to 20		4½c
" 21 to 24		5½c
" 25 to 28		5½c
Russian		13a14c

LEAD.

Galena	$7a7½
Spanish	6½a6¾
Bar	7½
Sheet	7¾
Pipe	7¾
Zinc White	11
Spelter	5½a6½
Steel, Cast	10a17
Spring	6a9
TIN PLATES ½ charcoal	10.38
I. C. Coke	8.88
Tin Banca	30a32c
Straits	29a31c
Bar	33c
Zinc, in casks	6½

LONDON METAL MARKET.

April 29th.

COPPER.

Duty:—Sheathing, free; Pig, Bar, and Old, 5 per cent; Bolt and Crosiers, 20 per cent.

		£	s.	d.
Sheathing and bolts	per lb.	0	1	2
Bottoms	"	0	1	3
Old	"	0	1	0½
Best selected	per ton	129	0	0
Tough cake	"	126	0	0
Tile	"	126	0	0
South American	"	127	0	0–128

IRON.

Duty 20 per cent.

per ton.

*Bars, Welsh, in London	10	0	0–10	5	0
*Ditto, to arrive	9	7	6–10	0	0
*Nail rods	10	10	0–11	0	0
*Nails, Stafford, in London	11	10	0–12	0	0
*Nail rods ditto	11	10	0–12	0	0
*Hoops ditto	11	15	0–12	0	0
*Sheets, single	12	10	0–14	0	0
Pig, No. 1, in Wales	4	5	0– 5	15	0
Refined metal, ditto	4	10	0– 5	0	0
Bars, common, ditto	8	2	6– 8	10	0
Ditto, railway, ditto	7	15	0– 8	0	0
Ditto, Swedish, in London	14	0	0–14	10	0
Pig, No. 1, in Clyde	4	2	0– 4	4	0

[redacted]

Duty 20 per cent.

English pig	24	15	0–25	0	0
Ditto sheet	26	0	0–26	10	0
Ditto red lead	26	0	0–26	10	0
Ditto white	29	10	0–30	0	0
Ditto patent shot	27	10	0–28	0	0
Spanish, in bond	24	0	0–25	0	0
American	none.				

FOREIGN STEEL.

Duty 15 per cent.

Swedish, in kegs	per ton	17	15	0–19	10	0
Ditto, in faggots		18	0	0–19	10	0
QUICKSILVER	per lb.	0	2	1		

SPELTER.

Duty 5 and 15 per cent.

		£	s.	d. £	s.	d.
Foreign	per ton	22	0	0–23	5	0
To arrive		23	0	0–23	5	0

ZINC.

Duty 15 per cent.

In sheets	31	10	0–32	0	0

TIN.

Duty 5 per cent.

English, blocks	124	0	0–	—	
Ditto, Bars (in barrels)	125	0	0–	—	
Ditto, refined	127	0	0–	—	
Banca	118	0	0–120	0	0
Straits	116	0	0–117	0	0

TIN PLATES.†

Duty 15 per cent.

IC Charcoal	per box.	1	11	6–1	13	6
IX Ditto	"	1	17	6–1	19	6
IC Coke	"	1	6	6–1	8	0
IX Ditto	"	1	12	6–1	14	0
Canada plates	per ton	16	0	0		

In London; 20s. less at the works.

Patent Yellow Metal Sheathing (Muntz) per lb.	0	1	0		
Wetterstedt's Patent Metal .. per cwt.	3	0	0		
Stirling's Non-laminating, or Hardened, Surface Rails, per ton	9	0	0–9	2	0
Stirling's Patent Toughened Pigs Glasgow	—		–3	12	6
Ditto Wales	4	0	0–4	5	0
Indian Charcoal Pigs in London	—		–6	0	0

* In Liverpool, 5s. to 10s. per ton less.
† At the works, 1s. to 1s. 6d. per box less. In Liverpool, 6d. per box less.

JOURNAL OF GOLD MINING OPERATIONS.

COINAGE AT THE PHILADELPHIA MINT.

The following table will show the coinage at the Mint of the United States, Philadelphia, for the first four months of 1854:—

	First Quarter.	April.	Total.
Double Eagles, . .	[illegible]	[illegible]	[illegible]
Eagles, . . .	[illegible]	[illegible]	[illegible]
Half Eagles, . .	[illegible]	[illegible]	[illegible]
Quarter Eagles, . .	[illegible]	[illegible]	[illegible]
Dollars, . . .	[illegible]	[illegible]	[illegible]
Total Gold, . .	$9,434,212.00	[illegible]	[illegible]
Half Dollars, . .	[illegible]	[illegible]	[illegible]
Quarters, . . .	[illegible]	503,000.00	[illegible]
Dimes, . . .	185,000.00	....	[illegible]
Half Dimes, . .	....	50,000.00	50,000.00
Total Silver, . .	$1,767,000.00	$750,000.00	$2,517,000.00
Copper, . . .	9,762.55	[illegible]	[illegible]
Gold, Silver, and Copper, .	[illegible]	[illegible]	[illegible]
Gold Bars, . . .	[illegible]	[illegible]	[illegible]
Total, . . .	[illegible]	[illegible]	[illegible]
In 1853, . . .	[illegible]	[illegible]	[illegible]
Decrease, . .	$1,545,010.81	$311,128.21	[illegible]

The deposits of precious metals for the first four months of the year were:—

	1853.		1854.	
	Gold.	Silver.	Gold.	Silver.
January, . .	$4,962,097	[illegible]	$4,215,379	[illegible]
February, . .	[illegible]	[illegible]	[illegible]	[illegible]
March, . .	7,533,752	[illegible]	[illegible]	147,500
April, . .	4,746,000	[illegible]	[illegible]	[illegible]
Total, . .	[illegible]	[illegible]	$14,153,579	[illegible]

Showing for the four months of this year a decrease of $6,656,793 in the deposits of gold, and of $1,097,060 in the deposits of silver, making a total decrease of $7,753,853.

We have presented the entire coinage in this place in order to notice its decrease, and to observe that it has occurred alike in silver as in gold. Had there been a decrease in the deposits of gold alone, and also in its coinage, it would have been logical to seek the cause in some circumstances affecting the supply, or in a special demand; but as the decrease occurs alike in both, it evidently proceeds from some cause of a commercial nature. What that is those persons will be at no loss to determine who have been familiar with commercial affairs during the last six months. With money abundant, and a good yield from the gold mines, the deposits should be well kept up, but a stringency might produce the same effect as a decline in the yield.

CALIFORNIA GOLD FIELDS.

The shipments of gold to the Atlantic States indicate that the yield of the California fields must be as fair and profitable as at any former period. The following running summary of operations in different parts of the State, represents them in a very flattering condition. We do not regard it to be necessary to notice, in detail, the various localities—a general aspect of the field presents all that is desired:—

Rogue River.—The bars are auriferous, but few have been worked advantageously.

Sailor Diggings.—Extensive placer diggings, supplied with water from Illinois Creek, by two races.

Althouse and Sucker Creeks are of considerable mining importance.

Yreka Diggings.—Placer diggings, the richest and most extensive ever discovered north of the Trinity range of mountains. The prospective yield will be immense in comparison with the past.

There is an area of country from Greenhorn Creek to the Shasta river—a distance of about six miles, by about one in breadth on an average—all of which, with an abundance of water for sluicing, will pay largely.

We have at this time a fair prospect of a good supply of water from the Shasta river, through the Yreka Water Company's flume, within one year from the present time. The saw-mill will be in operation in a few days, and the flume will be commenced shortly thereafter.

Cottonwood.—Placer diggings, next in importance to those of Yreka, and unsurpassed for richness by any in the country.

Mariposa Creek.—Both up and down, on this creek, the greatest activity is now displayed by our hardy miners, who are reaping, in some instances, rich rewards for their meritorious labor.

Agua Frio.—Our accounts from this place are quite cheering. The rains during the past week have enabled all parties to keep moving. We have been shown a piece weighing fourteen ounces, taken out at Upper Agua Frio. Miners are generally averaging from $8 to $10 per day to the man, though some few companies are making treble this amount.

Salmon Creek.—Miners are doing well on this stream.

Klamath River.—Miners at Hamburg and other places on this stream are making good wages at present.

Scott River.—This river has yielded largely since September, 1850. A friend writes from Scott's Bar, that some of the bank claims have paid first-rate this winter; among others, those of Galahan & Co., Warney & Co., and Hall & Co. Messrs. Neal & Co., working a hill-side claim above the Tennessee Bar, have been making some fine strikes lately.

Humbug Creek, it is thought, will yield as much gold this summer as it has any one season since the first.

Deadwood Creek.—The new diggings on the main creek below the junction of Deadwood and Cherry creeks have proved to be very rich.

Greenhorn Creek continues to pay good wages. The diggings are tolerably extensive.

Indian Creek.—There are several streams of this name in the north, on all of which gold has been found, but none in sufficient quantities to pay over $2 to $3 per day to the hand.

Jacksonville.—The mines in this vicinity are rich and extensive. Want of water has prevented extensive working.

New Diggings.—A correspondent, writing from Jacksonville, Oregon, says that new surface diggings have been discovered near Fort Lane, which bid fair to prove rich and extensive. The miners there are doing exceedingly well, better than has been done since the first discovery of gold in Rich Gulch some two years ago. It is thought this region has not been fairly prospected. Rich diggings are said to have been discovered on Rogue river, below the "Ferries."

Nelson Canon has been more thoroughly worked than during any previous winter. The banks yield as well as the bed of the stream, and miners are making from $6 to $10 per day to the man.

Suspension Canal.—The wires for the Suspension Canal, at the mouth of Missouri Canon, Middle Fork of the American, were stretched across the river on Monday last.

Spanish Flat.—Water scarce and miners making average wages. It is estimated that five hundred tom-heads could be sold in that vicinity should a branch of the Pilot Creek Canal be built to that point.

Iowa Hill is attracting attention. The town contains a population of about six hundred. The mining claims are selling very high. We have been informed that an owner of one of the rich claims at the Hill, sold an eighth-interest last week for $13,000.

Pinch Gut.—The miners on this ravine are working steadily along, at remunerating wages.

Weber Creek.—Miners are making good use of the abundant water. They are ground-sluicing the banks and bars, and look forward to a rich return for the labor they are now investing.

Independence Hill.—Miners have done well since the introduction of water by the Mokelumne Hill Canal Company, and when the dirt had been thrown up, the gulches had yielded a handsome profit. Quite a number of tunnels have been started into the hill, which pay well. The Chinamen are now working the sides and beds of the gulches left by the Americans, and make fair wages.

Douglass Flat.—Messrs. Seely & Co., in one day, washed out sixteen ounces. They are asking $1,500 for one-eighth of their claim.

Texas Bar.—The Stanislaus, some time since, delivered over to the Celestials, has been prospected by a company of Americans. Messrs. Jefferson & Loring sunk a hole some five feet deep, and took out six ounces on Friday last. They refuse $200 for the claim.

From the *Butte Record*, American Valley. The miners in this vicinity are doing well. We give the result of one day's work, Thursday, March 9, of the claims around Elizabeth Town and O'Neil's ranch:—Pappano & Co.'s claim, four hands, sixteen ounces; Fowler & Spencer, two hands, twelve ounces; Cornelison & Co., four hands, ten ounces; Tulmwinder & Co., three hands, four ounces; Jun Catrin & Co., four hands, six ounces, English Bill & Co., three hands, five ounces; O'Neil & Sons, one slug, eight ounces; seventeen ounces; Dave Potts & Co.'s claim, four hands, fourteen ounces. Provisions plenty, but boots scarce.

At *Rush Creek*, formerly considered very rich, the miners are doing as well as ever.

The mining claim located on Oregon Hill, three and a half miles below Coloma, has been worked in all 118 days, and yielded $3,364 70. The first seventy-nine days of the time, twenty-one of which were spent in cutting a tail race, they took out $1,764 70. The last thirty-nine days has yielded $1,600, making $11 per day to the man. The prospects are quite as favorable for months to come. Two years since this hill was abandoned, it being considered too poor to work.

At *Carson's Flat*, last week, Con. O'Leary & Co. took out a piece of solid gold weighing twenty-five and a half ounces. They are ground sluicing and working the same ground where a seven-pound piece was taken out by some Mexicans in '50.

French Corral.—Operations here are more extensive and profitable than ever before. The town is unusually prosperous, and the buildings, although not so numerous as before the fire, are better. Three fine hotels are doing a good business. One company, after expending $40,000 and the labor of two years, have just got into their lead, and are making $20 per day to the hand.

A novel way of prospecting in a long, sloping sandy hill, has been adopted at Cherokee, where attempts to reach the bed rock have heretofore failed. A trench, a few feet in length, was dug, into which was poured a stream of about ten inches, from the Grizzly Ditch. By this means a cut was made about 800 feet into the hill, with a depth of 60 feet at the upper end, at a small expenditure of labor.

At the middle crossing of the Yuba large mining operations are going on, and quite a village has sprung up. Daw & Robinson have built the best bridge in the State over the South Yuba, have constructed an admirable wagon road this side, and are now employing a large force in making an equally good one on the other side. When it is finished, wagons can run direct from Nevada to French Corral, Cherokee, Downieville, &c.

The shaft of the United States Company, commenced by Messrs. Rabbits, Loftus & Co., in October last, having been sunk to a depth of 100 feet, in search of the Blue lead, at an expense of over $7,000, is completed. The result is flattering, as they are now taking out gravel of the best quality. Their stock has advanced within a few days more than 300 per cent.

QUARTZ OPERATIONS.

From the headquarters of mining by extracting the gold from quartz, we have the following statement published by the *Grass Valley Telegraph* :—

Our quartz mills, generally, are doing a good business. A day or two since, we passed by the Gold Hill Mill, and in doing so, we noticed that the large pile of broken quartz which had been laying immediately alongside the mill was greatly reduced in size, and from the rich specimens which we noticed in it, we feel sure that the labor of the mill has not been in vain. The Empire Mill is also doing a good business; this mill has long sustained itself as a paying concern, and judging from the able manner in which it is conducted, we feel confident that for years to come it will continue to maintain the same fair reputation which has distinguished it for many months past. The Helvetia and Lafayette Mill is also doing a handsome business. This Company is well known for the richness of leads which are in their possession, and last, but not least, the old Crossett Mill, of which Mr. W. C. Crossett is the principal, is still in successful operation. We believe that this mill has been undergoing some repairs, and will be ready for extensive operations by the time the season fairly opens for successful mining.

The Manhattan Mill, formerly known as the Old Collins Mill, of which we have before given some notice, is now nearly ready for operation. In connection with quartz machinery, this mill has extensive saw-mill machinery attached, under the same roof. Though all the above mills are doing a fair business, yet in consequence of the extreme wet weather, they are none of them realizing as large sums as the mills are capable of yielding. Should the present mild weather continue, we shall in a short time be able to present our readers with reports that must convince the most incredulous as to the entire success of quartz mining in California.

RUSSIAN RIVER MINES.

We are informed by a friend from Sonoma that the diggings on Russian River have been found to be quite extensive, stretching from Fitche's Ranch to the head of the river, a distance of seventy-five miles, and back on each side into the hills and mountains nearly as far as the gulches extend. There are now four hundred miners on the ground, and the average pay is about $3 or $4, though a few are making a good deal more.

The people in the neighboring valleys of Sonoma, Napa, Petaluma, Santa Rosa, Rosa and Bodega, who were previously engaged in farming and stock raising, are considerably elated with the discovery, which brings a market to their doors and raises the price of their produce and their lands.

These mines are about twenty miles from the ocean, and the open valleys possess the same delightful climate for which the valleys of Sonoma, Napa and San Jose, are celebrated; a climate in which the warmth of the sun is tempered by daily breezes from the ocean, and where the fogs of the immediate coast and the burning heat of the interior valleys are alike unknown.

YIELD IN THE WINTER MONTHS.

With regard to the decreased yield of the California gold fields during the winter months, and the possibility of their exhaustion, we are furnished with the following explanation:—

It is well known that during that time there was a very general cessation of labor in the gold region on account of the failure of the early rains, and the consequent want of water requisite to carry on mining operations, and that this was the cause of the shipments falling short. Now that the mountains are sending down their thousand little streams, and the snow has disappeared from the ground, the miners are working to advantage, and the reports from all portions of the gold region exhibit a degree of success and prosperity hardly known since the discovery of the gold placers. We fancy those who foresaw this immediate exhaustion of the mines had not paid them a visit, and had not seen the enormous tunnels undermining the mountains, the deep shafts sunk into their summits, the lengthy canals, conveying water to portions previously dry during two-thirds of the year, and all the appliances which labor, capital, and science are bringing to bear upon our golden hills, valleys, and river-banks. We will not stop to argue whether there is any probability of the immediate exhaustion of the gold of California, for we think if we should, those who are acquainted with the facts, would only laugh at us for our pains.

AUSTRALIAN GOLD FIELDS.

The reports from the various gold fields up to February 1st, are much the same as in former years. At some of the diggings there is a scarcity of water, and at others, where water has been a hindrance, the diggers are enabled to proceed with their operations on a most extensive scale, while fresh rushes of people to newly discovered spots still vary the monotony of the digger's life. At Bendigo, the want of water has compelled a considerable number of diggers to try other gold fields, and the population there has greatly decreased. New and rich diggings having been discovered at Bryant Ranges or Creek, thirteen miles from Castlemaine, and thirty from Bendigo, such has been the rush, that a population of 18,000 persons are already located there; but the general opinion is, that the diggings could not be properly tested till the wet weather sets in. Some fresh discoveries have lately been made at Mount Alexander, and many of the old gullies have again been worked to advantage. Ballarat has for some time been re-established in its former high character as one of the best gold fields. From recent discoveries it is considered probable that the extent of the ground that can be profitably worked is not less than eighteen miles in length, being the distance from the celebrated Canadian Gully to Cresswick's Creek. In the direction of the Ovens, at the Buckland river, new diggings have been discovered, which are said to be very rich, although of limited extent, and about 6,000 persons are said to be there, and profitably employed.

YIELD OF GOLD.

The following quantities have been received by escort weekly since November:—

Week ending—	Castlemaine, Mount Alexander & Bendigo. Ounces.	Ballarat. Ounces.	Ovens. Ounces.	M'Ivor and Goulburn. Ounces.
Dec. 3,	[illegible]	7,652	—	[illegible]
" 10,	23,896	[illegible]	4,434	1,486
" 17,	[illegible]	[illegible]	—	[illegible]
" 24,	[illegible]	[illegible]	5,498	726
Jan. 2,	[illegible]	9,119	—	767
" 9,	[illegible]	[illegible]	4,784	423
" 16,	[illegible]	8,445	—	451
" 23,	19,644	8,903	5,058	612

The quantity exported in 1853 was one hundred and six tons, one cwt., six qrs., five lbs.

The following is a comparison of the exports from Victoria for the last two years:—

	Ounces.		Ounces.
1852	1,974,975	1853	2,547,960

Quarterly statements of the amount of gold brought to Melbourne and Geelong by escorts in 1853, compared with the corresponding quarter of 1852:—

	1852. Ounces.	1853. Ounces.
October,	[illegible]	[illegible]
November,	[illegible]	[illegible]
December,	121,827	[illegible]
Total,	854,098	538,253
Last quarter of 1852,		854,098
Decrease on the quarter ending 1853,		314,545
Decrease on the year 1853,		142,400

It may be proper to notice, that these figures comprise only the gold brought by escort to Melbourne and Geelong: they do not include the quantities taken from the Victoria gold fields to Sydney and Adelaide by their respective overland escorts, nor that brought by private hand.

Independent of gold, numerous discoveries, which from time to time have been made, lead irresistibly to the conclusion that we possess a vast quantity of mineral wealth. An analysis of an ingot of the tin of this colony has been made by Messrs. Johnson and Matthey, of Hatton-garden, London, which shows the following result:—

Pure tin,	98·35
Lead,	1·20
Zinc, with traces of gold,	·45—100

The proportion of gold is 2½ grains in the pound weight, but the proportion existing originally in the unsmelted ore is very much larger than this. This mineral abounds in the ranges of the Australian Alps.

MOUNT ALEXANDER DISTRICT.

By way of England, we have the annexed important facts relative to the future yield of these gold fields, through a correspondent of the *London Journal*:—

Dec 17.—I wrote you some months ago that the gold fields of Victoria were getting less promising than they had been, and that, notwithstanding the contrary reports, the falling off in the produce of gold is sufficiently evident to show that such is the fact, and unless new and very great discoveries are made shortly, the diggers must seek employment elsewhere. I do not mean to say but that there is a large amount of gold still left in the refuse, and some of the unwrought creeks in this and the other districts, but the cream has been skimmed off, and what is left can only be obtained by very laborious operations, and I may venture to say, at a very great sacrifice.

In October, 1852, Mount Alexander district alone produced weekly about 110,000 ounces, by means of the labor of about 60,000 diggers. The whole of the diggings of the colony at present scarcely produce 42,000 ounces weekly, with a digging population estimated at about 100,000. You may, therefore, conceive the state of the diggings, and the prospects before us. Unfortunately no *mines* have been discovered, and the only London companies which appear to have been established here, are the Port Philip and the Colonial, both of which, for very good reasons, have confined their operations to gold buying, and doubtless have realized large profits, if they have employed the whole of their capital in that business; and more especially the Port Philip, as it was first in the field, and embraced the melting and assaying, besides, on a very large scale. The diggers are leaving Forest Creek and Bendigo in great numbers—some to Ballarat, others to the Ovens, and many to Melbourne. The small companies which have been working on the quartz veins north of Forest Creek, Specimen Gully, &c., have labored in vain, spent all their money, and are offering their machinery for sale. Grinders and amalgamators may be seen scattered and lying about in the gullies of Forest Creek and Bendigo, with as little regard to their value as blocks of quartz. I have been informed that the gold quartz specs of New South Wales are all but abandoned.

The new Gold Fields Bill has caused great discontent, and I believe that the Government will be obliged to take away the license altogether, if they wish to encourage much more gold scraping; in fact, the fields are now getting too poor to pay the mere labor to dig and wash. The best thing they can do is to grant the deep and watery tracts of gold-ground to good companies, who will carry on permanent works, like the old rich stream-works of Cornwall. This would benefit the country, keep up the produce of gold many years longer, and prove profitable to those who would carry on such works properly. We are anxiously waiting for the new Governor. Merchants, storekeepers, and diggers are all complaining, and the universal belief is that we have arrived at a crisis which will compel the Government to throw open the land for cultivation, and alleviate, in time, the serious consequences which must follow, if no new gold discoveries be shortly made. The numerous recent discoveries announced in the Melbourne press have proved false, and much distressed the digging population.

Jan. 27.—There is an *on dit* that a discovery has been made on Bryant's Run, called the New Ballarat; but such rumors are so frequent, that they must be received with caution. The Mount Buffalo, the Avoca, &c., have proved total failures. The Bendigo yield is falling rapidly, but the total produce of the Victoria diggings is still about 42,000 ounces weekly. The total produce of 1852 was estimated at about £15,000,000 in value, and 1853 is supposed to be about £10,500,000. A large proportion of the produce of 1852 has been exported in 1853; hence the total export is about £14,000,000 in value. The "second bottom" by deep sinking, which has been held up by the Melbourne press as the grand source to keep up future supplies of gold, has turned out a failure. There is no such thing as a second bottom. The edges of the slaty rocks are the real, and indeed, the only bottom of all the diggings; and the great majority of the pits have been sunk to the hard rock.

The diggers are beginning again to revive the agitation against the reduced license fee, and indeed, they appear determined to get rid of it altogether; but the more prudent are leaving the fields, and falling back on other and more remunerative pursuits.

VICTORIA LICENSE ACT.

The Council of Victoria had been compelled to pass the new Gold Fields' Management Bill very hurriedly, the term of the temporary Act expiring on the 1st December. The new bill was read a third time, on the 29th of November. The scale of the license fees has again been altered; it is now fixed at £1 for one month, and £8 for a whole year, the fee for three months is £2, for six months £4. This alteration has been strongly objected to, as it removes the inducement to take out annual licenses offered by the former scale. Those who take out a license for the year will be entitled to the political franchise for the future representatives of the gold fields in the Legislative Council, and will also have a right to a plot of ground on the diggings, to cultivate as a garden. The annual license fee, therefore, partakes of the character of rent. The amount of royalty to be paid by mining companies taking leases of land for their operations, is fixed at 1 20th of the produce. In consequence of the strong opposition it met from all parties in the Council, the Gold Export Duty Bill was withdrawn by the Government. The lowest license fee in the Victoria gold fields, under the new Act, is twice the amount of that levied by the last regulations of the Government of New South Wales, in that province, and the rates for licenses of three, six, and twelve months, are 33 per cent. higher in Victoria than in the northern fields.

THE VICTORIA DIGGINGS.

A commercial writer at Melbourne makes a very favorable review of last year's operations, and thus states the present state of matters in Victoria:—

1. The most important feature that commands notice is the produce of the gold fields, which shows, satisfactorily, as compared with 1852, that gold still continues to be found in quantity in the colony of Victoria. During the early part of the year 1852, the limited number of diggers then at work procured gold by the pound weight; whereas now, from the increased number, the produce is spread over a larger community, and consequently ounces are now the extent of individual labor. Formerly when a rich vein was struck by a working party, they secured the surrounding claims, and protected themselves; whereas now, no sooner is a rich spot discovered, than claims are secured around it in every direction by parties too lazy to prospect for themselves. If success attends the pioneers, the encroachers commence digging, but if the reverse is the case, they at once abandon their claim and move on to another locality. This mode of acting is termed "shepherding" by the working digger.

2. The gross produce of 1852 and 1853 may be stated in round numbers at £25,000,000 sterling, the actual loss at £45,000. To the industrious and persevering individual, the remuneration at the gold fields is ample; thereby placing him beyond temptation. At the trials for robberies it was proved that the individuals had been convicts, thus strongly exemplifying the evils we labor under from our proximity to a convict colony.

3. The produce of the gold fields has been maintained throughout this year, with a regularity as to quantity which contrasts strongly with that of the last year. During the first six months of 1852, the average quantity was 17,000, while the last six months was 68,000. In 1853 it was 36,000 against 44,000. While a produce of such value continues to be raised at a cost of little more than that of sustenance to the digger, for the license fee is now so light a tax that it is hardly worth naming, the attraction to the gold fields for all new comers will continue, notwithstanding the high rate paid for labor, both in town and country. That great numbers have been unsuccessful in their first attempts at gold digging, cannot be denied, and it is perhaps well for the community that all have not been successful. This class forms the great body of well paid laborers in towns, who have returned with a tolerable competency, but who are at the same time not above following their usual

avocations; reserving for their old age the produce of their success at the gold fields.

EXPORT OF GOLD FROM SYDNEY.

The total export of gold from Sydney for the year ending 1853 has been 624,947 ounces, and the total export, from its discovery up to the end of the year 1853, has been 1,615,555 ounces, which, valued at £3 15s. per ounce, gives a total of £6,058,331 5s. There is calculated to be at present in Sydney upwards of 50,000 ounces.

NEW ZEALAND GOLD DIGGINGS.

At a recent meeting of the London Geological Society, a paper, "on the Coromandel Gold Diggings," was read by Mr. C. Heaphey, from which it appears that these diggings are on the west side of the dividing range, and have been worked in clays at the foot of the granite range, and in the gravel of a stream bed. The excavations have been generally shallow, and the yield has hitherto been but scanty. The clays, however, are locally upwards of 30 feet deep, containing rock-fragments in the lowest part, and have not yet been fully explored. They rest on granite and quartz rock. Gold has also been found on the eastern side of the dividing range. From Mr. Swainson's notice of the Coromandel gold district, it appears that the granite is flanked by vertical schists, and the range is skirted by conglomerates, that volcanic rocks abound in the district, and that the auriferous detritus contains quartz blocks, and fragments of granite, slate, and trap rock.

PHŒNIX GOLD COMPANY.

The annexed statement of the President of the Phœnix Gold Company contains some recent particulars respecting the property of the Company:—

Having just returned from a visit to your property in Cabarrus county, N. C., I am induced, from a sense of duty, to make a brief report on the condition and prospects of the mines as I left them. My stay there being short—about six weeks—it was of course impossible for me to make a thorough exploration of more than a small portion of our valuable estate. So far as time and circumstances permitted, I made a general and careful examination of the Company's property, and I have the pleasure to state, that all the anticipations which I had previously formed, have been realized to the fullest extent. In all, our property consists of about 700 acres, nearly every acre of which is, strictly speaking, mineral land. On a portion of the property, known as the Connor and Simonton Tract, comprising about 200 acres, are located the Sulphur, the Orchard, and the Elwood Mines, which have been successfully worked, though with limited means, for a long period of time; one of them for a quarter of a century, at least; the character of these mines is so well established, that comment from me would be superfluous. Besides these, numerous other veins of gold and copper ores are known to exist on this tract, and from personal observation, I feel assured that many, if not all of them, will prove to be workable and productive veins. Among the number, I beg leave to call your attention to the "Old Field Vein," designated as such on the map on file in the Company's Office, as also to another, equally rich in gold, known and designated on the same map as the "Black Oak Shaft." Both of these veins are exceedingly rich in the precious metals, and have yielded gold, equivalent to three dollars per bushel, by the rudest process known. The remaining 500 acres consist of several distinct tracts, one of which is the Barrier Tract, being 90 acres, more or less, and on which the celebrated Barrier Mine is located. This mine was opened many years ago, but was worked very little until our Company got possession of it; the prospects here are very flattering.

and it is the opinion of many experts in mining that this vein will prove to be one of the very richest in the State of North Carolina. Such, too, is the opinion of our Mining Captain, Wm. H. Orchard, who has had much experience in the mines in Cornwall in England, and in various localities in this country. Several shafts have been sunk on this mine, two of them to the depth of 108 feet, or more, and tunnels driven N. E. and S. W. on the vein, affording extensive stoping grounds. The ore is exceedingly rich, the vein full two and a half feet wide, and promises to increase, both in quality and size. Several other veins running parallel, have been discovered adjacent thereto, the appearances of which are precisely similar, and these I have no doubt will prove to be equally as valuable. Other portions of the property, known as the Hagler Tract, the Simon Bost Tract, and the Daniel Faggot Tract, have likewise been ascertained to be exceedingly rich in minerals, many veins having been discovered and opened to no very inconsiderable extent. On the Hagler Tract, there exists a copper vein, which, although proven to the depth of no more than twelve or fifteen feet, justifies the expectation of something very rich. The ore is of the species known as the yellow sulphuret, and yields 30 to 38 per cent. of metal. Other veins of copper ore were pointed out to me on this tract, but time did not permit me to investigate them.

The works of the Company, including mill-house and machinery for grinding the ores, are situated on the first-mentioned tract, within a few hundred yards of the manager's house. Two Chilian mills and six heads of stamps, worked by steam-power, crushing and grinding about 130 bushels of ore per day, are now in successful operation, and soon another mill will be added. With the present amount of machinery our daily yield of gold is more than double all expenses, and when in about six weeks hence the third mill shall be completed, our receipts will then insure to us a net profit, above our expenses, of not less than a hundred and fifty dollars per day, a sum equal to sixty per cent. per annum on the present market value of our stock. The mines are capable of producing any quantity of ore, and all that is wanted to make our income still larger, is the addition of more machinery, which I strongly recommend; and in connection with this subject it may not be amiss for me to state that there are ample funds in the treasury to do so, and that the Board of Directors have expressed their approval of, and willingness to comply with my suggestion in this particular.

AMALGAMATION OF GOLD ORES AND TREATMENT OF AURIFEROUS PYRITES.

It is our design in that portion of each number of the Mining Magazine which is devoted more strictly to mining news, to embrace information not only of what is done, but likewise what is said or written, of a practical nature, upon any point in mining or metallurgical operations. The English, the French, and the German journals and publications will be constantly examined with this view, and translations made from either of the latter whenever they contain anything of interest. Of Germany it may be well said, there is no country in the world which has such deep mines, or which is so rich in mining literature.

The gold mining interest of our country has become very extensive and important, and the same difficulties are encountered which are beginning to embarrass the English miners under the gold excitement which has recently arisen in that country. We have carefully noted the press of the country to observe what might be stated relative to the two great points in gold mining operations—amalgamation and the treatment of auriferous sulphuret of iron—and although nothing in advance of this country has, thus far, been presented, yet many opinions and discussions of interest have appeared. Some of these we compile from the English press, with the object above stated.

One writer, speaking of the little improvement made in the treatment of auriferous sulphuret of iron, says:—

The first step was to ascertain beyond all doubt whether the gold was held by the sulphuret in mechanical or chemical combination, and it is now agreed that it is combined mechanically; for otherwise the law of chemical equivalents would be violated, and the protosulphuret would contain 98 parts of gold to 44 of iron and sulphur. This being settled, the remaining questions are,—1. What is the best and cheapest method of eliminating the sulphur? 2. What is the cheapest and most efficacious process for calcining or thoroughly oxidizing the iron?

One mode adopted at the mines abounding in auriferous sulphurets of iron has been to spread them out in the open air, and leave them to rust; water, and sometimes salt, being frequently applied to them. This is not only a long and tedious process, but incomplete and unsatisfactory. Another mode of treatment, is the roasting the sulphurets in the open air, with the addition of salt or soda, and stirring the iron particles to free them from the sulphur. If complete calcination be thus effected, not much further difficulty will be met with. But this mode of roasting is expensive, the quantity of fuel consumed being large, and the time and trouble great, even for calcining a few hundred-weights of sulphuret. In the case of iron pyrites, or bi-sulphuret of iron, two roastings would be necessary, half the sulphur being given off by the first.

In noticing these remarks another writer observes:—

1. The mechanical means by which the gold is extracted proves that it is only mechanically combined with the pyrites.

2d. These ores have been subjected to reverberatory and to open-air processes of decomposition, with the view of reducing the bi-sulphuret into a soluble sulphate, but without success, the expense and losses being much greater than the ordinary treatment of the rough ore direct from the mine.

The Marmato lodes are composed of auriferous pyrites, and this mineral is treated by simple mechanical means with great dispatch, and at a cheap rate.

In reference to amalgamation the same author also adds, in a tone calculated to discourage the demand for amalgamating machines to work the gossan of English mines:—

1. That gold is always found in its metallic state, and never as a mineral. 2d. No calculations based on mere experiments can prove that 4 to 5 dwts. per ton will pay for working; it depends on other and more essential conditions. 3d. The large amount of quicksilver destroyed by grinding and trituration, and washed away in the slime, was considerably diminished by mixing a small quantity of red argol with the stuff to be treated. In washing the amalgam it was found that, although some of the mercury was saved, there was a large amount of gold found uncombined, and escaped with the water; in fact, whilst the quicksilver was employed, ¾ oz. per ton would not pay cost; whereas ¼ oz. of fine gold per ton, without the use of mercury, has left a profit. These experiments have not been confined to merely 30 tons, but to many thousands of tons.

In reply to these remarks, the following views were advanced:—

I am rather surprised to find that your correspondent considers that there is little or no difficulty in extracting gold from its matrix. He must evidently go upon the supposition that gold is only to be found amongst quartz and other minerals, disseminated in grains of a magnitude sufficient to enable them to gravitate in the fluid medium to which they are subjected, in order to separate the lighter mineral from the heavier gold, and upon this assumption the process is, indeed, a simple one, for crushing and washing is all that is needed. But suppose the gold to exist in invisible particles, then the case is widely different; such particles will not gravitate in a fluid so dense as water, and they will be carried off in the "tailings." As a case in point, is your correspondent prepared to aver that the St. John del Rey ores do not contain, at least, one ounce of gold per ton, and yet only half an ounce or less is extracted? The test proposed of grinding and washing gold ore on the spot, to ascertain its value, must be wholly fallacious, unless he can show that in every instance the gold exists in particles sufficiently large to enable them to gravitate in water. If such be the only test hitherto applied in England, we cannot wonder that the existence of gold has been so long doubted and denied in that country, except in a few isolated cases, where its particles have been of a magnitude sufficient to be discerned with the eye, and separated by hand. Suppose the gold exists in auriferous pyrites, alloyed with iron, forming a double sulphuret of iron and gold, how will any crushing or washing test such ore for gold? And it is quite clear, that those who have had experience in the gold countries, and know how to wash and extract the gold there from certain ores in which it is visible, are not necessarily the best judges of how to extract the gold from certain other ores found in a district in which they have maintained that gold, in any paying quantities, could never be found, and where the gold exists in particles which are not visible.

And if washing and grinding be alone resorted to, to test the value of the ores of foreign gold districts, it follows that ores containing ten dwts. of granular gold will be prized, whilst those containing as many ounces of chemically diffused gold per ton must as certainly be rejected as worthless. And what is really known as to the various states of combination in which gold may exist in various kinds of minerals? With all due deference to the superior knowledge and experience of your correspondent, I will venture to predict that the best gold ores have been hitherto neglected, simply because neither crushing nor washing could elicit gold from them, and in very many instances mercury may either wholly or partially fail to do so. Will stamping and washing extract silver from silver-lead ores? and yet who will now pronounce silver-lead ore barren of silver, because such a test must fail to yield any of that metal? I am far from wishing to advocate the "crushing quackeries," if any there be, and as far from believing implicitly the gold-inventing rascalities which are rife amongst the mineral swindlers, but I have no doubt that gold exists to an immense and highly remunerative extent in this country, and that the great desideratum is a cheap and certain method of extracting the whole of the gold from its ores. Crushing in mercury may get much of it out, but as long as mercury and gold ore differ so materially as to their respective specific gravities, so long will it be found impossible to bring them sufficiently into contact to enable the mercury to take up the whole of the gold, under the present system of operation; the light ore must for ever be floating upon the heavy quicksilver, they can never be intimately commingled.

These remarks drew forth the following statement, which contains some interesting facts:—

I beg to state that my observations were not confined solely to grains of gold of the magnitude to gravitate in muddy water, but were extended to impalpable gold, almost like a weak solution of gamboge, which will float on water and be carried away by a running stream. Yet four pennyweights of this impalpable gold disseminated in a ton of such a heavy mineral as iron pyrites, can be separated by the native gold washers of South America, by mere grinding and simple washing in "bateas," on the spot where it may be found. Therefore, when the object is to test the value of stuff, to ascertain its worth *in a commercial point of view*, this is the most ready, the most useful, and the most practical test known in old established gold mines and washings. The actual weight of the contents of any given sample is, of course, determined by assay. Even one ounce of gold per ton in iron pyrites is invisible until the bulk has been reduced and concentrated to about one cwt. Nor does the amount of the free and visible gold obtained from the grinding and washing operations of the rough pyrites in the *first instance* exceed half an ounce, thus indicating an apparent loss of fifty per cent. This led the gold companies to try innumerable inventions, to save the loss and extract the whole contents in the first operation; all of which have proved failures. However, these experiments have been the means of modifying and improving the old native processes to such a degree as to reduce the actual loss of the precious metal to a comparatively trifling amount.

We now preserve all the residue of auriferous pyrites until it is finally reduced and dissolved, not allowing the "remains" to be thrown away as formerly. We obtain only about fifty per cent. in the first operation, but the "remains" are laid aside for decomposition, and again reduced by suitable stamps and washing arrangements, out of which about twenty-five per cent. of gold is recovered in the second treatment, and the "remains" of the "remains" are again laid aside for further decomposition, until the whole is finally reduced, and all the *available* gold obtained. Those who attempt to extract the *whole of the gold in the first operation* (excepting in assaying samples, or stuff rich enough to pay for smelting and cupellation) can have had but little experience in the matter, and much less knowledge of the state in which the gold is found in the different minerals.

Will your correspondent inform me where "the best gold ores which have been neglected" are to be found, and where is there an auriferous compound containing from five dwts. upwards per ton which will not show gold by an *experienced* gold washer? The following are the ordinary compounds:—

Gold, in gravel, clay-slate, etc.,—easily washed, without loss, and without quicksilver.

Gold, in quartz,—easily extracted by our present arrangements, and without quicksilver.

Gold, in iron pyrites, and alloyed with about one-third of silver,—requires the greatest care and economy in the manipulating to extract a small product with profit, yet it is done by stamping and washing, and without mercury, with profit.

Gold, in iron pyrites, blende, and lead ores,—these are the most difficult ores to treat, unless they be rich enough to pay the cost of smelting. When the contents of the silver ore are of as much value as the gold, the washing process is different to the above, and the final treatment adopted in such cases is the conversion of the sulphurets into chlorides, and barrel amalgamation. I have put up "arrastres" and barrel amalgamating machinery, therefore I know their respective merits.

—Another writer entertains the following views on the reduction of gold ores:—

Each ore requires its own mode of treatment; differing, perhaps, but slightly, but still constituting a distinct treatment. Such is the case with the copper and tin ores of the Duchy, in which the Cornishman, by long experience, acquires a special proficiency. Such is the case with the Mexican or the Chilian with regard to silver, and his process, rude though it may be, is adapted to the successful achievement of the required result. Take up any competent treatise on working gold, and it will be found that there are peculiar processes and machinery used in Hungary, Savoy, Russia, or the Brazils, and each place holds to its own system. Gold ores very widely diffused, of great variety, of great delicacy, and it may be said of very minute per centage, require a special treatment, as the very process adopted, so far from obtaining the gold, may be the means of producing an antagonistic combination. Hence it is that gold ores present such anomalous results in their practical reduction; in very many cases half, or even two-thirds, or three-fourths of the metal being left unreduced or wasted.

BULLOCK'S PATENT QUARTZ CRUSHER.

A circular trough is formed of cast iron, say twelve feet in diameter, more or less. This trough is about eight inches wide on the bottom, inside; the edge or flanch of the trough rises perpendicular to the bottom about twelve inches, and the outside rises but six inches from the bed of the trough, and at an angle of about forty-five degrees; attached to the inside rim of the trough is a segment gear-wheel; edge wheels, as they are termed, are placed in the trough, supported by an axle or shaft passing through their centres in the usual manner; upon the inside of these crushing-wheels and attached to them, are cog-wheels, fitted to work in the segment gear on the trough, and the relative diameters of the several wheels are so proportioned as to cause the crushing-wheels to slip or slide upon the bed of the trough, as they roll forward; or, in other words, to make more turns or revolutions in running around in the trough than they would if left to roll upon the bed of the trough without the gearing; thus, as the wheels roll around in the trough, there is a continual *grinding* as well as *crushing* upon the material in the trough.

Another improvement consists in the arrangement of the centre on which the shaft (or axle) is made to turn or swing round, and bending the shaft down to connect with the centre pin on a horizontal line with the bed of the trough; this centre is so fitted in a socket as to admit the wheels and shaft to rise and fall as much as may be necessary in rolling over the quartz—at the same time it is kept perfectly steady in the centre of the trough.

Another improvement is in placing a circular trough of wood or metal around the grinding trough, so as to receive the water and material as it flows over the outer edge of the trough in which it is ground; in this outside trough is placed a quantity of quicksilver, and a disk so arranged and moved upon the mercury as to bring every particle of the quartz and water in contact with the quicksilver, and rubbing them *upon* and *into* the quicksilver; the arrangement is such as to prevent the possibility of either the quartz, water, or gold, escaping without coming in contact with the quicksilver. Or, if it is advisable not to amalgamate in this trough, the material may be run off to any other amalgamating apparatus or washing machine.

These machines are arranged with gearing also, to be worked by steam or water.

A GOLD WASHER.

The following is reported by the *Golden Era* of San Francisco:—

We were shown a few days since, by an old miner on his way to the Atlantic, the model of a machine which he had invented for the purpose of dry washing, or of separating the gold from the earth without the aid of water. In its construction it is simple, yet it fully exhibits the ingenuity of its projector. It consists of a hopper, the bottom of which is a sieve which is calculated to admit through it no substance larger than an ounce ball. Passing through the sieve, which is kept in rapid motion, the earth and gold fall between two large iron cylindrical rollers and pass through them in a powdered state. The earth is here received upon an inclined iron plate, from which it passes into a series of sieves, at the same time being subjected to a process of fanning. By this means, all lighter substances than gold are blown away and the gold arrives at the place made to receive it in an almost clean state. The power required to run it will be about four horse, with which it is calculated to wash one thousand or fifteen hundred pans of dirt per day.

THE GOLD FIELDS OF SOUTHERN AFRICA.

The Cape papers have hitherto alluded to the subject with great caution, but they now contain numerous letters from reliable persons, leaving no doubt that pure gold has been found in Southern Africa.

The *Cape Town Mail* of March 19th says:—Letters from Burghersdorp, from respectable parties, remove all doubts respecting the discovery of gold and copper deposits near Smithfield.

Smithfield is about 324 miles from Algoa Bay. It is the most southern point at which gold has been discovered, while Potchefstroom is the most northern. The distance between the two points is at least five hundred miles, the whole of which, it is highly probable, will be found auriferous. The whole of this immense tract of country is almost unknown, with the exception of a small strip.

The *Cape Town Advertiser* says:—The fact has been ascertained that prolific gold diggings have been discovered, and by yesterday's post some six or eight nuggets, one weighing forty grains, have been received here.

A letter in the *Cape Town Mail* from the Smithfield Diggings says:—

The hole dug by Finlay brought them down to the bed of an old river, where agates and other valuable stones were found. Here the largest nugget was found, but the water coming in in great abundance stopped further operations. Other holes have yielded more gold, and it has now been found in such quantity as to warrant the expectation of larger discovery.

The gold in some places is found in the centre of a ridge of iron-stone (which has evidently been thrown up by volcanic action) in a vein of quartz. The upper part of the vein is small, which gradually widens as the shaft is sunk. The most profitable part is thrown away, the diggers not having the proper washing cradles. From accounts I have received of California and Australia, there has been more gold found near the surface here than there. The deepest shaft that has been sunk is sixteen feet. Copper ore has also been found of a purity which will astonish you. I believe the copper ore will contribute as much to the enriching of the Territory as the gold discovery. The copper is found on the surface in wagon loads, and contains a considerable per centage of gold.

JOURNAL OF COPPER MINING OPERATIONS.

LAKE SUPERIOR COPPER REGION.

In the Lake Superior copper region the season has commenced with bright prospects. The amount of work done and the produce of the mines promises to be astonishingly increased, and we doubt not also the wealth of the enterprising proprietors of the numerous mines located there.

THE COPPER FALLS MINING COMPANY.*

The last report of this Company respecting their operations in 1858, is an extensive document. It comprises several papers, such as the reports of the Directors, of the Treasurer, of the Superintendent, Mr. Hill, and the Clerk. The following remark of the Directors in their report, expresses the true course to be pursued by every mining company which aspires to permanent success.—

Your Directors believe it to be the true policy in mining enterprises, in the first place to be well assured by extensive surface explorations and the necessary underground work, that the property is worthy of being developed, and then to lay out the mining plans upon a comprehensive scale, and not allow a

* The mines of this Company were last noticed on page 171, Vol. I.

short-sighted desire of immediate returns to interfere with their execution, and prevent the opening of such an extent of ground as will insure large and increasing returns in the future.

The quantity of masses and barrel work which was shipped during the years 1852 and 1853 was as follows :—

1852.

Weight of barrel-work,	18,000 lbs.
" masses,	4,662
Amount of pure copper,	12,651
Per cent. of yield,	72

[illegible]

Weight of barrel-work,	42,118 lbs.
" masses,	96,407
Amount of pure copper,	91,737
Per cent. of yield,	64

Among the assets of the Company mentioned in the Treasurer's Report are 12,655 pounds of copper, at Eagle Harbor, worth 20 cents per pound; 20,000 pounds of copper at the mine, in barrel and masses, at 20 cents; and 3,500 tons stamp work, at the mine, estimated at 4 per cent. worth. The sales of copper were 136,520, (69¼ tons), net yield 91,737 (45½ tons), copper amounting to $27,479.

MINING EXPENSES.

From the report of the Clerk we make the following extract relative to the expenses at the mines :—

The mining expenses from March 1, 1853, to March 1, 1854, have been as follows, viz. :—

HILL MINE.

$297\frac{13}{32}$ fathoms stoped,	$4,225.68	
$1912\frac{1}{12}$ feet drifted,	10,405.10	
$877\frac{6}{12}$ " shafts sunk,	5,921.43	
72 " winze "	623.62	
		21,175.83

COPPER FALLS VEIN. [illegible]

$144\frac{1}{36}$ fathoms stoped,	$2,067.54	
$2126\frac{1}{12}$ feet drifted,	11,567.11	
$875\frac{11}{12}$ " shafts sunk,	5,412.80	
66 " winze "	561.00	
		19,608.45
Total mining expenses,		$40,784.28

The above statement shows the entire extent of ground opened during the year, by sinking and drifting, to be $4980\frac{1}{12}$ feet; by stoping, $441\frac{1}{3}$ fathoms.

The average price paid (inclusive of mining costs) for

Sinking, per foot, about	$14.04
Drifting, " " "	5.44
Stoping, " fathom "	14.26

Average number of miners employed during the year, 65—present number, 97.

Average monthly earnings per man, $\$45\frac{1}{100}$; out of which are paid, board and physician's fees, leaving him a balance of $34\frac{15}{100}$, clear of expenses.

Sum total of surface expenses $35,066.09, which includes the expense of excavating foundation for, and building engine-house, stamp-house, saw-mill and warehouse; superintending erection of engine-house, and engine; constructing road to Eagle Harbor; road to Hill Mine, underbrushing and clearing land; cutting and hauling of sawlogs; wheeling dirt from mine, and the usual incidental expenses.

Average number of surface men employed for the year, 69; present number, 86; consisting of two engineers, two firemen, nine carpenters, four blacksmiths, six teamsters, fourteen wheelers, fourteen windlass-men, three whim drivers, four landers, four sawyers, eight choppers, one lumber-man, fifteen common laborers.

REPORT OF SUPERINTENDENT.

The Report of Mr. Samuel W. Hill, the Superintendent of the Copper Falls Mines, is highly interesting and valuable. Its length prevents us from inserting it entire—we therefore confine ourselves to its prominent features:

The last Report was made March 1st, 1851, since which time there have been added to the location, one hundred and sixty acres on the line of the Hill vein, south of the original territory of the Company, at a cost of eight thousand dollars, making the entire location to contain four thousand four hundred and twenty-one and one-half acres. This last purchase gives to the Company the whole length of the Hill vein in the trap formation, from the base of the ridge to its summit, a distance of one and three-fourths miles.

Omitting the description of the buildings, machinery, etc., erected on the property, we pass to the results of further geological examinations:—

Since the date of the former Report but little has been done in the way of exploring the location for veins, but a further geological examination has been made, and a section across the location, along the line of the Copper Falls vein, to the North Western Mine, has been constructed, which will be found interesting, and to which you are referred for information in regard to the extent of the trap formation, north of the crystalline trap or "greenstone." The south line of the location is but a few yards from the junction of the former with the latter rock, as shown in the section. The dip of the rocks has been carefully taken in many places, and the thickness of the crystalline trap measured. A description of those beds in which the mines are wrought, will be serviceable to those interested in the Company, as well as to those who may hereafter be engaged in searching the rocks of the country for metalliferous deposits, their character and value being materially influenced by the rocks in which they occur.

From the mouth of the adit level in the Copper Falls Mine, north, to the base of the ridge, the beds of trap are chiefly amygdaloidal in structure, and quite soft and porous. They are of no considerable thickness,—no one bed exceeding four hundred feet. Very near the base of the ridge are beds of sandstone alternating with beds of amygdaloidal trap. South of the adit level is a bed of brown amygdaloid, rather soft and porous. To the south of this bed is one very compact and firm, of a light blue color, and with occasional bunches of a soft chloritic mineral, some of which contain grains of copper. This bed of trap outcrops but a few feet to the north of shaft No 1 in the Copper Falls Mine. In the Hill Mine it is between shafts No. 3 and 4. It has been traced westward as far as the Phœnix Mine, and is distinctly seen to the north of the old mine of that Company. Through the Copper Falls location, as well as at other places where it has been noticed, its outcropping edge rises considerable above the beds which lie on each side of it, so much so that the three succeeding beds are rarely seen at the surface. Its thickness varies in different localities. In the Copper Falls Mine it is one hundred and fifty feet, while in the Hill Mine it is nearly double that amount. Underlying this bed, is a bed of brown amygdaloid, almost two hundred feet thick, somewhat firmer than the one mentioned as occurring near the mouth of the adit level. Under this bed is one quite singular in its lithological character. It is a trap, of a lightish blue color, and very porous, and is filled with amygdules of carbonate of lime. This bed has been noticed on the Native Copper location, six miles east of the Copper Falls. Its equivalent at the Phoenix Mine is a rather dark blue, chloritic, very soft rock, and which is exposed in the workings of the Armstrong vein. It is a few yards to the north of the old Mine of the Phoenix Company. Beneath this bed is a bed of bluish granular trap, about three hundred feet thick. It rests upon a volcanic ash bed, one hundred feet in thickness. Between these two beds is a lateral vein of several inches in width, which, where exposed, has been found to contain copper. The bed of granular rock has been moved upon the ash bed, so as to groove and striate the under side of one, and the upper side of the other bed to a considerable extent. A slight displacement is to be seen in these two beds, which has produced a fissure, along the line of contact of the two beds of rock, into which foreign matter, such as calc spar and other vein stone, has been introduced. East of the Copper Falls Mine, this east and west vein is quite strongly marked on the surface of the rock, and is there found to contain small sheets and bunches of pure copper. In the Hill Mine, it may be seen in the upper adit level, one hundred feet north of shaft No. 6. The ash bed underlying the lateral vein is of a brownish color, quite soft, and everywhere filled with fine copper. Intercalated in it, are two beds of soft amygdaloid, about eight feet in thickness, each having its amygdules filled, in part, with rounded particles of copper. These two beds are richer in copper than the ash bed. Sheets and lumps of pure copper, from a few ounces up to twenty and thirty pounds in weight, are to be seen in these beds, in the sides of the drifts, in both Mines. In the Hill Mine this ash bed is not so thick as in the Copper Falls Mine; and in the former, and near the underside of the bed, a belt of sandstone, eighteen inches in thickness, may be seen, every part of which is filled with copper. So far as it has been exposed, it appears to be excellent stamp work. In some portions it contains sheets and bunches of pure copper. On both sides of this sandstone belt, the ash bed is thoroughly filled with copper. This same ash bed may be seen a few yards to the north of the old Phoenix Mine, and also on the Chamberlain tract and on the Humboldt location, about one thousand feet south of the north line of that property. It has also been observed in the south part of the Native Copper location; and may be seen in the north half of Section eleven, Township fifty-eight, Range thirty. The extensive ancient mine work east of the Copper Falls Mine is in this volcanic ash bed, and in the lateral vein overlying it. Since the levels in the Copper Falls and Hill Mines have intersected this bed, the more western of the large ancient excavations, to the east of the first mentioned mine, has been opened by a shaft, fourteen feet square, sunk through the earth to the rock. The whole bottom of the shaft is filled with fine copper, mixed through the rock; and in some places pieces of pure copper of fifty pounds weight have been taken out. It was commenced with a view to the determination of the value of that bed for mining purposes. Only about two feet of rock have yet been taken up; but enough has been done to furnish the information required, and the work will not be continued for the present. About two hundred and fifty feet to the west of that excavation, the old Copper Falls vein may be seen, through which an adit drainage may be had to this ash bed, by opening a level about four hundred feet in length.

Much more might be said of this metalliferous bed and its character. By some it is believed that one part in every hundred is copper, but by others it is thought to be much richer. It is perfectly clear, from what can now be seen of it, that many thousand tons of mixed rock and copper will be taken from it, in opening the mines. It will require no calcining to stamp and wash easily, and can be cheaply excavated. Above the adit level in the Copper

Falls Mine, and on its inclination, its extent is over five hundred feet. In the Hill Mine, above the upper adit level, its depth is over four hundred feet. The deep adit level will intercept it between shafts No. 2 and 8, over fourteen hundred feet below its outcrop. So little has been done in testing the value of the bed in question by mining, that great caution should be observed in expressing an opinion of its value. Metalliferous beds of trap have been, and are now, mined in the Ontonagon district with some success, and in the Portage Lake district with prospects decidedly flattering. Some of the mines of that district now working in metalliferous beds, seem to warrant an opinion that they can be made profitable.

The metalliferous bed, which occurs on the Copper Falls location, differs materially in its lithological character from those of the Ontonagon and Portage Lake districts, being softer and less granular in its texture. The copper is also pretty uniformly disseminated through it, while in the two latter districts it is found more commonly in small lumps and masses.

To the south of this metalliferous ash bed, the beds of rock are firm and unbroken, close up to the crystaline trap. They are granular, and rarely contain amygdules. In all the beds of rock through which the mines have been worked copper has been found; but it is considerably more abundant south of a point three hundred feet north of the ash bed. The true metalliferous zone of the formation, north of the crystalline trap, has been, and is now believed to be, between this point and the latter rock. On first opening the mines, the position of those richer beds was known; but they could not be drained and worked efficiently, except through levels driven on the veins, in the less productive and more porous beds to the north.

The Copper Falls Mine has not been found so rich in masses of copper as the Hill Mine, although the vein is wide, and well filled with metal. The largest masses taken from this mine weighed eighteen hundred pounds. Others may now be seen in it, and doubtless many more will be met with in stoping, much larger than any yet taken from it. It is not to be expected that more than one-sixth of the masses of copper will be met with in opening the shafts and levels.

The Hill Mine has been found rich in masses of copper, the largest of which yet taken out weighed forty-six tons. The vein has produced, and is producing, a large amount of mixed rock and copper. It is very large, and is opening more extensively than any other mine in the Lake Superior region. The workings below the upper adit level about shafts No. 1, 2 and 3, have been carried forward to a considerable extent, and until water was found too abundant to be taken out without machinery; and hence the opening of deeper adit levels has been found expedient. * * *

At the junction of the volcanic ash bed with the rock overlying it, the Hill Mine has a fault of twenty-nine feet. Immediately to the south of the fault a mass of copper may be seen in the vein, in the upper adit level. South of shaft No. 4, and in the back of this adit are other masses. Small masses may be also seen in the vein north of shaft No. 5, and in the back of the upper level.

The whole amount of ground stoped in both mines, to this date, is five hundred and eighty-three fathoms; of this about forty fathoms have been in excavating for the shaft plats, and in the sides of levels, where tram roads have been constructed; leaving five hundred and forty-three fathoms of actual stoping in the veins. From this number of fathoms of vein stoped, four hundred and sixty nine thousand eight hundred and sixty-three pounds of seventy per cent. copper have been taken—equal to eight hundred and sixty-five pounds per fathom. In 1852, there were shipped eighteen thousand six hundred and eighty eight pounds; in 1853, one hundred and thirty-eight thousand five hundred and twenty pounds. There are now, at the Lake landing, twelve thousand six hundred and fifty-five pounds, and at the mine, in barrel work and small masses, ready to be sent to the harbor, twenty thousand pounds; and in three thousand five hundred tons of mixed rock and copper, on the surface, and ready for the stamping mill, estimated to produce four per cent. of copper, two hundred and eighty thousand pounds, making a total of four hundred and sixty-nine thousand eight hundred and sixty three pounds.

In the Copper Falls Mine there are, in readiness for stoping, two thousand three hundred and fifty-three fathoms; and in the Hill Mine, one thousand seven hundred and forty-eight fathoms. This amount of stoping ground, now ready in these two mines, has been ascertained by actual measurement of the backs which are known to have a good vein in them. In the backs, in different parts of the mines, are several thousand fathoms of poor and unprofitable ground; but none of this is taken into the above calculation. From these facts, it will readily be seen what the present condition and resources of the mines are. It must not be expected, however, that the whole number of fathoms, now ready, can be stoped this year, nor even the half of that number.

It will be noticed that these mines have a very large amount of ground opened—four thousand and one fathoms in both—in readiness for stoping. Eight hundred and sixty five pounds of copper to the fathom may seem a very great produce, but some parts of the ground stoped in the Hill Mine have produced more than one ton of copper to the fathom; and there are new stopes just commenced in that mine which will produce much more than one ton per fathom. The backs in the Hill Mine produce more copper than those in the Copper Falls Mine. Some experiments have been made in the country, to show how much copper, per fathom, is required to pay expenses of opening, stoping, raising to the surface, stamping, and washing, after all the requisite machinery has been placed about the mine. In one instance eighty pounds have been fixed upon as the amount required, but more generally, it is believed that one hundred pounds are requisite. At the present prices of copper, that amount is considered quite adequate to pay all expenses per fathom; but considerable poor and unproductive ground must, of necessity, be opened, the expense of which must be paid from the produce of the productive ground.

SILVER IN THE MINES.

Before giving the statistical information of the cost of the mine work, some notice of the occurrence of silver in the mines, and its value to the Company, in the state in which it is found, should be given. It has been found in every mine in the Lake Superior region; but in no instance has its occurrence been known as being regulated by any law of nature which can be studied, with reference to its profitable working. In the Cliff Mine, and near the surface of the rock, under the crystalline trap, considerable bunches of silver have been found. Beneath this point, and in the same geological position, but little, if any, has been seen. About the large masses of copper in that mine it has been found in merely isolated deposits. Some of the points or projections of the masses of copper have been noticed to be pointed with silver. At one time it was thought that the mine contained enough to justify the expense of separating it from the copper. In the deeper workings it has not been found so abundant as near the surface. In the Minnesota Mine it was found in excellent hand specimens, near the surface, and in isolated deposits. In the lower workings of the mine it is scarcely noticed. In very many of the other mines of the Ontonagon district, it has been found in small bunches and strings, very near the surface. In the Fulton Mine, some years since, a few hand specimens were seen.

The largest deposit of it yet ever met with, in any of the mines of the country, was in the old Copper Falls Mine, in a bed of trap about four hundred feet thick, and between beds of sandstone. This deposit was about forty feet from the sandstone overlying the bed of trap, and in the upper gallery. In the gallery below, and in the same geological position as where noticed above, it was not seen. To the south of that place, in that mine, it was but seldom met with. In the Hill Mine, and just over the large mass of copper, met with in shaft No. 5, in the winter of 1853, a bunch of silver was found. At this point in the mine there were three or four fathoms of the vein which contained silver, promiscuously scattered through the vein rock. In the deeper galleries, below that point, no silver had been found or noticed. In shaft No. 6, a very little has been noticed. In the Copper Falls Mine, a few hand specimens have been found during the past winter. In the Phœnix Mine, it has been met with, more thoroughly disseminated through the vein stone, than in any other mine, but when the workings have attained a considerable depth below the surface, it is doubtful if it occur at all.

The vein-stone of the Copper Falls Mine, when examined in a large quantity, is not found to contain silver, in anything like an amount which would justify the expense of separating it from the rock. A very few ounces, in perhaps as many tons of rock, might be found. In no instance has it been noticed to exist in any other than a metallic state. If it exist in the form of a chloride, it would have been easily detected long since, or if in the form of *any* ore of silver, it seems most singular that it should not have been observed, when it is certain that fair samples of the vein-stone of the mines of the country are in the possession of every scientific institution in the United States. They are also in England, in Paris, and in Vienna. They have been analyzed in the best schools in the world, and no such ores yet detected. The silver, then, in the veins of this region, exists in a metallic state, and not sufficiently abundant to render it of any value to be mined. The trappean rocks of the Lake Superior region can be successfully mined for copper *only*; and for the abundance of that metal, no other part of the globe, yet explored, can compare with it.

THE FOREST MINING COMPANY.*

The late report of this Company presents the state of operations up to the close of the last active mining season. We make such extracts from it as relate to points not previously mentioned in these pages:—

By a vote of the stockholders, at a special meeting, held March 28th, 1853, the quarter section (of one hundred and sixty acres), known as the "Glen location," was set off to a new organization, called the "Glen Mining Company," which was formed under the general mining act of Michigan, with a capital stock divided into twenty thousand shares; one-half, or ten thousand shares of this stock, have been transferred to three trustees appointed by the stockholders to receive the same, in consideration for a conveyance, by the Directors, of the aforesaid tract; and an agreement has also been received from said Glen Mining Company, that the remaining one-half, or ten thousand shares, shall be sold from time to time, and the proceeds applied to working the mine. Under this agreement, two thousand shares have been sold at two dollars per share. The Glen Mining Company have since purchased of the United States Government, an adjoining quarter section, making the property of the Company now, about three hundred and twenty acres. Mining work was commenced in June last, and has been vigorously prosecuted, under charge of Mr. Livingston, on a good vein, which, at the last dates, had been opened to a considerable extent. Several acres of land have been cleared, houses built, and a road made to connect with the Forest Company's road. The stock owned by the Forest Company in this mine, may be considered a valuable item in their assets.

At a special meeting of the stockholders of this Company, held August 22d last, it was voted, to set off to new organizations:—

The East Half Section No. 36, three hundred and twenty acres, to the

SHIRLEY COPPER COMPANY.

* The property of this Company was last noticed on page 481, Vol. II.

The S. E. Quarter Section No. 26, and N. E. Quarter Section No. 35, three hundred and twenty acres, to the

TREMONT COPPER COMPANY.

The S. W. Quarter Section No. 25, and N. W. Quarter Section No. 36, three hundred and twenty acres, to the

DEVON COPPER COMPANY.

Upon similar conditions as agreed with the Glen Mining Company.

Mr Livingston was instructed to make surface examinations on these different locations, preparatory to mining operations. The little time afforded previous to the fall of snow, enabled him to discover on the Shirley, the same vein now worked by the Glen Company.

On the Tremont and Devon locations, Mr Livingston also reports having found veins, but the time allowed him was insufficient to test their value; when the spring opens these explorations will be continued.

After these sub-divisions, there remains to the Forest Mine proper, upwards of one thousand acres, with an extent of more than one mile in length of their vein, which is sufficient for all purposes.

PRODUCT OF THE MINE.

The product of the Forest Mine for the year ending November 1st, prepared for shipment, was 84,485 lbs., of which 73,762 lbs. was shipped to Detroit, to be smelted by the Waterbury Smelting Company, which yielded 41,324 lbs., in ingots, and was sold in market at twenty-eight and twenty-nine cents per pound. The cost of freight to Detroit was seven dollars per ton. Cost of smelting fifteen dollars per ton. Freight to Boston, via Ogdensburgh, ten dollars per ton.

The amount of stamp copper at the mine is now very large, the daily product of the mine being more than sufficient to keep the stamps employed, beside making large accessions to the quantity estimated as on hand a year ago.

As much attention has been directed lately to the amount of "silver" contained in the veins of Lake Superior, it may not be out of place to state, that specimens taken indiscriminately from the barrel work of the Forest Mine, have been assayed, and found to yield thirty-five ounces silver to the hundred pounds of mineral. This is merely referred to as a fact, which may or may not have a bearing upon the value of the mine, being dependent upon the result of investigations now going on upon a large scale.

The financial condition of the Company is shown by the Treasurer's report submitted at this meeting, which, after paying for supplies sufficient for the mine until summer, and outstanding liabilities at this office to December, and including the whole amount of the last assessment of $5 per share, as paid, leaves a balance on hand of $21,114.61.

REPORT OF THE SUPERINTENDENT.

The report of Mr. R. R. Livingston is quite full in details of the progress of the mine.

From November 1st, 1852, to November, 1853, we have broken 2927.5½ feet of ground in the mine, as follows:—

Sinking:—Main shaft,	. .	58.6
West "	No. 1,	98.5
" "	No. 2,	110
South Vein Shaft,		12
West Winze, No. 8,		72.7
		351.11, at average cost of $11.19½.

Drifting:—West Drift, No. 1,	144.8	
" " No. 2,	[illegible]	
" " No. 3,	24 6	
2nd W. " No. 1,	62	
" " " No. 2,	45	
East " No. 1,	56.7	
" " No. 2,	68	
2nd E. " No. 1,	[illegible]	
" " " No. 2,	44 10½	
Drift from C. C. No. 1,	10.1	
" " W. Winze, No. 3,	6 6	
	825.6½,	at average cost of $7.54.
Cross-cutting:—C. C. North, No. 1,	74.3	
C. C. South, No. 4,	4.5	
C. C. South, No. 5,	6.3	
	84 11,	at average cost of $10 84.

Stoping:—Total faths., 277.3.1, sq. 1665 1 ft½ at av. cost of $4 02⅓.
Total No. of feet, 2937.5½

Beside the above, there has been a considerable amount of *timbering* done in the mine, covering an extent, in stulls, 580 feet, at an average cost of $2 per foot. Timbering shafts, 348 feet, at a cost of $1.30 per foot.

During the present season, I have shipped the following amount of copper from this mine, viz. :—

9 masses, weighing	6,656 lbs.
47 barrels, barrel-work, weighing . .	2 ,473
60 " Stamp-work, " . . .	40,078
Total, ...	74,7 8
And have on hand, ready for shipment .	11,269

Beside a large amount of undressed work, all of which, with the product of the mine during winter, will be ready for shipment this spring

The bottom of the mine in No. 1 shaft contains a lode *eight* feet wide and well charged with barrel and stamp work, and some masses, from 400 to 1,000 lbs. West shaft No 2 also looks well, carrying a heavy lode of stamp work: in the west drift No. 2, the breast at present is a solid piece of copper, composed for the most part of closely adhering barrel work with rich stamp work intermixed, but the whole is so closely united and so compact as to resemble a mass. The stopes of the second level between No 1 and 2 shafts, have turned out poorly, but I believe there is copper in the backs which it will pay to get out; I will commence sinking a fourth lift in No. 1 shaft, about 1st Dec, and from its appearance I expect something good On the whole, the present prospect is truly encouraging, and I am hopeful of shipping a fair amount of copper next season. Should the mine continue to improve in sinking, we shall require a steam engine next fall, as our depth at *that* time will be greater than horse whims can economically work in Depth is what this mine requires, and I am sinking shafts No. 1 and 2, as fast as circumstances will permit.

BOSTON AND LAKE SUPERIOR CONSOLIDATED COMPANY.

The latest report from this mine states that there are two veins on this Company's lands which have been traced over 300 feet by open cutting, and there is over 2,000 feet more of the Company's property through which, by their direction, they undoubtedly extend.

The shaft is down 70 feet—60 feet of that distance being in the rock. It is 5 by 8 feet.

For the first 20 feet down, the vein is from 3½ to 4 feet wide, after which for 35 feet the vein equals the shaft in bigness, so that the hanging wall is lost sight of in that cutting. In the last five feet they have again struck the wall, the vein being fully five feet wide.

It is thoroughly impregnated with shot-copper through its whole width, and is very rich, and increasing in richness with depth. It is said to be superior to the Clark, though their show is excellent.

MANITOU.

This mine was last noticed on pages 433 and 558, Vol. II. Later reports state as follows:—

The winze on this mine is down 52 feet; the vein is now in two branches, one on each side of the winze, about two feet wide, and very rich in copper. The same vein in drift No. 1 is in two branches, and in the drift between them they are 3 feet wide, and as rich as in the winze. This drift is now in 363 feet, and only about 137 feet south of the shaft sunk last summer. No 2 south drift is in 100 feet, they have cut several veins, feeders and branches, all filled with copper; the largest is 15 inches wide. It only wants sufficient depth driven on No. 1 vein to prove the mine satisfactorily.

MEADOW.

The vein is very rich, and several small masses have been taken out. It is from 14 to 16 inches wide, and contains an average of 50 per cent. of copper.

TOLTEC MINE.*

Later reports than those to be found on pages 197 and 315, Vol. II., are extremely favorable respecting this mine.

The mine has improved wonderfully in the second level. We have a large vein full two feet thick standing, west of No 3. Part of the vein has been taken down, and is heavily charged with stamp work, and with considerable barrel work. We cannot bore in the vein, in a great many places, on account of copper. We are in about 50 feet, and the walls are as regular as they can be. Drift east of No. 3 is about 35 feet, here we have a large vein full of stamp copper. In a great many places we cannot bore into the vein on account of solid copper. East of No. 2 on 2d level, the vein is looking well, over two feet thick and full of stamp work. We have taken down the vein in stopes, west of No. 3, and it is as rich as ever in small chunks and stamp copper. The vein will average three feet in thickness. In back of stopes pieces of copper are in sight. A large strip of vein will be taken down in a few days east of No. 3, and from all appearances we will get a large amount of copper.

ALGOMAH.

This mine was last noticed on page 197, Vol. II. Later reports state as follows:—

At the Algomah the vein is as large as ever. The vein cannot be taken down, until we commence stoping. The miners put very heavy blast behind it, but could not blast it down. Small pieces of copper are in sight and I would not be surprised if there was a small mass. The shaft is down about six feet, and we have commenced sinking No. 2 shaft. The vein is over two feet thick and full of stamp copper.

Another letter speaking of this mine says:—The Algomah has a "splendid show" indeed. The vein in No. 1 shaft is fully three and a half feet wide, and filled with rich barrel and stamp work. They have got the vein in No. 2 shaft, and I hear it is looking equally as well as the other.

PHOENIX MINE.

Everything at the Phœnix looks well, and a new vein has been discovered, between the old vein and the East Phœnix, that looks remarkably well, and opens better than anything heretofore discovered upon the location. The East

* For some particulars of the Toltec, Algomah, Glenn, Winthrop, Dana, and other mines, see "Commercial Aspect of Mining Interest" in preceding pages.

Phœnix vein where it is being opened I consider one of the best shows upon the north side of the range; the vein is two and a half feet wide and well filled with copper.

CONNECTICUT MINE.

The Connecticut looks well. No. 1 shaft is down 70 feet, No. 2 90 feet. All the rock taken from No. 1 shaft is good stamp work.

THE EMPIRE MINE.

We bring up the reports from this mine, which have been kindly forwarded to us, from our last notice on page 437, Vol. II. We would here state to Superintendents of mines that if they desire the public to be rightly informed of the progress of operations under their supervision, there is no persons so capable of giving us correct information as themselves, which will always be duly credited.

Mr. E. C. Hungerford, the Agent, writes Feb. 25th:—

Last night the miners ran across that mass of copper in shaft No. 1, only it was not full grown. They took out several beautiful pieces of copper, the largest weighed six pounds; the others were smaller, but they are beautiful. They are surrounded with quartz, and the small ones are filled with it.

We have just completed a house over shaft No. 1, it being so deep as to be in but little danger of injuring the roof by blasts below. The shaft is now timbered from three feet in the rock to the surface,—in all twenty two feet of timber, which is all of cedar, hewn on the inside, and is called by visitors a first rate shaft. In this, as well as all our work, I have tried to have it well done, considering it true economy.

The shaft is six by eleven feet. I let the first contract in the rock the 20th instant, to a party of four miners, to sink thirty feet, which will, as you will see by the plan, bring us to the adit level. I have some men cross-cutting at the point marked on the map, near the cedar swamp; as soon as we strike the vein I shall commence the adit level, and drift south as fast as possible, thus draining the surface water from shafts Nos. 1, 2, and 3, as soon as they can be reached.

Again on March 18th he writes:—

Our vein is now looking first-rate; we have taken out one mass, since my last letter, weighing 17 lbs. Our entire vein is rich stamp work, better than any we saw at the Iron City Shaft. We are getting out daily snags and pieces of pure copper from one or two ounces to two or three pounds. This mine is taking out more copper than any mine this side of the North-West,—it will bear praising.

MISSOURI MINES.

A correspondent writing to us from St Louis, states some interesting particulars relative to the metalliferous wealth of that rich State:—

Dear Sir:—You will please send your Magazine to the "Stanton Copper Company," addressed to St. Louis. The work is desired from Vol. I. No. 1.

I have myself felt much solicitude that your work (to which I am already a subscriber) should prove worthy of the cause in which you have enlisted. So long as you continue to give us facts from practical men, rather than theories from book-men, you will accomplish great good for the country.

The mining interest of the United States, particularly gold, copper, lead, nickel, cobalt, and coal, only needs the spread of knowledge to give it rank among men of capital, and take the management of mineral affairs out of the hands of mere stock-jobbers.

At some future day, we shall make arrangements here to post you up in regard to the metalliferous wealth of Missouri. This State has 20,000 square miles of lead, copper, iron, nickel, and cobalt. But the geology and mineral character of the State is not yet even partially understood.

The Company for which I have ordered your work are now developing a mine which promises results that will astonish the uninitiated. The opening of it throws a flood of light on the metalliferous geology of the State. And fortunately the mine is in hands that hold it to work, and not for sale in any stock-jobbing operation.

If your mining men in New York (such as the American Mining Company) were rightly advised in regard to Missouri, they would scarcely find it necessary to go so far as Cuba to work mines. Truly yours, R. S. E.

NEUVITAS COPPER COMPANY.

The mining property of this Company was last noticed on page 201, Vol. II. The President of the Company, Mr. F. G. May, thus reports the progress of operations: -

The number of laborers employed is 28, and it is intended to increase the number to 60 or 70. The rollers and crushers are ready for use, and the buildings of the Company will be sufficient for many years to come. The shaft is down 51 feet, and about half a ton of ore is taken out of the first level by two men. The Superintendent believes that at the depth of 80 feet he can take out 5 or 6 tons per day. It is expected that this Company will have ready for shipment on the 1st May 201 tons sulphuret of copper, averaging 25 per cent.

ISABELLA COPPER MINE.

The location of this mine is described on page 422, Vol. I. Recent accounts from the mine state that the miners are turning out large quantities of copper ore—have some three hundred tons now ready for the smelting works, and could have had more by this time if it could have been removed.

The Captain of the Isabella writes, under date of April 13:—It will be just eight months, the 22d of this month, since the first pick was stuck in the ground on this mine, and within that period we have driven 285 feet of levels—350 feet of open cut—have sunk 87 feet of shafts—No. 1 57 feet, and No. 2 30 feet; have built ore floors, dressing-house 30×60 feet, smith shop, boarding-house, dwelling-house, etc.

DOLLY HIDE MINE.

In regard to the Dolly Hide Mine, *The Liberty Banner* says:—

The delivery from this mine in a few weeks will most likely be over 100 tons of superior ore per month, regularly, and the advantages of the low rate of transportation on the Baltimore and Ohio Railroad to Baltimore, where there is always a brisk demand for it, must make it pay well. The mine has been steadily increasing in value for the last six months, and the developments made within the past month on the west side of the Dolly Hide stream, we are told, fully meet the most sanguine expectations of the owners.

PER CENTAGE OF ENGLISH COPPER.

From July 30th, 1852, to July 30th, 1853, there were sold of copper ores in Cornwall 180,095 tons, and in Swansea 29,240 tons, making in all 209,335 tons, producing 16,202 tons 18 cwts. of fine copper; which is equal to an average produce of 7.74 per cent.

CAPE OF GOOD HOPE.

The following statement will present some idea of the mining operations at the Cape of Good Hope at the recent dates. The reports of gold discoveries, although at present indefinite, are, to a certain extent, doubtless correct.—

At the Cape mining operations were occupying a large share of attention. Mr Sowerby, a geologist, who had been sent out by a company in England to make investigations at Natal, had arrived at Cape Town, on his way home, when the Maitland Mining Company engaged him to go up to their mines, and make an exploration. It was reported he had discovered gold mixed up with quicksilver upon their property, about 18 miles from Port Elizabeth. Extensive deposits of copper had been found in Namaqualand, and the adjacent country, which was exciting considerable interest among the merchants, and several small companies had been formed to work on lands they had leased from the Colonial Government. Upwards of 100 tons of copper had been received during the past year in Cape Town. Orders have also been given to employ some scientific men to investigate and explore the lands of the Clanwilliam district, some of the leading merchants at the Cape having obtained leases from the constituted native authorities, granting them the exclusive right of the opening and working copper and other mines upon tracts of land occupied by aborigines and others, at and about the Rhenish missionary station of Steinkope, between the Buffel and Orange rivers.

AMERICAN MINING COMPANY'S MONTHLY REPORT FROM THE MINES.*

(Prepared for the Mining Magazine.)

Norwich Mine.—[Extract of letter from A. C. Davis, Agent, April 2d, 1854.]—"Our mill has been running two weeks and a half and works finely. We had one battery of four stamps in motion last week, and have another battery done. The engine works as well as could be wished for.

"The bottom of shaft B is rich in mass copper, as are the sides in going down. The 3d level east has mass copper both in top and bottom. The 3d level west, for the last 20 feet has shown mass copper. The 2d level west shows a large lode well charged with small masses and barrel and stamp work. Stope No. 1 east shows mass copper. Stope No. 3 back of 3d level west, shows small mass copper and barrel. The balance of stopes, good lodes of barrel and stamp work. Winze in bottom of 2d level west has a good lode of stamp and barrel work. Winze in bottom of 3d level west of shaft, shows signs of mass copper. In all respects the mine looks as promising as I ever saw it. The copper we have ready for shipment is certainly good for 75 per cent."

Windsor Mine.—[Extracts of letters from D. Plummer, Agent, and A. C. Davis, dated March 20th, 1854.]—"This mine is looking well. The winze is down to the 2d level. We are now getting good copper in this level going westward; we took out one piece weighing a hundred pounds, and there is another piece in the end of the drift which from appearances will be much larger. I shall have a good deal of stoping ground that I can beat down during summer. I have done no stoping this winter. There is now at least four tons in sight, in large and small masses. On the *new vein*, I spoke of in my former letter, the shaft is now down 30 feet, and I have got part of the vein in it, which looks very well indeed."

April 2d, 1854.—"The Windsor is looking as big as ever, and will ship a good lot of copper this summer."

* These reports will hereafter be continued every month in this Magazine.

Derby Mine.—[Extracts of letters from S. S. Robinson, Agent, and A. C. Davis, dated April 1st, 1854.]—"The shaft in the north vein is now down 57 feet. The vein is still regular, and strong, but not as rich as it has been. The shaft in the south vein is down 50 feet and is looking better than I have seen it before since I have been here. The ground contains soft epidote, quartz, and something much resembling soapstone. This soft ground is now carrying some copper."

April 2d.—"The Derby south vein is improving. The north vein is about as when I last wrote."

Sharon Mine.—[Extract of letter from A. C. Davis, April 2d, 1854.]—"The Sharon lode is very encouraging. Have one shaft down on this lode 31 feet. The lode is from 18 to 20 inches wide, with stamp work and an occasional chunk of barrel work. The north vein we are drifting east and west from shaft No. 1, at a depth of 80 feet."

San Augustine Mine.—[Extracts of letters from H. P. Chamberlin, Agent, dated April 12th, 1854.]—"We are looking very well in our underground works. The winze still shows a good lode, looking best as it goes east."

April 28th.—"We have steadily progressed with our drifts to the east and west of the main workings in the winze. These ends have not shown as rich a yield of prill ore as in previous months, but still continue to show a fine quality of spar well mingled with yellow ore. The lode seems to be making down in full force. In the 12 fathom level going west, have commenced a cross cut, in a section of the mine never worked before, and of fine promise. The ground is killas and spar, with a very good kind of yellow ore. I expect to reap a rich yield in the stope, as the workings around the shaft at 10 fathoms had some beautiful gray ore and red oxide."

[From R. Gibbs Esq., Neuvitas, April 30th, 1854.]—"You will see by Mr. Chamberlin's report, he is driving away, and will have a good-sized vessel's cargo to go shortly. He has a handsome pile of prills. In fact every thing goes like clock work, and looks prosperous at the *San Augustine*."

San Antonio Mine.—[Extracts of letters from James Porter, Agent, March 23d, 1854.]—"I have some of the best miners on the south lode, stoping away from 1st level in Presdencia shaft at 36 feet from surface. Am also driving in Lloyd shaft, at the 2d level, 100 feet from surface. The appearance of the ground for the last 10 feet in the Isabel shaft, give as good indications for ore, as any ground we have gone through in the whole workings."

[From R. Gibbs, Esq., Consul, Neuvitas, April 30th, 1854.]—"Mr. Porter is more sanguine, and I have no doubt will make a good show from San Antonio. From my own knowledge, and information from the former Director, I have every confidence that he will soon be turning out large lots of malachite."

Cabarrus Mine, N. C.—[Extract of letter from H. B. Fairbanks, April 21st, 1854.]—"We have struck a good lode 10 inches wide, in the drift from Bevan shaft, at 42 feet east from the shaft. Fink shaft is cut down 24 feet and the timbers set in."

[April 22d, 1854, from William Everhart.]—"The drift in the Pitts shaft is 25 feet, vein 5 inches wide, drift in Bevan shaft is 16 feet, vein from 10 to 12 inches thick, and the ore is good. The carpenters have the framing all done."

[May 4th, 1854, from A. A. Parker, General Agent.]—"We have just got at the vein in the Bevan shaft to-night, and took out about 5 bushels of ore. It looks well, being some 6 inches in width and increasing.

"The drift in the air shaft promises to be one of the best places in the mine, being some 12 or 14 inches in width, of rich brown ore. I have no fears but that we can get ore enough in this country."

May 19th.—"The foundation for engine is all dug, and the engine building up and enclosed. The separating building timbers are all ready to be raised, and our lumber and shingles all on the spot. Stone and mortar are on the ground, ready to lay foundation to engine and crushers. Our shaft is ready for the pumps; a comfortable office and good barn built; and the vein proved for over 2,000 feet, with some ore on surface."

Jamestown Mine, Wisconsin.- [Extract from Report of W. B. Colburn, Agent, May 10th, 1854.] — "Some 3,000 to 4,000 lbs. of mineral was taken from the south side range where the quartering crevices cross it, and was raised at the pump shaft.

"There are three shafts on Engine range marked M, N, and O, the last of which is engine shaft. We have got several thousands between N and O in new ground, and there is still more in sight.

"I sunk one shaft on the south side range marked X, down to water, and have it drifted each way in all 80 feet. In the end of the drift going east there is some mineral in sight.

"The pump shaft is now down 120 feet and is working very well, with a fair appearance of another opening not far distant.

"The next range south is the Obishawn range, on which there is but one shaft, P, in which we have done any work. It appears to be very hard rock, but every pocket in the rock is full of fine ore, and there is a thin sheet all the time in the crevice as we go down.

"The next range south is the Ellson range, on which I have sunk two shafts Q and R. From these shafts I have only taken 1500 pounds mineral.

"The next range is the Thomas range, and has yielded considerable mineral. I have sunk three shafts upon this range, T, U, V. The mass of the mineral in this range was found in drifting from W west to T, just below old works. In almost all the places where we found mineral, and took it out, we left it good below, and in some places above. In sinking and drifting T, we got 5,000 lbs of mineral.

"The shaft V was sunk down to water. The first opening was small, but had in it some very fine specimens of ore.

"On the Burns range is shaft I, which is being sunk. They have just got to the *cap rock* to-day, and have hit the crevice exactly; have got at least a dozen pounds that mineral on top, with a *sheet* sticking in the crevice.

"On the Liddle land are shafts F, G, and H. The latter is a new shaft, where they have not been long at work, but have raised many thousands; at G, an immense quantity has formerly been taken out. On the Cave range is shaft Z, this I am now sinking. Also on the old Engine range, shaft Y. These two are among the best ranges in the country. Since I have begun writing, the miners in drifting in the shaft X before spoken of, on the south side range, have struck mineral and took out 800 pounds, and it looks well ahead."

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

SILVER COINAGE IN 1858.

The silver coinage of the United States, England, and France, in 1858, was as follows :—

United States.	England.	France.
$1,570,514	£701,341	f30,069,778

OPERATIONS OF THE AMERICAN MINING COMPANY IN WISCONSIN.

A statement of the location of this Company in Wisconsin was made in page 203, Vol II. We are indebted to the editor of the *Jeffersonian* at Galena, for the details relative to the Company's operations and their progress : —

The American Mining Company, a well known and wealthy organization, of which F. E. Phelps, Esq., of New York, is the President, has been, as our readers are aware, for about a year past engaged in an enterprise near Fairplay, Wis., within twelve miles of this city, which is of no small interest to the owners of mineral lands, and the people of the mining district generally. A few days since, we visited the works of the Company.

The ground upon which the principal shaft is sunk, is owned by the Company—twenty acres in all. It is a part of the high land midway between the Sinsinawa Mound and the lower country adjoining. Contiguous to their own ground, 800 acres belonging to the monastic order of St. Dominique—a part of the endowment of Sinsinawa Mound College near at hand, under the supervision of Rev. Father Jarboe, the Prior—have been leased for mining purposes upon favorable terms. Much mining has been done upon this ground in years past, but it has been like too much other digging hereabout, only superficial. The frequent half filled shafts, sucker holes and pits, attest the success of the labor expended there heretofore. Not only this locality, but numerous others, were carefully examined by Dr. J. G. Percival, the eminent practical geologist and mineralogist, before a blow was struck. Upon the strength of his opinion touching the mineral resources of the country in general, and particularly upon the prospect there promised for a speedy return of any amount of money that might be judiciously expended, operations were commenced by the erection of a permanent engine house and machine shop, together with other buildings necessary—a residence for the agent, barn, etc., etc. An excellent engine of some thirty to forty horse power was set up, and for the first time in the history of the lead mines, we were enabled to say, that a mining company with money and a willingness to spend it, was fairly at work.

At the period of our visit, we found every thing in complete working order. The pump shaft has been put down one hundred and fifteen feet, from which a ten-inch pump, of the latest and most approved construction, was lifting a miniature flood at every turn of the wheel. The operations in this shaft are continued without intermission day and night. As the shaft deepens, the water, as the miners have it, becomes "stronger," and we learned that the agent is daily expecting a pump of greater capacity, with which no difficulty is anticipated in keeping the numerous shafts entirely dry.

At Fairplay, as elsewhere in the mines, mineral is found to exist in ranges or crevices in the magnesian lime rock. These, upon the Company's grounds, are about sixty yards apart. Six ranges have been opened, running parallel with each other, and all affording abundant evidence of the existence of valuable bodies of ore. Upon these six ranges thirteen shafts have been sunk—most of them to a level with the bottom of the pump shaft, or as near that level as the water will permit. The quantity of mineral already raised in their preliminary operations, is sufficient to justify extravagant hopes of future developments. As it is not the object of the gentlemen engaged in this enterprise, to make a show on paper, for the purpose of creating a market for their stock, all digging done thus far has been with a view to "prove" the ground—to ascertain the existence, probable richness, extent and direction of the lead bearing veins. Where lead has been encountered, it has been worked out, simply to remove it, but not with the intention of following the vein until, in miners' language, it "peters." When the ground is thoroughly tested, and more powerful machinery is set up, we may expect a rich reward to the capitalists who have the enterprise in hand. At present, this mine gives employment to fifty men—miners, engineers, and laborers.

Without asking the question directly, we are of the opinion, from what we saw, that the expenditures up to this time have been not far from $30,000. We understand that it is not the intention of the Company to discontinue their operations until that amount is quadrupled—sunk without prospect of return. That success will not crown their efforts, no man who is familiar with what our country contains, will, for a moment, believe. It is possible that they may meet with drawbacks and discouragements—with obstacles that would, to an individual, be insurmountable; but we have no doubt that their reward will be so signal that the example they have set will be widely imitated. Indeed, the encouragements are so many that this same Company have already leased, in the neighborhood of Hazel Green, 1,600 acres of valuable mineral ground, upon which, during the summer, more powerful engines than the one now at work at Fairplay will be set up.

It is hardly possible to calculate the effect upon this country, that the undoubted success of this Company's experiment would produce. The mining district is not less than 100 miles in length by 40 miles in width. In every township, inducements are held out for the employment of capital, but little or not at all inferior to those which set the works at Fairplay in operation.

When it shall be demonstrated that associated capital may be profitably employed in the search for lead ore, the whole country from the Wisconsin river to Savanna, will rise into instant importance as the richest mining district in the world.

SILVER MINES IN CHILI.

Little is known in this country of the mineral wealth of Chili, and especially of the richness of its silver mines. The following facts respecting them are stated by Mr. Wm. Sincock. They are quite explicit. On page 439, Vol. II. of this Magazine, will be found many facts concerning the mineral weath of this South American Republic :—

The rich and highly-famed mineral district of Agua Amarga de Chili was discovered in October, 1811, by Jose Paco Hecuione, and is situated 24 miles south of Ballenai, city of Huasco, with an excellent horse-road, which can easily be made available for carts. It is well provided with wood and pasture, and has six watering-places. The discoverer known by the name of Chamblas first found the vein called Portizuilo de Zuleta. Agua Amarga contains at least 150 mines opened, although only the following are actually being worked: Caldera, Ariz, Monto de Astongo, Francelo, La de Mieres, Espejo, Fuiberta, Veles, Suena, and Sucavon.

The class of metal to a certain depth is horn silver and native silver, but further down changes into arsenical silver ores of a fine rich quality, and of a varied class, containing in many instances as much as 50 per cent. and upwards of silver—average produce, say 300 marks per every 6400 lbs., equal to say 50 lbs. of silver per ton of ores. This is a low average, the Ariz mine gives about 400 marks per 6400 lbs.

This mineral, entirely isolated, has almost a north and south direction, and for an extent of two leagues, by one league in width, the stratum is good, even better than in the best of minerales of Copinpo, and prolongs itself to the very base, without any change in form, from which it is universally inferred that the rich silver stratum continues to a great depth. The deepest mine in the Caldera is 150 fathoms below surface; others generally are not above 20 or 30 fathoms.

The mineral is undoubtedly the most celebrated of all Chili, from the epoch of its discovery, and from its having contributed its riches to the emancipation of Chili, the national treasury having received immense sums, not only as duties on the produce, etc., but being also enriched by the inhabitants of Huasco, who made extensive voluntary donations to sustain the expenses of the war at that time.

Produce of silver mines in Chili from 1811 to 1848.—Rincon de Navarron, $824,000; Restauvadora, $202,000, Mine Ariz, $352,000, Compania, $24[illegible],000; Caldera, $162,000, Pluta, $648,000; Veliz, $105,300; Los Chies, $121,500; Cortadera, $162,000; Discobredora, $93,000; Ohamader, $409,000.

LEAD PRODUCT OF GREAT BRITAIN.

The estimated lead product of Great Britain in the five years from 1848 to 1852 inclusive, was 450,880 tons of ore and 308,108 tons of lead.

SILVER PRODUCED FROM THE MINES OF GREAT BRITAIN AND IRELAND IN 1852.

Locality.	Proportion of silver in each ton of lead in ounces.	Total ounces of silver produced in each district	Value.
Cornwall, . .	35	250,0[illegible]	£62,[illegible]
Devonshire, . .	40	9[illegible],[illegible]40	22,[illegible]65
Cumberland, . .	9	52,[illegible]98	13,223
Durham, Northumberland, and Westmoreland,	12	191,736	47,934
Cardigan, Carnarvon, and Caermarthenshire, .	15	91,650	22,990
Flintshire and Derbyshire,	7	47,183	11,7[illegible]
Montgomery and Merionethshire,	6	5,662	1,3[illegible]
Ireland, . .	10	22,2[illegible]	5,[illegible]55
Scotland, . .	8	19,[illegible]48	4,7[illegible]2
Isle of Man, . .	20	56,700	9,375
Total, .		818,325	£205,080

It is stated that the quantity of silver produced from British lead in 1852 was about 818,325 ozs., valued at 205,080*l.* The imports of silver ore have been rapidly increasing, but cannot, it appears, as yet be correctly ascertained; it is asserted, however, that 10,000*l.* worth are sold regularly each week at Swansea, and a larger quantity at Liverpool. This table discloses the distinctive qualities of the quantity of silver contained in the lead ore of the different parts of the British Isles. Thus, we have Devonshire the highest, and the portions of Wales said to be most rich in auriferous products, the lowest. The disproportion between the northern and southern counties of England is very striking; the quantity of silver in the lead ore of Ireland exceeds that found in the lead ore of Scotland, and that in the ore of the Isle of Man considerably exceeds both, although greatly beneath the ore of Cornwall and Devon.

GOLD AND SILVER IN DERBYSHIRE.

The singular discovery has just been made that a mine at Over Haddon, near Bakewell, produces both gold and silver metal in small quantities. Some of the proprietors being struck with the color of the ore, caused it to be assayed; and were not a little agreeably surprised to find that it produced about 6*l* 10*s* worth of silver to the ton of ore. A further assay has given the presence of gold.—*Derby Reporter.*

NEW DISCOVERY IN SMELTING.

Many silver-lead ores also contain copper, which not only embarrasses by its presence the extraction of silver, but in the end is totally lost. Many plans have been suggested for removing the copper out of the slag, but all inapplicable on a large scale. If we are to believe the testimony of a Russian mining agent, M. Guerngross, superintendent of the smelting works of Zmeinogorsk, in the Altai Mountains, this difficulty has been successfully overcome. His plan, at all events, is rational, and deserves to be tried. It consists in subjecting the slag, either alone if it contain sulphur, or mixed with sulphate of soda if necessary, to a process of slow roasting, and washing the residue. The roasting operation generates sulphuric acid, which, uniting with the copper already oxidized, forms a soluble salt of copper, which can be easily washed away. This method, remarks the discoverer, may be applied to many ores of copper and silver, as well as slags, requiring neither lead, nor mercury, nor salt, for the purpose of removing the copper. Its advantages are thus obvious. Instead of the complex operations now followed, it would suffice to stamp the ore, pass it through a sieve, roast it, and wash it, by which means removal of the copper would be effected.—*London Mining Journal.*

VALECILLO MINING COMPANY.

The property of this Company will be found very fully described on page 570, etc., Vol. I., and page 34, etc., Vol. II. We herewith present a plan of the old and new works at "Jesus Marie," one of the mines of the Company in Neuvo Leon, Mexico.

It shows the surface operations, the engine houses, the offices, the ovens for refining the lead ore, and in general the inclosed hacienda, where the ores are amalgamated. It is on the same plan for operations which is adopted at all the extensive silver mines in Mexico, full details of which will be found on the preceding pages above referred to.

The mouth of the main shaft, which was opened in former years, is seen opening within the hacienda, or large square yard.

On the left is placed one of Bull's engines, manufactured by Thomas, Corson & West, of Norristown, Pennsylvania. It is of one hundred and fifty horse power, and the largest engine on the Cornish plan ever manufactured in this country. The cylinder is placed over the shaft which has been opened by the Valecillo Company.

The oldest workings commence on the right, and go down something like an inclined plane. The mineral there taken out was all carried up on the backs of men.

The old shaft, which comes up in the hacienda, was subsequently opened, and cut the new vein, and the workings were extended. By reference to former pages, as above noted, the small plan representing a perpendicular section of the veins will be found described.

From the portion of the workings named "Pozo of Corpus Christi" the present Company have sold $20,000 worth of silver bars. This part of the mine was temporarily drained by means of force pumps, with which the water was forced up into the old shaft on the right, but the method proving so expensive the Company abandoned it and procured the new engine of Thomas, Corson & West.

The old shaft was sunk eighty varas, and the new one on the right goes down the same depth, so that a complete ventilation is secured through the mine.

The work to be performed during this year and the ensuing one will open a very large section of ground below the point of the junction of the veins.

Those of our readers desirous of comprehending the system of operations in practice at the most productive silver mines of the world will find much satisfaction by investigating this map, in connection with the ample details furnished in the pages of this Magazine above referred to.

al of Silver and Lead Mining Operations.

VALECILLO MINING COMPANY.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE FOR 1854.

	Tons.
Shipments from Richmond to close of week ending May 13th,	357,805
Same time last year,	289,960
Increase,	67,845
Amount sent by Reading Railroad, to May 13th,	701,175
" " Schuylkill Canal,	211,702
Total,	912,877
Same time last year,	701,089
Increase,	211,788
Lehigh coal shipments to May 13th,	126,486
Same time last year,	131,443
Decrease,	4,957

MARYLAND COAL TRADE.

tatement of coal transported over the Mount Savage Railroad during the ending on Saturday, 13th May; also the amount sent by each Company he year beginning January 1, 1854 :—

	To R. R.	Canal.	Week.	Year.
Frostburg Co.,	1,414	900	2,314	13,067
Borden M. Co.,	1,467	1,015	2,482	14,008
Allegany M. Co.,	1,190	633	1,823	9,124
Parker Vein, "	143		143	248
Total,	4,214	2,548	6,762	36,447

tatement of coal transported over Cumberland Coal and Iron Company's oad during the week ending on Saturday, the 13th of May; also the amount by each Company for the year beginning the 1st of January, 1854 :—

	To R. R.	Canal.	Week.	Year.
Cumberland Co.,	2,748.06	3,468.09	6,216.15	31,127.14
Tho. Ker,	730.03		730.08	9,874.09
Percy & Co.,	445.19		445.19	2,874.09
Total,	3,924.08	3,468.09	7,392.17	48,876.12

tatement of coal transported over the Baltimore and Ohio Railroad from Vesternport region during the week ending on Saturday, the 13th of May; the amount sent by each Company for the year beginning the 1st of ary, 1854 :—

	Week.	Year.
FROM GEORGE'S CREEK.		
Parker Vein Co.,	1,179.07	6,556.16
Swanton Co.,	1,165.19	5,684.16
George's Creek Co.,	1,332.13	9,707.12
Caledonia Mining Co.,	1,205.08	7,106.19
FROM PIEDMONT.		
New Creek Co.,	850.07	10,534.10
Llangollen Mining Co.,	279.07	4,166.13
	6,018.01	43,757.11

ASPECT OF THE COAL MARKET.

Mining of coal is at the present moment prosecuted with more vigor than probably at any previous period. The high prices which existed the last season, and the present bareness of the markets, give the most flattering encouragement to the operators. At Philadelphia sanguine expectations are entertained, which have found expression in the annexed statement from the *North American* :—

Vessels for carrying coal are just now in greater demand at Pictou, Nova Scotia, than ever was known before, and freights there are unprecedentedly high. A similar state of affairs prevails at Philadelphia, and it would thus seem that the supply of coal is largely deficient in the markets of New York and New England, and that the consumption has greatly increased. There is now no obstacle to the production or transportation of coal to tidewater. All the operators of our Pennsylvania mines are fully employed, and the several lines of railroad and canal are doing a much better business than last season, except, perhaps, the Lehigh, which suffered considerably by the spring storms. We have also a railroad connection opened with the Dauphin and Susquehanna mines for the first time, and their coal product is now arriving at our port for shipment. Large numbers of vessels are engaged in the trade, carrying coal to all parts of our Atlantic coast, but the high freight ruling here is an unmistakable evidence that the supply of carriers is not equal to the demand.

Last season the heavy consumers at the eastward neglected to give their orders at the proper time, hoping, no doubt, by delay to obtain coal at lower rates. They were egregiously mistaken in their calculation, as experience has shown them. In consequence of their orders being sent in late, we have had coal ranging at unusually high rates here. It was supposed that with the advent of summer and the opening of the canals, the price of coal would fall, as the supply would be largely increased. But the event has not justified the expectation. Coal is higher now than it has been for several years past, and prices continue to go up. The Eastern markets are reported to be bare of coal, and the demands there for the supply of the factories are pressing. The obstruction of the Lehigh has prevented a large quantity of coal from reaching tidewater, and the damage sustained by the Morris Canal has cut off, for a time, an important avenue to the New York market. Not the least among the causes of the rise, also, has been the complete stoppage, for so long a period, of operations at the mines of the Cumberland region, in consequence of the strikes of the workmen. The consumers of that coal, finding an entire failure of the supply, have been driven by necessity to draw upon the Pennsylvania mines.

Thus all things have conspired to put up prices, and stimulate, to an unwonted degree of activity, the Pennsylvania coal trade. Everything looks auspicious for the operators, and if there should be no strikes of the miners, nor interruption of the canal and railroad lines by breaks, we shall present this season some great results in the way of increase. Already the Reading Railroad and Schuylkill Navigation are far ahead of their coal tonnage of the parallel period of last season, as our readers will have noticed by the statements.

While rejoicing in this prosperity, and viewing, with satisfaction, the great demand for our coal, we cannot refrain from expressing regret that means are not adopted to increase the supply of coal in our markets sufficiently to reduce the price. It is at present so high as to act as a stimulant upon the operations at other regions. In consequence of it, we find that the Pictou coal is largely in demand at the eastward, and freights there are ranging higher even than they are here. So, also, it has caused a settlement of the wages dispute between the Cumberland operators and their miners, and the resumption of mining in that region with spirit and vigor. Parties interested in the Pennsylvania coal mines should take these facts into consideration; as to those who can properly estimate their bearings, they are indicative of the truth that we must be watchful lest we build up formidable rivals elsewhere by maintaining prices too high here. Unhealthy present profits will thus be dearly purchased at the expense of future competition with powerful rivals, and the losses consequent thereupon.

CUMBERLAND COAL COMPANY.

The following is a statement of the condition of this Company, April 1st, as submitted to the stockholders by the President, Mr. A. Mehaffey.—

Railroad, rolling stock, mine cars, machinery, etc.,	$575,316.65
Canal boats, steamers, schooners, barges, and other personal property, and real estate in the cities of Cumberland, Alexandria and Baltimore, .	464,079.42
Mining lands, improvements at the mines, etc., .	4,595,897.71
Cash assets, bills receivable, and balances due on accounts, ...	267,197.52
2,522 shares of the capital stock belonging to the Company, ...	$5,902,491.40

The above property comprises 12,000 acres of coal lands, on which 5 mines have been opened and worked; 11 miles of locomotive railroad, extending from the Company's town of Eckhart to Cumberland, and connecting with the Chesapeake and Ohio Canal and the Baltimore and Ohio Railroad; mine railways extending from main track into each opening; 5 locomotives, 70 hopper and gondola cars; 400 mine cars; horses, implements and machinery for mining 2,000 tons of coal daily; several acres of land in Baltimore and town of Cumberland (purchased for coal yards, depots and wharves for future wants of the Company), of great value, and extensive wharves and wharf-room at Alexandria, 44 barges, of 200 tons, plying inland from Baltimore to Philadelphia and New York, built by the Company within the past year; 54 canal boats on the Chesapeake and Ohio Canal; 12 sailing vessels, of from 200 to 600 tons burthen, built expressly for the Company within the past year; and 2 steamers employed by sea; all of which property is paid for, and on which no incumbrances or liens of any kind exist, except the funded debt referred to below, which is a lien upon the coal lands and railroad only.

The surface of the tract (underlaid with coal) is largely improved and cultivated. On the property there are over three hundred dwellings, machine-shops and engine-houses. The total tonnage of the road in 1853 was 240,000 tons—a large number of passengers were also carried over the road during the year.

The Company has no floating debt. Its bonds, originally $825,000, were anticipated, paid and cancelled to the amount of $288,000, leaving outstanding $537,000.

Since the resumption of work, the Company has already dispatched a daily average of 833 tons of coal to market, and is constantly increasing the quantity.

ACTIVITY OF THE CUMBERLAND COMPANY.

This Company, in the first working year of its existence, is sending more coal to market than was mined by the Lackawanna Company, (Delaware and Hudson Canal) in any year until after 1847, a period of more than fifteen years after the completion of its works. It took the Lehigh district a quarter of a century to produce 320,000 tons per annum, and the entire Schuylkill was ten years in producing 340,000 tons per annum. The history of mining coal shows no parallel to the Cumberland district in the increase of coal.

THE CALEDONIA MINING COMPANY.

We have received a letter from a friend at a distance making inquiries in relation to the property of the Caledonia Mining Company, and more particularly asking whether the price paid—$1000 per acre—was not extravagantly high. Now, although it has not been our habit to answer such questions in the columns of our paper, yet in compliance with the desire of one whom we highly esteem, we shall depart from our usual course on the present occasion.

The mines of the Caledonia Company are situated on the Lonaconing Railroad in the George's Creek Valley, about five miles from the Baltimore and Ohio Railroad at Piedmont. They consist of 352 acres of the purest 'big vein' coal of the Cumberland region, which, without any exaggeration, is fully fifteen feet thick at this point. The coal is of remarkable excellence, being as free from sulphur, slate, iron pyrites or any other impurity, as any similar mineral in the world. It may be thought by some that we have over estimated the thickness of the vein that underlies the whole property of the Company. Such, however, is not the case; for whatever may be the mode of calculation, it will be found that it will come up to the mark we have assigned it. Let us then make an estimate of the coal contained in this property.

In an acre of land, underlaid by a vein of coal fifteen feet thick, there are 24,200 cubic yards of coal. Now as one cubic yard will yield one ton of coal, there are consequently 24,200 tons of coal in each acre; and as there are 352 acres in the Caledonia tract, all underlaid with coal, there are seven millions and forty thousand tons of coal in the entire property! And if 4,200 tons per acre be allowed for waste, which is ample in mines constituted as these are, still here will remain a sufficient quantity of coal to furnish a supply of one hundred thousand tons per annum for more than seventy years!

But let us go further and make some estimate as to the value of this coal. It may certainly be said that if it is worth anything at all, as it lies in the ground, it is worth five cents a ton. That surely will be conceded by the most skeptical as to the value of coal property. Well, at the low value of five cents per ton, each acre, containing 20,000 tons of available coal, is worth one thousand dollars—the price paid by the Caledonia Mining Company. If, however, we estimate the royalty at sixty cents per ton, the price paid in Pennsylvania for coal more difficult and expensive to work in every respect, then every acre of this property is worth the sum of twelve thousand dollars!

These calculations may surprise those who have never seriously reflected upon this interesting subject. They will, nevertheless, be found to be based upon correct premises and to certain reliable results. We have made them in relation to the Caledonia Mining Company for the reasons stated in the commencement of this article. We are well aware that they will hold good for many other coal properties in this region.—*Cumberland Journal.*

EXPLOSION AT ENGLISH COAL PITS, VIRGINIA.—PRINCIPLES OF VENTILATION, ETC.

The English Coal Pits are located in Chesterfield county, about fourteen miles from Richmond, in Virginia. These mines have been worked for a considerable period. An explosion occurred there on the 15th May, which destroyed twenty valuable lives. It is so recent that little is known as to the cause, no investigation having taken place at the time we write this. A visitor to the scene of destruction thus writes:—

The explosion took place about 12½ o'clock, and must have happened just at the time when the miners had ceased their labors and were eating their dinners. How it originated it is impossible to tell at this time, though the presumption is that some of the men thoughtlessly approached some of the old "damps" with their lamps, and that the explosion was caused by the escape of gas from unknown leaks. Certain it is that not ten minutes before the accident two of the miners ascended the shaft, and up to the time that they left no gas or foul air had been discovered. The pit is six hundred and twenty-five feet deep, and explosions have occurred in it two or three times before.

In connection with this deplorable occurrence, we will here notice a late English colliery explosion, which has been under judicial investigation, and serves to show how little can be determined as to the immediate causes even by the most scientific and experienced, how important is a proper system of ventilation, and what are the views of the English Government Inspectors on the subject. We compile these important points from the lengthy notice of the proceedings before the Coroner's Inquest in the *London Journal*:—

Another appalling explosion in the Arley Mine of the Ince Hall Coal and Cannel Company, in the vicinity of Wigan, with a fearful sacrifice of human life, eighty-seven or eighty-eight human beings having perished, has been added to the long and sad catalogue of previous catastrophes. The Arley Mine is situate between the Leeds and Liverpool Canal, and it is not a little remarkable that a similar explosion took place in it in the month of March last, in which fifty-eight persons were killed. The downcast shaft appears to have been four hundred and fourteen yards deep; the upcast or furnace shaft, which is thirty-three yards further to the north, is a little less deep, but the workings under ground are very extensive, and are admitted to extend to the north side nearly three-quarters of a mile, but as others assert much further. About ninety colliers worked in the mine, with the other persons necessarily attached to them, so that the total number who descended on Saturday last, the fatal day, rather exceeded two hundred and fifty. The fatalities resulting from the explosion appear to have been confined to the workings on the north side of the downcast shaft, and although the weather was very tempestuous, it does not appear that any interruption of the ventilation was observed, or that it had been necessary to damp the furnace fire, to which the previous explosion had been attributed.

It would seem, from the details of the survivors, as yet imperfectly presented to the public, that sulphur was in excess. Some of them stated that they could not stand the sulphur, by which they were completely overpowered, and it is alleged that at one point it was so strong that a man was forced back by it, and ultimately lost his life. It has been stated by a correspondent of the *Times* from Wigan, that the workings at some points extended even two miles from the pit shaft, and that there was not any air pit or shaft for the whole distance; and the writer further asserted that it was next to an impossibility for a sufficient quantity of good air to enter from one shaft into such extensive workings. If this statement, which we can hardly consider correct, is sustained, it will fully account for the sulphurous atmosphere in which these wretched men were forced to work, and cast a fearful responsibility upon those to whom the management and supervision of such a mine were confided.

It is perfectly horrifying to read the details. About twenty of the victims seem to have been married men, with families. In addition to those who were suffocated by the choke-damp, many of the bodies appear to have been frightfully burnt, and one unfortunate being, to whom, if he lives, existence must be a burthen, had sustained fractures of both legs and arms. We are yet altogether in the dark as to the immediate cause of this fearful calamity, and must, of course, await such evidence as may be submitted to the coroner's jury.

* * * * * * * *

The inquest on the unfortunate sufferers by the late disastrous explosion at the Arley Mine, still proceeds slowly, and the real cause of the catastrophe yet remains unrevealed. From the evidence of Mr. Elliott, one of the witnesses examined, who passed through all the northern side of the colliery, it would seem that it was completely swept by the current of air. He expressed a decided opinion that the air was abundant—that he had no reason to suspect a deficiency in any part; he considered that the ventilating power of the existing shafts was more than commensurate with the requirements of the mine, and that, in fact, without any third pit being sunk, as had been suggested, the quantity of air passing through might be doubled, by enlarging the furnaces and airways. He admitted, however, that if he had anticipated such a calamity, he would have taken care to have had the pit ventilated by a steam jet or a fan-blast; or, what would have been still better, the furnace might have been fed with fresh air, the return air not being permitted to come near the fire, for which it appears that there was abundant shaft room, without at all taking the air required for the workings. Mr. Elliott states that, in consequence of the previous sacrifice of life, his attention had been devoted to endeavoring to discover some means of dispensing with the use of gunpowder and naked lights. He had tried hydraulic, pneumatic, and chemical applications for bringing down the coal, and by continually working at the idea he had contrived very much to reduce the number of shots, and, as he conceived, the chance of accidents from that cause. He had not, however, been able to dispense with the use of gunpowder altogether; there was stone to be encountered, in which case shots are essential.

It is observable that Mr. Elliott did not concur in the views of Mr. Dickinson, as to the plan of working the collieries by driving the levels to the extremity of the workings, and then bringing the coal back; he stated as his opinion that if such a course had been attempted in this mine, the danger might have been somewhat shifted, but he believed it must have been greater than under the present system. He concluded by declaring that the system adopted in the Arley Mine was that which had been used from time immemorial in Northumberland and Durham; that there was no fault in the management; and that the most fastidious man could not complain of the way in which the collieries had been worked. Mr. Elliott's evidence was sustained by that of Mr. Forster, manager of extensive collieries in the neighborhood of Newcastle-upon-Tyne. He found the ventilation of the colliery, when he examined it, good; and if it was in the same state at the time of the explosion —and there was evidence that everything was right up to within a very short period prior to the occurrence—Mr. Forster could not arrive at any other conclusion, than that the liberation of gas by a sudden fall was the cause of the explosion. He recommended the directors entirely to prohibit the use of gunpowder by the colliers in getting coal, except, perhaps, in some special places in the levels which are filled with fresh air; where stone was to be got rid of, powder would, of course, be still required. Even as to stone, he declared that he would certainly blast only in the night, when the men were not in; and he fully agreed with Mr. Elliott, that attempts to drive levels to the extremity, and to work back, would be a more fertile source of explosions than the plan now adopted, as the men would most decidedly have to work in return air.

The evidence of Mr. Dickinson, the Government Inspector of the district within which the colliery is situated, is of course entitled to the highest weight, and he stated that there are three causes to which the catastrophe may be attributed. First, the boisterous weather might have affected the ventilation, and so caused a temporary derangement, and although the effect would not have been so great as in shallower pits, and although a sensible diminution does not appear to have been felt, and the presence of gas might not have been perceivable until it was near the explosive point, it is possible that the return air might have become foul, and that gas in quantity might have been given off by the men in the further workings, all driving "fast ends."

The second supposition would be, that the two "rise" places above Pilkington's cut through, were filled with gas. They could contain about 2500 cubic feet, and although that may seem a small quantity to produce such results, the force of the explosion might have been aggravated by the dryness of the mine, and the great quantity of dust in it. According to Mr Dickinson's observations, those places appeared to be more extensively charred than any other, all the men in the neighborhood were found badly burnt, and the coal was ignited in a corner; so that the two places might be set down as the centre whence the blast radiated.

The third supposition, which would seem to have been adopted by the former witnesses as the most probable, was the sudden eruption of a quantity of gas, which was carried by the return air to the point of explosion. Although Mr. Dickinson admits that there are holes in the floor of the mine, apparently caused by the heaving of the strata, which might, although not probable, have been caused by eruptions of gas, and although there was an ait little discharge of gas on the face of the level, which, if not removed, would soon accumulate, he seems to dissent from the received opinion. He thinks, if there was an eruption of gas, that it did not come through the fall, but that the fall was the result of the explosion. He tried with his lamp whether any gas was coming "out of the cavity, and he found none," and if gas had come from that quarter in quantity, as had been suggested, it was not likely that it would have suddenly ceased. Supposing the fall had taken place at the precise moment required by other circumstances, it is quite possible, he admits, that a sufficient quantity might have come off to account for the explosion; but he thought the suspected spot the least likely in the colliery for such an accumulation, for as the workings had been extended eight hundred yards beyond, any gas would probably have found some vent previously. If a sudden outburst did, however, take place, in his view it was far more likely to have come from the holes in the bottom than from the fall, which he felt tolerably satisfied did not take place until after the explosion.

Mr Dickinson emphatically repeated his deliberate opinion, that the system of working the coal in that mine was not what he considered the best in Lancashire; it was not what he should call the "Lancashire system"—driving levels to the extremities, and getting the coal backward instead of forward. The result he stated to be, that the workings were more intricate, the ventilation more difficult, and that more gas was given off from those workings than would be the case otherwise. He admitted that the ventilation of the mine had been greatly improved, and that it was only in the mode of working that his suggestions at the former inquest had not been observed. He believed that all the great explosions in Lancashire had resulted from the use of the Newcastle system, where the seams are much flatter; and he did not know of anything like a great explosion having taken place under the Lancashire system, which he had so strongly recommended for general adoption. Mr Elliott here expressed his entire disagreement with Mr Dickinson, and declared that the result of the plan proposed by the Inspector would be to leave behind the men a constantly increasing magazine of gas. Mr Dickinson adhered to his opinion, and although it would seem that some of the workings of the colliery in question were under the town, he saw no reason why his plan should not have been pursued in the Arley Mine. Mr Dickinson admitted, on his cross-examination, that he had not made any inspection of the Arley Mine between the termination of the last inquiry and the commencement of the present one. This he justified by the statement that he had, in his district, eight hundred and seventy-six pits, and sixty levels, from which coal was procured, and that during the last year he had visited one hundred and thirty-eight of these pits, and declared that he could not do more. He concluded by stating that he adhered to his repeatedly expressed opinion, that the Lancashire system was best suited to Lancashire mines, and that he, at the same time, knew that the Newcastle viewers were thoroughly wedded to their own views, and that every attempt to introduce it into other parts had completely failed.

Mr. Pease, the manager of the collieries of the Earl of Crawford, and Balcartes, was next examined; and although locally acquainted with the colliery, his evidence was at right angles with that of Mr. Dickinson, as to the probable cause of the explosion. In his opinion, the fall was the only apparent cause of the explosion which had any degree of probability, and he was certain that there must have been an outburst of gas to have caused it.

We have thus laid before our readers in a condensed form, the leading features of this very grave and important investigation. They give rise to various reflections. It is clear that all inferences and opinions respecting the cause of the calamity are purely conjectural, and that a concurrence cannot be expected amongst the witnesses, or a satisfactory verdict from the jury. Secondly, the conflict of opinion between the best authorities as to the most prudent and proper mode of working a colliery of this fiery description, while it shows how unsettled men's minds are on the subject, irresistibly leads to a conclusion that our present system of coal mining is defective, and requires revision before some highly constituted tribunal; and, lastly, that our Government plan of inspection is a mere apology, which, while it nominally imposes duties upon a public officer, which it is impossible for one human being to perform, deludes the country by an assurance that all the coal mines in the kingdom are under perfect Government revision.

THE COAL FIELD OF MICHIGAN.

The following facts respecting the coal field of Michigan form a portion of an extended sketch of it, just published in a pamphlet form, by R. R. Lansing of that State. The coal beds are represented as quite extensive and of an excellent quality. We hope to receive a copy of this pamphlet, but are indebted for these particulars to the Editor of the *Detroit Tribune*:—

According to the geological report of Dr. Houghton, in 1845, the rocks which include the coal beds of the State, are embraced within the counties of Jackson, Calhoun, Ingham, Eaton, Kent, Ionia, Clinton, Shiawassee and Genesee. The most extensive beds of coal which are known to exist in the State, are in township 4 north, range 1 and 2 east, in Ingham county, and range 3 and 4 west, in Eaton county.

The coal-bearing rocks extend through nine counties, and probably more, a distance of nearly 100 miles, and the same stratum of coal belonging to the lower coal basin, is exhibited to view at three different points of outcrop, viz., at Barry, in Jackson county, at Red Cedar River, in Ingham county, 35 miles from Barry, and at Shiawassee river, 25 miles from Red Cedar River, occupying a line of at least 60 miles in extent, thus affording conclusive evidence of a continuous stratum of coal for that whole distance. The thickness of this stratum is found to be nearly the same at each of these three outcrops.

By casting the eye upon the map, it will be seen that the coal beds are known, by examination, to extend through a tract comprising about one eighth of the territory of this large State. It may be added, that the accomplished geologist, President Hitchcock, assigns to Michigan a coal field of 12,000 acres, or about one-fifth of the entire territory.

The quality of the coal varies in different locations. A bed of bituminous coal, says the Geologist, C. C. Douglas, more than two feet thick, of a superior quality, in town 4 north, range 2 east, occurs in the bed and bank of Cedar River, Ingham county. Several bushels were removed, which were found to be bituminous, and of an excellent quality, containing but very slight traces of iron pyrites. It is compact, has a glossy lustre, ignites easily, burns with a light flame, and leaves only a small quantity of earthy residue.

Some 14 tons of the coal of this State were transported to Detroit, to be subjected to all the tests for the various purposes for which bituminous coal is generally used. The following evidence of the results of the experiments is given:—

DETROIT, Nov. 26, 1853.

J. W. BROOKS:—Sir—In pursuance of your instructions, I have caused the relative value of the Blossburg and Michigan coal, for smith work, to be tested.

Two forges were supplied with coal of equal weight, and both were strictly employed at the same kind of work, and during a trial of ten and a half days.

The result exhibits a consumption of 808 lbs. of Blossburg, and 1,200 lbs. of Michigan coal, and shows a difference of about one-third in favor of the Blossburg coal. The Michigan coal is free from sulphur, and if its durability is improved to a par with the Blossburg, by a further penetration into the mine, (that which we have used being alleged to be surface coal,) I see no reason why it should not be as valuable for blacksmithing purposes as the Blossburg, with the exception that the present quality of Michigan coal, by means of its brisk burning, emits more smoke than the other—a fault which will doubtless cease to exist when it improves in strength and durability.

The trial of the relative value of the Blossburg and Michigan coal was made as follows:

One forge was worked five days with Blossburg coal, and consumed 404 lbs., and then five days with Michigan coal, and consumed 600 lbs.

Another forge was worked five and a half days with Blossburg coal, consuming 406 lbs., and then five and a half days with Michigan coal, consuming 600 lbs. In all, 808 Blossburg, and 1,200 lbs. of Michigan.

Yours, etc., S. H. NEWHALL.

The proprietor of the Biddle House, to whom a portion of the coal was given, to test its qualities for producing illuminating gas, says:—

My gas apparatus being upon a small scale, is perhaps as well calculated for making such a test as any other, because an immediate result can be very readily produced. My decided opinion is, that your coal yields as much gas as any other domestic coal used for that purpose, and its luminous qualities certainly exceed any other gas manufactured by us.

Adrian R. Terry, M. D., speaks of the coal for household use, as follows:—

I have been burning it in an open grate for the last four weeks, and I have never, in the western country, burnt a coal which gave so clear and brilliant a flame, and of which the coke (after the bitumen was burnt out) made so permanent and hot a fire. It leaves but an insignificant amount of ashes, or earthy residuum, in comparison with any coal I have ever burned in this region. The coal I had from you was too much broken to exhibit its full value as a fuel for household use.

Mr. E. B. Ward, speaking of the use of Michigan coal for creating steam, says:—The coal burned freely, emitting a great deal of flame, and raising steam rapidly; was reduced to ashes without exhibiting any evidence of sulphur, or leaving any slag or clinker, or making any impression on the grates of the furnaces, which, after the experiment, were left as free from any adhesive matter as if wood had been burned. Wood had uniformly been burned in the furnaces, and therefore any injury to the grates could be readily detected.

Respecting coke, Mr. Francis Smith says:—

The circumstances in which I have been placed during many years of my life, have been such as to warrant me in giving an opinion with regard to coke. I have seen some hundreds, or I might say, some thousands of furnaces, in daily operation, for the purpose of making coke, for years, in the north of England. And I feel no hesitation in saying, that the coal known as "Michigan coal," will make almost, or altogether, as good coke as any I have seen.

COAL DEVELOPMENTS AT LA SALLE, ILLINOIS.

The following encouraging facts relative to the supply of coal in Northern Illinois have recently transpired in that region, and are worthy of notice:—

There have been some recent excavations for coal at La Salle, which, in their result, are of great interest, not only to that town and vicinity, but to Chicago and other portions of Northern Illinois. It has been known for some years, that there were three strata of coal at that point which cropped out at Cramp Rock, about a mile and a half above La Salle, and constituted a portion of the northern borders of the great Illinois coal field. The outcrop had been traced for a number of miles in each direction. The strata had a dip or inclination of from 1 in 6 to 1 in 12 descending from the outcrop. As two of these were 4½ feet each in thickness, and one of three feet, the quantity obtainable at a workable depth, would be of course very considerable. When, however, the work should be carried on as extensively as the wants of the country should require it, it is quite apparent that the expense of raising the coal would constantly increase, provided it should continue at the same inclination. There were, however, indications in the position of the superincumbent strata, as shown on the face of the bluff, that the coal strata at no great distance from the outcrop assumed a level position.

A gentleman interested in determining this question, during the past winter commenced boring directly on the bank of a steamboat basin in the city of La Salle. This has been continued to the present time. The experiment has been entirely successful, and the result of the most satisfactory character. At a depth of 135 feet from the surface of the ground, the upper of the three strata of coal was reached, having a thickness of five feet. It is thus demonstrated that the coal is at a moderate depth, entirely inexhaustible in quantity, and obtainable at the most convenient possible point for commerce and for local use.

The expense of delivering it at Chicago from that point is less than that of transporting coal to Erie and Cleveland respectively, from the mines by which these cities are supplied.

Another advantage of obtaining the coal at La Salle from a depth of 130 to 140 feet, is that it will be found in a pure state, and would undoubtedly show that the bad reputation of Illinois coal, arising from its having heretofore been taken out near the outcrop, is quite undeserved. We are the more persuaded of this, because we are informed that the separate and independent analyses of Professor Charles U. Shephard, and of Professor Johnson, show the coal to be almost identical in its constituents with the best coals of Ohio.

THE STATE IN WHICH GAS EXISTS IN MINES.

1. Shallow coal-seams have lost their fire-damp by its escape to the day. It is replaced in those beds by water and carbonic acid gas.

2. In mines which are deeper than those of the first head, the communication with the day is more intricate and difficult. Nevertheless, in them also the gas continued to escape so long as its tension much exceeded that of the atmosphere, and what remains is of that feeble expansive power which indicates exhaustion to a point that just balances the atmosphere. Here is situated the region of common blowers, the study of which has, by an inadequate generalization, deceived us into a belief that the state of the barometer has a good deal to do with explosions; whereas no more in reality is established by the circumstance of a coincidence between its fluctuations and the issue of fire-damp than this, that the original supply of gas is in such situations very nearly spent off by the system of natural drainage alluded to.

Under this 2d head are to be ranked the masses of liberated gas in goaves and old workings, as well as the common blowers of fire-damp and stythe. It may be added, that in connection with the 1st and 2d heads, barometric observations are very useful; but to the 3d, and really dangerous category, they are inapplicable.

3. In the next gradation of depth we have the fire-damp of great tension, the high-pressure gas as it may be called, distinctively from the little com-

pressed gas of the 2d head. We are now at a depth where the dryness of the beds indicates them to be unreached by fissures from the day, and existent in a state that may be considered uninfluenced, as yet, by external causes of change. It is here, therefore, and not until we arrive here, that an opportunity occurs of studying the fire-damp in its more dangerous form. What we have previously ascertained is correct enough so far as it goes, but very imperfect; and, as already intimated, the cause of a generalization on the subject, which is far from being sufficiently comprehensive.

In these deep mines, so long as no more than the capillary issue goes on, the gas is yielded gradually, and is quite manageable; there is then no collected mass of it; it is entangled in the cellular structure of the coal, and encounters too much resistance to escape at all freely. We have however seen, that even under these circumstances, a gradual and continuous issue takes place until the tension becomes very high, provided the gas issues into a confined receiver. And it evidently does not matter, in principle, whether such receiver be the artificial space of a mine barred up by water, or a natural cavity in that mine equally protected with the other from communication with the open atmosphere.

We may remark, however, that the tension is likely to be greater in the natural receiver than the artificial one, since the chances are that in an extensive mine-space, there may be some crevices through which the gas escapes as its tension increases.

It is scarcely necessary to say that natural cavities are to be found in mines; they exist, in reality, both in roof and thill, above, below, and also in the beds of coal; their formation, we must conclude, is due to those disturbances which have so much shaken the earth's strata, and they are most common in the neighborhood or along the line of faults, being precisely the situation where bags of foulness are most frequently met with.

It does not follow that every cavity will yield, on being reached, its stock of high pressure gas; on the contrary, the gas may be forced by its pressure through the cleavages of the coal as the workings approach it; and when the cavity is reached, there may in this case be little or no gas given off: sometimes a fissure or a hitch may communicate at a distance with the charged receiver, in which case the drainage is also gradual on account of the resistance which has to be overcome. But that the mine does contain in its cavities, and at its first opening, this high-pressure gas, is an obvious deduction from the premises. And whenever the intervening coal and strata accompanying it are compact enough to act as a dam, the gas will at length be reached and given off at this high rate of tension. * * * * * *

1. It has been shown that there are two distinct conditions of the existence of fire-damp in mines; one consisting of liberated gas, the emission of which is influenced by the state of the barometer, the other, and really dangerous condition, consisting of gas of a tension greatly superior to that of the atmosphere.

2. The receptacles of the fire-damp are the cellular tissue of the coal, and the cavities which are found to a greater or less extent in mines, more particularly along the lines of disturbance and fracture of the strata.

3. The emission of gas from the cellular tissue of the coal is slow and gradual, and such is the usual and manageable form of issue; it being neither by this form of its emission, nor by that of the liberated gas, that the great explosions of the mines of the north of England have been occasioned.

4. In the mines of class 3, a state of high tension is not casual nor accidental; but it is the natural condition in which fire-damp subsists, provided there are no means of spontaneous drainage. The cavities mentioned under head 2 are filled with gas, the minimum tension of which is $4\frac{1}{2}$ atmospheres, but the actual tension probably much greater; and when the intervening strata are compact enough to act, entirely or partially, as a dam, or when the rate of excavation is faster than that of drainage, the gas of these reservoirs

will be discharged into the mine in a state, the tension of which has an indication in the displacement from the face of a block of coal of 6 tons at Jarrow, in 1839, and one of 11 tons at Walker, in 1845.

5. There are numerous ascertained instances of the discharge of high pressure gas into mines, and other cases in which it was obvious that such issue had been the cause of explosion; but in the majority of cases it is difficult to discover the source of issue when explosion ensues, and as no living witness remains of the fact, a peculiar degree of obscurity generally hangs over the immediate cause of these accidents.

6. Cases are cited in which air currents of 4.39 and 6½ feet per second were quite inadequate to dilute a stream of gas; and it is further shown by calculation from experiment, that our existing ventilating agencies are extremely feeble in comparison with the antagonist they have to contend against; and that if we were enabled to increase even tenfold the efficiency of these agencies, the ventilation would still be quite inadequate to meet the danger.

7. The cases of heavy explosions in the north of England have occurred, without a proved exception, in the whole mine, where the ventilation is the most perfect, but where the occurrence of eruptions of gas is most likely to be met with.

8. While good ventilation is, and will continue, essential for removing the ordinary and manageable gaseous products; and while it may be looked to as a security against the gases of mines of the 1st and 2d classes, (Appendix No. 8,) it is yet manifest from the premises that we require some further means of protection, in the case of mines classed under the 3d head; and though further research may lead to yet undiscovered measures of safety, we are yet bound in the mean time to use the means in our power, and already devised, as a safeguard against explosion in those mines.

9. These means consist of the universal employment of the safety-lamp in the mines of the 3d class. Without giving a preference to any particular lamp, the experience of above thirty years in the mines of the north of England, has proved the common Davy lamp to be a practically safe lamp.

10. The expense of lighting mines with safety-lamps is, on the whole, less than that of lighting with candles; and though it is desirable to exclude naked lights as much as possible, yet the use of gunpowder, under proper regulations, is not inconsistent with that of safety-lamps.

11. With the safety lamp exclusively in use throughout the mines of the 3d class, it is a legitimate conclusion that we should, in future, be as free from explosions in the whole mine as we now are in the pillar districts.—*From an unpublished paper, by T. J. Taylor, England.*

THE COAL FORMATION OF VICTORIA.

As there has been so much said of late, in reference to the discovery of available coal in Victoria, a few words on this question may not be considered irrelevant. Coal seams are formed in the secondary or sedimentary series, and the quantity and quality depend on the period and extent of their development. Hence it follows that countries barren of sedimentary rocks can have no crystaline and available coal; whereas the regions where such rocks are formed may contain this important substance. The greatest coal fields are seen in the northern hemisphere—Europe and America; moderately within the tropics, in the east and west; and in a lesser degree in the southern hemisphere. It has already been stated that the sedimentary rocks of Victoria are limited to the southern coast, with the exception of the shingle and loam in the northern boundary; therefore should coal be found in the colony, of any importance, it will be discovered in the south formation. Several thin seams have been described as seen in Western Port, Cape Otway, and in various parts between Geelong and Portland, showing that if any thick or workable coal exist it must be here, and can be easily detected by boring, inasmuch as the formation is comparatively soft, and only thinly developed as a coal formation. This sedimentary clay slate is deposited on the undulating surface of the primary rocks, and only partially consolidated, and very little affected by the ordinary "faults." Limestone formation appears to have much influence in coal deposits. I have found invariably that the coal seams of the calcareous basins were more extensive, more uniform, and of better quality, than the seams inclosed in the clay and arenaceous sedimentary rocks, without calcareous beds. Those who seek for coal in this colony must not be guided by the great formations of England, but take those of Van Diemen's Land and New South Wales as the types. Although fossils are of important assistance in determining on such formations in Europe, they are of little avail here; and as the sedimentary rocks are so slight in this colony, the search of organic remains is unnecessary, as any important seams which may exist are easily discovered. Numerous small seams of coal are found in sandstones and clays, formed from carbonaceous matter in solution, and crystallized in the subdivision of the beds during consolidation, like water freezing in joints. Therefore it must not be supposed that all the coal seams are mere compressed wood, or decomposed vegetation. Fern trees are the characteristic fossil Flora of the principal coal fields of the world, yet these impressions may be seen in many formations of this division without coal being formed in any available quantities. It is to be hoped that these few hints may prove of some service to those who are looking for workable coal seams in this colony.—E. Hopkins.

COAL MINES LIGHTED BY GAS.

The continued fearful accidents in coal mines, owing to a practical defect in the means of their illumination, have given rise to many contrivances for preventing such evils. One of the most ingenious suggestions is from Mr. Septimus Piesse, who proposes to illuminate the mines by means of coal gas, thus rendering useful that which at the present time is the very bane of the miner. The gas is to be made "on the bank"—that is on the surface, and carried down the shaft and along the "rolley-ways" by fixed piping in the usual way, there to be kept constantly burning in properly constructed lamps, with an immovable gauze of wire round the flame. For supplying the lamps "in the galleries," where the actual workings are being carried on, the gas is to be conveyed by flexible tubing; by this means there will be no difficulty in moving the light to the position needed by the miner. Each lamp is to have a cone of fine Davy gauze wire round the flame, and to be protected by an outer casing of coarse gauze, which will prevent the transmission of flame to any outward explosive mixture in the pit.

COKE OVENS.

Guillaume Lambert, of Mons, in the Province of Hainault, Belgium, has applied for a patent for a useful improvement in coke ovens. The first part of the invention consists in constructing, arranging, and combining the ovens, two by two, in such a way that the smoke and gaseous products generated in one during the earlier stages of the coking process, may be burned in the other, which was charged earlier and in which the coking has progressed to a more advanced stage, and may deposit therein a portion of their carbon, and that the incombustible products of combustion may, by passing in contact with the exterior of the oven in which the process is least advanced, serve to assist in heating the charge and setting free the gases. The second part of the invention consists in certain means, by which each or any one of a long range of coke ovens may be discharged of the whole of its contents at once.

MANUFACTURE OF COKE.

Mr. P. Hart, of Brierley-hill, Stafford, has patented some improvements in the manufacture of coke. The inventor takes coal, and slack of coal of any quality (except stone-coal, which will not coke to advantage), and having carefully set it up in a heap, or pile of round or oblong shape, covers it all over with fine slack, and then blacks or covers this with fine ashes or breeze up to the shoulder of the heap or pile; and that part of the heap which extends from the shoulder over the top, he covers with small coke embers upon the fine slack, as the quality of the coal may require, so as to exclude as much as possible of the atmospheric air from the coal, and thereby prevent its action upon the coal while the smoke and other volatile matter contained therein is being expelled, before general combustion is allowed to take place.

NEW FUEL.

Mr. R. A. Brooman, patent-agent, has patented an invention which relates to the manufacture of fuel from small coal; and consists—1. In the use of Trinidad, Cuba, or other similar bitumen, alone or combined with resin, as a means of solidfying or agglomerating small coal into masses fit for moulding; and 2. In the use of water in which clay has been dissolved, and allowed to subside, with or without the addition of gum-arabic, gum-senegal, or other similar gum or glutinous matter, for the purpose of moistening the mixture of small coal, resin, and bitumen.

UNLOADING CANAL BOATS.

Mr. Amos Young, of Georgetown, has received a patent for an improved method of discharging cargo from canal boats. What he claims as new and useful, is the method of discharging and transferring coal or cargo from canal boats, by causing the boat to "free itself" of the cargo by the settling or falling of the boat in the lock, in drawing off the water from the latter, in such a manner that the cargo contained in one or more cargo-boxes or trucks, provided with suspension truck attachments or devices as specified—is left suspended at its draught or floating level in the canal, on a suspension truck or railroad built on the sides of it over the lock, whereby the cargo may be discharged from the boat with despatch, and with but little labor, and be run off at a *high level*, to any distant place of transfer, and there be transferred from one receptacle to another without inconveniently detaining the boat, and whereby the many other advantages specified are obtained; the said cargo-box, with its suspension truck, attachments or devices, boat, dock and suspension truck or railroad being arranged and operating together as set forth —and the whole serving to economize time, labor, and reduce the cost of trains and delivery at a *high level*, in a practicable manner.

IRON AND ZINC.

ANALYSES OF ZINC ORES OF WISCONSIN.

The zinc ores of Wisconsin have been recently analyzed by Dr. Hayes; the results are stated in one of the papers accompanying the geological report of Prof. Daniels upon that State. Alluding to the series of ores and minerals placed in his hands, those of which were of zinc are thus reported by him:—

No. 11 of the series. (Dry-bone diggings, near Shullsburg.)—The specimen is a carbonate of zinc, with accidental portions of carbonates of lime, iron, and manganese.

One hundred parts of this ore consist of—

Pure oxide of zinc,	59·76
Oxides iron, manganese, and lime,	4·84
Earthy matter, or rock,	1·40
Carbonic acid and water,	34·00
	100·00

One hundred parts of this ore, after roasting or heating to redness, contain 90·50 pure white oxide of zinc.

No. 12 of the series, from Platteville.—The specimen is a carbonate of zinc, with a little silicate of zinc and carbonate of lime.

One hundred parts of this ore consist of—

Pure oxide of zinc,	60·20
Silica and oxide of iron,	2·20
Carbonate of lime,	12·60
Carbonic acid and water,	24·00
Earth or rock,	·40
	100·00

Specimen No. 12.—One hundred parts of this ore, after being heated to redness, contain 79·20 of pure white oxide of zinc.

No. 13 of the series, from Mineral Point.—This specimen closely resembles No. 12, consisting of carbonate of zinc with rock.

One hundred parts consist of—

Pure oxide of zinc,	56·20
Oxides iron, alumina, etc.,	1·80
Carbonate of lime,	2·00
Silicious rock,	6·60
Carbonic acid and water,	33·40
	100·00

One hundred parts, after heating to redness, contain 84 3-10 parts pure white oxide of zinc.

No. 14 of the series, from Mifflin.—Carbonate of zinc, with some earthy matter.

One hundred parts consist of—

Pure oxide of zinc,	57·00
Oxides iron, alumina, etc.,	5·40
Earthy matter,	7·60
Carbonate of lime,	2·00
Carbonic acid and water,	28·00
	100·00

One hundred parts of this ore, after having been heated to redness, contain 79 1-10 parts of pure white oxide of zinc.

No. 21, of the series, from Messersmith's, near Dodgeville.—This specimen is also a carbonate of zinc, mixed with earthy matter, mostly silicious.

One hundred parts of this ore consist of—

Pure oxide of zinc,	56·20
Oxides iron, alumina, etc.,	2·80
Carbonate of lime,	1·80
Silicious rock,	6·20
Carbonic acid and water,	33·00
	100·00

One hundred parts of this ore, after having been heated red hot, contain 83 9-10 parts of pure white oxide of zinc.

The value of white oxide of zinc as a pigment, is becoming generally known, and it has a market price much higher than white lead. Most of the metallic lead consumed for paints is first made into white lead, which thus becomes the staple manufacture based on metallic lead. Now these ores of zinc, familiarly known as "dry-bone," are the best ores for producing the white oxide of zinc; but the manufacture is not here based on the metal, but on the ore. By merely heating these ores in heaps on brush-wood, they lose their carbonic acid and water, and become soft mixtures of from 72 to 90 per cent. oxide of zinc, with earths and iron oxide. The material thus obtained, mixed with charcoal, gives in the muffle furnaces, by one operation, nearly all the oxide of zinc which the ore contains. Extensive manufactories can be sustained by the consumption at present going on, of this product, which continues to be imported largely. But these ores are equally as well adapted to the production of metallic zinc, a very useful metal, bearing a higher price than lead. The ores used abroad for the production of this metal, are far inferior to these in quality, and they are not extensively distributed. On economical considerations, therefore, these ores have a high value. They offer the advantage of employing a large capital with a certainty of the manufacture being profitable and important. A State possessing such mineral deposits, must be regarded as rich in resources of a highly important kind.

NEW JERSEY ZINC COMPANY.

The following extract from the last annual report of the New Jersey Zinc Company furnishes a summary statement of the production of the dry white oxide of zinc during the years 1852 and 1853, from which it appears—

That the total production of 1852 was 2,425,506 lbs., and that of the year 1853, 4,048,415 lbs., being an increase of 70 per cent upon the preceding year, and that the production during the latter half of the year 1853 was increased nearly eighty per cent. upon that of the first six months.

During the end of September and beginning of October, the works were stopped to make the necessary connections between the new engine, machinery, and furnaces, which accounts for the comparatively small production during that period, but at the same time the important results of the extension of the works is most satisfactorily illustrated by the very largely increased production during the month of November, which was more than double of the monthly average of the entire year.

The works are now regularly producing at the same rate, over 150,000 lbs. per week, and there is no reason to doubt that the production of the year 1854 will amount to eight millions of pounds, being the double of 1853, and nearly fourfold that of the year 1852. A favorable feature of this large increase of production, is the fact that the general expenses of the Company remain the same as before, and amount, consequently, to a greatly reduced per centage upon the enlarged production. Another gratifying circumstance is, that whilst in the year 1852 the proportion of the second and third qualities of paint was fifteen and one-half per cent upon the whole production, it amounted to only five and one half per cent. during the year 1853; in fact, so much is the process of manufacture improved, that it has been deemed advisable to strike the No. 3 entirely off the list of manufacture.

The report exhibits the financial condition of the Company on December 1st, 1853, from which it appears that the business yielded during the year ending November 30th, 1853, a net profit of $50,592.16.

It also shows the present surplus of assets over liabilities, exclusive of the 10,111 shares of reserved stock, to be $49,258.10, consisting of bills receivable running to maturity, and manufactured stock and materials on hand, valued at cash prices.

NEW JERSEY FRANKLINITE COMPANY.

This is the oldest Company organized for working the Franklinite ore of New Jersey. Others are in the field and will, probably, soon be in operation. The ore at the mines is almost inexhaustible, and its excellence for the production of a superior article of iron well tested. If the steel which is made from it possesses the fine temper represented in the subjoined statement of the Company it must greatly enhance its value. For the purpose of illustrating this point, we append, at the close of the report, some astonishing facts relative to the importance of Swedish iron to Great Britain for the manufacture of steel.

This Company is chartered by the State of New Jersey with an authorized capital of twelve hundred thousand dollars, in shares of twelve and a half dollars each, of which amount two-thirds have been appropriated to the purchase of the mines of Franklinite ore and the use of the patent rights for working the same, and the other third, equal to four hundred thousand dollars, for the erection of furnaces and other works necessary in the process of reduction, and for the purchase of lands, buildings, etc., contiguous thereto. The mines situated at Franklin Furnace in Sussex county, N. J., are believed to be inexhaustible, and are estimated by Dr. Charles T. Jackson, and other geologists, to contain about one million tons of the ore above water level, and to extend to unknown depths below it. It may be quarried like stone from the side of the hill, where it lies extensively uncovered and visible, while a short inclined plane of a few hundred feet will deposit it at the side of the furnaces.

These are intended to be located near to an excellent water power recently purchased by the Company, together with upwards of four thousand five hundred acres of land, much of it well timbered, a store, dwelling for the Superintendent, and numerous houses for the residence of workmen and others; also, a blast furnace, and extensive mines of magnetic iron ore, recently belonging to and worked by the Messrs. Ames, from whom a highly satisfactory purchase has been made.

The property purchased of Mr. Ames consists of upwards of four thousand five hundred acres of land, and the following improvements: —

Doland farm and buildings.

Saw-mill, water power and houses.

Blast furnace, foundry, coal houses, barns, sad iron shop, foundry, tin shop, etc.

Sixteen dwelling houses, blacksmith and wheelwright shops, tin shop, etc.

Tavern house and lot on turnpike.

Iron mines.

Store, dwelling house, and land for agent.

This peculiar iron ore, called *Franklinite*, has but recently been made available for the production of iron in the blast furnace, and it is believed that its importance will constitute a new era in the manufacture of this article. It contains, on an average, about

60 to 70	per cent.	oxide of	iron.
21 to 30	do.	do.	zinc.
12 to 14	do.	do.	manganese

The iron produced from it is of the toughest and most fibrous character, adapting it in a peculiar manner for the manufacture of railroad axles, steamboat shafts, and other purposes requiring great strength, while the steel made from it is of the very finest character, and will entitle it to take the place of Dannemora and other Swedish iron, commanding the highest prices in Sheffield and elsewhere for this purpose. Samples of it may be seen at the office of the Company. While the quality of the iron will thus entitle it to the most extensive use as well as the highest price, the oxide of zinc will also perform a most important economy in its reduction into pig metal. In the process this oxide is driven off in the form of vapor at the trunnel head, from which point suitable sheet-iron pipes or passages, connected with an exhaust rotary blower, will draw it off, and thence force it into muslin sacks, where it will be connected in a manner similar to that in successful operation at the New Jersey Zinc Company's works at Newark. The demand for the oxide of zinc is very extensive at this time, and, from its great superiority and cheapness compared with white lead, its use is extending with more rapidity than the present means existing admit for supplying the demand. The oxide of this quality, being of No. 2 whiteness, will, at the present time, command about four cents per pound, but in order to make a safe estimate, if we calculate it at two cents, or one half its present value, and suppose that but about twenty per cent (which is less than the lowest estimate of the quality contained in the ore) be collected, it *would about pay the entire cost of making the pig iron.* This will be apparent from the following calculation, in which we will suppose that it takes three tons of the ore, or six thousand seven hundred and twenty pounds, to make one ton of pig iron:—

Three tons ore, delivered at furnace cost, at $1, is . . .	$3.00
Three tons anthracite coal, at $5.50, is	16.50
Three-fourths of a ton limestone, at $1, is	0.75
Labor, including saving of zinc, ...	4.00
	$24.25
Deduct value of 20 per cent. on 1,344 pounds oxide of zinc, at 2 cents, ...	26.88
Leaves excess of value of zinc over cost of production of both zinc and iron, ...	$2.63

Extraordinary as this result may appear, it has, nevertheless, *been submitted to the examination of intelligent and sober-minded men*, and the practicability and the facts of the case, it is believed, cannot be controverted.

The peculiar furnaces required for the reduction of this ore are also of a less expensive kind than those used for that of other iron ores, being of considerably less height, and consequently require a much smaller amount of labor and materials in their foundations and superstructure. The buildings and apparatus for saving the oxide of zinc are also simple, and of no considerable cost.

The Directors propose at this time to erect two blast furnaces of fourteen-feet bosh, each with the necessary buildings and apparatus for saving the oxide of zinc at an estimated cost of about $15,000, and to provide a further sum of $30,000, to be used as a working capital, and for other contingencies not now foreseen.

IMPORTANCE OF SWEDISH IRON TO GREAT BRITAIN.

The importance of iron of a quality such as the Swedish or Russian to Great Britain, is a subject which has perhaps not attracted a thought beyond the immediate circle of those intimately acquainted with the manufacture and uses of this most valuable metal. If we can produce an article equally good from the Franklinite mines of New Jersey, or from any other locality of our immense iron treasures, we shall bind the most potent nations of the world to keep the peace with us ever hereafter. The following statements, from the pen of Robert Mushet, an intelligent English writer, were drawn out in reply to a remark of the London *Mining Journal* that England, by her improvements in the manufacture of steel, could in a great measure supply herself, without being extensively dependent upon foreign countries. These statements are made in somewhat glowing colors, and must be taken doubtless with some allowance. They serve, however, to illustrate our view, which is the importance of a fine quality of iron to the civilized world:—

I can only say that were the supplies of Swedish and Russian iron cut off from England, her pre-eminence as an engineering and manufacturing nation would suffer to an incalculable extent, and I believe few of your readers can readily imagine how many departments of art and trade would, in consequence, be brought almost to a standstill. Take, for instance, the tin-plate trade. How would the chilled rollers, through which the plates are passed, be turned and fitted were there no foreign iron? No English made iron will produce steel which is efficient for this purpose, and without these accurately fitted rollers what would become of the tin-plate manufacture. Again, the whole art of steel-pen making depends upon the power of procuring chilled rollers hard enough to roll cast-steel in the cold state. Nothing but steel made from the best Swedish iron will face the hardened metal of these rollers, and unless they are turned and fitted to a nicety they are useless. Boring tools, planing tools, and turning tools, are all made of Swedish steel, and were the best English steel used in its place all the endless operations performed with these tools would be doubled and quadrupled in their cost, and a much longer time would be required for finishing engineers' work. Then, again, taps, dies, and fitter's chisels, must all be made from best foreign iron, and without taps, dies, and fitter's chisels what would the engineering interest be reduced to? It would, in fact, be all but annihilated. Wire drawing is amongst the most important of existing trades, especially in connection with the system of electric telegraphs. Now, wires are drawn by passing rods of iron through graduated holes pierced in frames of iron, coated with steel, or perforated through tools of cast steel; unless in each case the steel be made from the best foreign iron, the perforations become immediately rugged and get out of shape, and the wire can no longer be drawn to a given size, and truly round. These tools are expensive, and the perforations require the utmost skill and care to produce them accurately, so that unless they wear well when made the most serious loss is incurred. Stop the supplies of foreign iron, and the 1,290,000*l.* worth of ores produced annually in Cornwall and Devon would be reduced to 400,000*l.* The granite quarries would all be shut up. The burr-stone quarries would share the same fate, and where ten bushels of flour are now perfectly finished, not three bushels would be turned out, full of grit, and coarsely ground. Mill stones could not be furrowed and dressed as at present, and the mill-stones at present in use would soon clog up and lie idle. Without foreign iron, the united skill of all the engineers in the kingdom could not place a single locomotive engine upon the rails; and without foreign steel, with which the rollers are grooved, the rails themselves could not be produced to half the present extent. The humblest village smith will add his testimony to mine. The rough, ugly bar of blister-steel, for which he gives 5*d.* or 6*d.* per lb at the nearest ironmonger's, is, he well knows, the only steel he can depend upon for any particular purpose, unless he indulges in the expensive shear, or double shear, at 9*d.* to 1*s.* per lb., all prepared from the same indispensable foreign iron. The shearing of iron for boiler plates and other purposes can only be done with foreign steel. Any steel will, indeed, make shears, and cut iron; but to make shears large enough, and true enough, to shear iron plates many feet in length and breadth, requires steel made from the best foreign iron.

All coal and mine owners, who consult either their own interest or the ease of their workpeople, purchase blister, shear, or cast steel for their tools, made from foreign iron. English steel does, after a fashion, for ordinary mining purposes, but a point of good foreign steel will wear out three points of the best English steel, and the ease with which the workman performs his work is likewise proportionately affected. Russian iron is not equal to Swedish iron for making steel, but it is the next best suited for that purpose. As to sheet steel, steel wire, knives, files, saws, carpenters' chisels, needles, drifts, spindles, etc., they are all well and readily made out of English steel, but many of them can only be manipulated by means of tools made of foreign steel; and, in fact, a file made out of the best Swedish steel is at all times worth threefold the money that an English steel file ought to fetch—at least, it will be less worn with three times as much use, and the workman using it will get over twice the work in a given time. I am certain that, were the Czar to lay his hands upon Sweden, and lock up the Swedish and Russian iron, he would in ten years reduce, not England only, but the United States, and to a great extent the whole world, to a state of helpless dependence upon him for the sinews of manufacturing prosperity. That is, provided no adequate substitute could, *ad interim*, be found to replace this foreign iron. At present there is no substitute for it, and of all her imports, the insignificant 30,000 tons annually of Swede iron is to England the most valuable and vitally important. Improvements in the manufacture of steel there are none. An eminent Sheffield steel-maker affirms that they make their steel just as their grandfathers did, and whilst the art of manipulating steel into various tools and appliances has been, at Sheffield, carried to a pitch that appears to preclude the possibility of further improvement, not a single step has been made to improve the steel itself during the present century, save and except the great and notable discovery of the late Mr. J. M. Heath, as to the use of carburet of manganese in converting worthless steel into steel of excellent quality, *free of expense*. There is no good steel made in Sheffield except from Russian or Swedish iron, if, indeed, I except the few tons of Acadian and Indian iron which may have found their way there, and neither of which are yet produced in abundance sufficient to supply the market, or of an uniformity of quality to suit all its exigencies. England was supplied with foreign iron ever since she became a great manufacturing nation, and she has never known the want of it. Foreign iron is, therefore, little thought of. Water is never prized by those who have always access to it; yet water is not more indispensable to the welfare and existence of mankind than is foreign iron to the prosperity of England. Cut off her supplies of tea, sugar, or tobacco, with all their annual millions of import value, and the loss would be trifling when compared with the loss of a few thousands of pounds' worth of foreign iron per annum. Go throughout the world, and you will find that wherever manufacturing interests have developed themselves they all hinge upon steel of a first rate quality, and the steel of first-rate quality all comes from England, and the iron it is made from is all imported from Sweden and Russia. And this steel is all of two kinds, cast or bar steel; the latter is merely the foreign bar-iron, baked for six or eight days with charcoal in a brick box; the other is simply these baked bars, melted in a brick pot, and poured into an iron mould. And this is the vaunted art of steel making in Sheffield; any excellence that the steel possesses was originally possessed by the unbaked bar at the rude Swedish forge; and except from these rough bars all the baking and boiling in brick pots and pans at Sheffield has never succeeded in producing a single pound of serviceable steel for all appliances. There is, I believe, small probability of the supply of Swedish iron being cut off; but if it is, a blow will be inflicted which England will not speedily recover, for a substitute will require time to provide. It would require 150,000 tons of charcoal annually to produce in England as much bar iron as would in *quantity* replace the deprivation; and where this supply of charcoal could be found is a problem not easily to be solved. India and the North American colonies possess a supply of charcoal, but the requisite skill will not be found under a quarter of a century at least. Those who wish to learn the true importance of the supply of Swedish steel-iron to England, France, and the world at large, would do well to read M. Le Play's papers on steel and steel manufacture, in the

Annales des Mines for, as far as I recollect, 1842. The want of Russian iron will be felt in many departments of the steel trade, but an increased consumption of Swede iron will most likely be the result.

RAILWAY IRON WORKS.

The following statistics of six States, show the number of mills engaged in the manufacture of railroad iron; the probable amount of manufactures in the present year; the items of raw material used, labor and capital employed, etc.

	Tons.
Montour Iron Works, Danville, Pa.,	18,000
Rough and Ready, Danville, Pa.,	4,000
Lackawanna, Scranton, Pa.,	16,000
Phœnix Iron Works, Phœnixville, Pa.,	20,000
Safe Harbor, Safe Harbor, Pa.,	16,000
Great Western, Brady's Bend, Pa.,	12,000
New Works, Pittsburg, Pa.,	6,000
Pottsville Iron Works, Pottsville, Pa.,	8,000
Cambria Iron Works, Cambria, Pa.,	5,000
Trenton Iron Works, Trenton, N. J.,	15,000
Massachusetts Iron Works, Boston, Mass.,	15,000
Mt. Savage Iron Works, Mt. Savage, Md.,	12,000
Richmond Mill, Richmond, Va.,	5,000
Washington Rolling Mill, Wheeling, Va.,	5,000
Crescent Works, Wheeling, Va.,	5,000
New Mills, Portsmouth, Ohio,	5,000
Total,	160,000

REPRESENTED ITEMS IN THE PRODUCTION OF 160,000 TONS OF RAILWAY IRON.

		Tons.
Pig iron required,	1⅓ ton per ton of rails,	213,333
Coal used,	5¼ tons per ton of rails,	840,000
Iron ore,	3½ tons per ton of rails,	560,000
Limestone,	1⅓ per ton of rails,	214,333
Total number of tons raw material,		1,826,666

LABOR EMPLOYED, FROM THE MATERIALS IN THE GROUND TO THE FINISHED RAIL IN MARKET.

In mining, transporting and delivering coals, per ton of coal, at $1.92,	$1,612,800
In mining, transporting and delivering iron ore, per ton of ore, at $1.60,	896,000
In mining, transporting and delivering limestone, per ton of limestone, 65 cents,	138,666
At and about the furnace, per ton of pig iron, at $3.11,	663,466
At and about the mill, per ton of rails, at $12,	1,920,000
Carrying rails to market, say average $2,	320,000
Number of men employed, 18,500—Yearly earnings, $300 per head,	$5,550,932
Population supported, 5 times 18,500, equal to	92,500
Breadstuffs consumed per annum, 92,500 persons, at $50 per head,	4,625,000
Capital employed in rail iron works now erected,	10,000,000

Other interests, as below:

Owners of coal lands—royalty—valued on a ton of rails, at $1.84,	$294,000
Coal operator—his average profit valued on a ton of rails, at 95 cents,	152,000
Owners of ore lands—royalty—valued on a ton of rails, at $1.41,	225,500
Owners of limestone quarries—quarry cave—valued on a ton of rails, at 13 cents,	20,800
Capitalists—use of money, interest, etc., valued on a ton of rails, at $1.50,	240,000
Transportation Companies—clear profits over and above working expenses, valued on a ton of rails, at $3.78,	604,800
Storekeepers and others, for merchandise, oil, brass, fire brick, etc., valued on a ton of rails, at $2.39,	382,500
Total,	$1,919,600

NEW IRON COMPANY.

A bill has passed the Legislature of our State incorporating a new Company for the manufacture of iron under the title of the Thomas Iron Company, with a capital of $200,000. David Thomas, of the Crane Iron Works, is at the head of the Company. The site selected for the Works is on the Lehigh Valley Railroad, one mile above Catasauqua, in Lehigh county. Two stacks have been already commenced, and two large engines of sufficient capacity to drive four stacks, have been ordered. It is the intention of the Company to complete the works as soon as possible, and put them in operation. The works will be under the charge of David Thomas.

IRON BUSINESS AT IRONTON.

The statistics of the pig iron manufacture at Ironton, Ohio, for 1853, are as follows:—

Ten furnaces now transact their business in Ironton, nine of which transport their iron over the Iron Railroad. The number of tons of pig metal (a ton being 2268 lbs.) each of these furnaces has sent out during the year is shown below:—

Furnaces.	Tons.
Buckhorn,	1,818
Centre,	2,[illegible]84
Clinton,	1,841
Etna,	1,[illegible]71
Mt. Vernon,	2,416
Lawrence,	2,[illegible]87
La Grange,	1,118
Olive,	1,831
Vesuvius,	1,[illegible]65
Hecla,	1,500
Total tons from above furnaces,	18,396

It is proper to add that the above figures do not show the make of iron for the several furnaces during the year, as some part was of the make of 1852, and some part of the make of 1853 is not yet brought into town. Some of the furnaces have made less and some more iron than the figures annexed to their name above would indicate. During the last part of December no pig iron was brought in, owing to repairs of the machinery of the railroad, but for which the pig iron business of Ironton for the year 1853 would have reached, in round numbers, twenty thousand tons.

And the value of the metal for the year is probably but little, if any, short of nine hundred thousand dollars.

We may add that the entire pig metal business of Lawrence county for 1853, probably amounts to 28,000 tons, valued at but little short of $1,400,000—and of this entire iron region, to 75,000 tons, valued at over $3,250,000.—*Register.*

One writer in that district thus describes the cost of manufacture at the Buckeye Furnace:—

I am acquainted with the cost of manufacturing metal at the Buckeye furnaces; their ore is not as rich as many others of the furnaces in the same neighborhood. It yields about 33 per cent., consequently it takes three tons to make a ton of metal, which costs them, on the furnace bank, $2.25 per ton—$6.75; they use 225 bushels of charcoal per ton, at 4 cents per bushel, $9; limestone for flux, 50 cents; expenses per ton for manager, clerk, storekeeper, and furnace hands, $4; incidental expenses for "gin" or outdoor hands, 50 cents; for hauling metal from furnace to Jackson, 10 miles, $2 per ton—making $22.75, which in reality is about $5 below the actual cost, as I know in several of the furnaces their ore costs but $1.62, or $1.75 per ton;

their average cost for manufacturing is $25 per ton, and it costs many of them over $30. Now, these prices may be reduced by deducting the profits made by selling merchandise and provisions to the hands. A few years back, they sold goods at an average cost of 100 per cent., and their profits for the year were from $8,000 to $10,000, but I am satisfied, for the last six years they have not made a profit on merchandise and provisions of over $6,000; say that they make 1800 tons of metal, would lessen the cost of the Buckeye manufacture $3.53, which would make it $19.42. I know they have not realized the half of $6,000, the last year, as 33 per cent. is about the average of the balance of the furnace, and from $8,000 to $12,000 is the amount of their purchases in the course of the year.

IMPROVEMENTS IN IRON MANUFACTURE IN GERMANY.

We have extensive reports of the important improvements introduced in Germany during last year, in the various departments of metallurgy, but more particularly in the manufacture of iron. In order to afford more time for their translation, we shall commence the publication of them in the July number of this Magazine, which also commences a new volume. The entire translation will occupy some pages in several numbers of the next volume.

In this connection it may not, perhaps, be improper to state that our arrangements for the future are such as to enable us to enrich the pages of the Mining Magazine with the important intelligence, either of a scientific or practical nature, which may from time to time transpire on the continent of Europe, and which would be valuable to the mining interest in this country.

IRON EXPORTS OF SWEDEN.

According to Swedish accounts, the exports of their bar iron to Great Britain and Ireland is about 40,000 tons per annum; to other countries, about 60,000 tons, thus making a total of 100,000 tons; of steel, to the United Kingdom, 1120 tons; to other countries, 2415 tons, making a total of 3585 tons.

EXPORTATION OF IRON PROHIBITED.

Sudden inconvenience of a serious character has just been experienced by the London firms in the iron trade from a resolution conveyed to them through the Customs, prohibiting the exportation of all kinds of iron to the continent of Europe. Many shipments have thus been stopped to Hamburgh and Rostock, and other ports in the Baltic, which, inasmuch as they were in execution of orders, cannot be suspended without loss or difficulty. It is presumed that some general regulations will be forthwith issued to facilitate the continuance of the regular trade, under such restrictions and securities as may be deemed sufficient; but unless these are of a simple nature, and are issued promptly, great damage will be inflicted in many quarters.—*Times.*

IMPROVEMENTS IN THE MANUFACTURE OF IRON.

Mr. H. Leachman, of Islington, has patented an invention, which consists in treating iron by means of certain materials, or a certain combination of materials, for the purpose of producing a more plastic and malleable iron than heretofore. For this purpose, common brick dust, salt, black oxide of manganese, and pig-iron, are employed, as hereinafter mentioned. The first three mentioned materials are mixed together in the following proportions, that is to say:—Common brick-dust, 120 lbs.; common salt (pounded fine), 600 lbs.; black oxide of manganese, 280 lbs.=1000 lbs. These three materials are to be thoroughly intermingled, and reduced to a state of powder, and used in the boiling process to which the pig iron is usually subjected. When the metal is thoroughly melted and commences to rise, the powder is to be added, in quantities varying from 4 lbs. to 10 lbs. weight, according to the quality of the metal. If the metal is of a very poor quality, 10 lbs. weight to the heat of 420 lbs. of metal is used; and as the quality is superior, so less is to be used proportionately, up to 4 lbs., in doing which the manufacturer must be guided by experience. The powder should be added to or thrown into the metal all at once, at the same time stirring it briskly about, so that the whole gets thoroughly mixed; and the iron is then ready for use. Calcined clay may be used instead of brick-dust. The patentee claims the treating of iron by or with a compound of materials, as above described.

IMPROVEMENTS IN ROLLING METAL.

In the method at present employed for rolling iron, or other metals, either the rolls are stopped after passing the sheets through, and then reversed, and the metal passed the contrary way, or the rolls are continued in motion, and the piece of metal lifted over the rolls previous to again passing through. Messrs. Roden and Thomas have taken out a patent for a new arrangement, by which the operation is greatly facilitated, and time saved. Two separate sets of rolls are placed end to end, and by suitable toothed-wheel gearing, made to revolve in opposite directions. On passing the piece of metal through one pair of rolls, it is immediately conveyed by a suitable carriage to the others, and passed in a contrary direction, the operation being repeated until the required section is obtained.

IMPROVEMENTS IN CAST-IRON.

We have received a communication from Mr. B. L. Phillips, of Upper Kennington lane, relative to a discovery made by him in the process of iron-founding, which he describes as of considerable importance, rendering the metal more homogeneous, tough, smooth on the surface, and greatly increased in strength. He states that many castings have been made at various establishments near London, the result of which proves, beyond doubt, that the metal fluxes easily, is perfectly freed from cinder and other impurities, increases in elasticity and strength, and the castings are more solid, and far superior to ordinary iron for turning, boring, and planing. We are not in a position at present to give any description of the process, as no patent right has yet been obtained; but it tells something for the discovery, whatever it may be, that Messrs. Scott, Russell and Co. have tested it in many ways, and have certified that its strength is from 25 to 30 per cent. greater than ordinary iron.

IMPROVEMENT IN THE MANUFACTURE OF SHEET-IRON.

Mr. E. G. Pomroy, of Pittsburg, Pennsylvania, has obtained a patent for an improvement in the manufacture of sheet-iron. He says, I do not claim the use of the above materials, in combination, as a paint or composition that may be forced into the surface of iron; but, believing that I am the first person who has ever incorporated solid carbonaceous matter with the surface of iron, by mechanical force, what I do claim is, the incorporating substantially as described, solid carbonaceous matter with the surface of iron, so as to protect it from oxidation, and beautify it at the same time.

IMPROVEMENT IN FURNACES FOR ZINC WHITE.

Mr. J. G. Trotter, of Newark, New Jersey, makes the following claim in his patent:—What I claim is, the combination and use of the upper and lower discharge or passage ways from the fire-place to the furnace; that is, the upper passage way for discharging or carrying off the lighter gases from the fire-place, by the reverberatory flue and return flues, and to the chimney and the lower passage ways, for discharging the flame from the fire-place direct upon the mass of ore on the bed of the furnace, and thereby reducing or subliming it more effectually and with less consumption of fuel than ever before accomplished. Also, the combination of the alternating series of bridges or brakes in the return flues, with the reverberatory flue, double arched conformation of the roof of the furnace, and the upper passage way and lower passage ways from the furnace, for the purpose of working zinc ores for making white oxide of zinc, substantially as set forth.

QUARRIES AND CLAYS.

RED SLATE QUARRIES.

Quarries of red slate are worked at Hebron on the dividing line between New York and Vermont. We have a specimen of roofing slate taken from them, which is a very compact, fine-grained and firm article. It would doubtless present a very pleasing contrast on the roofs of freestone and other buildings.

MACHINES FOR DRILLING STONE.

Mr W C Wright of Boston has obtained a patent for an improvement in machines for drilling stone. He thus states his claim :—

What I claim is, the combination of mechanism described, for operating the drill bar, consisting of two pairs of grippers, attached to rods having slotted heads which receive the wrists of the cranks, the said cranks being arranged diametrically opposite to each other on a common axis, and the slots in the heads of the gripper rods being of such form as described, so as to cause one set of grippers to be always rising while the other pair are descending, but to cause a cessation of motion before every descent, in order to give time for the drill bar to fall.

Mr S. Pettis of New York has patented an improvement in machines for drilling stone. He thus describes his claim :—

The nature of my invention consists in constructing one for drilling rock, etc., of an exceedingly portable character, and by the arrangement of the operative parts, giving certainty of action in the turning of the drill head, thus obviating the liability to jamb or deface the lifter, while, at the same time, the diagonal rib on the face of the lifter serves the purpose of a greater throw than one placed radially from the shaft on which the lifter turns.

What I claim is, so placing on the sliding frame the windlass with ratchet, whose pawl is acted on by the drill head at each descent thereof, and thus feeds the entire mechanism as the work proceeds, substantially as set forth.

MACHINES FOR DRESSING STONE.

Mr. E. G. Hastings, of Brooklyn, N. Y., has patented an improvement for dressing stone, and thus describes his claim :—

The nature of my invention consists in the employment of a cylindrical cross-head, by which the ways or guides which carry and give direction to the motion of the tool stock are supported in front, and on which they turn freely, and of a tool stock to which the cutting tool is attached, having in its lower side a recess, corresponding more or less nearly to the curvature of the said cross-head, which said cross-head thus serves also as a rest or stop, at whatever angle the said ways or guides may be adjusted and determines always the depth of the cut, and causes a perfectly true surface to be produced on the stone.

What I claim is, making the cross-head of cylindrical form, and the tool stock with a corresponding concavity, substantially as shown, so that the ways or guides which carry and give direction to the motion of the said tool stock, turn freely on the said cross-head, and the said cross-head serves as a rest or stop at whatever angle the said ways or guides may be adjusted, and thus always determines the depth of the cut, and causes a perfectly true surface to be produced on the stone.

Mr. J. T. Foster of Jersey City has patented an improvement in stone-picking machines, and thus describes his claim:—

The nature of my improvement consists in combining three or more or less series of rows of teeth with a cylinder, secured on the axle of the cart, on rods running lengthways of the cylinder, in such a way as to fall back and be concealed in the cylinder as they come in contact with the discharging plate, so as to prevent any liability to locking the cylinder by stones wedging underneath them when falling into the discharging trough, as is sometimes the case in my original machine, and in their dropping out again as they get to the underside of the cylinder to pick up the stones again, and in which position they are held by spurs on the end of the rods, working or running over a cam attached to the cart frame for that purpose.

What I claim is, the use of a cylinder for picking stone or other articles, in combination with series of rows of drop teeth, and cam and spurs for operating the same, substantially as set forth. I also claim the use of the solid discharging plate, and its combination with the drop teeth in a cylinder, and operated substantially as set forth, and the combination of the drop teeth with the adjustable rake.

MISCELLANIES.

MACHINES FOR PULVERIZING ORES.

Mr. A. K. Eaton, of New York, has patented an improvement in machines for pulverizing ores, and claims as follows:—

What I claim is a rotating dish or mortar, to hold the ore to be pulverized, and the water, mercury, or other liquids with which it may be advisable to mix the same, in combination with a vibrating rubber or pestle, which is made to traverse the bottom of the mortar, substantially as set forth.

THE CARBONIFEROUS PERIOD.

Silence was on the mighty deep,
  And in the teeming air,
Silence—the unborn beings' sleep,
  Rested o'er earth so fair.
Morn broke above the beauteous plain,
  Yet woke no note of bird,
And through the noontide's sultry reign
  No insect hum was heard!
Unnoticed evening shadows fell,
  And stars stepped forth on high,
But their clear glance's potent spell
  Met not one human eye.
Midnight and noon alike sublime
  In silence rolled their way;
Beneath them, everywhere, one clime,
  One level surface lay.
Rank fern and giant palm, arose,
  [illegible] the earth's [illegible] breath,
Fell back in [illegible] repose,
  Heralding life through death.

Cambridge Chronicle.

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