

ENGINEERING and MINING JOURNAL.

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"THE ENGINEERING AND MINING JOURNAL" ADVOCATES THE ADOPTION OF THE METRIC SYSTEM OF WEIGHTS AND MEASURES, and urges all who are interested in the simplification of our present complicated and unsatisfactory systems to aid, by their active sympathy and encouragement, the early introduction of this much needed reform.

AMERICAN INSTITUTE OF MINING ENGINEERS.

OFFICIAL BULLETIN.

The annual meeting of the Institute will be held in Wilkes-Barre, Pa., beginning Tuesday evening, May 22, at 8 o'clock. Full particulars will be given later.

Members and associates will please give early notice to the Secretary of their intention to present papers at this meeting.

EASTON, PA., April 24, 1877.

T. M. DROWN, Secretary.

THE MAY MEETING OF THE INSTITUTE.

This meeting, which is to take place at Wilkes-Barre, Pa., will be full of professional interest. The coal mines near Wilkes-Barre are among the very largest and best equipped of any in the world. The hoisting engines, pumps, ventilating fans, and breaker machinery are of the largest and most improved types, and this excellent opportunity to examine them, in company with experts who can supplement the information there given by that gleaned in nearly every mining region in America or Europe, should not be neglected by engineers in charge of works and mines elsewhere.

Full particulars of the programme of the meeting will be given probably in our next number, but we may say that visits will be made to some of the principal mines, where magnificent specimens of machinery will be examined, and the most advanced practice in mining ventilation, and in methods for combating mine fires and prodigious discharges of fire-damp, will be seen. The large machine shops of Wilkes-Barre and other manufactories of great interest, and which engineers have rarely an opportunity to examine, will probably be among the attractions of the meeting. One day, it is expected, will be devoted to visiting the great furnaces and the new steel works and other matters of interest at Scranton.

Added to the objects of great professional interest, the unrivalled beauty of the charming Wyoming Valley will prove an irresistible attraction to many of the members.

THE RULES OF THE INSTITUTE.

The *Iron Age* did much more than newspapers usually do to atone for its savage and baseless attack on the management of the Institute of Mining Engineers. Having sent a copy of that article to each member and associate of the Institute, it mailed to the same persons subsequently special copies of its retraction. This was, indeed, no more than fair; but fairness is sometimes heroic. We trust this eminent virtue still abides with the *Iron Age*; for we are obliged to appeal to it again.

The *Iron Age* now criticises the objects of the Institute, the means by which they are carried out under the Rules, and the manner in which the means themselves are administered. The latter point is made with due caution; for this is the ground which proved slippery before. We shall dispose of it first, simply to clear the way for a consideration of the other.

It is charged that the author of a paper does not always receive the twelve copies of it to which he is entitled by the Rules. This is quite true; if he does not want them, he may not get them. "We know of more than one instance"

—to adopt a frequent phrase from the *Iron Age*, which we suppose means two instances—in which authors have not cared to receive their twelve copies, having made other arrangements for separate publication. If the *Iron Age* means, however, that authors sometimes desire these copies, apply for them, and fail to receive them, we can only reply that we are not aware of any such case, and do not believe it has occurred.

It is charged that a member, with an accepted paper to read, once sat through a whole session waiting for his turn, in vain; that the paper was subsequently read by title, and never appeared in the Transactions. The *Iron Age* may here confound the "Transactions"—that is, the volume so named—with the "Proceedings," which is the term usually given to the publication in this JOURNAL. As for the woes of gentlemen who sit through "a whole session" waiting for their turn, they are among the inevitable annoyances of all such gatherings. The Institute holds four or five sessions during each meeting. Many of the members arrive with papers, perhaps not announced in advance, or so announced as not to give accurate knowledge of their length. Nearly all of them have decided preferences as to the session at which they wish to read their papers. One must leave by a certain train; another wishes to be heard while certain experts are present, who cannot stay long; another needs an evening session to show his lantern-views; another wants time to put tables of figures on the black-board; and so on. The Council does its best to harmonize these interests and suit everybody, while giving some preference to papers which will arouse profitable debate. The programme is placed in the hands of the presiding officer, and he endeavors to carry it out. But suddenly a debate arises, not down on the bills, yet full of interest. The chairman lets it go on as long as he dares, and reluctantly cuts it short at last. Two such occurrences in one session are very likely to exclude some patient waiter who was last on the programme for the day. Gentlemen usually recognize the difficulties that environ the presiding officer in this matter, and take their disappointment good-naturedly. That any gentleman ever carried a grievance of this kind to the *Iron Age*, we should be sorry to believe. That the *Iron Age* should listen to it, and give it the dignity of leaded type, is surprising enough. Moreover, it does not seem to see that the Rules are framed to prevent this annoyance as far as practicable. If business and discussions could be indefinitely continued, according to ordinary parliamentary law, as long as the assembly chose, many members would have to wait in vain, who are now rescued by the authoritative voice of the chairman putting an end to the consumption of the time assigned to them. The only other course would be to fix the time for each paper in advance—which would break up the audience, destroy debate, and give to the proceedings that cut-and-dried tone which has been a recognized evil in many other societies.

It is charged that papers read at the meetings are sometimes suppressed from publication altogether. If this means that papers furnished by the authors for publication are suppressed, it is not true. If it means that by the fault or at the desire of the authors papers are occasionally withheld from publication, it is a statement as true as it is trivial.

So much for the abuses of administration. The indictment is not a serious one. Such grievances might furnish matter for a complaining letter to the Secretary, and for such explanation and remedy as could be offered. Paraded "in the interest of the public," they make a sorry figure. The *Iron Age*, having taken in hand a great reform, ought to disdain these small pickings by the way; and the "more than one" member, who prefer to "reform" the Institute by getting somebody to attack it from the outside would work to more advantage if they took the same position.

But the *Iron Age* lays most weight upon the Rules. It finds the objects of the Institute objectionable, and its Rules unjust and unsatisfactory. It seems to think that these regulations have been cunningly devised, on a radically new plan, so as to restrict the rights of members, and create (for some ill purpose not named) a monster corporation of tyranny.

As to the objects of the Institute, they are not likely to be changed. The safety of such a society, administered by "arbitrary authority," lies in narrowing its objects, and rigidly adhering to them. If the *Iron Age* thinks the purpose should be "treble" what it is, we beg leave to assure it that the present plan requires hard work enough, and all the money which the Institute can command. Moreover, in view of the fact that the Institute has been successful, while other societies with much wider and more numerous purposes have "gone to pieces," we must say that we prefer not to commence tinkering at the foundations of the building, lest they might turn out to have something to do with its stability. The *Iron Age*, sagely criticising from a safe distance, may advise many things; but the folks that live in the house, you know, are just a little disinclined to pry out the corner-stone.

But the upper stories are, of course, more easily altered. And of these, Rule VII., it appears, needs overhauling badly. By this rule, the Council has power over the reading and publication of papers, and the copyright of all papers is vested in the Institute, unless otherwise agreed between the Council and the author.

At this point, we beg leave to say to the *Iron Age* that the Rules of the Institute were originally copied from those of the North of England Institute of Mining Engineers, one of the oldest and most successful societies of the kind. Changes have been made to suit the peculiar circumstances of a widely scattered membership; but the feature to which the *Iron Age* objects is not changed. It is, moreover, almost invariably the rule with such societies.

The management of such a body by its Council has been found far better than the reference of business matters at every meeting of the whole body. The

perils of "arbitrary authority" are less than the nuisance of wasted time and patience over matters of detail. The *Iron Age* thinks that a member whose paper has been refused should have the right of appeal to the whole body. Pray, what could the whole body do but hear the paper in order to decide whether it was properly referred? And if the Council also must be heard, and all the reasons of refusal given, is not the last state of that man going to be worse than the first? And even if he liked it, what would be its effect on the members who were patiently "waiting for their turn"?

The *Iron Age* has overlooked a very important point. The Institute imposes no sure conditions of membership. It does not inquire whether a candidate is a skillful and experienced engineer. Its associates need have no other qualifications than respectable character and a desire to share its benefits. Members and associates alike may write papers. There is absolutely no barrier against flooding the meetings with valueless, crazy, or inappropriate papers, except the discretionary power of the Council. Moreover, the "reading" of papers, as the *Iron Age* should know, is often a mere oral statement. Frequently, the Council can only judge in advance by the account or abstract which the author gives. It may happen that, upon hearing the public statement, the great mass of it is plainly seen to be inappropriate to the Transactions. We know of no case in which the author himself has not assented to the suggestion that the publication should be made elsewhere. The Council has seldom, if ever, exercised its "arbitrary authority" to suppress a paper. If the *Iron Age* has heard of one or "more than one," we challenge it to print the papers; and we will promise to make of them monumental illustrations of the wisdom of Rule VII.

Besides the printing of the Proceedings in the ENGINEERING AND MINING JOURNAL, the Institute publishes volumes of Transactions. The first of these comprised two years; the other three, a single year each. These volumes are carefully edited; sometimes papers and remarks in debate are omitted from them. This is done with the assent or at the desire of the authors. Mere speeches of welcome, etc., when they do not contain matter of permanent professional value, are omitted. From the first volume, some papers of real value were left out, simply because the size of the volume was limited by the money in the treasury. Since that time the funds have been sufficient for a full publication. It is to this contingency, however, that the clause in Rule VII. refers. It is intended to enable the Council to print what it can afford to print in book-form. But it has never been employed, so far as we know, against the wish of any author. If the *Iron Age* knows to the contrary, let it produce the rejected paper. The writer of the present article enjoys the proud distinction of having had more of his productions left out of the Transactions than anybody else; but he hastens to assure the Council that he knows better than to complain, and that he will never, no, never, ventilate his grief in the *Iron Age*!

But the copyright is vested in the Institute! Indeed! Well, it must be vested somewhere, mustn't it? And if the Institute prints the paper, it must hold the copyright, or else nobody can, not even the author. But what need an author do, if he does not like this arrangement, but "otherwise agree" with the Council, according to the rule? As not a single paper has ever been copyrighted, all this agony about a hypothetical case seems somewhat absurd. The *Iron Age* has copied from our columns too many papers not to be aware that, by general consent of authors and Council, the copyright is entirely thrown open to the public. The right to control it exists, but is not used. There is at present no restriction whatever upon "additional" publication, except that the author cannot buy copies of the Institute at the cost of paper and printing in order to sell them.

The *Iron Age* has received official printed copies of the papers of the Iron and Steel Institute of Great Britain, which it is free to reprint; and this example is held up to us. But all the members of that body, and all the newspapers, and anybody that chooses to subscribe, have received these copies also. Hence, the *Iron Age* gets from the Iron and Steel Institute exactly what it gets from the Institute of Mining Engineers—the privilege of reprinting its official publications, after the members have received them, and in common with every other journal that wishes the same privilege. The fact that the official publication precedes the meeting in one case, and follows it in the other, does not alter the matter. If all the papers intended to be offered at any meeting of the Institute of Mining Engineers were published before the meeting in our columns, and the *Iron Age* were just as free to copy them as it is now, would it be satisfied? Not at all; what it desires is to print the papers in full before their official publication—a thing which it cannot have from any society in the world which makes such publications at all.

We beg to call the attention of the *Iron Age* to the rules of the Iron and Steel Institute of Great Britain, which it undertakes to praise without having read them. Section vii. of those rules is as follows:

"23.—All communications shall be submitted to the Council, and, after their approval, shall be read at the general meetings.

"24.—All communications made to the Institute shall be the property of the Society, and shall be published only in the Transactions of the Institute, or by the authority of the Council."

It would be interesting to have the views of the *Iron Age* on this "unjust and unsatisfactory" arrangement, and since the British society, which it brought forward as a model, thus disgracefully fails to come up to its description, we "wait our turn" with patient curiosity to see what other society the *Iron Age* will honor by a hasty selection. It will probably wish next time to read the rules of its proposed model before recommending them. In that case it may consult our files and library, which are apparently better furnished in that line than its own.

The "remedy" which the *Iron Age* suggests is to decree that Rule VII. shall be construed in a certain way. But this is exactly the practical construction now put upon that rule. The only thing it does not give the *Iron Age* is the right to ante-date the official publication. We respectfully suggest to our contemporary that a more careful study of the Rules and the facts would give it a second access of enlightenment, equal to that which it has acquired from a first perusal. It attacked the management before it had read the Rules; now it attacks the Rules without knowing how they work, or why and how they came into their present form, or even what they mean and to what they refer. We make allowance for the difficulty of its position. It is pretty hard to reform the abuses in a society to which one doesn't belong, and particularly when the abuses do not exist. It is always hard to manage other folks' business, though it looks easy. But there is one good thing about the *Iron Age*, it owns up handsomely when it fails—and that is now in order. The *Iron Age* need not "wait for its turn." *

GULCH MINING ON SOUTH CLEAR CREEK.

About fifteen companies are working claims in this cañon between Floyd Hill and Fall River. The gulch was known to be rich in gold from the early days of the country, and altogether about \$3,000,000 in dust has been taken from it up to date. At present the annual yield is ranging from \$70,000 to \$80,000 a year, taken mainly from only partially developed mines.

The gold is found in a narrow (but generally very rich) pay streak on the bed-rock in the center of the present channel. In some cases, however, the old channel does not coincide with the existing one, but is found 50 to 100 feet to the right or left. Usually the bed-rock is not reached under 50 feet, and is found covered with a heavy deposit of water-worn boulders, weighing from 25 to 50 lb. This old channel is yet, in its entirety, somewhat of a myth, though confidently believed in by old miners in the gulch; and, in truth, such facts as are known not with much certainty to its existence. The gulch is, however, too narrow to admit of any great divergence of the course of the stream, and no evidences have yet been found that the bed of the creek was ever much higher up on either slope of the cañon than it is now.

In spite of some serious disappointments in the past—which in reality were errors of judgment, and not at all demonstrative of the barrenness of the gulch—several new attempts will be made this year in the town of Idaho Springs to strike the old channel. The bar on which that town is located is broad and deep, and through it, without a doubt, the creek once ran. The work to be done this year will be conducted with more judgment, energy, and on a better financial basis than any in the past, and is not unlikely to be successful. †

THE COPPER MINES OF BUTTE, MONTANA.

The almost new district of Butte, in Montana, produced last year 800 tons of copper ore, carrying on an average 35 per cent. of that metal and 15 ounces of silver per ton. When it is remembered that the district is but two years old, and that it lies 300 miles away from any railroad, this yield will not seem small.

Late issues of the *Butte Miner* give the following information regarding the copper veins of the district, and the revival of work this spring upon them. In consequence of the isolation of the town, some of the mines are not yet sufficiently developed to continue work without a cash market for ores, are shut down in the winter, and remain so till transportation opens in the spring. The *Miner* says:

"For some time past the copper mines of this district have been under a cloud, and but little has been said about them. The owners of the several mines have been steadily at work, however, and again our copper mines are attracting attention. On the Mountain lode Messrs. Foster & Ray and First National Bank of Helena are taking out large quantities of No. 1 ore. Louis Behm, on the same lode, has 50 or 60 tons of 40 per cent. ore on the dump. J. D. Allport, lessee of Parks' claim, on the Parrott, is throwing daylight on plenty of 35 per cent. ore. Belk & Co., on the same lode, have out about 75 tons of good copper ore. Work at the Belk is being energetically continued with satisfactory results. Steward & Co., on the Nipper report favorable progress. Ransom & Co., one the Modoc and Dexter, have doubled the value of these mines by recent developments, besides many other leads which space prevents us from mentioning this issue. Judge Davis has started up on the Gem, with the intention of seeing the bottom of a 100-foot shaft. The Hattie Harvey, which for some time past has been in litigation, it is reported, will be taken hold of by a joint stock company, and a smelter erected at an early day. The Olin works are now concentrating about 12 tons of copper ore per day. The Poznainsky Bros. and Belk, Wilson & Co. will erect concentrating works at an early date.

"The Poznainsky mine, Mountain lead, gives employment to nine men, who take out, on an average, eight tons per day, the bulk of which is second-class ore. Of this grade 800 tons remain on the dump, while some 200 tons have been hauled to the Olin works for concentration.

"On the Parrott, lead Parks' Mine, only a small force is engaged in taking out ore, and, consequently, the output is light. The total amount of first-class ore in the sheds will not exceed 60 tons. there is a very large amount of second grade ore at the mine which is now being concentrated by the use of hand-jigs. The operation, though slow, is successfully accomplished, and, with the exception of the finest particles of ore, all is saved.

"At Discovery shaft on the same lead, the output of 40 per cent. ore is daily from two to three tons, and probably double this amount of ore, which will run from 15 to 25 per cent. This low-grade ore is soon to be utilized by concentrating, and hand-jigs for this purpose will soon be put up.

"The Behm Mine on the same lead east has a day shift of hands at work. The ore body still shows every indication of continuing in the same rich character of ore as when first met with. The ore on hand at this mine will not exceed 150 tons of both high and low grade. The present season there has not been as much activity in copper mining operations as before, probably owing to the low price of copper and the failure to complete concentrators at a time when expected. The mines all show well, not only those that are being worked, but a score of others which are idle."

The ores of the district are oxides (mainly the red oxide) and copper glance. On nearly all the veins carbonates are found on the surface which disappear as

soon as depth is gained. In a few there is a preponderance of sulphide. The veins are quite numerous, and cut across the country like huge dikes, in places traceable by their colored outcrops for hundreds of feet at a stretch. They average from 3 to 20 feet in width, and carry a very regular seam of pay, which rarely disappears entirely.

Butte is, next to the Clifton district on the border of New Mexico and Arizona, the most prominent copper-producing camp in the West. Its growth has been very rapid, owing to the existence of very good silver mines in the same belt of veins, and that point in its development has been reached which precludes the possibility of any permanent retrogression. Sufficient depth has been gained to demonstrate the permanence of the deposits, and to give great confidence to anyone investing capital in this exploitation. While it will yet require several years to so open the mines that their production will be regular and constant and beyond the influence of hard winters, such as periodically come to the more northern Rocky Mountain towns, there can be no question that the district is one of permanent value.

Within the last few years the development of base metal districts in the West has been one of the most important features in its history. We have become quite accustomed to new and rich discoveries of the precious metals, and the excitement which attends these has, in a measure, hidden the less brilliant but equally valuable discoveries of lead, copper, and iron deposits. In time it is not unlikely that the value of the latter metals produced on the coast will approximate to that of gold and silver, and already it amounts to a very respectable figure. Last year the value of pig-lead and argentiferous galenas shipped East amounted—exclusive of silver contained—to about \$4,000,000, while the yield of copper was about \$1,000,000.

The production of the Butte mines this year promises to exceed 1,000 tons of 35 per cent. ore. The proportion of silver carried in the ore is reported to be decreasing as greater depth is gained, which would be a rather favorable circumstance, unless it increased to a high figure. It is a pity, however, that the Butte ores must be transported more than 3,000 miles overland, at an expense of about \$60 per ton, before they are smelted. This expense comes, of course, out of the pockets of the miners, and makes the profit of the producers so small that the mines are opened slowly and developed under great disadvantage. There is a most favorable opening in this camp for the erection of copper-smelting works. We think any one who looks over the field will not be disappointed or discouraged by the showing.

NEW PUBLICATIONS.

THE MOLLY MAGUIRES: The Origin, Growth, and Character of the Organization.

By F. P. Dewees. J. B. Lippincott & Co., Philadelphia.

The interest in the history of this infamous society has increased rather than diminished as its character became known, and it is not surprising that this book should have a very large sale. Mr. Dewees, who is a member of the Schuylkill County Bar, has written a very valuable book, and places in the most impartial manner the facts fully upon record. While he avoids extending the opprobrium beyond the class to which it belongs, he fills us with loathing for the wretches who composed this infamous band. As a reverse to the horrible picture of the cruelty and cowardice of the Molly Maguires, Mr. Dewees shows us the remarkable courage and ability of McParlan, the detective, through whose immediate instrumentality Mr. Gowen, the President of the Philadelphia and Reading Railroad Co., was enabled to break up this band of thugs, the greatest service which has been done by any one man for the Pennsylvania coal regions since they were first opened. Every one should read this history of the thugs.

RAILWAY ACCOUNTS—DISBURSEMENTS. By MARSHALL M. KIRKMAN. Published by the *Railroad Gazette*. New York. \$2.

It is to be hoped that this book will find its way into the hands, and its principles into the practice, of all our railroad managers.

PRIMARY LESSONS IN METALLURGY.—II.

Written for the *Engineering and Mining Journal*.

Now, let us consider the manner in which the conditions of reduction—viz. the exposure of hot metallic oxide to the action of hot reducing gases—are brought about in the bloomery fire.

This fire is built and maintained in a rectangular trough or open-topped box, made of cast-iron plates set in brick-work, and the plates are hollow slabs, which are kept cool by water circulating through them. At one side of the box or hearth a tuyere is inserted, which is connected by pipes with a blowing machine of some sort, and inclined so that the blast of air from the tuyere is directed upon the bottom plate at its middle. The blast of air is sometimes heated by carrying it through pipes in the chimney. Above the box or hearth there is a space two or three feet high, inclosed upon three sides by brick walls, while the fourth side is open, and the whole is covered by a sort of canopy connected with a chimney to carry off the gases of combustion. A tap-hole is made in the bottom of the hearth to draw off slag.

The fuel used in bloomery fires is wood charcoal, on account of its freedom from earthy impurities, and the ore is usually, in this country, a rich magnetic oxide, which has been finely granulated by stamps and afterwards washed over as to be as free as possible from silica and other impurities commonly found as minute crystals disseminated through the mass.

To set the bloomery fire in operation, charcoal is heaped in the hearth and kindled, and the blast turned on. When the coal is all ignited, the blast is reduced, so that CO₂ combustion occurs in the lower part of the fire, but the resulting CO₂ gas burns back to CO as it rises through the heap of coal, and CO gas escapes at the surface; but this immediately burns to CO₂ by reason of access of a fresh

supply of air drawn along the surface of the fire. Thus we have at the bottom a very hot stratum or zone of CO₂ combustion, and above that a cooler zone of backward combustion to CO, and a thin upper zone of considerable heat from CO₂ combustion of the gases at the surface.

When matters are brought to this state, a thin layer of ore is spread over the top of the fire. The first effect upon the ore is a roasting by reason of the heat of the burning gases immediately above it, by which each granule is made spongy by the elimination of crystalline water and other volatile impurities, and by expansion within itself. As the fuel is consumed the fire is replenished by adding layers of coal and of ore alternately, so that the layers of roasted ore gradually sink down through the zone permeated by CO gas, both fuel and gas being at a red heat.

Under these circumstances, the heat of itself loosens the hold of the O of the ore upon the iron (Fe), and the pervading CO seizes upon it and burns with it to CO₂, leaving the iron in a spongy state, but nearly pure, and the particles capable of being welded together. If we conceive a molecule of CO in the lower part of the fire as seizing upon an atom of O from a molecule of ore, we must conclude that a molecule of CO₂ will be the result; but we must also conceive that this molecule of CO₂ will immediately come into contact with hot coal and take up another atom or two of C, which will restore the molecules to the form of CO, ready to operate in the same way upon the next contact with ore, and so on until the gas finally escapes at the surface.

As the first layer of ore sinks downward, it finally reaches the hot zone of the hearth, and, having by that time been reduced to metallic sponge, the heat at that point is sufficient to cause the particles to agglomerate and form a rough sort of ball, which the forge-man presses together with an iron bar, and as the successive portions come down they are pressed against and welded upon the nucleus.

At this stage it will be well to consider the impurities of the ore which have not been eliminated by the stamping and washing. Although each granule of iron may be pure in itself, the interstices are filled with the silicons and aluminum particles originally in the ore.

It happens that silica and alumina, although each is practically infusible by itself, will combine together under intense heat, and form a rough sort of glass, called slag or cinder, which remains liquid at or below the welding heat of iron. So silica or alumina combines under like conditions with lime, potash, or soda, and forms a more or less liquid slag.

Another means of forming slag is derived from the iron itself, iron protoxide having the same quality of combining with silica and making slag, which is liquid at the welding heat of iron. As the iron sponge passes downward through the blast zone of the fire it meets a stream of very hot mixed gases, in which there is a preponderance of CO₂ gas and much free O, which under the heat existing in that zone rapidly oxidizes the surfaces of the nodules exposed to its action. Although the final result is a coating of peroxide, it is easy to see that the stage of protoxidation must be passed through, during which stage the silica remaining is seized upon and converted into silicate of iron, which is fusible, so that the portion of each impurity which had not been fluxed by another impurity, or by potash from the coal ashes, is at last fluxed by a part of the iron itself. And it will also be seen that a quantity of slag will collect during the working of a charge upon the bloomery hearth, which, being liquid, may be drawn off through the tap-hole.

The melted slag has a valuable quality by reason of its specific gravity. It is lighter than metallic iron and heavier than silica and most other stony bodies, so that, when the iron sponge is immersed in slag and stirred about, such stony particles as have not yet been fluxed and melted float upon the surface of the slag, and the iron sinks to the bottom when the stirring is stopped, so that the iron may be easily rinsed and levigated in its own slag.

This sort of levigation is unwittingly practiced by forge-men: the first nucleus of the ball or bloom which comes down upon the hearth is spread out in the form of a shallow dish, and the iron sponge coming down afterwards is directed into this dish as much as possible, where it is stirred about under the coal, and the form of the dish preserved to the end of the charge by directing the accretions to the bottom or rim as may be required. The slag which runs over the rim of the dish is drawn off at the tap-hole from time to time.

When metallic iron, in the form of sponge especially, is exposed to a high heat in contact with carbon gases or with solid carbon, it absorbs or combines with carbon and becomes hard, in fact steel, and upon the absorption of more carbon it becomes "cast iron." Now, these conditions for carburizing iron exist in the bloomery fire below the tuyere. The heat is great by reason of the CO₂ combustion going on immediately above, and the loup of iron resting upon the hearth is surrounded by incandescent charcoal, so that the atmosphere is one of carbon gases. It is a fact that the iron becomes steely in the fire if the slag is kept low upon the hearth, and by skillful manipulation a real steel may be produced in that way. In practice the loup is allowed to carburize but little, because the object is the production of a soft and tough kind of iron. The real benefit of so much carburization as is allowed arises from the necessity of oxidizing a part of the iron of the loup, while giving to it the final high heat to prepare it for the hammer.

When the loup has grown to a sufficient size, the forge-man omits to charge ore for some time, and, when he judges all the ore in the fire to have been reduced, he raises the loup from the bottom to the front of the blast tuyere, when it is rapidly brought to the welding heat, and also rapidly oxidized. This oxidation assists materially in bringing the loup to the requisite heat, but, as iron so far advanced in its manufacture is an expensive sort of fuel, the oxidation is avoided as much as possible. At this time the carbon which had before combined with the iron burns away at the surfaces, thus saving iron, and much of that which exists in the interior of the loup afterwards combines with the O of the oxidized coal, and effects a further saving of iron.

When sufficiently hot, the loup is taken from the fire and compacted into a bloom under a tilt hammer, and is ready for market. N. W. W.

MONONGAHELA VALLEY COAL TRADE FOR MARCH.—The following is a recapitulation of the coal trade in the Monongahela Valley for the month of March:

Pool No.	Bushels.
1.....	1,691,800
" 2.....	6,007,200
" 3.....	1,398,500
" 4.....	2,300,700
Total.....	11,398,200

The shipments for February were 8,869,950 bushels, showing an increase of 2,528,250 bushels. There is a falling off, however, compared with the shipments for March, 1876, and the outlook for the present month is not very encouraging. Not half the works are in operation, and there is a general movement to reduce mining to two cents, which will be resisted by the miners, who now receive from two and one-half to three cents. There are now more miners in the valley than can find profitable employment, and many of them are leaving for other places or engaging in other pursuits.—*Pittsburg Commercial*.

THE ALLOUEZ MINE AND ORE DRESSING, AS PRACTICED IN THE LAKE SUPERIOR
COPPER DISTRICT.*

By Charles M. Bolker, E.M.

The Allouez Mine is situated in section 31, town 57, north of range 32 west, Michigan. The mine is being worked in conglomerate bed, which conglomerate is generally conceded to be the continuation of the Albany and Boston conglomerate of Houghton County. Besides the well-known Calumet & Hecla with the adjoining Osceola, both working on the same bed, and the new location, the Seneca, now being tried on the Kearsarge conglomerate, the Allouez Mine is the only one working on a conglomerate bed. The Albany & Boston, in Houghton County, of which, as said before, the Allouez is supposed to be the continuation, shares with all the remaining conglomerate beds, near and around Portage Lake, the property of being non-quartziferous, while the conglomerates of Keweenaw County are all highly quartziferous in character. This change takes place, according to Professor Pumpelly, about six miles northeast of Portage Lake. The Allouez conglomerate, with a dip of $38^{\circ} 15'$ and a general course of about 36° east of north, is overlaid by a trap, and has as its foot-wall an amygdaloid. The trap is followed by a series of amygdaloidal melaphyres and true amygdaloids, further on by the greenstone and ashbed; towards the lake shore alternating traps and conglomerates are found. At the foot-wall of the Allouez conglomerate, an amygdaloid lies, the thickness of which is not known, which is also the case with the other formations, accurate surveys and geological researches of this district having, as I was informed, never been made. About 198 meters (650 feet), horizontally measured, from the Allouez conglomerate another amygdaloid bed can be traced, on which the present rockhouse stands, further on a melaphyre is exposed, and then follow the diverse conglomerates, the Calumet, the Kearsarge and Kingston, which, according to the last geological report, are at about the respective vertical distances of 436.5 meters (1,432 feet), 760.8 meters (2,496 feet), and 882.7 meters (2,896 feet) from the Allouez conglomerate. The Allouez conglomerate in the mine is 12.8 metres (42 feet), measured horizontally across, or 7.92 metres (26 feet) on the perpendicular. As all the beds make a sweep towards the northeast, partially following the curvature of the lake, the Allouez conglomerate is found again at the Central Mine, having a thickness of from 4.57 to 6.1 metres (15 to 20 feet), while near the Phoenix it is replaced by a layer of soft red clay, locally called the "slide," of several centimeters in thickness. This same character has been observed in the Allouez Mine in the winze north of No. 1 shaft in the crossing. Here is found a red clay having preserved yet the structure of a conglomerate, showing the thorough decomposition. The conglomerate in the mine is variable in character. At the foot-wall it is a very coarse pudding-stone, the portion following this a quartzose porphyry with a variable amount of pebbles. At about the middle of the bed the conglomerate is of a very fine structure, resembling a sandstone. This is locally called the "sand slip"; it is variable in thickness, changing from 7 to 30 cm. (3 to 12 inches), being on an average probably 7 to 10 cm. (3 to 4 inches). Beyond this sand slip little or nothing is known, the hanging wall having only once been struck in the second level, and a drift run along it for a short distance, proving the rock at that point similar in character to the portion to which active exploitation is limited.

general character of the copper impregnations being decidedly fine-grained. The richness of the rock in copper is very changeable, and it requires great discretion and experience to decide which portions to leave in the mine and which to take out. The average yield during the previous year, ending July 1, 1876, according to the annual report, was, 0.87 per cent. of ingot copper referred to the quantity of rock broken and hoisted, or 1.4 per cent. referred to the quantity of rock sent to the stamp-mill. The total quantity of rock hoisted during that year was 82,410 tons, and the quantity sent to the stamp-mill was 51,135 tons, showing that at this mine only 62 per cent. of the total quantity of rock broken is sent to the mill for crushing and washing. The Quincy Company stamped and washed nearly 75 per cent. of the rock mined during the year 1876. The percentage of rock of the Atlantic Mine, working on an amygdaloid belt, was given to me as 1.3 per cent. of mineral, or 0.99 per cent. of copper ingot per ton of rock. At the Copperfalls Mine they work on the ashbed (presumably the same belt as the one on which the Atlantic Mine works), on a rock averaging below 1 per cent. of ingot referred to the quantity of rock stamped. The Calumet & Hecla Mine averaged during the year 1875 to 1876 $4\frac{3}{8}$ per cent. of ingot copper.

The rock as it comes out of the mine is in variable sizes. The smaller rocks are screened. The larger rocks vary all the way up to 61 to 76 cm. (24 or 30 inches). These in case of the Calumet & Hecla are broken by a steam hammer, which does the work admirably. At the Allouez and other mines they are block-holed. The steam hammer saves the wages of 12 block-holers per day for a mine of the Allouez capacity. The rock-breakers in use at Lake Superior are the Blake crushers, the No. 9 and No. 7, the coarse or preliminary breakers, and the No. 5 and No. 4, the finishers, which reduce the rock to the proper size for feeding under the stamps. Generally for one No. 9 or No. 7 two No. 5 or No. 4 are found in use.

The stamp-mills at Lake Superior are very often located at a considerable distance from the mines. The Calumet & Hecla have their mills situated at Torch Lake, and the mine is connected with the mill by a good railroad about 13 kilometers (8 miles) long, the latter end of the route terminating in a well-laid out automatic inclined plane. The Atlantic mill is situated at Portage Lake, about 4.8 kilometers (3 miles) from the mine. Southeast of this is the Osceola mill, about 13 to 14.5 kilometers (8 to 9 miles) distant from the mine. Then follow along the shore of Portage Lake the Quincy mill, the Pewabic, and the Franklin mills. The latter three have the advantage of being closely connected with their respective mines by automatic inclined planes. The Allouez mill is connected with the mine by a railroad about 3.6 kilometers ($2\frac{1}{4}$ miles) long; it is situated in section 30 away from water. It draws its water supply mainly from Gratiot River by a system of launders, 71 by 40 cm. (28×16 inches) deep and 4 kilometers ($2\frac{1}{2}$ miles) long. A smaller supply is taken from a dam built about 1.2 kilometers ($\frac{3}{4}$ of a mile) south of the mill, intercepting smaller streams.

The system of ore dressing at Lake Superior in its main points is alike in all the mills, and a description of one mill in its principle will illustrate the mode now in use in these so famous copper districts. Small variations certainly are found in going from one mill to another, to enumerate all of which would lead too far in this paper.

The stamp-mill houses have the rock-bins on the back part of the building,

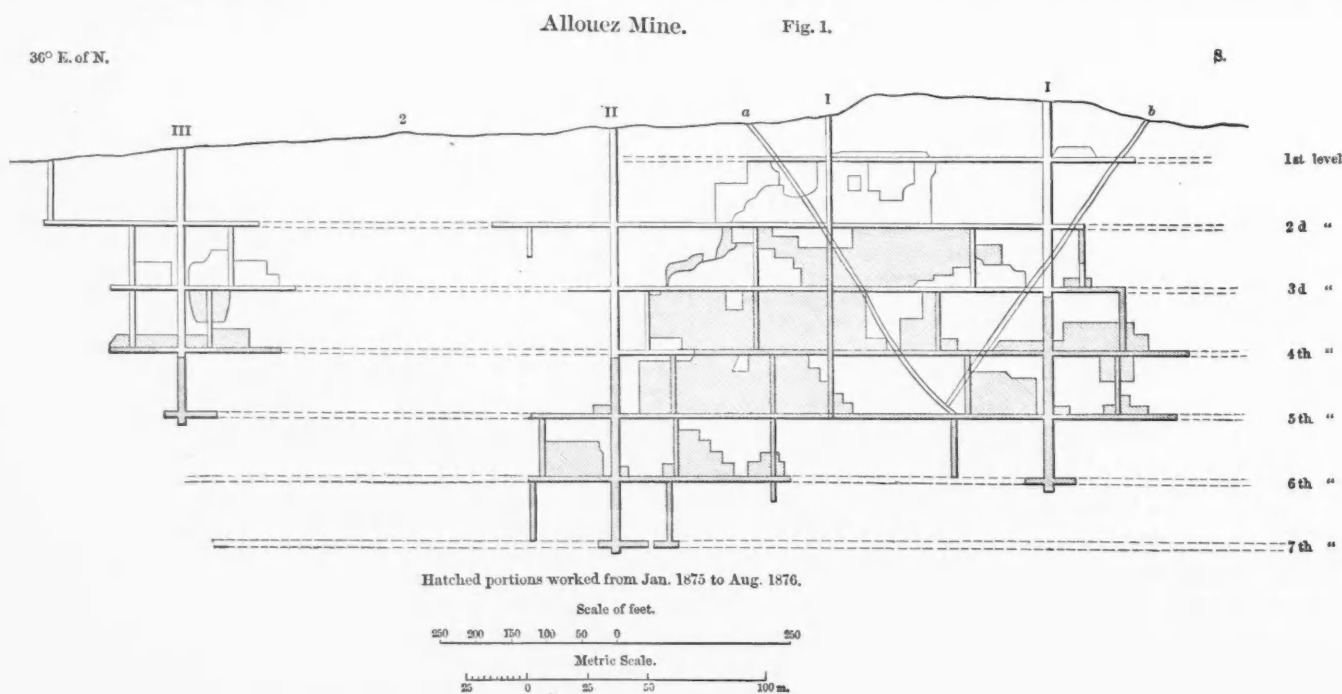


Figure 1 shows the longitudinal section of the mine and its workings up to August 1, 1876. Three shafts and one winze have been sunk on the bed. Shafts No. 1 and No. 2 are those by which work is pushed. No. 3 has been abandoned at present and is full of water. The drawing shows two crossings, the one north of No. 1 winze dipping south, the other south of No. 1 shaft dipping north; they dip at about 65° towards each other. The crossings are marked by a great deal of broken ground, and have disturbed the surrounding rock materially, keeping the ground poor in copper. Since my return from the lake I have learned that crossing *a* has partly gone down the winze between the 5th and 6th levels, and then jumped off its regular course; that crossing *b* has been lost entirely. On the fourth level a fissure (not shown on the section) appeared, which was being struck at the time on the 6th level by shaft No. 1. On the hanging wall of this fissure some of the richest rock of the mine has been struck. The ground around No. 3 shaft was at the time the most promising part of the mine. Here the copper is coarser than in any other part of the mine, the

in which variable amounts of rock can be received according to the capacity of the mill; for instance, Calumet & Hecla, 2,500 tons; Atlantic, 1,000 tons; Allouez, 450 tons, etc. The bottom of the bin has such a slant as to make the rock run towards the charging floor, whence the feeders shovel it into the mortar of the stamps. This charging floor is always the second story of the mill building. In the building there are always three, sometimes four, floors, one of which is used as a machine shop—a necessary adjunct to a Lake Superior mill. The stamps in use at Lake Superior are the Ball stamps, the Atmospheric stamp at the Phoenix mill, already described by Mr. John F. Blandy in the second volume of the *Transactions*, and the common Cornish stamp used at the Quincy and Central mills. Some of the older and smaller mills, now nearly all shut down, patronized the Gates stamp.

The foundation of a large Ball stamp is mainly made in the following way: A pit is dug 3.65 meters (12 feet) deep, around which a wall is built, which is from 0.9 to 1.21 meter (3 to 4 feet) thick. The section of the pit is 4.25 to 4.86 meters (14×16 feet) inside of the walls just mentioned. On the bottom of the pit a heavy anchor piece is laid, say 3 tons in weight. The pit is filled by courses of

* A paper read before the American Institute of Mining Engineers, at the New York meeting, February, 1877.

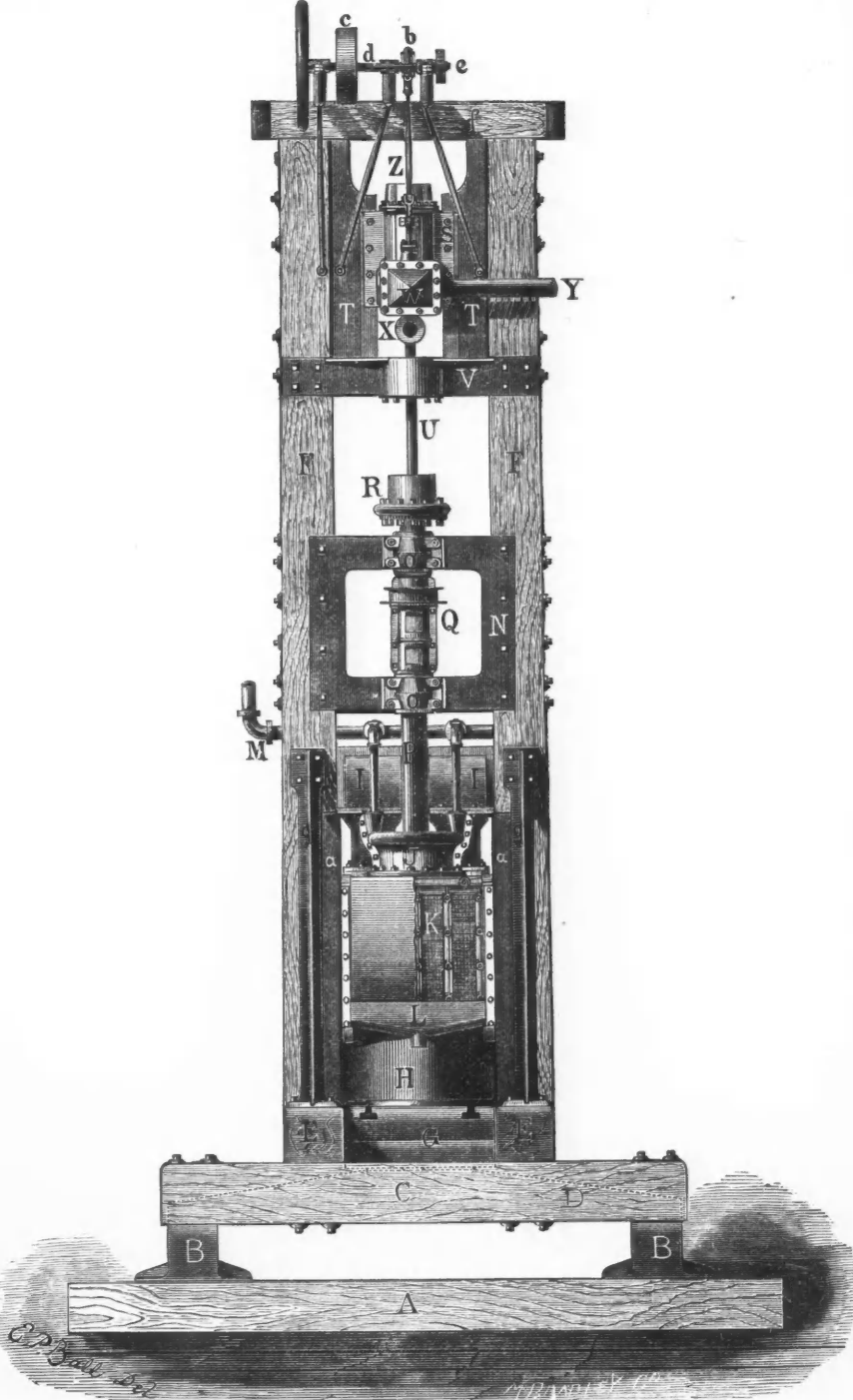
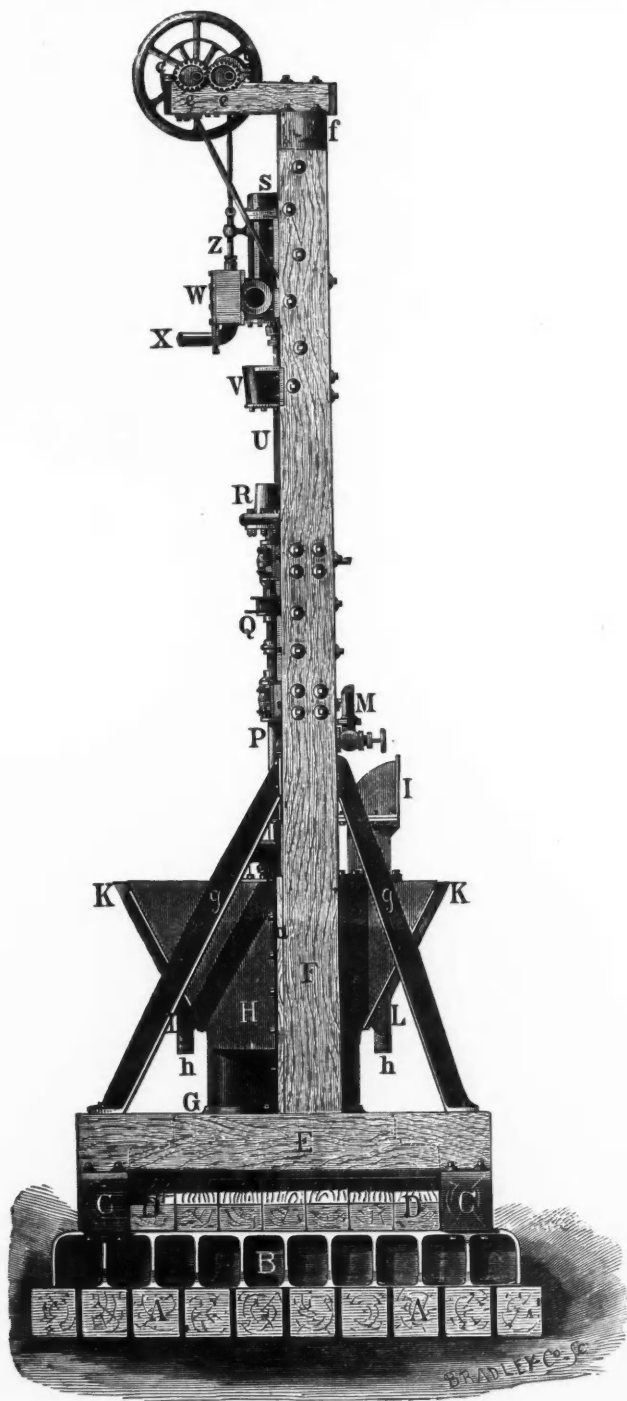
timber, each row alternating in direction. Through these timbers iron bolts pass which hold the anchor plate in its position. When one of these long bolts breaks, a log screw is made, which is a bolt with a rough wood screw cut on it; this is then put in its place. The joints of all the timbers are cemented tight up to the top, each bed of timber being cemented as it is put in. A space of 25 millimeters (1 inch) is left between the timbers and the walls all around, which space is not filled out till all the timbers are in. Two cast-iron sills B B (see cuts 1 and 2) are bolted on to these timbers. These sills have a broad base, and they are made firmer yet by attached knee-braces. On these rest the seven spring-timbers D D, so that their ends have a bearing on the top of the iron sills. Outside of the two extreme spring-timbers D D two wooden sills C C pass, laid across the iron sills B B, and secured to them by bolts. The spring-timbers are 407 × 457 millimeters (16 inches deep by 14 inches wide). The bed-plate rests on these, and on it the mortar. Spring-tim-

AMERICAN STUDENTS OF MINING IN GERMANY.*

By J. C. Bartlett, Cambridge, Mass.

(Concluded) from page 258.†)

But thus far our schools offer as much, and there is no reason why they may not actually give as much, as the Freiberg academy. We have larger, more convenient, and better appointed buildings; we have more money; we have equal facilities for laboratory and field practice, except in mine surveying; we have visits to works, geological trips, and summer excursions. Nay, even our schools ought, for the American student, to be very superior to any German school. American methods and machinery are hardly mentioned at Freiberg, and certainly do not receive the attention and discussion which their importance and the presence of a large number of American students might justify. American pumps, drills, engines, water-wheels, amalgamating machinery, and metallurgical



bers last generally from 10 to 12 months. Along the mortar, in the longitudinal direction of the stamp, are two wooden sills E E, which rest upon and across C C, and support the two vertical posts F F of the stamp frame, to which the principal part of the work is bolted. These posts F F are held in an upright position by the iron braces G G. G is the bed-plate arranged between the sills E E and across, and having its bearings upon the spring-timbers D D, etc. Upon the center of the bed-plate G stands the mortar H, which is held in position by guides on its sides, which work in the ways A A, on the front of the posts F F, allowing a free movement of the mortar in a vertical line, at each blow of the stamp, by the elasticity of the spring-timbers, avoiding the severe jar and wear which would otherwise come upon the machine. The lower portion of the mortar H is circular in form, the upper portion being oblong, with a flat top and vertical sides. On the front and back sides are inclined openings for receiving the screens.

TO BE CONTINUED.

processes are quite ignored, and American hydraulic mining is disposed of in about five minutes with some apparently fabulous accounts of hundreds of miles of ditches and the washing away of whole hills. In fact, the student gets nothing peculiarly American from his course, and hence what he learns outside of general principles he must unlearn or at least reconstruct. But the one great advantage overtopping all others and outweighing all deficiencies is the intimate connection of the academy with the works of the vicinity, and the permission to visit and study similar works which is granted throughout Germany, and also in Austria, to the holder of the Freiberg student's card. Almost no limits or restrictions are placed upon the student; he may, on proper application, either

* A paper read before the American Institute of Mining Engineers, at the New York meeting, February, 1877.

† ERRATA.—At the foot of the first column, on page 258, it should have been stated that the article was to be continued (the conclusion is here given), and by an error the discussion which should have followed the paper in this number was inserted on page 258 of our last.—Ed. E. & M. J.

before his theoretical course or during it, make what is called a practical course. In this case he is placed under the direction of a mining captain, who puts him through all the different operations of mining, giving him information on each operation, answering cheerfully all questions, and assigning him a place to work in this or that gang of miners, who are also invariably very kind and willing to assist by information or example. Or, he may make an independent course, and visit any of the mines in the vicinity every day, or as often as he likes. In the same way he has perfect liberty to visit and work in the ore-dressing establishments about Freiberg, or in the excellently managed coal mine and washer at Zankeroda, near Dresden. He may study in a similar manner at the Muldner and Halsbrucker smelting works, and as a good foundation for such study a practical smelting course is given during the first two weeks in August at the works by the professor of metallurgy or his assistant, which any student upon application may attend. Nor are less advantageous facilities granted outside of Saxony. It was the privilege of the writer, with one or two companions, to spend some two or three weeks in the summer of 1875 in the ore-dressing works of the Harz, at Clausthal and the neighboring towns, Grund, Lautenthal, and St. Andreasberg, and in the summer of 1876 some two weeks in the mines and ore-dressing works at Pzibram, in Bohemia; again two weeks in the Harz and about the same length of time in works near the Rhine, at Laurenberg, Ems, Mechernich, and Cologne. At no place was permission to examine the works refused. On the contrary, the directors and overseers were everywhere willing to impart any information in regard to their works, and spent much time and pains in so doing. Permission was given to make sketches, take notes and dimensions, copy working drawings of machines, and statistics as regards cost of working and working capacity. The Germans and Austrians are particularly kind to foreigners, and they ask and expect nothing in return except the appreciation on the part of the student. Other young men, who were studying coal or iron in other places, were equally well received; the testimony from all sources is the same. Herein lies the great advantage of studying in Germany, and in spite of discomforts and expense, and objections such as have been mentioned, our students will continue to go thither till some definite, sure, and permanent connection is established between our schools and the mines and metallurgical works.

Last year there were at the Freiberg academy 139 students, as follows: from Germany 64, including 42 Saxons; from Wallachia, Spain, Portugal, Holland, Asiatic Turkey, 1 each; from Switzerland and Japan, 2 each; from Italy and Norway, 3 each; from Greece, 5; from England, 9; from Russia and Poland together, 11; from Austria-Hungary, 11; from America, 24. Of the 24 from America, 1 was from Canada, 2 were from Chili, 3 from Mexico, and 18 from the United States. Of these 18 one came from each of the States of Alabama, Connecticut, Iowa, Louisiana, Maryland, Massachusetts, Michigan, and Ohio; 2 came from California, 3 from Pennsylvania, and 5 from New York. Of the 18, one was pursuing especially the study of mineralogy, one the study of iron, two of coal, four general metallurgy, and ten mining and concentration, or were not pronounced. Of the 18 perhaps a half were hard workers, a part of the remainder worked easily, the rest made no pretensions, but were going to begin. In general, the reputation of the students from the United States is good among the professors, at the works, and in the town. Together with the English and Canadian students, with whom they stand on terms of intimacy and friendship, they form the largest distinct foreign element, being about one-fifth of the whole number—a very creditable element, exhibiting that robustness and energy which characterize the English-speaking people everywhere. Thither, also, they carry their fondness for and proficiency in outdoor athletic sports, which are not cultivated by the other students. In skating they have no rivals or competitors, and in other games, such as base-ball and foot-ball, they have the field alone. Although this muscular development is not mental training, it is nevertheless conducive to mental activity, and the vigor and originality of the English race are largely due, perhaps, to physical health and freshness caused by the active outdoor sports practiced from boyhood up to and into manhood.

The principal subjective drawbacks to the progress of the American student in Germany are youth, an insufficient previous training in habits of study, and want of a working knowledge of the language. The first two generally go together, and often all three are combined; in which case the young man easily falls into ways of idleness and dissipation, which make his stay in Germany worse than useless, if they do not prove his utter ruin. To obviate these objections, it may be allowable to suggest as a course of study a collegiate course followed by two years in a mining school at home and then one or two years abroad; or, what would be a saving of time and obviate the course abroad, a college course followed by two years in one of our mining schools, the time from the first of May or June till October in each of these years being spent at mines or works. It is now generally acknowledged that a liberal education is the best foundation for a professional training, and certainly, if the profession of mining engineering is to rank with the other liberal professions and be acknowledged by them, such a foundation is necessary, even if it does require as much time as is required by the other professions. Under the first plan a young man would be ready to reconstruct his art at the age of 25 or 26, and in the second case to begin work at 23 or 24, or one year later if it should be considered expedient to require another year of steady work after the two summer courses already indicated.

The preparatory schools for our best colleges are the best training schools for boys, for the one reason, if for no others, that they not only have a definite and not insignificant amount of instruction to impart, but that this instruction is to be tested by the broad and strict examination for admission to college, and it is a fact, unpalatable indeed, that those who, by reason of physical or mental weakness or indolence, are not capable of being brought up to this standard, deviate to a technical school, where they are nursed for a year or two till they are strong enough to leave and go into business.

While in college the student may, besides attending faithfully to his literary subjects, anticipate the mathematics, chemistry, physics, modern languages, a part of the geology and mechanics, and some other studies, so that in two years at most he may finish the course in one of our mining schools. Then, if he wishes to study in Germany, he has a character all formed, a liberal and technical drill, and a good knowledge of the language.

The devising of a plan for the union of the schools and works is full of difficulties. The conditions are so widely different here from what they are in Germany that the introduction of the German system without important modifications is practically impossible. There both schools and mines are, to a great extent, directly under the control of the government. It grants to the student the right to assume the responsibilities of an engineer only after he has served as "practicant," and requires the mines to receive its students in such capacity. As our schools and works are all private enterprises no other than a voluntary arrangement can be made here. There competition is not so sharp and speculation is not so wild as here; the richness of good mines does not have to be concealed to freeze out undesirable owners, poor mines do not have to be puffed

to effect a sale, and secret processes are not so common, consequently permission to visit works is more readily obtained. Moreover, our schools are more numerous, and are already established far distant from the important works, which are scattered far and wide, separated by many hundreds or by thousands of miles, and often difficult of access. Very strong arguments were presented, as you remember, by the United States Commissioner of Mining Statistics, in 1868, and again in 1869, in favor of a national school of mines. As yet the government has not seen fit to act according to the suggestions, and I am not aware that the subject is likely to receive the attention of Congress. It would be impossible to locate such a school anywhere in this country as advantageously as the German institutions are situated, from which in a few hours, or in a day or two at most, any of the large mines or works may be reached. In consideration of this fact, and the possibility that, on account of State or local jealousy or interests, or political jobbing, or for other reasons, the foundation of a national school west or east of the Rocky Mountains may be delayed indefinitely, and of the fact that we already have millions of dollars invested in magnificently equipped mining schools, is it not advisable, instead of seeking other millions to endeavor to increase the usefulness of those already invested? We certainly have schools enough, more perhaps than we having teaching ability to supply. One great and just criticism on American education is that we have so many institutions that the instruction is too dilute. Two or three good professors in a mining school cannot of themselves make that school satisfactory, and drawing away a good professor from this school and that to found another weakens those drawn upon, and generally adds another to the long list of moderately efficient attempts.

Cannot and will not this Institute, having as members representatives of the schools and practical engineers, become the instrumentality to bring about the desired union? Cannot the Institute through its Council, or through a special committee appointed from among its members, draw up a circular (unless some better method of making a beginning is suggested) to be sent to the schools and to the principal mines and works, stating the advantages which other nations offer their students, the disadvantages under which our students now lie, the benefit which might result not only to the students but also to the mines—in short, a strong and complete statement of the case, and asking co-operation? The benefit which might reasonably be expected to accrue to the works should be particularly considered, because there is great misapprehension on this point.

The works generally consider that they only grant favors and receive no good in return, and perhaps from their previous experience they have reason to consider the students nuisances. But it is not so abroad, and there is no reason why it should be so here. The labor of the student would not be worthless, and, indeed, to secure the owners against imposition or loss, and to insure diligence on the part of the student, the power of discharging an unfaithful young man would, of course, be one of the rights reserved by the works. Moreover, the works, always having several young men making a practical course, would have an excellent opportunity to select from the number some who would be valuable men to employ permanently, first as assistants and eventually as engineers. Moreover, as part of the compact, the schools might agree, as some return for the kindness of the owners, to furnish assays, or analyses, or geological opinions, or surveys, or plans, or drawings, or render some other assistance to the engineer of the works. It is by no means a case in which the favors are of necessity all on one side.

To begin on something definite, the circular might contain a preliminary plan of operations, and might ask each mine or industrial work and each school whether, on the proposed basis or on any basis, it would co-operate; it might invite criticism and suggestions for improvements on the plan, and from the discussions before the Institute, and from the answers to the circulars, a final arrangement might be made and put into operation.

THE NOMENCLATURE OF IRON.*

By Henry M. Howe, A. M., M. E.

(Continued from page 256.)

Thus, on examining our divisions of organic matter into animal and vegetable, of matter into liquid, solid, and gaseous, of phenomena into physical and chemical, of animals into vertebrate and invertebrate, and a thousand others which at first sight seem to be very broadly and clearly marked, we find that, in the cases of certain sensitive plants, of sea-anemones, of sponges, etc., the classes animal and vegetable shade into each other; in the cases of viscous liquids, there can be no sharp line between the liquid and solid states, except it be an arbitrary line, for the glaciers teach us that even ice can flow; so between the finely divided liquids which we see in mists and true vapors, and again between vapors and true gases, the divisions must be made arbitrarily, if at all; in certain cases we find that the lines between mollusks and vertebrates must be arbitrary, though these classes seem so utterly dissimilar, as must also the division between the milder forms of chemical action, such as solution and purely physical action. Yet these are eminently proper and scientific classifications. We divide the spectrum into red, orange, yellow, green, blue, and violet; yet how can we separate red from orange, or blue from violet, or greenish yellow from yellowish green, except by purely arbitrary lines? And who will deny the usefulness of this classification of colors? We divide coals into anthracite, semi-bituminous, bituminous, lignite, peat, etc.; yet do not these useful and appropriate classes imperceptibly blend into each other? Must not almost all the classes of lithology be separated by arbitrary lines, if at all? How else can we separate siliceous limestones from calcareous sandstones, or hornblende granites from micaceous syenites, or bituminous shales from shaly coals, or crystalline from fragmental rocks? Very many of the classifications of chemistry, mineralogy, metallurgy, biology, physics, and indeed of every branch of natural science are necessarily more or less arbitrary. I would ask these gentlemen if they have found it so very inconvenient to divide spiegeleisen from ferro-manganese, or foundry from forge pig, by arbitrary lines? Or do the copper smelters find life intolerable because coarse metal, blue metal, white metal, blister copper, dry copper, and fine copper shade into each other imperceptibly?

Thus classes are formed which each possess within certain limits the qualities on which the classification is based, and these limits may be more or less exactly agreed upon according to the nature and requirements of the case. The reason why divisions must generally shade into each other, and why dividing lines must usually seem arbitrary, is that most important qualities (qualities so important that the convenience of thought and language make it desirable to indicate, by classifications based on them, their presence or absence, or the degree to which they are present) exist in proportions which increase gradually, if not uniformly, from sub-variety to sub-variety, or from individual to individual, by

*A paper read before the American Institute of Mining Engineers, at the New York meeting, February 28, 1877, in opening the discussion on the motion to adopt the report of the International Committee on the Nomenclature of Iron and Steel.

very small or even infinitely small increments, without sudden or marked breaks anywhere which can serve as broad dividing lines between classes. When we wish to indicate to what extent such a property is present, we are forced to use arbitrary divisions. This is due to the nature of things, and not to the arbitrariness or tyranny of philosophers.

Now, I will not deny that classifications as such would be more convenient if nature had dropped out all the things which lie near our lines of demarkation, and had allowed us to separate our classes by broad and plain dividing lines. But as she has not, for the purposes of expressing our thoughts it is necessary to make use of arbitrary lines of division. For all our needs these classifications are clear enough, although they do blend into each other.

To reject all arbitrary classifications would be to make speech impossible, to destroy language itself.

To say that it is unscientific to classify iron according to the extent to which it has the carbon properties, simply because the groups would shade into each other, is idle. It shows an ignorance or forgetfulness of the classifications which science has made, and the inability or unwillingness to compare the classification we are discussing with those without which our daily conversation would be impossible.

It is rather amusing to note that the carbon classification is charged with being unscientific only by men who rather boast that they are practical and not scientific, while nearly all those who call themselves men of science defend it.

It is most astonishing that such men as Mr. Holley and Mr. Metcalf should bring forward such an objection seriously, and that Mr. Holley should say: "Obviously no two men can agree on the amount of any hardening element which may constitute steel." Why not? There is no reason why they cannot agree on that point if they wish to.

Nor is it so necessary that they should agree. Are men agreed as to the exact position of the line which separates bituminous from anthracite coals, or beef from veal, or spiegeleisen from ferro-manganese, or horses from colts, or sandstones from quartzites, or milk from cream, or magnetites from hematites, or fresh eggs from stale eggs, or metallurgy from chemistry, or mechanics from engineers, or music from discord, or cake from bread, or gun-metal from bell-metal, or metals from metalloids, or conductors from non-conductors, or the English from the Anglo-Saxon language, or dolomites from limestones, or mush from porridge, or brooks from rivers, or mountains from hills? Does not "the importance of a quality here make the existence of that quality a definite basis of classification when it exists in both classes, gradually increasing in one and decreasing in the other, and being practically the same near the dividing line"? And are not these useful, convenient, and in some cases absolutely indispensable classifications?

Mr. Holley says: "A very serious objection to the proposed division is that it occurs about midway in a range of structural steels." Do not the divisions of metalloids from metals, of blue from violet, and many other of the divisions I have enumerated, in an exactly parallel way occur midway in ranges which are in constant use, without diminishing their value or usefulness? [The dividing line between wrought iron and steel is placed at the point of 0.30 per cent. carbon, because, as Karsten has shown, this is a critical point in the curve representing the degrees to which differently carburized varieties of iron possess the carbon properties.]

Had the gentlemen said that a carbon classification was valueless because the carbon-given qualities are unimportant (and I think no one has been so indiscreet), the charge would have needed answering. For, since the use of a classification is to indicate whether the property (or properties) on which it is based is present or absent, or to what degree it is present, the importance of that property determines the importance of the classification. Until the carbon qualities have ceased to be important, there will be a need and a use for a carbon classification.

But the claim that it is to be given up simply because its classes blend into each other cannot be discussed, because it is not a valid objection.

Unless the gentlemen will undertake the difficult (because impossible) task of showing why a blending of its classes, and a division at a salient point which occurs midway in a range, should affect a carbon classification in an entirely and radically different way from that in which perfectly parallel blendings and divisions affect thousands of perfectly parallel classifications, such as I have cited, they are logically forced to acknowledge that this blending and division of the carbon classification is not incompatible with a high degree of usefulness, or even with absolute indispensableness.

If we were prevented from having more than one classification of iron (a contingency not likely to arise), and were thus compelled to choose between several classifications, based on equally important properties, then the fact that one classification admitted of much more broad dividing barriers than the others might weigh in its favor. But there is no question as to the propriety in this case of having both a fusion and a carbon classification, except that the retention of the latter would prevent the mechanical engineers from using its terms for the former.

On this head Mr. Holley has said, "Whitworth has proposed to divide wrought iron from steel at the point of 28 tons tensile strength," and asks triumphantly: "How would Mr. Whitworth like to order gun steel, by this definition?" How would Mr. Holley like to order razor steel, or even rail steel, by his own definition? At our last meeting he said in the same vein, "This carbon classification is of no earthly use, for, practically, when one orders steel, one specifies the percentage of manganese and carbon desired," or words to that effect.

When one wants a horse that has run inside of 2.18, one does not merely order an animal, nor a vertebrate, nor a mammal, nor a quadruped, nor even does he merely vaguely call for a horse. He describes explicitly what he seeks. Yet these broad and general classifications of animals, vertebrates, mammals, quadrupeds, and horses have their value, and form a necessary part of language, though they are not universal machines, and though they do not describe things minutely. So our broad carbon classification into iron, steel, and cast-iron has its value and use, though it may often be necessary to use more explicit terms in describing particular lots of iron. And precisely similar necessities for the use of specific terms would arise were the classification of the mechanical engineers in use. But, supposing the carbon classification to be utterly useless, and therefore to be formally abandoned, I cannot see the wisdom of seizing its names for the classes of the fusion classification.

The advocates of the mechanical engineers' classification are men of most marvellous mechanical ingenuity: have they so little philological ingenuity that they cannot invent an appropriate name for the new product they have given to the world? Can they not or will they not? Will they not accept one that is offered to them? Or have they such a lusting to call their new product steel that

they will not only blot out the carbon classification, but also ravish its names? Whenever a new discovery is made, are previous classifications to be destroyed and their names to be appropriated for describing the new thing? Or would it not seem more sensible to amend and supplement our existing classifications so as to introduce the new element while preserving the old ones? Shall not the old names be kept for the old things, and new ones found for the new things?

The case seems to me like this: Disregarding, for the sake of illustration, the European and Asiatic coal-fields, let us suppose that the Virginian Carbonite had really turned out to be an enormously valuable mineral, as was prophesied, and so far superior to ordinary semi-bituminous coals as to make it necessary to apply some special name to it, such as carbonite, and that it really deserved to rank as a new class in the classification of coal. Suppose a great number of coal miners, without any great geological pretensions, should say to Dr. Hunt, or to his geological congress at Paris: "Gentlemen, we find that the classification of coals into anthracite, semi-bituminous, bituminous, lignites, peat, etc., etc., is wholly beastly and unscientific, because we find that anthracites shade into graphite, on the one hand, and into semi-bituminous coals, on the other, as do the latter into bituminous coals and anthracite, etc., etc. This is vile. We coal miners are going to adopt a wholly new and beautiful classification. This is so much more charming than the present one that the latter has forfeited all claims to its names, which we will use for our new classification, which the coal miners have used these five years. We do this, first, because it is a shame not to call the newly discovered coal cannel coal, for it is a really charming and most superior coal, as superior as the new kind of wrought iron is to the old; and we are all sure that it will sell better if we call it cannel, which is higher priced than ordinary bituminous coal. Secondly," triumphantly, "if you do not call it cannel, what would you call it?" We propose to call all coal found in New England lignite; it has none of the properties formerly associated with lignite, except that it is an inferior coal, which, like puddled steel and blister steel, is not much used now, and is not worth fussing about. All found in the Appalachian range and in the Middle States we call cannel coal, because it is very superior, and is all quite free from sulphur; quite as the new wrought irons are free from slag. All found in the Western States east of the Mississippi we call bituminous, because they are inferior to the Middle States coal, but better than the New England coal; and all west of the Mississippi, anthracite. This is the only practical classification."

Dr. Hunt replies that "it would be wiser to preserve for the old classes the old names, and, if necessary, invent a new name for the newly discovered valuable coal, and supplement the existing classification so as to make this a distinct class." "That a geographical classification is perhaps desirable, but that there is no reason why it should not coexist with the present classification; and certainly no reason why the terms of the latter should be used for the proposed geographical classification, which would better have a new set of geographical names; just as the desired fusion classification of iron would better have a new set of fusion names which will confuse no one."

They reply that "they are simply 'enlarging' the term 'cannel,' really nothing else; that the names of new materials are gradually developed to meet the general convenience, and to tip over all existing and therefore useless classifications, and not according to the senseless edicts of arbitrary, unreasonable, and despotic philosophers."

Have philosophers—which term I interpret as meaning men of science—nothing to say about scientific classifications of things that happen to be commercially valuable? In comparing our simple system of weights and measures, with its long ton, its net ton, and its miner's ton, its avoirdupois, its troy, apothecaries', and diamond systems of weights, its liquid, dry, cubic, and fluid measures of volume, its statute, Gunter's, nautical, and cloth linear measures, its hundreds of different bushels, its scores of different gallons—in comparing this simple and practical system of weights and measures, which the Anglo-Saxon race has developed to meet the general convenience, with the foolish, theoretical, unpractical metric system which the arbitrary edicts of tyrannical philosophers have imposed on the slavish hordes of Europe, one feels the wisdom of Mr. Holley's dictum.

Like the question of the metric system, you are to decide whether the world shall have a simple, rational nomenclature for iron, or whether it shall have the irrational one advocated by the mechanical engineers. Unlike the metric question, you have not to ask, Will it pay to displace the present system for a better? but merely to decide which of two practically new systems you will sanction—the one, like the metric system, the calm choice of able men; the other, like our present weights and measures, the confusing outgrowth which tries to meet general convenience: the one introducing the minimum of change with the new necessary element; the other introducing the new element at the expense of the old ones.

The propriety of your arranging the nomenclature of the metallurgy of iron in the way which seems to you best and most systematic, be it against the protest of the iron masters, is quite as clear as was the duty of the chemical world to systematize its nomenclature, in spite of the protests of the chemical manufacturers, as it has just done, amid the applause of the world.

And your right to call the new wrought iron "ingot iron," although the iron masters have called it steel, is as clear as the right of the naturalists to say that a whale is not a fish, but a mammal, though the fishing industry does style it a fish.

DISCUSSION.—The discussion on this paper will appear in our next number.

DEPOSIT FROM MINE WATER.—Mr. M. Fryer, recently read a paper before the Newcastle-upon-Tyne Chemical Society, upon a deposit formed last autumn in a water-box in the shaft of the Jane Pit, at Walker. The box has been filled up until its sectional area is reduced from seven and a half square inches to less than half a square inch, and in places it is almost completely closed. The deposit consists of alternate whitish and brown layers, the white layers being generally much thicker than the brown ones in the upper portions of the box, but the brown layers increasing in thickness farther down the shaft. The deposit is moderately soft, much resembling "Bath brick" in texture, and is readily pounded, the color of the powder being a little buff. The composition of the deposit was found upon approximate analysis to be roughly represented as follows:

	Per cent.		Per cent.
Barium sulphate, about.....	90	Silica, alumina, ferric oxide, etc.,	
Strontium sulphate, about.....	8	about.....	1
Calcium sulphate, about.....	1		

The water showed, on analysis, small quantities of ferric oxide, silica, alumina, and sulphuric acid, a moderately large quantity of calcium carbonate, and a large amount of potassium and sodium chlorides, the total quantity of solid matter being about 800 grains per gallon; but, although about two gallons of the water were evaporated, no trace of barium or strontium could be found.—*The Engineer.*

² *Trans. Am. Inst. Mining Engineers*, vol. ii. p. 141, l. 15.

¹ *Loc. cit.* = 146, l. 23.

³ *Loc. cit.* p. 147, l. 2.

⁴ *Loc. cit.* p. 328, l. 7.

IRON RIVER SILVER DISTRICT, SOUTH SHORE OF LAKE SUPERIOR.

By Col. Charles Whittlesey.

(Concluded from page 254.)

To show more clearly the uniformity in composition of the quartzite belts, at the base of the slate, I present the results of my profiles in a condensed form in the following table, beginning at the Cummings location, A, on the southwest:

Local Sections of the Quartzose, Copper, and Silver-bearing group lying between the Black Slate and Lower Potsdam Sandstone, Iron River, Michigan.

Order of Beds, counting upwards.	Cummings' location A of Plan, Sec. 12, T. 50, R. 44, Dip South 30° East 30°.	Nonesuch Mine, B. Secs. 1 and 2, T. 50, R. 43, Dip South 40° East 28°.	Cleveland Mine, C. Sec. 25, T. 51, R. 42, South East Quarter, Dip South Easterly about 30°.	Superior Mine, D. Sec. 25, T. 51, R. 42, North East Quarter; Dip North 26°.	Scranton Mine, E. Sec. 13, T. 51, R. 42, South West Quarter; Dip estimated South 30° East 13°.	Hubbel Shaft, F. Sec. 13, T. 51, R. 42; North East Quarter, Dip estimated South 30° East 14°.	Lone Rock Location, G. Sec. 26, T. 51, R. 44; North West Quarter, Dip North 35° West 30°.
1	Reported by Mr. George F. Cummings. Potsdam Red Sandstone; thickness not less than 2,000 ft.	Brown, coarse-grained Red Sandstone and Breccia-like conglomerate; thickness not less than 2,000 ft.	Brown Sandstone and Conglomerate; thickness not known.	Coarse brown Sandstone.	Coarse brown Sandstone with pebbles of Jasper and trap.	Reported by Captain D. Beaser. Red Shaly Sandstone and Conglomerate.	Red shaly sandstone, Potsdam; 2,000 feet thick.
2	Clay gangue; carrying native Silver; thin.	Thin gangue.	Gangue thin or wanting.	Gangue thin.	Not seen.	Bands of Reddish Gray Quartzite and Red Shale; 4 ft.	No gangue.
3	Quartzite; carrying Copper and Silver; thickness, 5 ft.	Gray Quartzite, with native Silver; 2½ ft.	Gray Quartzite in three bands; lower 16 ins., rich in Silver and some Copper glance; = to 2½ ft.	Reddish Gray Quartzite with waving black layers, and a gangue above all, carrying Silver; 1 ft. 8 in.	Reddish Gray Quartzite in two bands, with ripple marks and thin waving black streaks, carrying Silver and gray and purple Copper glance; 2 ft.	Quartzite, with black streaks; no Silver visible. Dark blue color; 1 ft. 8 in.	Not seen.
4	Black Slate; no mineral; 1½ ft.	Black Fissile Slate, carrying very fine native Copper, with a gangue above, carrying native Silver; 15 ft.	Fissile Black Slate, with fine Copper.	Fissile Black Slate, carrying Malachite; thickness not seen.	Fissile Black Slate, carrying Copper.	Black Fissile Slate, carrying Malachite in specks.	Black fissile slate with a band of calc-spar, all carrying malachite and glance; 5 ft.; red shale above the 5 ft. slate. Reddish gray quartzite; 4 inches.
5	Gray Quartzite; carrying Copper; 6½ ft.	Greenish Gray Quartzite rich in native Copper, 2½ to 3 ft.; more compact and barren on the top; 1 ft.	Not examined.	Five feet above No. 3, a band of altered sand (rock) carrying copper glance.	Not seen.	Not seen.	Reddish gray quartzite; 4 inches.
6	Main Black Slate; thickness not known	Main Black Slate exposed on the basalt edge; 250 ft.	Black Slate, main body; thickness not known.	Main Black Slate.	Black Slate, main body; thickness not known.	The overlying Black Slate is of a bluish cast of color.	Black fissile slate, carrying malachite; 12 ft.
7							Gray quartzite, lower part flaggy; 12 ft.
8							Gangue of soft green & red shale; 1 ft. 8 in.
9							Greenish gray quartzite with purple copper glance cut by a dike; 4½ ft.
10							Breccia conglomerate and a band of iron pyrites; 5 ft.
11							Quartzite group a, b, c, d, e, rich in gray copper glance; 2 ft. 10 in.
12							Main black and dun-colored slate; 200 ft. thick.

The composition of what I call "glance" is not determined. Most of it has a lead-gray color, and slight crystallization. It exists in specks, streaks, and blotches. The purple variety seems to be a mixture of red oxide and gray sulphide of copper carrying a little silver. Particles of what appears to be black oxide of copper have been seen. What I call quartzite is generally an aggregation of greenish gray silicious grains without sharp crystalline edges. Sometimes it is quite close-grained and compact showing metamorphism. In the coarse portions there are grains of jasper and chlorite, which to a certain extent control the color.

Both the silver and copper are in a very finely divided state, frequently invisible without a magnifier. At the Nonesuch Mine the copper is so fine that probably not more than half the metal was secured by the usual washing processes. With Frue's vanners it is said nearly three per cent. has been obtained from rock not selected for richness. At the Lone Rock location an average of a band 16 inches thick gave by analysis five and a half per cent. of copper.

Dip and strike of the rocks from Iron River, Ontonagon County, Michigan, along the coast to Carp River, bearing magnetic variation 6° East.

Locality and Character of Strata.	Strike.	Dip.	Rate.
Mouth of Iron River—Slate	N. 70° W.	N. 20° E.	20°
Cuyahoga Landing—Coarse brown and sandstone	N. 80° W.	N. 10° E.	1 ft. in 4=15°
¼ m. west of same—Sandstone and conglomerate	N. 75° W.	N. 15° E.	1 " " 4=15°
½ m. from Cuyahoga Landing, N. West—Conglomerate	N. 80° W.	N. 10° E.	1 " " 4=15°
½ m. N. West—Brown sandstone	E. & W. N. and S.		1 " " 3=18°
¼ " " Heavy ledge	S. 85° W.	N. 5° W.	1 " " 3=18°
1 m. N. West—Coarse bedding	S. 85° W.	N. 5° W.	1 " " 3=18°
1½ m. N. West—Some pebbles at N. W. cor. of S. W. qr. Sec. 9, T. 51, R. 42.	S. 85° W.	N. 5° W.	1 " " 3=18°
<i>Mem.</i> —From bottom of Union Bay to this point thickness corrected for level about 1,500 feet, thence south to gray trap on sec. 16, about 1,000—2,500 ft.			
Carp Lake Mine Landing, thence to Lone Rock, in places 40°	N. 70° W.	N. 20° E.	30°
Foster & Whitney, on Sec. 16	S. 60° W.	N. 30°	30°
La Fayette Landing, about same bearing.			25° to 30°
Sec. 20, T. 51, R. 44—Beaser's trail	S. 60° W.	N. 30° W.	25°
" " " Base of slate	S. 55° W.	N. 35° W.	32° (Brown)
Sec. 20—Quartzite sand	S. 57° W.	N. 33° W.	30°
Sec. 27—Sandstone-points outside of Presque Isle point	S. 45° W.	N. 45° W.	25°
Sec. 34—Midway, conglomerate	S. 30° W.	N. 100° W.	25°
" " ½ m. East of Carp River—Sandstone	S. 37° W.	N. 53° W.	30°
Sec. 33—Mouth of Carp River—Conglomerate	S. 32° W.	N. 58° W.	30°
Little Carp, ¼ m. up stream	S. 45° W.	N. 45° W.	20°
" " ½ m. " "			Level.
" " ¾ m. " "	S. 20° W.	N. 70° W.	30°
" " 1 m. " "	S. 30° W.	N. 60° W.	30°

Between Band B and C (see fig. page 254) the outcrop of the belt is not seen. Except in the streams, the rocks are covered with 20 to 50 feet of red clay, or other drift material, and the country is flat. There may be in the space between the Nonesuch and the Cleveland and Collins mines, on Iron River, at C, another contortion of the beds like that between D and E. Very little effective work has been

done either in exploring or mining. Between the streams, shafting in the clay is necessary to find the lode.

A ten-stamp mill, with amalgamators, was erected by the Ontonagon and Superior Companies, at D, of which Mr. Crosby had charge in 1875. Only about 300 tons of ore have been taken out from the three working shafts of the Cleveland, Ontonagon and Scranton mines, of which less than 50 tons was milled. Though the machinery was incomplete, the average yield was about \$40 per ton.

The owners of stock labored under the delusion that the silver band is rich enough to develop itself without capital. When the collapse came in 1875, there had not been money enough spent on six of the so-called mines to develop a single one successfully. In 1876 the Cleveland was the only one prosecuting its work. The death of the principal owner caused that mine to close operations last fall. For cheap mining, with a capital well put in, this region presents a promising field, notwithstanding past experiences.

It must strike every one who compares the above sections, or explores the region himself, that this quartzose group is very persistent in its geological and mineral aspects. It has been wrought for copper at only one place, the Nonesuch Mine; but it is capable of being worked at other points, provided all the metal can be saved. The metal-bearing bands are very uniform in yield, easily mined and easily crushed.

Captain Hooper, of the Nonesuch, reports the average prices of sinking, drifting and cross-cutting 1,810 feet, to be about \$10 per foot. This, with a smaller number of feet previously done, opened 30,000 tons of vein matter, at a cost of about \$1 per ton.

In the Superior Mining Company, F. W. Crosby, mining engineer, estimated the cost of all mining expenses and charges, to the delivery of the rock at the mill, \$2.50 per ton gross. For all processes to the ingot silver, including the above, his estimate is \$9.37 per ton. In the heavy soft beds carrying copper, I estimate they may be worked at not exceeding \$5 per ton.

All the trap beds are not yet explored, or even numbered. The most northerly is known as the "gray trap," or No. 1 of the plan, and is 400 feet thick. Its outcrop is along the crest of the uplift, north of Carp Lake, elevated at the middle about 1,000 feet above the lake, dipping north about 28°, and bending down at both extremities in the form of a very flat bow. The old La Fayette adit was driven on it at the west end, and the Cuyahoga at the east end—both now abandoned. The Carp Lake Mine was opened at the surface of trap No. 2, known as the "amygdaloid bed," in the sandstone which lies between Nos. 1 and 2. The Union Mine was opened in a gorge at the base of trap No. 3, but it is not now worked and its machinery sold. South of the Carp are an unknown number of alternate strata of traps, sandstone and conglomerate, which are reported to carry copper. Through the whole mass, several thousand feet in thickness, there are transverse veins, none of which have been tested. Copper-bearing beds, forming part of the general stratification, are now producing more metal, in the Superior region, than true veins.

The Porcupine Mountain system is certainly one where metalliferous belts prevail over fissure veins. These belts are numerous, regular, and persistent, which is a very encouraging feature.

What has for thirty years been known as the "Great Spar Vein," on Section 26, a mile and a half west of the Lone Rock, proves to be a portion of a very heavy dike, cutting the sandstone and the slate. It bears N. 40° W. by needle, and stands apparently upright. About 130 feet of the easterly side is a mixture of sandstone and calc spar, from which flux has been quarried for the old smelting works at Ontonagon. West of this is about 300 feet of compact bluish-black traps, with strings of vitreous quartz. On the west the black slate abuts against it undisturbed, and on the east the reddish-brown sandstone, with occasional pebbles of jasper and trap. The only mineral yet observed

near the dike is black oxide of copper in joints of the slate. From it to the east, where the slate should be expected, if it is not thrown, the rocks are covered by drift or swamp for several miles. Nothing is yet known of this dike on the trap range a mile and a half south, nor of any dislocation.

Half a mile along the coast, to the southwest, over a continuous outcrop of slate, there is another smaller dike, 15 feet wide, bearing about north 20° west, which has not disturbed either the slate or the sandstone.

CLEVELAND, O., February, 1877.

CORRESPONDENCE.

WURTZ AND VON RICHTHOFEN—THE ORIENTAL PORCELAIN QUESTION.

TO THE EDITOR: SIR—While thanking Professor R. D. Irving, of the University of Wisconsin, for the courtesy of his communication in your last issue (April 14), I must ask leave to make a statement or two, necessary to remove some misconceptions that appear likely to arise therefrom, involving what I deem to be something less than justice to my own fair claims in this matter.

You will remember, of course, that I brought you the letter of Baron Von Richthofen some weeks ago, long before you had heard from Professor Irving; though it is true that, at the time the advance sheets of the *American Chemist* were struck off, I had not yet encountered it, for the reason that this immensely important document has been entirely ignored as yet in ceramic literature. On discovering it, I sent it immediately to Professor Chandler, but too late for publication as a supplement to my report. It will doubtless appear as such hereafter; and it is already incorporated in the official publication of my report by the U. S. Centennial Commission, now in type.

Now to my main point: Prof. Irving remarks, "This prior discovery thus is evidently to be credited to Von Richthofen." It is to this sentence that I feel a right to demur. First: my direct investigations and demonstrations relate to the materials and products of an art whose seat is nearly a thousand miles distant from King-te-ching, and, I might almost claim, on another continent. The broadest interpretation of the important observations of Von Richthofen could in no way justify even the hypothesis that the *Japan* porcelains contain no porcelain earth, and are felsitic in composition. Second: I am unable to see how the conclusion would be justifiable, from Von Richthofen's letter, quoted by you, that the *Chinese* wares of King-te-ching are made from petrosilex or felsite. He compares the materials he found to *jade*, and intimates that the Chinese themselves compare it thereto. Now the Chinese jade (*Damour's jadeite*) is a species, of composition, characters, and properties widely removed from petrosilex. *Jadeite* (the *Feil-sui* of Pumpelly) will be found fully described by Dana, with analyses by Damour, Fellenberg, and Pumpelly. The name "jade" has, however, also been applied vaguely to amphibolic varieties (*nephrites*), and to the highly calciferous mineral *zoisite* (*saussurite*). It is difficult, for me at least, to understand how Von Richthofen's statements, without my analyses, could lead any one to any conclusion of value regarding the real nature of the material employed at King-te-ching. He himself intimates (in a passage not quoted by you) that "examination in the laboratory" remains to be made of the materials he found. Such examinations have not been made, so far as I am aware, and it is probably only from my own analyses of the Japanese minerals that we have so far any data from which to infer the mineralogical nature of Von Richthofen's "Kao-ling" and "pe-tun-tse," as varieties of albitoid felsites or petrosilexes.

I submit, therefore, the two questions: Is it not indisputably just to concede to me entirely the discovery that the finer Japanese porcelains are composed of albitoid felsitic mineral, without any clay or porcelain earth, such as we designate by the name "kaolin"?

Is it not more just, while giving all honor to Baron Von Richthofen for his most important and surprising observation, to concede to me the credit of having shown the probability—inferred by me in my report, from recorded analyses of Chinese wares, though at the time ignorant of Von Richthofen's letter—that fine Chinese porcelains are also composed of petrosilex; an inference which receives from reference to Richthofen great strength and confirmation? Respectfully,

HENRY WURTZ.

12 HUDSON TERRACE, HOBOKEN, April 18, 1877.

GOLD IN SCHEELITE (TUNGSTATE OF LIME) FOUND AT CHARITY MINE, WARREN'S, IDAHO.

TO THE EDITOR: SIR—I have received from the Charity Mine in Idaho a hand sample of what was supposed by my correspondent to be gold in garnet, a natural mistake enough, as the mineral resembles grossular garnet. But I find it is *scheelite*, or calcic tungstate, a species never before, as far as I am informed, found as a gangue for gold. In the hand specimen sent to me, the *scheelite* is more than one-third the whole mass, the other minerals being quartz with a little pyrite, leuco-pyrite, and chalcop-pyrite. I shall publish a more detailed notice of this interesting mineralogical association in the *American Journal of Science*.

Meanwhile permit me to thank my correspondent through your pages for his thoughtful attention. If miners and others in our remote mineral districts would make it a rule to send us by mail things interesting or seemingly new to them, they may often confer benefits to mineralogical and mining knowledge, and they may be sure always of prompt and civil attention. Yours truly,

NEW HAVEN, April 21, 1877.

B. SILLIMAN.

SIMULTANEOUS FIRING IN BLASTING.

TO THE EDITOR: SIR—The great blast recently attempted at the Port Henry Iron Mine was only a partial success. Its failure has been attributed to either imperfect electrical arrangements or to the freezing of the nitro-glycerine compounds used, or both. It is evident that the consequences of a result of this kind would be great danger to human life in the subsequent prosecution of the work, also loss of capital, and, where the work is carried on for the removal of submarine obstructions, perhaps a total failure of the operations. It therefore becomes a question of moment whether, in our present state of knowledge of high explosives and their mode of detonation, there is any reason why such a failure should occur. In considering this point the following questions suggest themselves:

1. Is it possible to fire, with certainty, simultaneously a large number of mines?
2. Can frozen nitro-glycerine compounds be detonated?
3. Will simultaneous detonation of a large number of charges of considerable quantity of high explosive not be dangerous to surrounding structures?

This last query, although having no direct bearing on the question at issue, is still so intimately associated with it that its consideration here is thought not to be without interest.

That a large number of mines can be simultaneously successfully fired was

demonstrated by Gen. Newton's blast of Hallett's Point Reef, where over 4,000 separate charges were simultaneously exploded. The method here adopted consisted in dividing all of the charges to be fired into a large number of independent groups, supplying sufficient battery power for each group to fire with certainty all the fuses in the group, and then at the requisite moment simultaneously closing the circuits of all the groups, by means of the apparatus since patented by the writers of this communication.

This apparatus, as employed for firing large blasts, consists principally of two wooden plates, one fixed, the other movable vertically above the first. The former is provided with brass cups filled with mercury. The brass stems of these cups extend beneath the table, where they end in screw cups for wire connections. The movable plate carries pins passing through it and corresponding to the mercury cups. The ends of these pins also form screw cups at the upper side of the plate for wire connections. This plate is supported by a suspension cord into which a small cartridge is introduced, whose explosion by an independent battery, placed at a convenient and safe distance, severs the cord, thus allowing the pin plate to drop, thereby causing the pins to simultaneously enter the mercury cups, and consequently closing all the open circuits in case the wire connections [viz. from positive pole of battery to fuses, from fuses to mercury cup, from screw cup of pin to negative pole of battery] of each of the groups to be fired are previously completed.

As the number of cups and pins can be increased at will, and since the probability of firing a number of mines increases with the number of groups into which they are divided, and the probability of detonating a single charge is proportional to the number of independent fuses placed into it, it follows that this method of simultaneously firing an unlimited number of independent groups offers a sure means of preventing misfire, and that five thousand charges can, with the same degree of certainty, be ignited as ten. Until recently the method employed for the simultaneous firing of mines by means of electricity consisted in placing the fuses in the charges, uniting the ends of the fuse and lead wires, in groups or single series, bringing the lead wires to the battery, placed at a safe distance, and there touching off the blast. This manner of ignition necessitated a large and expensive battery as source of electricity, long and heavy lead wires as electrical conductors, complicated wire joints, and, moreover, was of very uncertain character, a break in the single current formed by the lead wires being sufficient to produce a misfire of all the fuses. The method of independent groups, with the interposition of the circuit closer described, overcomes these defects. When placed and used in conjunction with the batteries close to the mines, but short lead wires are required, and hence smaller batteries will suffice. Enabling the simultaneous firing of all the charges, however divided up into sets of independent groups and batteries, the circuit closer offers in addition the enormous advantage of simpler wire joints and greater security against misfire, since a fault in one of the sets—being here centrally localized—does not affect the other groups.

Although the apparatus is with slight alterations also applicable for electricity of the highest tension, yet the necessity of perfectly insulating the conducting wires, and the difficulty of accurate testing of high tension fuses in the method of ignition by electric spark, are alone sufficient objections against the attempt to use friction machines for large and important blasts. The choice between the electrical sources reduces itself, therefore, to an adoption of voltaic batteries or magneto-electric machines.

In addition to the electrical appliances used we may also apply the laws of detonating charges by transmission. For this purpose the different charges should be connected by proper tubing when blasting on land, while the agency of water would be employed for transmitting the detonation in submarine blasting. It will thus be seen that there is no reason to doubt the possibility of simultaneously firing, with certainty, any number of mines.

In reference to the second point, it is only necessary to state that numerous experiments have proved that nitro-glycerine compounds can positively be exploded in the frozen state as well as when not congealed, provided that the proper fuse is used.

Regarding the third point, General Newton's successful blast of Hallett's Point Reef, in the destruction of which over 50,000 pounds of high explosives were simultaneously exploded, without damaging structures within 600 feet measured from the most extreme mines, is still so fresh in our memory that no further comment is needed, save to say that this satisfactory result was due to the fact that the above quantity of explosive was divided up into about 4,500 well-tamped charges, each of them proportionate to the work it had to perform in breaking up the rock assigned to it. We thus see that, if the charges are properly proportioned to the work to be performed, the whole energy of the explosive being consumed in the demolition of the rock, no fear of any destructive external action need be entertained.

Very respectfully, your obedient servants,

JULIUS H. STREEDINGER, C. E.,
17 University Place, New York City.
A. DOERFLINGER, C. E.,
62 Fort Greene Place, Brooklyn.

NEW YORK, April 24, 1877.

THE MINING LAWS OF TOLIMA.—The portion of the *Código de Fomento* of 1858 relating to mines has been carefully translated and annotated by Mr. R. C. Philpott (London: Clowes & Sons), and will be found very useful to capitalists engaged in mining in that State. It is explained that in the State of Tolima all mines of emeralds and of rock salt belong to the Granadian Confederacy; all mines of other precious stones, and those of metals of every class, whether native or in combination, always provided that they can be worked so as to render the metals available, belong to the State; and all mines not comprised in the two former paragraphs belong to the owners of the surface of the ground. Concessions of mines belonging to the State are granted to discoverers, and upon denouncement in writing. Explorations must not be made within a town or village, but are free in all other places with the consent of the owner of the land; on unfenced lands indemnity must be given for damage. Mines are classed as vein, sedimentary, or alluvial mines. He who receives the title of a mine pays \$25 to the Treasury of the State. The first discoverer of a mine has the right to the concession. The pretension of a vein mine is 2 hectares or 200 meters on the vein by 100 meters wide; if the vein average less than 60 centimeters, 50 meters more on the vein is given; of a sedimentary mine, the area is 1 hectare, in square or rectangular form. The discoverer of a vein mine is entitled to one claim if it correspond to a vein known at some other point; to two claims if it be a new mine on a known ridge; and to three claims if it be a vein and ridge where no mines of the same class are known. Possession is lost by failing to pay \$10 per year tax, and to employ two or more peons for at least one month in each year. The miner has right of way for materials and minerals over adjoining owners' road to reach the public road. The Toliman laws appear to be very liberal, and by making them known Mr. Philpott will have done much to direct the attention of British capitalists to its mineral resources.—*Mining Journal*.

MINERAL STATISTICS OF BRITISH COLUMBIA.

We take from the *British Colonist* of April 11 the following abstract of the report of the Minister of Mines upon the mineral production of British Columbia:

The Hon. A. C. Elliott, who, in addition to filling the onerous dual positions of Attorney-General and Provincial Secretary, is also Minister of Mines, laid his annual report on the condition of the mines of the Province before the House on Thursday. There is much to interest and instruct the reader in the report. The gold yield of 1876 is estimated at \$1,786,648 50, a falling off of over \$500,000 as compared with the yield of 1875. The following carefully compiled table will show that the gold yield since 1858 has aggregated \$39,953,618:

Table showing the actually known and estimated yield of Gold, the number of Miners employed, and their average earnings per man, per year, from 1858 to 1876.

Year.	Total.	Number of Miners employed.	Average yearly earnings per man.
1858 (6 months.)	\$520,353	3,000	\$173
1859	1,615,072	4,000	403
1860	2,228,543	4,400	509
1861	2,666,118	4,200	634
1862	4,246,266	4,100	517
1863	3,753,850	4,000	482
1864	3,491,205	4,400	849
1865	2,662,176	4,204	813
1866	2,480,838	2,982	893
1867	2,374,972	3,044	814
1868	1,774,978	2,390	962
1869	1,336,956	2,369	749
1870	1,799,440	2,348	569
1871	1,610,972	2,450	734
1872	1,305,749	2,400	671
1873	1,844,618	2,300	567
1874	2,449,948	2,868	643
1875	1,780,648	2,024	1,222
1876	1,780,648	2,282	783
	\$39,953,618	60,251	\$662

The report contains dispatches from Mr. Vowell, the Gold Commissioner of Cassiar, as to the encouraging prospects of that district for 1877, which prospects, there is every reason to believe, will be realized. A list of the claims working on McDame, Thibert, and Dease Creeks, and the approximate yield of each claim, is furnished. The yield of gold in Cariboo for 1876 is estimated by the government agent at \$646,000, as against \$760,000 for 1875. The falling off is chiefly in the rich claims on Lightning Creek, which alone produced over \$500,000 in 1875. Several new creeks have been opened, among which Canyon Creek attracts considerable attention. The working of quartz ledges is attracting notice, and a company has been organized to test ledges that have been discovered, and the government have extended a helping hand. The general tenor of the agent's report may be considered satisfactory. The agents at Yale, Lillooet, and Lytton have made returns showing that \$42,000 in gold was mined from the bars and benches of Fraser and Thompson rivers during the year, and Chinamen are making from \$5 to \$7 a day to the hand on diggings at Hill's Bar, abandoned by white miners since 1859. Mr. C. A. Vernon, acting as gold commissioner at the Cherry and Mission creeks diggings, reports on December 18th that diggings that will pay \$6 a day to the hand have been found there. Pierre Bissett and George Leblanc took out \$540 in a month; Squires and Thorp took out \$90 in a few days. A tunnel has been run into the hill from the creek some sixty feet, and a good prospect obtained. A company has been formed to bring in water. Some \$8,000 was taken out during the season, Christian Bros. being most fortunate. It is evident from this report and from private information which we have obtained that these diggings are destined to attract much attention. The returns from Kootenay show a falling off in the gold yield of \$16,000; but great hopes are entertained of Quartz Creek.

The returns from the coal fields show a large increase, notwithstanding the depressed state of the San Francisco market and the fire which during the summer most unfortunately broke out in Wellington Mine. The total output of coal in 1876 was 139,101 tons 15 cwt.; in 1875, 110,145 tons, showing an increase 29,046 tons 15 cwt. There were sold in 1876, 140,185 tons 2 cwt.; in 1875, 97,644 tons 10 cwt.; an increase of 42,540 tons 12 cwt. During the year two new mines have been opened, viz. the Harewood and Baynes Sound, with every prospect of success.

An important discovery of silver and copper has been made on Salmon Arm, Jarvis Inlet, which promises to be of considerable value. The gobbled-up iron island of Taxada remains *in statu quo*, having fallen into the hands of speculators.

MINING NEWS.

Staff Correspondence of the Engineering and Mining Journal.

ARIZONA.

From the *Arizona Miner* of the 6th (an unusually good number) we condense the following notes regarding the mines of that Territory:

Humburg district is growing rapidly, and is to have a ten-stamp mill shortly. The Tip-Top, Pearl, Swilling, Cricket, Willow, Cottonwood, Hidden Treasure, and Eddy claims are all under work and showing well. The developments on these mines amount to shafts sunk 30 to 100 feet, which the *Miner* reports has opened an unusually large amount of high grade silver ore.

There is much excitement about Camp Grant over the reported discovery of cinnabar lodes in Arivapah cañon, where coal is also believed to exist.

In Alexandria district the Doyle, Warren, and Sour Juniper are showing well. Recent advices from California report again the sale of the Peck Mine, in this district, for \$400,000.

The Vulture is doing well and keeping Smith's Mill at Wickenberry steadily running.

The *Enterprise* of the 11th inst. says: The Black Warrior Mine in the Peck district is a large bold ledge carrying a very high grade of galena ore. The gangue is porphyry in a formation of slate, and there are three shafts down upon the mine. A tunnel has been run from the north eighty feet, striking the main shaft at a depth of sixty-seven feet. Two hundred feet south from the main shaft another shaft has been sunk to the depth of forty-five feet, and to the north of the main shaft one hundred and fifty feet; the north shaft is sunk, which is now down thirty-five feet. The pay streak is from three to four feet wide.

Messrs. Walsh, Pletz, and others have recently made a discovery of a large body of lead in Walnut Grove district, and have named it the "Lady Josephine."

The character of the ore is carbonate and sulphide of lead in a gangue of spar, and it is thought to be, and probably is, the best smelting ore yet discovered in Yavapai County. The vein is about three and a half feet wide, carrying a thirty-inch streak of ore, and is in a formation of granite. We have seen a large specimen of the ore, and it bears every characteristic of first-class ore for reduction by smelting process.

Upon the claim on the Goodwin in Turkey Creek district the tunnel is now in sixty feet, forty feet of which is upon the ledge. At fifty feet the tunnel crosses the shaft at a depth of fifty-five feet. The vein is four and a half feet from wall to wall, and carries a pay streak of from one to two feet wide, being a fine grade of rich antimonial silver ore.

COLORADO.

A ten-stamp mill is to be built at Parrott City.

The shaft or main opening of the American is now 220 feet deep, and 1,100 feet of levels have been run, so that the vein is pretty thoroughly opened. The pay material varies from an inch to 20 inches in thickness. During the last three months the value of the ore has been considerably higher than during the preceding six, first-class (selling price) averaging \$7,000 per ton, and second-class from \$400 to \$600. Besides this there are from six to eight hundred tons on the dump which is worth from \$50 to \$60 per ton. In the thirty months of operation under Mr. Hitchcock's ownership, this vein has produced a total yield of \$190,000 in gold, a large proportion of which has been profit. It is at present clearing from \$6,000 to \$8,000 per month.—*Register*.

The Humboldt is now down to the depth of 450 feet, and is employing 40 men. The mine for some months past has been undergoing development rather than stopping, and is rapidly getting into splendid condition, the backs now being opened aggregating 650 feet in length by 200 deep. The mine is well supplied with hoisting and pumping machines, and is yielding from 150 to 200 tons of ore per month, which will average about \$120. At the bottom a good vein of ore is still found. For the amount of development done very few mines in the West can show so good a record of productiveness as the Humboldt and Pocahontas claims of the Pocahontas vein.

COAL ITEMS IN UTAH AND COLORADO.

Staff Correspondence of the Engineering and Mining Journal.

The Molly Maguires, or some branch of that interesting family of lawless individuals, have evidently emigrated from Pennsylvania to the West since the recent persecution of their order in the Keystone State. About four months ago a strike took place in Erie, the northern coal center of Colorado, consequent upon a determination of owners of mines to reduce the pay of miners from \$1 to 75 cents per ton. The strike culminated last week in the burning of the Boulder Valley shaft and incline houses, and the blowing up of about fifty feet of the timber-work at the mouth of the river by gunpowder, thus preventing production from that vein for some time, even if the company running it are not further hindered by more violence on the part of the operatives. Unfortunately, the number of producing coal mines in the State is so large that there is little hopes of owners getting the better of the men at present. On the contrary, several mines outside of Erie, are taking advantage of the trouble at that town to push their product on the market, a course which will probably compel the Boulder Valley and Rob Roy companies to relinquish their attempt to lower the price of mining for the present.

The prospect which Utah had two years ago of producing its own coke from San Pete coal, and which was destroyed for the time by the transfer of the control of the Utah Central and Southern railroads to the Union Pacific, has again revived. At the time mentioned it was shown by tests on a large scale, at the Germania, Flagstaff, Saturn, and other large works, that San Pete coal could be coked with excellent results, and furnished to smelters in Utah and Nevada at about 25 per cent. below the cost of the Connellsville article; that the coke was of the best quality, fully capable of sustaining the heavy burden of lead furnaces; and, further, that it was sufficiently free from impurities to be used in the smelting of iron, of which metal there are excellent deposits in the Territory, both in the immediate vicinity of the fuel and also along the line of the Trans-Continental Railroad. Of late, however, a move has been made among San Pete coal men looking towards the building of an independent narrow-gauge road from their mines to the Salt Lake Valley, which may ultimately be successful. The amount of coke now imported to Utah foots up about 30,000 tons annually, and costs the Territory nearly a million dollars. San Pete coke can be delivered at Sandy at \$20 per ton, and yet give a good margin of profit to the burners. It is to be hoped that the contemplated road will be built this summer.

The bed of semi-anthracite coal discovered several years ago on the southwestern flank of the Elk Mountain range, in Lake County, Colorado, is to be opened this year, it is reported, and an attempt made to market it in San Juan. The bed, so far as known, is not very extensive, yet large enough to be mined to a profit if a sale for it is found not too far off. Lake City, the present metropolis of San Juan, is situated about 60 miles southwest of the Elk Mountains, and between the two localities is an open rolling country, easily traversed without heavy grades, and likely soon to be settled by farmers and stockmen, as the valleys are broad, fertile, and productive of as fine natural grass as is to be found anywhere.

Trinidad coal has been found to coke so well, and to produce such an excellent quality of material, that the sale of it this year is bound to be large. The owners of the mines are preparing to burn a large quantity, and have made efforts (with what success we are unacquainted) to introduce it in Wyoming, Utah, and Nevada in place of Indiana coke. Prof. Wm. B. Potter, of Washington University, St. Louis, who made an extensive trip through the Colorado coal districts in 1875, has lately finished a very thorough examination of the coals of the State, and expresses his opinion on the Trinidad seams in the most favorable terms. His analyses, we believe, will shortly be published, and we think they will be a surprise to those who have thought lightly of Colorado lignites.

RECENT MINING DECISIONS.

A recent decision by the Commissioner of the General Land Office, in the case of the Woodville placer application, is as follows: Where no adverse claim was filed, and no suit begun within the period of publication, or thirty days thereafter, but a suit was afterwards instituted before a court of competent jurisdiction, wherein the plaintiff recovered judgment against the applicants for a patent for an interest in their mine, and he then filed with the Commissioner a transcript of the judgment-roll as a bar to the issuance of a patent, *Held*: That the plaintiff had no standing before the Land Office, and that his remedy was in a Court of Equity, to compel the patentees to convey to him that portion of the patent for which he recovered judgment in the court of law.

The Secretary of the Interior, in the case of Poley & Thomas vs. The State of California, involving title to a school section in the Stockton land district, has

decided that title to all of the 16th and 36th sections of unoccupied public lands in California vests in the State at the date of the survey, if at that time they are not known to be mineral or are not treated as such by the State. The important general principle announced has never been authoritatively established. The section in controversy was not discovered to be mineral until four years after the date of survey; but, according to this decision, the State title would have firmly attached to the section if minerals had been discovered upon it the next day.

The following is the full text of an important ruling by the Commissioner of the General Land Office, which decides a question of interest to miners:

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE, WASHINGTON, D. C.
March 26th, 1877.

Register and Receiver, Stockton, California.—Gentlemen: On the 17th of October, 1876, Horace Bellows, H. C. Badger, and Augustus Walker presented their application for patent for one thousand linear feet of the Champion Mine, with surface ground six hundred feet in width, said premises being designated by the Surveyor-General as lot 37, township 11 south, range 23 east, Mount Diablo meridian.

You refused to receive and file said application, as it includes and embraces a portion of the northeast quarter, section 32, in said township, which was entered by Richard M. Keyes, October 21, 1874.

The papers submitted in the case and the records of this office show that R. M. Keyes and two others located one thousand feet of the Champion Mine on the 21st day of May, 1866, and that such location was recorded in the Recorder's office of Fresno County, California, on the same day, at the request of R. M. Keyes; that Keyes on the 21st of June, 1866, purchased the interest of one of his co-locators, and conveyed his entire interest to the present applicants for patent, December 1, 1866, and that the present applicants purchased the remaining interest in said mine on the 2d day of July 1867. The applicants allege that they and their grantors have been continuously in the possession of said mine since the original discovery thereof, and that they have in all respects complied with the requirements of the law in holding and working the same.

On the 21st of October, Richard M. Keyes made final homestead entry No. 280 of said northeast quarter, section 32, and on the 20th of January, 1875, patent issued upon said entry.

No title was acquired by virtue of this patent to any known mine, for, by the positive provisions of the statute, lands are not subject to pre-emption or homestead entry "on which are situated any known mines or miners." (Sections 2253 and 2289, Revised Statutes.) Title to mineral land can only be acquired by parties who show compliance with the terms of the Act regulating the disposal of mineral lands.

A "known mine" did exist upon the land in question at the date Keyes made his entry, a mine located by himself and others, and sold by them to the present applicants.

It appears by a copy of the decree of the court of the Thirteenth Judicial District of California, rendered on the 18th of November, 1876, in the case of H. Bellows et al. vs. R. M. Keyes et al., that it was decreed by said court that "the plaintiffs have had ever since the 27th day of May, 1867, and still have, the possession and exclusive right to the possession of their said mining claim and premises, and are and have been for years past entitled to apply for and receive a patent from the government of the United States, under the laws of Congress, and in conformity thereto, of and to and for said mining claim and premises. That the said patent to said R. M. Keyes conveys and grants to him or to his assigns no right or title or interest in or to the land embraced within the said northeast quarter of said section 32, covered by this mining claim and premises of the plaintiff. . . . That the said patent and the said conveyance thereunder made, be, and the same are hereby, set aside and declared null and void, and the defendant, and each and every one of them are forever estopped and hereby precluded from claiming any right or interest in title to or ownership of said mining claim and premises or any part thereof. . . . And the right of possession of plaintiffs of and to their said mining claim and premises is hereby affirmed and declared valid, legal, and just."

As the Government has not yet divested itself of the title to said mine, you will receive the applications of said H. Bellows et al. for patent therefor, upon compliance with the law and instructions.

Be pleased to inform all parties in interest, and acknowledge the receipt hereof. Very respectfully, your obedient servant,

J. A. WILLIAMSON, Commissioner.

NOTES.

THE BETTS COVE (NEWFOUNDLAND) COPPER MINE.—The deposit in this mine is a large one and well situated for mining and shipping. The cars which bring the ore out of the mine can dump it on board the largest class of vessel without transshipment. Work is being pushed with considerable vigor, but without much technical skill. The consequence is that the workings are unsafe, several accidents having occurred involving a grievous loss of life; and although large quantities of ore may be cheaply extracted at present, yet the future of the mine is being most seriously impaired.

A "FIRE-DAMP METER" WHICH MAY SERVE TO DETERMINE THE AMOUNT OF PROTOCARBIDE OF HYDROGEN IN A MINE.—M. J. COQUILLION.—The author has contrived two forms of his apparatus, the one for use in the mine and the other for laboratory purposes. Both depend on the principles that hydrogen and its gaseous carbides are completely burnt in presence of oxygen and a palladium wire raised to white redness.—*Chemical News*.

DURANGO MINING CO., SAN DIMAS, MEXICO.—The mines have been for the past 2 years in charge of Mr. A. V. Temple, of this city. At the end of thirteen years of operation the company has struck rich ore in the tunnel now being driven to drain the old mines. These old mines were last worked about sixty years ago, are some 1,000 feet in depth, and the tunnel driven in from the side of the mountain will be about 1,350 feet in length and will strike the old works which are now filled to the depth of 400 feet with water; at a depth of probably 975 feet—vertical—from the surface. The ores are principally sulphide of silver, containing gold in iron pyrites. Ore has just been struck in the tunnel, now 1,250 feet, in which, after assaying, is valued at \$800 per ton.

EXODUS OF MINERS FROM SCRANTON, PA.—A telegram to the New York Herald of the 19th April, notes the departure from Scranton, Pa., of fifty-four families for the Far West. It adds: Every workingman in the valley who can muster together enough funds to carry him away to the distant farms of the wild West is preparing to leave, and it is expected that before the 1st of May no fewer than 500 families will have left the Lackawanna and Wyoming valleys. Those who left to-day were of a sober, industrious class, who cannot bear idleness, and who are eager to face privation and poverty in order to win a little home for themselves. Toil has no terrors for them, and they are just the very ones that a community regrets to lose.

FICHELITE AND RETEN, CRYSTALLINE HYDROCARBONS IN THE PEAT DEPOSITS OF THE FICHEL RANGE OF MOUNTAINS.—A. Schmidt.—Fichtelite is a crystalline hydrocarbon, occurring as fine monolinic crystals, or brittle, yellow scales in the peat. Its formula, according to Gorup, is C₁₂H₁₀, while Bromeis makes it C₁₄H₁₀. Its melting point is 46° C. It is soluble in ether and can be sublimed without decomposition. Along with Fichtelite in similar relations, though more rarely found,

is another hydrocarbon, which has been called Reten, and to which the formula C₁₄H₁₀ has been given. It is distinguished from Fichtelite by crystallizing from its solution in ether, while Fichtelite remains as a resinous mass. It is gradually soluble in dilute H₂SO₄, and gives a crystalline compound with trinitrophenol. Its point of fusion is 213°.

ROUMANIAN AMBER.—According to H. Biziste, of Bucharest, Roumanian amber differs totally from the German amber found on the shores of the Baltic Sea. Both are the fossil resins of antediluvian trees, and agree in chemical composition, but differ in color. German amber is found only of light colors—yellow, white, and pink—while Roumanian amber is red, pink, brown, blue, green and black. These colors are frequently found mixed in a single piece, and we also have lumps with silver-colored veins and gold specks. On account of this variety of colors, the Roumanian amber is highly esteemed, and the darker and more beautiful pieces are more costly than yellow amber, especially as they are more rare. German amber is found in the sea or in alluvial earth; the Roumanian amber is only found in mountainous places and highlands, where it is sought and dug out by the peasants. The collection of amber languishes, or, more properly speaking, is never conducted in a rational manner. The peasants, being ignorant and led only by instinct, dig here and there, wherever they guess that amber is to be found. Formerly, this amber was found in larger quantities, and also in much larger pieces than at present. Biziste is of the opinion that if the search for amber and its collection should be carried on in a scientific manner by competent judges, it would prove remunerative. At the Vienna Exhibition, Biziste took a diploma for a beautiful collection of cigar holders, ornaments, etc., made of black amber.—*Scientific American*.

GOLD MINING IN SPAIN.—In the books of Titus Livius mention is made of the splendid ornaments of fine gold worn by the Roman matrons, and that the gold came from the district of Tamaya in Spain. A short time since an enthusiastic classical scholar who knew the district, and was aware that there did not even exist among the indigenes even the tradition of the existence of the mine referred to, resolved, if it were possible, to discover it. After several months' careful investigation, and when he was about to give up the attempt in despair, what appeared to be an old shaft was discovered under the shade of an old oak tree. This was carefully cleaned out and extensive Roman galleries were laid open. On a survey being made a lode of ferruginous conglomerate, 80 centimeters (32 inches) wide, was found. In this gold was discovered, perfectly visible to the naked eye. Since then assays have been made both in Paris and Madrid, and the lode stuff has been practically tested in bulk by Figueroa, of Cartagena. These trials have given the enormous results of 22 oz. to 24 oz. of gold per metric quintal, with 12 ozs. to 14 ozs. of silver. Arrangements have now been made for a perpetual lease at a royalty of 15 per cent. on the gross product of gold, with option of purchase within one year for £100,000, £5,000 being payable on signing the definite contract of lease, and three months being offered for making any investigations that may be desired. It is stated that in the lode already mentioned there are seven others of nearly equal width running into it at nearly right angles. The main lode can be followed right up the mountain, and the whole property can be worked by adits. As the mine is within a short distance of a railway station there would be great facilities for working it, and it is believed that if English capital could be secured for developing it, the results would be satisfactory to all concerned.—*Mining Journal*.

A NEW KIND OF MINING.—BURIED CITIES IN CENTRAL ASIA.—An expedition to explore the buried cities of Central Asia is talked of in Bombay and elsewhere in India. That treasures like those at Mycenae may be found in the sands of Mongolia is at least possible. If tradition be of any value—a tradition, too, which has persistently clung to one locality through the lapse of centuries—the tomb of Ghengiz Khan is yet, with its fabulously rich treasures, to be found (as Colonel Prejevalsky was told by the Mongols) to the south of Lake Tabasum-Nor. Your readers may remember the quaint legend about the last resting-place of the great Khan. Within the tomb lies a man who seems asleep. Every evening a sheep or a horse is tied near to the spot, and lo! in the morning the animals have been eaten. In 300 years, says the Mongols, the sleeper will awake and lead countless hosts of his children to victory and dominion. The old story is said to be circulating more and more widely every year. Then the Mongols say that constantly the drifting sands disclose here and there gold and silver treasures, which they have a superstitious dread of touching. The buried cities under the sands of the Gobi are affirmed to be mines of incalculable wealth, guarded by gnomes and fearful spells, while all the deserts around the hidden ruins are peopled by myriads of howling ghosts. Dr. Bellew established the fact some time since that we shall probably have several of these buried cities revealed shortly, in a similarly natural manner to that in which they were primarily concealed from the sight of man. The sands of the deserts of Central Asia regularly move and drift from east to west, and even now the eastern borders of deserts are being denuded widely of all soil that can be torn away and borne westward by the violent winds that rage with incredible fury many months of the year in those regions. Will Russia be the first to avail herself practically of the knowledge of this?—*London Athenaeum*.

EXPORTS OF RAILWAY IRON FROM GREAT BRITAIN, extracted from Government returns by Messrs. W. W. & C. Richardson:

To	Month ending March 31.			3 months ending Mar. 31.		
	1875. Tons.	1876. Tons.	1877. Tons.	1875. Tons.	1876. Tons.	1877. Tons.
United States.....	4,052	31	302	9,013	85	762
Russia.....	2,205	814	3,625	3,228	1,038	7,516
Turkey.....	11	35	...	16	70	5
British India.....	2,709	5,738	9,831	10,015	11,497	16,800
British North America.....	641	324	31	6,221	2,083	879
Egypt.....	2	66	133	2	136	133
Australia.....	9,144	2,202	6,004	22,593	8,245	12,774
Brazil.....	341	991	1,724	2,678	3,990	6,450
Holland.....	256	43	261	388	60	590
Spain and Canaries.....	947	754	1,060	3,046	3,058	6,315
Sweden and Norway.....	2,965	4,362	850	8,490	9,431	1,853
Chili.....	626	551	475	5,650	631	507
Denmark.....	87	8	144	212	38	200
Peru.....	880	739	3	9,832	1,644	3
France.....	18	22	24	11
Germany.....	43	166	254	541	195	480
Belgium.....	124	4	48	346	135	50
Italy.....	297	2,963	573	2,541	9,267	1,512
Other countries.....	6,101	2,148	3,850	17,802	11,991	10,954
Total.....	31,369	21,931	30,078	102,626	63,618	67,784
Total exports from Great Britain of iron and steel to all countries.....	164,067	149,196	176,948	473,569	418,519	446,519

	Month of March.		3 months to March 31.	
	1876. Tons.	1877. Tons.	1876. Tons.	1877. Tons.
Estimated total of iron rails.....	15,852	14,378	46,592	30,385
“ “ steel rails.....	2,876	12,077	7,953	28,741
Total of rails.....	18,728	26,455	54,545	59,126

STATISTICS OF COAL PRODUCTION.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines. Comparative Statement for the week ending April 21, and years from Jan 1st.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
Wyoming Region.				
D. & H. Canal Co.	51,584	588,212	60,783	492,830
D. L. & W. RR. Co.	47,381	586,422	35,928	360,502
Penn. Coal Co.	21,105	283,657	13,563	263,602
L. V. RR. Co.	14,001	288,873	31,225	250,390
P. & N. Y. RR. Co.	1,110	13,714	984	7,371
C. RR. of N. J.	36,123	379,677	41,277	271,141
Penn. Canal Co.	19,224	23,253	8,422	18,546
	199,528	2,163,818	192,187	1,670,382
Lehigh Region.				
L. V. RR. Co.	63,775	727,184	70,996	562,978
C. RR. of N. J.	39,133	388,649	31,598	246,857
D. H. & W. B. RR.	234	5,375	632	11,453
	103,142	1,121,408	103,226	821,288
Schenck Region.				
P. & L. R. RR. Co.	147,280	1,372,693	145,603	843,430
Shamokin & Lykens Val.	14,432	125,530	10,655	83,141
	161,712	1,498,223	156,258	926,571
Sullivan Region.				
Sul. & Eric RR. Co.	28	3,693	463	16,723
Total	455,410	4,787,167	452,134	3,434,966
Increase	3,276	1,352,201		
Decrease				

The above table does not include the amount of coal consumed and sold at the mines, which is about five per cent. of the whole production.

Receipts of Coal at Boston, for the week ending April 20, and years from Jan. 1.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
From				
Alexandria and Georgetown		1,298	954	5,556
Philadelphia	15,980	96,969	14,840	78,755
Baltimore	2,660	24,744	2,220	23,422
Other places	10,016	56,724	15,455	63,551
Great Britain		707		3,407
Nova Scotia	2,865	3,679		199
Total	31,521	184,111	33,469	176,890

Perth Amboy business: Tons.
 Received for the week 23,579
 Shipped for the week 33,652
 On hand April 21 134,771

The Exports of Coal from Baltimore for the week ending April 20, were 1,482 tons, and since Jan. 1st, 12,646 tons as against 10,850 tons for the corresponding period of 1876.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 42,599 tons, as compared with the corresponding period in 1876.

Belvidere Delaware RR. report for week ending April 21.	Week	Year.	Year.
Coal for shipment at Coal Port (Trenton)	800	2,672	39,144
" " " " South Amboy	3,267	172,909	139,607
Coal for distribution	3,995	52,260	42,733
Coal for Company's use	1,521	23,823	16,159

The production of Bituminous Coal for the week ending April 21, was as follows:

Tons of 2,000 lb., except where otherwise designated.	Week.	Tons.	Year.	Tons.
Cumberland Region, Md.		46,220		284,617
Barclay Region, Pa.		5,581		112,474
Broad Top Region, Pa.		3,386		46,652
Huntingdon and Broad Top RR.		830		14,155
*East Broad Top				
Clearfield Region, Pa.		745		11,284
*Snoe Shoe		22,296		383,636
*Tyrone and Clearfield				
Allegheny Region, Pa.		3,604		57,305
*Pennsylvania RR.				
Pittsburg Region, Pa.		3,499		56,811
*West Penn. RR.		497		15,647
*Southwest Penn. RR.		11,352		224,070
*Penn & Westmoreland gas coal, Pa. RR.		6,452		111,058
*Pennsylvania RR.				
*For the week ending April 14.				

The Production of Coke for the week ending April 14.

Tons of 2,000 lb.	Week.	Year.
West Penn. RR.	509	22,914
Southwest Penn. RR.	7,466	176,986
Penn & Westmoreland Region, Penn. RR.	1,605	23,422
Pittsburg, Penn. RR.	3,402	43,288
Total	13,073	266,610

COAL TRADE REVIEW.

NEW YORK, Friday Evening, April 27, 1877.

Anthracite.

There has been a very large business done since there were appearances, sufficient to mislead the uninitiated into the belief that a combination would be formed. During the past week there has been a very active business, but at prices much below circular rates, and if anything, a little lower than at any time heretofore.

These prices are certainly quite unsatisfactory to most producers, but there does not appear to be any chance of an improvement until some, through lack of funds, shall be compelled to abandon the business. The manner in which the Reading Company is pushing its business, and the low prices at which it is selling its coal, would indicate that it intends to work its road and mines to their full capacity, and if it secures the quantity of business necessary, the competitive business of the other companies, after the special coals have been supplied, will be very much reduced, and in the strife to secure what remains, we are likely to see pretty low prices for some of the coals that do not attempt to meet the Reading now.

On Wednesday, the Delaware, Lackawanna & Western Railroad Company sold at auction about 92,000 tons of coal as against 75,000 tons announced to be sold. The attendance was large and the prices show an advance as compared with the March sale. The purchases, however, were made by but a few parties, and the general belief is that prices were bolstered. This belief is almost unavoidable by those familiar with the trade and with the parties who made the purchases. There was not an important buyer at this sale who did not, or should not have known, that they could buy coal of equal and even superior quality for less money, and that these buyers should have been the ones to bid up prices and then take the majority of the coal, clearly indicate, to our mind, that the object was to create a false impression as to the market value of coal. What advantage may have been anticipated in this result we do not know, nor will we accuse the company of being a party to it. A short time previous to the sale, we had advices of a "bull" movement in "coal stocks," and on the morning of the sale, those best informed in such matters anticipated an advance in the prices of coal (to strengthen the value of stocks) although they acknowledged that the condition of the market did not warrant it, but on the contrary that a decline should take place if the coal were sold on its merits. As we cannot see that the company has any advantage over others in a market where every buyer is overwhelmed with offers at low prices, we can only suppose the advance to form part of a "bull" movement by stock gamblers.

The following quantities were sold, and average prices obtained, comparison being made with the prices of the March sale:

Tons.	April 25.	March 28.
8,500 Steamer,	\$2 95	\$2 75
30,500 Grate,	2 82½	2 72
20,800 Egg,	2 82½	2 82½
26,900 Stove,	3 35	3 22
5,000 Chestnut,	3 00	2 81

The Delaware & Hudson Canal Company has issued, since the sale, a circular advancing its prices. If it intends to stand by the prices named in this circular (which we do not in the least expect it will do), it might just as well close its mines so far as the business to be done from the North River is concerned. The Lehigh Valley Coal Company did a more consistent thing; it issued a circular announcing a reduction.

There are still some who think that because the combination has not been formally declared a farce, that something may yet come out of it. It is well to state, however, that the number who so think is quite small. There are other reasons why coal is being so freely purchased now: the knowledge that it is very cheap, and a desire to avoid higher rates of coastwise freights, anticipated in case of a serious European war. The former cannot be denied, although it is very probable that we have not seen the worst yet. Some advances in coastwise freights may be established by a demand for vessels to carry grain, which would take some of the larger ones now employed in the coal trade; but with the unusually large amount of business doing now there will probably be unexpected quietness at what is counted as the busy season, which will result in a liberal supply of vessels and an easy rate of freight.

The production of anthracite coal is still on the increase, having been 455,410 tons for the week ending on the 21st inst., as against 434,249 tons for the week previous, and 452,134 tons for the corresponding week in 1876. The production last week, although in excess of the corresponding week of 1876 and any previous week this year, was considerably curtailed by a strike at the Lehigh Valley Railroad Company's wharves at Amboy. The total production from Jan. 1 has been 4,787,167 tons as compared with 3,434,966 tons for the like period of last year, showing an increase this year of 1,352,201 tons. During the corresponding period of

1876 there had been to this time a suspension of production (so termed although not a complete one) for six weeks, and beginning with the first of June there was an attempt to enforce one during alternate weeks, which reduced the average out-put from that date to the time the combination broke (the end of August) to an average of only about 300,000 tons. Considering the great depression that still exists in nearly all branches of industry, the excess of shipments already this year, the large amount of coal now being produced, and indications that this quantity will best still further increased, we may reasonably look for great demoralization during the summer months, the Delaware & Hudson Canal Company's circular advancing prices to the contrary notwithstanding.

Bituminous.

During the week we have learned of sales amounting to about 110,000 tons of Cumberland and Clearfield coals. The Boston & Albany Railroad Company is reported to have purchased 35,000 tons of Cumberland coal for shipment from Georgetown; 25,000 tons for shipment from Baltimore; and 25,000 tons of "Ocean" Clearfield for shipment from Philadelphia. The Boston & Fitchburg Railroad Company has purchased 5,000 tons of Cumberland coal for shipment from Baltimore. It is also reported that the Inman line has contracted for about 25,000 tons of Cumberland, but this we have been unable to authenticate. Last year the Boston & Albany Railroad Company contracted for about 100,000 tons of coal, for delivery from Baltimore, and this large loss of trade to the Baltimore & Ohio railroad is said to be the result of dissatisfaction on account of the unfair policy of allowing secret drawbacks adopted by that road this year, and an effort made to establish competition among all of the companies, a consummation that must be advantageous to all consumers.

What advantage the company anticipates from such a policy, we cannot see, for it simply gives one mining company an advantage over another. It is reported on very good authority, that the same policy has been introduced into its grain business, with the result of driving away capital intended to do an export trade from Baltimore.

Prices continue very much unsettled and a shade lower than a week ago. There has been no particular developments in the war between the Chesapeake & Ohio Canal Company and the Baltimore & Ohio Railroad company, although it looks as though the bottom had been reached. The Baltimore American of the 24th inst says it has "learned that Mr. John W. Garrett, President of the Baltimore & Ohio Railroad, is preparing a letter to Mr. A. P. Gorman, of the Chesapeake & Ohio Canal, in reply to a communication on the subject of an adjustment of the differences that exist between the railroad and the canal in the matter of freight rates on coal from Cumberland. The reply is expected to be lengthy, and will review the whole freight question."

If this had been done promptly, considerable loss of tolls might have been saved to both companies.

The production of Cumberland coal last week, was in excess of the week previous and the corresponding week of last year, while the Clearfield production shows a considerable falling off.

The Pennsylvania railroad company has not shown an inclination to openly meet Cumberland, although it is believed that some concession was made to secure the Boston & Albany railroad contract.

Gas Coals.—The contracts made so far have only been with small buyers, and aggregate not over 30,000 tons. There are no indications that the large companies who, as a rule, are well stocked, will purchase for some time.

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.	Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich.			
Philadelphia	\$4 50		\$5 50
" " at S. Amboy	5 00		5 50
Red Bank Cannel Pa. at Philadelphia	8 00		8 50
Youghiogheny, Waverly Co., at Balt.	4 00		5 65
Despard, West Va., at Baltimore	4 50		6 00
Murphy Run, West Va., at Baltimore	4 50		5 86
Fairmount, West Va., " "	4 40		5 70
Newburg Orrel, Md., " "	4 50		6 00
Cannelton Cannel, West Va., " "			10 00
" Splint " at Richmond	6 00		7 00
" Gas Coal at Richmond	4 14		5 65
Peytona Cannel W. Va. at Richmond			10 00

Manufacturing and Steam Coals.

Cumberland at Georgetown and Alexandria, Va.	3 00@3 15	4 40
Cumberland, at Baltimore	3 15@3 25	4 70
Clearfield f. o. b. Canton, Baltimore	@

Foreign Gas Coals. Sterling. Am. cur'cy. Newcastle at Newcastle-on-Tyne... Liverpool House Orrel, at Liverpool... Ince Hall Cannel... Gas Cannel... Scotch Gas Cannel, at Glasgow, nominal, Gold.

New York and Philadelphia. Wholesale Prices of Anthracite Coal f. o. b. at the Tide Water Shipping Ports per ton of 2240 lb.

Table with columns: Lump, Steamer, Grate, Egg, Stove, Chestnut. Rows: Wyoming Coals, Lehigh Coals, Schuylkill Coals at Port Richmond, Philadelphia.

Wyoming Coals. Lackawanna and Scranton at Hoboken and Rondout... Wilkesbarre at Port Johnston... Plymouth, R. A... Susquehanna Coal Co., (S. H. Brown & Co.) At Amboy... Kingston at Hoboken... Pittston at Newburgh... A. S. Swords... Penn. Coal Co... Wyoming at Perth Amboy.

Lehigh Coals. Old Company at port Johnston... Old Company's Room Run... Sugar Loaf, Hobok. & Amb... Lehigh at Perth Amboy... Honey Brook Lehigh... Beaver Meadow at South Amboy... Mount Pleasant at Hoboken... Cross Creek at Elizabethport.

Schuylkill Coals at Port Richmond, Philadelphia. Schuylkill white ash... Schuylkill red ash... Lorberry... Lykens Valley.

Boats towed by the D. & H. Co. at its expense to and from New York Harbor.

Freight from Hoboken and Weehawken to New York. Freight by the boats of the companies from Hoboken, Rondout, Port Johnston, Weehawken, South Amboy and Perth Amboy to New York City and vicinity 50c.

Pittston coal at New York delivered by Penn. Coal Co.'s boats 60c. per ton additional.

Lackawanna coal delivered to carts in New York or Brooklyn, 50 cents per ton additional.

Retail Prices in New York. Anthracite. Per 2000 lbs. Grate and Egg. Stove. Chestnut. Pittston coal, in yard... Lackawanna coal, in yard... Wilkes-Barre, delivered... Lehigh and Locust Mountain, del'd... Schuylkill Red Ash, del'd.

The Cost of delivery for Pittston and Lackawanna coal ranges from 40 cts. to \$1.10 per ton, according to distance from the yard.

Bituminous. Liverpool House Orrel, delivered, per ton of 2000 lb... Liverpool House Cannel... American... Cannelton Block, or splint... American Orrel... Red Bank Cannel... Cumberland.

Baltimore. April 25, 1877. Wholesale Prices. Afloat by cargo. Lump and Steamboat... Broken... Egg... Nut.

Lykens Valley Red Ash, afloat. Broken... Egg... Stove... Chestnut.

From wharf or yard to the trade, 75c. per ton additional. Bituminous. George's Creek, f. o. b. at Locust Point... Clearfield, Canton.

Boston. April 21, 1877. Coal is dull, and the tendency in prices is downward. Retail dealers, generally, place very little confidence in the reports of a strong combination, and refuse to stock up.

Freights are quoted at \$1.40@1.45 from Philadelphia, \$1.50@1.55 from Baltimore; \$1.50@1.60 from Alexandria and Georgetown, and \$1.20@1.25 from New York.

In Nova Scotia coal there have been further contracts of Langan at \$1.75, gold, delivered at the mines, or about \$4.50, currency, here. Cumberland has been in demand, and large contracts have been made at \$3@3.25, delivered at Georgetown and Alexandria. At the inside figure the Boston & Lowell is said to have contracted for 20,000 tons delivered at Baltimore. In gas coals nothing of any consequence has been done as yet. The price is \$5 delivered at Baltimore, and \$4.70 at Philadelphia, but leading companies have not purchased to any extent as yet. It is reported that Provincial gas coals have been sold at Baltimore.

We quote Boston wholesale prices as follows: Anthracite, broken... do egg... do stove... Cumberland... Clearfield... Westmoreland... Caledonia.

Commercial Bulletin. Buffalo. April 24, 1877. Specially reported by LEE & LOOMIS.

Table with columns: Lump, Run of Mine, Nut, Slack. Rows: Connellsville Coke... Brookfield Coal... Briar Hill... Youghiogheny... Monterey... Catfish... Stoneboro... Sterling Cannel... Reynoldsville... Cameron.

In New York city funds. Chicago, Ill. April 23, 1877. Specially reported by Messrs. RENO & LITTLE.

Lackawanna Stove... Chestnut... Grate and Egg.

Cincinnati, O. April 24, 1877. Specially reported by the Consolidated Coal and Mining Co.

Table with columns: Per bush, 2000 lb., Delivered, Per bush, 2000 lb. Rows: Youghiogheny lump... nut... slack... Camden, W. Va... Peytona Cannel... Connellsville coke... Youghiogheny coke... Crushed coke... Anthracite, Wilkes-Barre or Lehigh by car load.

Cleveland, O. April 23, 1877. Specially reported by Messrs. LAMBE & BATES. Per ton of 2000 lbs. f. o. b. vessels.

Table with columns: 1 to 10 tons, 10 to 100 tons, upw'd. Rows: Briar Hill lump... nut... Massillon and Mineral Ridge lump... nut... Straitsville Lower Vein, Hocking & Shawnee... Del Carbo lump... Rich Hill lump... nut... Columbiana, lump... nut... Lackawanna, Wilkesbarre and Pittston egg and grate... Stove... Chestnut.

The following are the prices established by the Coal Exchange until further notice: RETAIL TRADE.

Table with columns: 1 to 10 tons, 10 to 100 tons, upw'd. Rows: Briar Hill lump... nut... Massillon and Mineral Ridge lump... nut... Straitsville Lower Vein, Hocking & Shawnee... Del Carbo lump... Rich Hill lump... nut... Columbiana, lump... nut... Lackawanna, Wilkesbarre and Pittston egg and grate... Stove... Chestnut.

Lehigh \$1.25 per ton higher. All sales to be strictly cash with order or C. O. D. Hamilton, Ont. April 24, 1877. Specially reported by V. BARNARD.

Prices as quoted below give the present state of our market for coals that are in demand: Grate... Egg... Stove... Nut.

Indianapolis, Ind. April 24, 1877. Specially reported by Messrs. CORB & BRANHAM. Wholesale on board cars, and retail delivered to consumers.

Table with columns: \$2.50, \$2.25, \$2.00, \$1.80, \$1.70. Rows: White River, per ton... Brazil Block... Highland, grate... Block coal, nut, per car... Highland... Block Slack.

ANTHRACITE (Lackawanna and Wilkes-Barre). Broken... Egg... Lehigh Anthracite. Broken... Egg.

Retail, per bush, delivered. Sand Creek... White River... Brazil Block... Highland Grate... Block Nut, domestic use... Highland Nut.

GAS COKE (measured.) Crushed... Anthracite. Wilkes-Barre and Lackawanna (all sizes)... Lehigh, retail.

Louisville, Ky. April 24, 1877. Specially reported by Messrs. BYRNES & SPEED. Below find latest quotations:

Table with columns: Wholesale. Rows: Pittsburg... Raymond City... Pine Hill... Kentucky.

RETAIL. Pittsburg... Raymond City... Indiana Cannel... City Make Coke. Pine Hill... Kentucky... Honeywell Can'l... Anthracite \$8.50 to \$9.00 per ton.

Milwaukee, Wis. April 23, 1877. Specially reported by Messrs. R. P. ELMORE & Co. Retail price per ton of 2,000 lb.

Table with columns: \$8.00, \$9.00, \$8.00, \$8.00, \$8.00. Rows: Lehigh Lump... Lehigh Prepared... Lackawanna (all sizes)... Pittston... Scranton.

Montreal. April 23, 1877. Specially reported by Messrs. ROBERT C. ADAMS & Co. Wholesale per ton of 2,240 lb.

Table with columns: \$4.50, \$4.25, \$6.50, \$6.50, \$7.00. Rows: Scotch Steam... Pictou... Anthracite at retail, per 2,000 lb. delivered... Egg... Stove.

New Orleans, La. April 23, 1877. Specially reported by Messrs. C. A. MILTENBERGER & Co. PITTSBURGH COAL.

Table with columns: 35c. per bbl., 45c., 50c., 75c. Rows: At wholesale (by boat load)... To steamboats... "manufactories"... "families"... In hds. (for shipment).

ANTHRACITE COAL. At wholesale (per ton) \$6.00 to 7.00 per ton. "retail" 11.00.

VIRGINIA CANNEL COAL. At retail \$1.25 per bbl. To steamboats... "families".

Philadelphia, Pa. April 26, 1877. Specially reported.

There is no change in the trade here. The difficulty with the Railroad and the Engineers has somewhat disturbed the supply of cars at the mines, but the Company is now doing better, and on the whole, considering the magnitude of the undertaking, is doing remarkably well. Their prompt action has saved the trade from what might have been a serious interruption, if they had not been so well prepared. Now it can be said that they master fully the situation. Vessels have been a little more plenty for one day past, but rates are firm at \$1.60 to Boston, and \$1.30 to Providence. The advance at the auction sale is not considered of any importance, as it is not generally believed to be legitimate. The expectation was, some firmness in large sizes by a decline in stove and Chesnut.

Pittston, Pa. Apr. 26, 1877. Pennsylvania Coal Company's Coal in yard, ton of 2000 lb. Retail.

Table with columns: \$2.25, 2.00, 1.00. Rows: Lump, Egg and Stove... Chestnut... Pea.

Delivered, fifty cents per ton additional. Richmond, Va. April 26, 1877. Specially reported by S. H. HAWES, Dealer in Coal.

Table with columns: \$9.00, \$4.25, 3.50, 3.25, 4.90. Rows: Kanawha Cannel... Coalburg Splint... Lewiston... Kanawha Gas Coal.

Sandusky, O. April 25, 1877. Specially reported by C. E. BLACK, Agt. Con. Coal & Mg. Co. We quote coal on cars at Sandusky, as follows: Per ton of 2,000 lbs.

Table with columns: \$6.00, \$6.10, \$6.60, \$6.60, 6.75, 6.85, 7.35, 7.35. Rows: Anthracite. Wilkes-Barre... Lackawanna... Lehigh.

BITUMINOUS. Massillon... Del Carbo... Hocking Valley.

San Francisco, Cal. From the Commercial Herald April 19, 1877. COAL—Imports from January 1st to April 16th:

Table with columns: Tons. Rows: Anthracite... Australian... Coos Bay... Cumberland... English... Chile.

The receipts, foreign as well as Eastern, have thus far in April been large, causing a very dull and depressed market for all kinds, excepting Australian of the better sorts which, by reason of scarcity, holds up surprisingly. Our total supplies for the first quarter of 1876 and 1877 compare as follows: 118,993 tons, 119,896 tons, a small difference in the aggregate. At present our yards and store ships are loaded down with accumulated stocks, and dealers see no profit in buying even at present low prices. The fact is we are suffering like all other marts from over production, causing very low prices, ruinous prices to prevail. British Columbia mines as well as those of the Pacific Coast are sending us constantly large supplies, and although many cargo sales are made sub rosa, yet we are convinced that cargo sales have been made this month for cash at \$7@7.50 per ton. Our quotations must be looked upon as entirely nominal. Bellingham Bay, Coos Bay, Black Diamond, and Mt. Diablo coals arrive freely, all selling at low prices from the wharf, say for cargo lots \$7.50@8. Vancouver Island coals,

85c@90 by the cargo; Scotch and English steam, \$7.50 @88; Australian cargoes to arrive, \$9@9.25.

The following gives the comparative imports for the first quarter of—

Table with columns: Foreign, Tons, 1876, 1877, Increase, Decrease. Rows include Australian, English, Vancouver, Eastern, Anthracite, Cumberland, Domestic, Mount Diablo, Coos Bay, Bellingham Bay, Seattle, Rocky Mountain, Totals.

St. Louis, Mo. April 23, 1877.

Reported by JAS. J. SYLVESTER, Secretary of the Anthracite Coal Association.

Retail prices, delivered. Ton of 2,000 lb.

Table with columns: Anthracite, per ton, Lackawanna, Wilkes-Barre, Blossburg, Indiana Block.

Toledo, Ohio. April 24, 1877.

Specially reported by Messrs. GOSLINE & BARBOUR. We quote coal as follows on cars at Toledo for rail shipment:

Table with columns: Ton of 2,000 lb., Straitsville lump, Shawnee lump, Hocking Valley lump, Pittston, Wilkes-Barre, Lackawanna, Lehigh.

For retail delivery, from 50c to \$1 per ton in addition to above prices is charged. Prices soft coal f. o. b. vessel for Lake shipments will be from 15 to 20c. per ton more than prices on cars.

Rates of Transportation on Anthracite Coal to Tide Ports.

Table with columns: Schuylkill Coals, per ton of 2240 lb., From Pine Grove, From Tamaqua, From Schuylkill Haven.

From Tamaqua, to Catawissa, McAuley, Mahville, Rupert, and Danville, via Catawissa and Williamsport Branch Railroad.

From Tamaqua to Williamsport, Hall's, and Montoursville, via Catawissa and Williamsport Branch Railroad.

Coal sent to points on the Catawissa and Williamsport Branch will be charged one and one-half cent per ton per mile, and two cents per ton additional to Tamaqua.

For shipment via Main Road or Schuylkill Canal, one and one-half cent per ton per mile, and two cents per ton additional to Schuylkill Haven, Pine Grove, Tamaqua, or Port Clinton, for Canal, as the case may be.

For consumption at local points in coal region, including Shamokin, Herndon, Schuylkill Haven, Pine Grove, and Tamaqua, three cents per ton per mile, and two cents per ton additional; and a charge for car service, of fifteen cents per ton to individuals, and five cents per ton to manufacturers, when in Philadelphia and Reading Railroad cars, provided no charge, including freights, tolls, and car service, shall be less than twenty-five cents per ton.

Sent westward via Northern Central Railway (in N. C. R. W. Co.'s cars), four and two-tenths cents per ton per mile, to Locust Gap, Shamokin, or Herndon, provided no charge will be made less than fifteen cents per ton.

One mile extra will be added for coal passing through the East Mahanoy Tunnel. Fractions of distances and rates will always be stated in tenths.

No charge will be made for weighing or making returns of coal shipped, and the latter will be furnished free of charge, upon application to the Weighmaster; if these returns are to be sent by mail, envelopes, properly stamped and addressed, must be furnished to the Weighmasters.

All coal will be charged the rates (both lateral and Main Line) current on the day it is weighed; it will also be weighed on the same day.

Circulars relating to freights on Schuylkill coals will be found in the issue of this Journal of March 24 and March 31 in the "Coal Trade Review."

Lehigh and Wyoming Coals.

per ton of 2240 lb.

Table with columns: From Penn Haven, From Mauch Chunk, From Hazleton, From Lehigh, From Ashley and Sugar Notch.

From Mauch Chunk to New York (121 miles), (towing limits) and Jersey City via Lehigh Valley RR.

From Mauch Chunk to Philadelphia (92 m) via L. V. and L. and S. RR. and North Penn. RR.

From Mauch Chunk to Philadelphia (92 m) via L. V. and Perkiomen RR.

For way points between Mauch Chunk and Phillipsburg on the New Jersey Railroads.

From Phillipsburg, N. J., to Hoboken (82 m) for shipment via Delaware, Lackawanna & Western RR., Morris and Essex Division.

From Phillipsburg, N. J., to Newark (75 m) via Delaware, Lackawanna & Western RR.

** Rates on line coal from Hazleton are 10c. per ton above these figures.

† The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be \$1.00 per ton.

‡ On coal received by canal at Jersey City, a charge additional to the freight, of twenty cents per ton, will be made for transferring it from boat to boat, and thirty cents per ton for placing the same on the wharves and re-shipment.

The distances in the above table are computed from Mauch Chunk. From Ashley to Mauch Chunk the distance is 51 miles, and from Upper Lehigh, 33 miles. From Hazleton 24 miles, and from Penn Haven 8 miles.

From Wilkes-Barre to Perth, Amboy via the Lehigh Valley Railroad Company, the distance is 161 miles, and from Mauch Chunk it amounts to 106 miles.

Freights

Representing the latest actual charters up to April 26. Per ton of 2240 lb.

Table with columns: PORTS, From Philadelphia, From Baltimore, From Georgetown, From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.

* And discharging and towing. † And discharging. ‡ And towing. § 3c. per bridge extra.

Towing.

Rates of Towing from New York to places on the Hudson River. Boats of 200 tons capacity and upwards. Per ton of 2,240 lb.

Table with columns: Manhattanville, Verplanck's Point, Yonkers & Spuyten Duyvel, Haverstraw, Piermont, West Point & Cold Spring, Nyack, Tarrytown & Sing Sing, Newburgh, Peekskill, Croton Landing, Poughkeepsie, Rondout.

Special Rates will be made for Saugerties and Catskill. East River and Sound Ports, from the foot of Twenty-third Street to the following points, and return, per ton of 2,240 lb.

Rates to the following places and return per boat: 61st Street, E. R., 79th, 93d, Harlem and Mott Haven, West Farms (mouth of creek), College Pt. & Whitestone, 23.

Boats carrying less than 20 tons will be charged the same as if carrying that quantity. Boats for New Haven will be landed at Bell Dock, or Canal Dock only; all towage to Derby Dock, and to yards, to be paid by consignees. Boats for Bridgeport will be landed at Naugatuck R. R. Dock or Housatonic R. R. Dock only. All towage to yards to be paid by consignees.

Rates via the Hudson River are furnished to us by A. B. VALENTINE, No. 41 Jay Street. Rates via the East River are furnished by the Eastern Transportation Line.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, April 27, 1877.

American Pig.—We note sales of about 2,500 tons of Thomas iron at \$19 for No. 1 foundry; \$18 for No. 2 foundry; and \$17.50 for forge. With this exception we learn of nothing worthy of note.

Business, as a rule, is very quiet with generally an unsettled feeling. We quote No. 1 foundry at \$19; No. 2 foundry, \$18; and forge, \$17@17.50. It is reported that the Crane Company will blow out all its furnaces. The Keystone furnace has blown in.

Scotch Pig.—Under advances in the prices of pig iron in Scotland and freights from there to here our prices are quoted higher, but as American pig iron is constantly weakening in price, and there is but a very small demand for Scotch, it is doubtful if the quotations can be maintained. We quote Eglington at \$25; Glengarnock, \$26.50; and Coltness, \$28.

Messrs. John E. Swan & Brothers, (limited) of Glasgow, under date of April 13, report 110 furnaces in blast as against 118 a year previous; quantity of pig iron in Connal & Co.'s stores, 128,734 tons as against 62,724 tons a year previous; 127,734 tons for the week ending April 7, 9,071 tons as against 8,556 tons for the corresponding week of 1876; total shipments from Dec. 25, 1876, 102,596 tons as compared with 105,742 tons for the like period of 1875-6. They quote No. 1 pig iron as follows: Gartsherrie, 61/; Coltness, 64/6d.; Summerlee, 59/6d.; Langloan, 62/; Glengarnock, 59/; and Eglington, 56/.

Rails.—We note sales of 2000 tons of steel rails for Amboy delivery. The sale of 4,000 tons, delivery from Baltimore, reported in our last, is said to have been at \$47.50 at that city. Most of the mills are said to be well supplied with orders. Although most of them are running full now, the absence of demand to furnish them with future employment appears to have a weakening effect with some of them. We quote iron rails at mills at \$33@37; and steel at \$46@50.

Old Rails.—These are without business, and nominally quoted at \$19@20.

Scrap.—There is no inquiry for No. 1 wrought, and indications of a continued lack of demand. We quote at \$25.

Baltimore, Md. April 25, 1877.

Specially reported by Messrs. R. C. HOFFMAN & Co. The iron market is without any special change. The demand continues fair and no change in prices. We quote:

Table with columns: Baltimore Charcoal, Mottled and White, Virginia Charcoal, Charcoal C. B. Blooms, Anthracite No. 1, Billets, Anthracite No. 3, Refined Blooms.

Boston. April 21, 1877.

Pig continues depressed, with no demand at all for future delivery, and a very small inquiry for spot lots. We quote: \$23.50 to \$25 for No. 1; \$23 for No. 2, and

\$22 to \$23 for gray forge. Scotch pig is dull. We quote \$27 to \$30 for store lots. Bar is dull, quoting \$47 to \$48 for refined, and \$38 to \$39 for common. Nails are in light demand at the reduction.—Commercial Bulletin.

Chattanooga, Tenn. April 24, 1877.

Specially reported by J. F. JAMES, dealer in pig iron, ores, etc.

The demand for all grades of well-known standard brands of pig iron continues about the same, with no material change in prices. It is rumored another coke furnace is to be erected here immediately, under the supervision of Mr. McNeal, of the Ridge Valley Iron Co., Ga. It is somewhat surprising that so few furnaces have been erected in this district, when it is an established fact that pig iron is produced here at an average cost of \$12 per ton. I quote as below:

Table listing iron products and prices: Tenn., Ala. and Ga. Charcoal, No. 1 Foundry... \$19 00@20 00; Tenn., Ala. and Ga. Charcoal, No. 2 Foundry... 18 00@19 00; etc.

Red Hematite (about 55 per cent. metallic iron) f. o. c. at mines... 1 25; Brown Hematite (about 55 per cent. metallic iron) 1 75

Cincinnati, O. April 24, 1877.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

Below please find closing quotations of our pig iron market, viz.:

Table listing charcoal and stone coal prices: Hanging Rock No. 1 Foundry... \$25 00@...; Soft Silver Gray... 22 00@23 00; etc.

Table listing hanging rock and mill prices: Hanging Rock, C. B... 38 00@43 00; Tennessee... 28 00@32 00; etc.

Table listing hanging rock and mill prices: Hanging Rock, C. B... 38 00@43 00; Tennessee... 28 00@32 00; etc.

Table listing hanging rock and mill prices: Hanging Rock, C. B... 38 00@43 00; Tennessee... 28 00@32 00; etc.

Table listing hanging rock and mill prices: Hanging Rock, C. B... 38 00@43 00; Tennessee... 28 00@32 00; etc.

Cleveland, O. April 26, 1877. Specially reported by Messrs. C. E. BINGHAM & Co.

Per gross ton, on four months' time. Subject to change in market. Discount for cash a per cent.

Table listing foundry iron prices: No. 1, L. S. Charcoal... \$26 00; Am. S. No. 1, Ch. Val... 24 00; etc.

Table listing car wheel and malleable iron prices: No. 3 L. S. Charcoal... 26 00; No. 5 & 6, L. S. Charcoal... \$27 00; etc.

Table listing Bessemer iron and forge iron prices: Nos. 1 & 2, L. S. Char... \$25 00; No. 1, Gray... \$21 00; etc.

Louisville, Ky. April 24, 1877.

Specially reported by Messrs. GEORGE H. HULL & Co.

The market continues without change in either price or tone. The mills and foundries are running light, and buying only to supply immediate wants. The usual time, four months, is allowed on the quotations below:

Table listing foundry iron prices: No. 1 Hanging Rock, Charcoal... \$24 00@25 00; No. 2... 22 00@23 00; etc.

Table listing hanging rock and mill prices: Hanging Rock, and Cold Blast... 37 00@40 00; Alabama and Georgia... 28 00@35 00; etc.

Table listing hanging rock and mill prices: Hanging Rock, and Cold Blast... 37 00@40 00; Alabama and Georgia... 28 00@35 00; etc.

Milwaukee, Wis. April 23, 1877. Specially reported by Messrs. R. P. ELMORE & Co.

Table listing L. S. No. 1 Charcoal and L. S. No. 1 Anthracite prices: L. S. No. 1 Charcoal... \$26 00; L. S. No. 1 Anthracite... 24 00

Montreal. April 17, 1877. PIG IRON.—Gartsherré, \$22@22.50; Summerlee and Calder, \$21@21.50; Eglington and Clyde, \$19.50@20; Hematite, \$26@27. Bars—Scotch and Staffordshire, \$2@2.10; best, \$2.20@2.30; Swedes and Norway, \$4.75@5.50; Lowmoor and Bowling, \$6@6.50.—Monetary Times.

Pittsburgh, Pa. April 24, 1877.

Specially reported by A. H. CHILDS.

Table listing Pittsburgh iron products: No. 1 F'dry... \$23 00@24 00; Mottled & White... \$17 50@20 00; etc.

Richmond, Va. April 23, 1877.

Specially reported by ASA SNYDER, Esq.

Table listing Richmond iron products: There is very little inquiry for charcoal irons; shipments of 100 tons only for week; offers very little below quotations were declined for 150 tons additional. The stock here is merely nominal.

St. Louis, Mo. April 24, 1877.

Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.

Table listing St. Louis iron products: No perceptible change is noticed in the condition of our market since last letter. Demand continues very light and prices unchanged. We quote as below:

Table listing St. Louis iron products: Missouri No. 1 Foundry... \$23 00; Missouri No. 1 F'dry... 25 00; etc.

METALS.

NEW YORK, FRIDAY EVENING, April 27, 1877.

The business of the past week has been very quiet under an unsettled feeling all around. Prices are in no case higher, while generally they are lower.

Gold Coin.—During the week under review the price of gold has ranged at 106 3/4 to 107 3/4, and closed at 107.

Bullion.—Silver bars in London are quoted at 54 1/2 d., as against 54 3/4 d. a week ago. The price here is 118, and in San Francisco, 7 1/2 per cent discount. Gold is quoted at par to 1/4 per cent. premium.

Copper.—The business of the week under review has been confined to about 300,000 pounds at 15 1/4 @ 19 3/4 c., with copper still offering at 19 3/4 c. Manufacturers are generally pronounced fairly busy, but from some cause show a disinclination to enter the market. Copper is expected to arrive here from the Lake regions about the middle of next month—earlier than usual. But as a very large quantity has been shipped overland since the closing of navigation it is not anticipated that stocks will be materially increased. The latest cable advices announce a reduction of £1 in the price of Best Selected, and quote Chili Bars at £70, and Best Selected £77.

Tin.—A very fair jobbing business has been done, although we learn of no wholesale business. Straits in London is quoted at £69 10/, and at Singapore at \$19.87 1/2 per picul. We quote, in gold, per pound as follows: Straits, 16 3/4 c. on spot, and 16 1/2 c. to arrive; L. & F., 16c.; Refined, 16 3/4 c. @ 16 1/2 c.; Banca, 18 1/4 c. @ 19c.

Tin Plates have been in fair request, and are firm at our quotations which are as follows, in gold, per box: Charcoal tins, \$6.50 @ \$6.75, and ternes, \$5.87 1/2 @ \$6; Coke tins, \$5.62 1/2 @ \$5.87 1/2, and ternes, \$5.25 @ \$5.50.

Messrs. Robert Crooks & Co., of Liverpool, under date of April 12, say of tin plates—"The market is at date completely demoralized by well authenticated reports of sales having been made in United States at considerably under the bottom figures touched here. Under these circumstances buyers here are at present holding off. Makers are very badly off for orders, and anxious to book for early delivery.

Lead.—400 tons are reported to have been sold on private terms, supposed to be at about 6c. The nominal market price is 6 1/2 c. with a very quiet feeling.

A correspondent of the Chicago Inter-Ocean, writing from Salt Lake City, Utah, under date of April 18, says: "Utah alone will produce over 30,000 tons this year, or one-half of our consumption, and as we cannot export in competition with Europeans our market must depend upon home demand. The present stock of lead is concentrated largely with the friends of the Omaha Smelting and Refining Company, and the production is greatly on the increase, and the present trade very limited.

Foreign lead can be imported at 7c. currency, when gold is not over 5 per cent. premium.

To take foreign lead entirely out of the market and let the Omaha company, with its backers, control the market by buying all the lead up, and it is possible for them to put the price higher, otherwise the price must rule very much as it is now, say about 6 1/2 cents in New York.

The San Francisco Commercial Herald of April 19, says: The steamer San Francisco carried en route to New York, via. Panama, 908,145 lb. Pig Lead.

Spelter and Zinc.—Domestic spelter is quoted at 6 20c. @ 6 3/4 c. with but very little business doing. Sheet zinc is quiet at 7 3/4 c. @ 7 1/2 c. currency.

Antimony is dull of sale, and has still further declined, being quoted now at 11 3/4 c., gold.

Quicksilver.—This article is quoted a little higher in San Francisco, being 41 1/4 c. @ 42c., while London still quotes £7 10/.

The San Francisco Commercial Herald of April 19 says of Quicksilver: "The demand is rather in excess of the supply. Some purchases made on speculation at 41c. now held at 41 1/2 @ 42c. The steamer City of San Francisco carried to Mexican ports 816 flasks. The O. and O. steamer Oceanic, to sail on the 21st inst. for Hong Kong, will carry perhaps 2,000 flasks. The quicksilver exports by sea the past week have been as follows:

Table showing quicksilver exports: To Callao, per Paul Revere... Flasks. Value. Thomas Bell... 200 \$6,426; To Mexico, per City of San Francisco... Thomas Bell... 810 25,920; Totals... 1,010 \$32,346; Previously since Jan. 1... 15,580 542,836; Totals since Jan. 1, 1877... 16,590 \$575,182; Totals same period 1876... 9,743 452,107; Increase this year... 6,847 \$123,075

Exports by sea for the first quarter of—

Table comparing exports by sea for 1876 and 1877: New York... Flasks. Value. 800 \$37,249; Mexico... 1,660 78,279; Chile... 50 2,295; New Zealand... 26 1,200; China... 5,434 251,774; Japan... 91 4,403; Central America... 117 5,086; Australia... 241 11,612; Peru... 300 13,922; Honolulu... 1 1; Totals... 8,719 \$405,820; Increase this year... 4,937 76,196

FINANCIAL.

New York Stocks.

NEW YORK, FRIDAY EVENING, April 27, 1877.

The business of the week under review has been somewhat larger than last week. The sales of Delaware, Lackawana & Western Railroad have aggregated over 280,000 shares, at prices ranging from 43 1/2 to 49 3/4. Up to Tuesday the tendency was downward, when, through clique manipulation, both this stock and Delaware & Hudson were steadily advanced and brought to the climax on Wednesday by a "washed" coal sale, after which prices declined, reaching 45 3/4 for Delaware, Lackawana & Western yesterday, and 42 for D. & H. Canal: since when a reaction has set in, and the market closed strong to-day at 47 1/4 for the former, and 44 1/2 for the latter. The sales of New Jersey Central have amounted to but 1,306 shares at 7 1/2 @ 8 1/2, closing at 8 3/4.

Saginaw Land, Salt and Mining Company.—The annual meeting of this company will be held at the company's office in this city, at noon on the 8th prox.

Philadelphia Stocks.

PHILADELPHIA, FRIDAY EVENING, April 27, 1877.

The feature of the week in this market has been the unparalleled fluctuations in the stock of the Pennsylvania railroad company. The sales in this stock alone have reached the large aggregate of 190,206 shares. The Philadelphia Evening Telegraph of the 23d inst. gives the following table of quotations for this stock upon the accompanying dates:

Table showing Philadelphia stock prices: Per share. Jan. 3, 1850... \$40; Jan. 3, 1865... \$64 1/2; Jan. 2, 1851... 40 1/2; Jan. 2, 1866... 56; Jan. 3, 1852... 40 1/2; Jan. 3, 1867... 56; Jan. 3, 1853... 40 3/4; Jan. 3, 1868... 52 1/2; Jan. 4, 1854... 48; Jan. 2, 1869... 55 3/4; Jan. 3, 1855... 42 1/2; Jan. 3, 1870... 54 3/4; Jan. 2, 1856... 43 3/4; Jan. 3, 1871... 59; Jan. 2, 1857... 48; Jan. 3, 1872... 59 1/2; Jan. 2, 1858... 38 3/4; Jan. 3, 1873... 57 3/4; Jan. 3, 1859... 43; Jan. 3, 1874... 48 1/2; Jan. 3, 1860... 37 3/4; Jan. 2, 1875... 53 1/2; Jan. 2, 1861... 37 1/4; Jan. 3, 1876... 53 3/4; Jan. 3, 1862... 36 3/4; Jan. 3, 1877... 48 3/4; Jan. 3, 1863... 60 1/2; April 2, 1877... 39; Jan. 2, 1864... 69 1/4; April 10, 1877... 38 1/2; On the 21st inst. the price of this stock reached 30 1/2

(\$50 shares), closing to-day at 35%, which is still lower than at any time during the past twenty-seven years, previous to this week. The Board of Directors met on the 25th inst. The usual resolution for the meeting of the Finance Committee on Monday next, to take up the statements for the dividend, was passed. The committee will report to the board at its meeting on Tuesday, which is the regular day for deciding the dividend question.

The stock of the United Railroads of New Jersey in sympathy with the Pennsylvania Railroad, fell to 119 1/4 on the 21st inst, a decline of \$13 per share.

The transactions in Reading Railroad have amounted to about 418,000 shares selling down to 10, recovering to 12 1/2, and closing to-day at 11 1/2.

Lehigh Coal and Navigation Company has ranged between 17 1/4 and 21%, closing at 20 1/2. The sales have aggregated 16,563 shares. This Company has commenced proceedings at law against the Central Railroad of New Jersey, and probably the status of the two parties will now be definitely established. The plaintiffs set forth that they had leased to the defendants the Lehigh and Susquehanna Railroad, upon a working lease, the lessees to pay the lessors one-third of the gross earnings of the road. Recently the New Jersey Central has been placed in the hands of a receiver since which event an instalment of rent has fallen due, but has not been paid. The prayer, therefore, of the plaintiffs is that the Court will order the receiver to pay them one-third of the gross receipts at the time specified in the contract, or to surrender the lease as terminated by non-fulfilment of conditions. The legal question involved is whether a lessor is estopped from his usual remedies by the appointment of a receiver to administer the affairs of the lessee. The case has commenced, but is yet unfinished.

Lehigh Valley Railroad stock has changed hands to the extent of 6,700 shares, at from 33 to 36 1/4, closing at 35 1/2 for \$50 shares.

Pittsburg, Titusville, & Buffalo Railroad Company.—The annual meeting of this company will be held on the 7th of May.

Westmoreland Coal Company.—15 shares of the stock of this company were sold at auction during the week at \$79 per share.

Edge Hill Iron Company.—200 shares of the stock of this company were sold at auction during the week at \$1 per share.

Glendon Iron Company.—The annual meeting of the stockholders of this company will be held on the 2d of May.

Miscellaneous Sales and Quotations.

Sales and quotations of the stocks and bonds dealt in here and at Philadelphia, for the week ending the 27th inst. are given in the following tables. The Philadelphia quotations will have a * affixed.

STOCKS.

Table with columns: STOCKS, QUOTATIONS, High-est., Low-est., Clos-ing., Sales Shares. Includes American Coal Co., Cambria Iron Co., Pennsylvania Salt Manf'g Co., Westmoreland Coal Co., Buck Mountain Coal Co., Schuylkill Nav. Co., St. Louis, I. M. & S. R. R. Co., Spring Mountain Coal Co.

BONDS.

Table with columns: BONDS, QUOTATIONS, High-est., Low-est., Clos-ing., Sales Shares. Includes D. L. & W. 7s. Conv., N. J. C., 1st mtge., Conv., L. & W. B. Coal Co., Am. Dock & Imp. 7s., D. & H. C. Co., St. L. I. M. & S., Ches. & Ohio, L. V. R. R., P. R. R., Gen. mtge. reg., Con. m. 6s. cou., P. & R. C. & I. Co., L. C. & N. Co., RR. loan, Con. mtge. 7s., Cvt. gold, Gold Loan, Schuylkill Nav., Pa. and N. Y. Canal, Pa. Canal Co., Susquehanna Coal Co.

Total transactions for the week.....\$163,000

Salt Lake Ore and Metal Market.

Telegraphic advices from Salt Lake City, dated April 28th, gave the following prices for base bullion and argentiferous lead ores. The market is inactive: Argentiferous Lead (Base Bullion).—\$74 per ton for lead. \$1.22 per ounce for silver. \$20 per ounce for gold. The quotation for silver is based upon the silver contents in the lead of 70 ounces per ton of 2,000 lb.

The Inter-Ocean correspondent, under date of the 17th inst., says: The bullion market is firm at last quotations, and some activity. The weather has been very stormy in the mountains the last thirty-six hours, but it is now clearing off. The shipments of ore and bullion for the week ending the 14th inst. were as follows: 24 cars bullion to Omaha; 7 cars bullion to Pittsburg; 7 cars bullion to New York; 9 cars bullion to St. Louis; 4 cars bullion to Philadelphia; 20 cars lead ore to Pittsburg; 1 car lead ore to Hilliard; 2 cars lead ore to Chicago; 2 cars copper ore to Pennsylvania. Total bullion, 1,073,460 lb.; lead ore, 477,126 lb.; copper ore, 44,000 lb. Grand total, 1,594,586 lb. A sale of 10 cars of about 60-ounce bullion was made for \$1.22 per ounce for silver, and \$74.50 per ton for lead.

SILVER QUOTATIONS IN LONDON.

Table with columns: Range of silver in London for the week ending April 27; April 21st, 23d, 24th; April 25th, 26th, 27th. Values range from 54 1/2 d. to 54 d.

The German Government has recently sold considerable quantities of silver in the London market, but it is understood that the lowest limit at which it will dispose of its surplus silver is fifty-five pence per ounce. The decline of the market price below that figure recently caused a suspension of the sales. The withdrawals of old silver from circulation in Germany during January and February were larger than during previous months. Of the sum retired during February, more than 51,000,000 thalers in two thaler pieces was withdrawn, a sum which is considerably greater than previous estimates of those coins in circulation. This fact has led to the suspicion that the amount of one thaler coins will also be found in a similar and even more serious excess. If this proves to be true, the estimates of the amount of silver to be sold by Germany made last year, even during the panic, will be found to have been below rather than above the mark.

A sale of 600,000 ounces of refined silver has been made by the Nevada Bank of San Francisco, for shipment to China.

Copper Stocks.

Reported by Wilson W. Fay & Co., Bankers and Brokers Room 7, Travellers Building, 31 State street

BOSTON, THURSDAY EVENING, April 26, 1877.

Although the market does not show much more activity than it did a week ago, there is a firmer undertone in most all classes of securities. The market on coppers is very dull, but there is, however, a feeling that there is to be a much better market in the near future. Calumet is about 2 points better, sales being made at 182. Copper Falls in demand at 2 1/2 against 2 one week ago. Duncan is weak and little disposition to purchase. Perhaps the stock is held in too few hands for speculators to buy. Franklin has settled to 10 1/4 bid. National better at 1/2 bid. Pewabic at 2 1/2 bid. Quincy closes at 40 bid after selling at 41. Ridge is in better demand at 2 1/2, but probably no stock could be purchased under 3 1/2. In small coppers nothing.

The Atlantic Copper Mine product for March was 118 tons of mineral.

Gold and Silver Stocks.

NEW YORK, FRIDAY EVENING, April 27, 1877.

The sales on the American Mining Board for the week have been 88,550 shares as against 84,340 for the previous week. The sales in Comstock mines have been about 25,000 shares, or the same as last week. The feature of the market has been Merrimac, of which there have been sales of 27,500 shares at from 6 1/2 to 7%, closing at 7. Of Seaton there were sold 11,100 shares, at from 3 1/2 to 4%, closing at 4 1/2. The sales of Hukill have only amounted to 2,500 shares, at from 4 to 4 1/2, closing strong at the higher figure. There have been sales of 4,700 shares of Henry Tunnel, at 6 1/2 to 7%, closing at 7.

We condense the following from the Gold Hill News of the 18th inst. —The Consolidated Virginia Mine is yielding 400 tons of ore per day, one third of which is extracted from 1,550 feet level, and the remainder from the 1,650 feet level, which at an average of \$75 per ton would be equal to a daily out-put of \$30,000. California is yielding 500 tons of high grade ore per day, which at \$100 per ton (the average of the three previous months) would equal a daily out-put of \$50,000. The bottom of the C. & C. shaft is still in hard blasting rock, and the flow of water very strong. The ore being taken from the old ore stopes on the 1,600 feet level of the Ophir mine, averages \$50 per ton. The daily out-put is about 30 tons. The pumps in the Savage mine are making slow headway with the water which is now about 20 feet below the 1,000 feet level. Justice is yielding 400 tons of ore per day, which is being crushed as fast as extracted. The ore stopes in all the levels are looking well. In the east cross-cut on the 2,000 feet level of the Crown Point mine, good paying quartz has been encountered. It is now rumored that there is to be a sharp contest for the control of this property at the annual election in June. Great dissatisfaction exists with the old management, and the contestants who are reported to be strong in stock will probably ventilate the many reports afloat. The old management is strenuously exerting itself for proxies, with indifferent success, as holders of stock have got knowledge of what is contemplated and intend to retain the manage-

ment of their shares in their own hands. The east drift on the 1,300 feet level of the Overman has penetrated the vein a distance of 65 feet, and being throughout in fine quartz. The flow of water from the east drift, on the 1,400 feet level, is gradually decreasing, although it gives some trouble. This drift has about 75 to 80 feet to be driven to reach the ore vein. The upraise recently started on the 1,465 feet level of the Mexican mine, is ten feet square, the entire face being in ore that gives average assays of from \$20 to \$25 per ton. The flow of water at the bottom of the new shaft of the Yellow Jacket mine has been very strong during the past week. The north winze, below the 2,040 feet level, is down 270 feet with the slope of the ledge. It is being sunk at the rate of five feet per day, and has about seventy feet to go to reach the 2,200-foot level. The operations in the Bullion Silver-Hill, Chollar-Potosi, Belcher, Gould & Curry, and Imperial Consolidated mines are being actively prosecuted, and differing but little from former reports. The strong flow of water very seriously interferes with the work in the Hale and Neocross mine. The Diamond Drill is at work on the 1,500 feet level of the Sierra Nevada mine without any developments worthy of note. In the Sutro Tunnel the face of the header is in soft ledge porphyry, with streaks of clay and quartz, requiring constant and careful timbering in order to prevent caving. The powerful drilling machinery heretofore employed is not so much needed just now, consequently the force of men is somewhat decreased; but with the next hard stratum encountered comes an increase of the working force again to keep the drills in full operation. The tunnel is passing through the various strata lying immediately eastward of and parallel with the great Comstock fissure, and will penetrate the main range itself in the early part of next year.

The Mines of Silver City, Idaho, which includes The Golden Chariot, Northern Light, Idlewild, Belle Peck, Potosi, and Hidden Treasure are yielding and giving every promise of producing satisfactory results to their owners.

Advance Gold and Silver Mine, Monitor, Alpine Co., California.—A recent strike made in the west drift of this mine, at the 320 feet level, running toward the prospecting shaft in ledge 3, has penetrated ledge two 70 feet and not yet reached the foot wall. The hanging wall of this ledge is well defined—course north, 16° east, at an angle of 82°. Several feet of rich ore is found on the hanging wall; and the entire ground through which the drift has passed in this ledge is fine vein matter, thoroughly impregnated with mineral, and giving good assays in silver and gold, increasing in value as the foot wall is approached. The northerly drift on this level is running outside of and parallel to ledge two, all in pay rock, including some very rich quartz feeders.

San Francisco Stock Exchange Sales.—The Commercial Herald gives the following figures showing the sales of mining shares for the first quarter of the past four years:

Table with columns: Month, 1874, 1875, 1876, 1877. Rows for January, February, March, and Totals. Values range from \$17,080,245 to \$61,959,610.

Sunbeam Mine, Tintic District, Utah.—A strike of gold and silver bearing ore has recently been made in this mine.

In the Star Silver Mine, which is located in Lewis District, near Battle Mountain, Nev. a rich strike has been made on the 90-foot level. It is stated that the average assay value of the ore is \$250 per ton.

The Gold Mines of Grant Co., Oregon.—The annual average yield of gold from the various mining camps in Grant county, Oregon, for the past six years, has been \$300,000.

The Monumental Gold Mining Company has 150 tons of ore on the dump. The company is running a tunnel to intersect the ledge 300 feet below the surface. Six tons of ore recently produced an average of \$260 per ton.

Favorable prospects for good placer diggings have been struck on McClellan's Creek, about sixteen miles west of Canyon city, and several claims have been located there.

The Sumner Gold Mine is located in Kern County, California.—Eighty stamps have been started up on ore from this mine. The recent discovery on the 300 feet level, proves to be quite extensive.

The New Coso Silver Mine in Inyo County, California, is shipping bullion at the rate of nearly \$2,500 per day. The shipments to the 18th inst., on April account, amounted to \$41,400.

The Eureka Gold Mine of Grass Valley, California, is producing amalgam at the rate of 220 oz. per week.

The Tybo Consolidated Silver Mine is shipping bullion at the rate of about \$80,000 per month. The shipments to the 14th inst., on April account, amounting to \$41,000.

The Northern Belle Silver Mine is yielding ore at the rate of about 100 tons per day, which averages nearly \$50 per ton. At this rate, the monthly out-put of this mine equals \$130,000.

Eberhardt and Aurora Silver Mine.—The tunnel in this mine has passed its first 1,000 feet. Work is being pushed on the incline below the 1,000 feet station. Several new drifts are being run for prospecting pur-

of the transactions are in Lacrosse and American Flag, which stocks sold up to 40c. and 11c. per share, respectively; the highest point arrived at since the Board opened.

Copper stocks are more active, with a slight decline in prices.

Sales and quotations of copper stocks are as follows:

Sales.

Atlantic.....	350 shares@7. @6 7-8
Pewabic.....	100 " @8 3/4
National.....	100 " @50c.
Quincy.....	25 " @40c.

Closing Quotations.

	Bid.	Asked.
Alouez.....	6	7 25
Atlantic.....	6 75	7 25
Calumet Hecla.....	182 00	183 00
Central.....	35 00	38 00
Franklin.....	10 00	12 00
Madison.....	20	30
Mesnard.....	37 1/2	62 1/2
Minesota.....		
National.....	25	62 1/2
Oseola.....	22 00	26 00
Pewabic.....	2 75	3 00
Quincy.....	40 00	45 00
Ridge.....	2 50	4 00
Rockland.....		

Gas Stocks.

NEW YORK, FRIDAY EVENING, April 27, 1877.

Gas stocks are very quiet; we alter a few of the quotations to lower figures. The Mutual of New York, from \$94 to \$92 per share. The Metropolitan and Manhattan of New York, and the Nassau of Brooklyn, each show declines of \$5 per share. The Harlem Gas Company will hold its annual meeting on the 7th of May.

Allen Gas Company, of Allentown, Pa.—\$8,000 of the 7 per cent. bonds of this company were sold at auction in Philadelphia during the week at 51 per cent.

Northern Liberties Gas Company.—20 shares of the stock of this company were sold at auction during the week at \$40 per share.

Chelsea (Mass.) Gas Company.—We are reported a sale of 60 shares of the stock of this company at \$97 per share.

Boston (Mass.) Gas Company.—We are reported recent transactions in this stock at \$820 per share, equal to about 133 per cent.

Metropolitan (N. Y.) Gas Company.—34 shares of the stock of this company were sold at auction during the week at \$137 per share.

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H. PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad st., N. Y.

Companies in New York and vicinity.	Capital Stock.	Par.	Dividends.		Quotations.	
			Rate per an.	Date of last.	Bid.	As'd
Mutual, N. Y.....	\$5,000,000	\$100	10%	2 1/2 Apr. '77	92	95
" Gold Bonds	900,000	1,000	7%	3 1/2 Feb. '77	107	107
N. York.....	4,000,000	100	10%	5 Nov. '76	126	131 1/2
Metrop. " Certf.	2,500,000	100	10%	5 Sep. '76	137	138
" Bonds	1,000,000	1,000	7%	3 1/2 Dec. "	103	105
" Certf.	500,000	1,000	7%	3 1/2 Dec. "	103	105
Harlem.....	1,850,000	50	8%	4 Feb. '77	104	—
Manhat. " Certf.	4,000,000	50	8%	0 Dec. '76	210	215
Brooklyn, B'klyn.	4,000,000	52	15%	15 Nov. '76	170	174
Nassau, " Certf.	1,000,000	25	4%	4 Jan. '76	82 1/2	—
" Certf.	700,000	1,000	7%	3 1/2 Nov. '76	95	—
People's, " Certf.	1,000,000	10	4%	3 1/2 Jan. '76	51	—
" Certf.	300,000	1,000	7%	3 1/2 July '76	84	60
" B'ds	325,000	—	—	3 Feb. '77	90	95
Metrop. " Certf.	1,000,000	10	5%	3 1/2 Nov. '76	77	80
Wash'g " Certf.	1,000,000	50	10%	3 Oct. '76	130	135
" Certf.	1,000,000	—	—	7% July	100	102
Citizen's " Certf.	1,200,000	20	—	2 1/2 Jan. '76	90	97
J. C., N. J. " Certf.	320,000	1,000	7%	3 1/2 Oct. "	74	102
Cent. Westch. N. Y.	750,000	20	10%	5 July '75	160	—
Subur'n " " "	466,000	50	7%	4 July "	85	90
" " " "	295,000	50	7%	3 1/2 Oct. '76	90	100

‡Paid irregularly.

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0	2 1/2	1 1/2	4	'03	3/4	3/4	1	3/4	6	\$70.00
1	3 1/2	2	4	'05	3/4	3/4	1 1/4	1	10	80.00
1 1/2	4 1/2	2 1/2	5	'11	1	1	1 1/2	1 1/4	20	125.00
2	5	3	7	'25	1 1/4	1 1/4	2 1/2	1 1/2	30	175.00
3	6	3 1/2	7	'29	1 1/2	1 1/2	3	2 1/2	40	215.00
3 1/2	7	4	7	'38	1 1/2	1 1/2	3 1/2	2 1/2	60	260.00
4	8	4 1/2	10	'68	1 3/4	1 3/4	3	2 1/2	90	350.00
4 1/2	8	5	10	'85	1 3/4	1 3/4	3	2 1/2	125	370.00
5	10	6	10	'21	2	2	4	3	150	420.00
5 1/2	10	7	10	'66	2	2	4	4	200	450.00
6	12	7	10	'66	2	2	4	4	200	500.00

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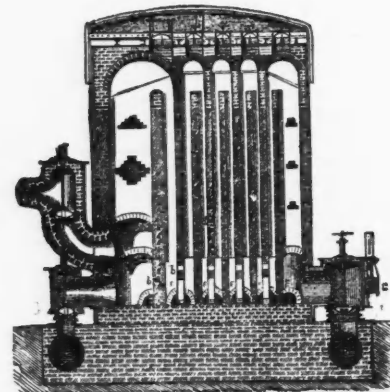
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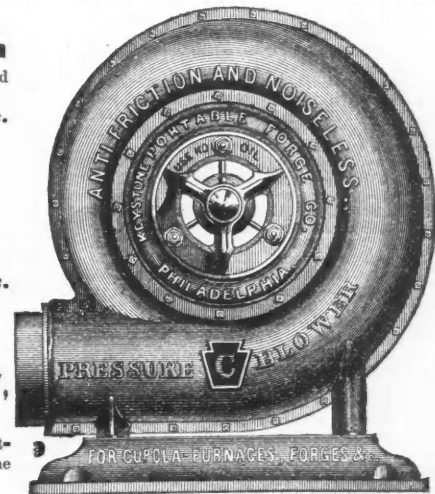
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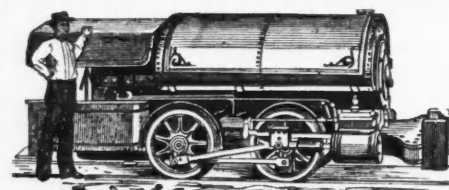
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