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THE nerves of our petroleum producers and exporters have been so often harrowed that they will not be seriously affected by the latest report—that at Balakhan, near Baku, Russia, a new petroleum spring, which rose 150 yards, flooded the country, impregnating everything. Nobody, it is naively added, ventures to light a fire for fear the town will go off like fireworks.

THE reports of the Lake copper companies, now beginning to be published, form interesting reading to those who are watching the copper market in its present critical phase. For the first half of the current year the companies' reports would, of course, show rather better proportionate returns than for the whole of 1887; but still the effect of the fall boom can be traced in the reviews for the last year.

THE promptness with which some of our esteemed English contemporaries publish American news can not be too highly commended. The following bit of information from a most valued E. C. is particularly refreshing: "One marked feature in current American railway practice is the change from the use of iron to the employment of steel in making rails and various other appliances used in railroad operation. The substitution of steel rails for iron may be considered a fixed fact, and, at

the relative prices now holding for the two classes of material, there is no economy in buying iron rails, even as regards first cost."

THE position of the ENGINEERING AND MINING JOURNAL as to the Harney Peak property and its recent "promoters" has been pretty clearly defined. The question is not as to the actual merit of the property, which has not even yet been fairly developed, but as to the relation between capitalization and prospective returns. Professor BLAKE, in a letter to the JOURNAL, again protests against misuse of his name by the London "boomers," and denies having made any change of front.

THE reports of the government scientific bureaus should be phenomenally free from error, considering the time spent in preparatory or field work and observation; study of the data collected, writing, revising and re-writing the report; dragging it through the tortuous course of government type-setting, proof-reading, correction, stereotyping, printing, illustrating, binding, etc., and finally in distributing the finished product—all of these stages not only being marked off by deliberative interregna, but also admitting of further revision and addition up to the last. Blame for the resulting delay of from one to fifteen years in issuing such publications is hard to locate, or even to proportionately segregate—and this division of responsibility is probably the main reason why there is any blame at all. The whole system is at fault; but an intelligent jury, in the absence of more pressing claimants, would be apt to award the medal to the U. S. Government Printing Office.

IRON ORE CONCENTRATION.

THE memoir of Messrs. MAYNARD and KUNHARDT, of which a portion is published in this issue of the JOURNAL, is admirably thorough in its treatment of a very complex subject, and it is to be regretted that want of space prevents publishing all the data on which their conclusions rest. Apart from its merit as a contribution to the literature of the subject, the description of the tests conducted personally by the authors is valuable as showing what can be attained by systematic and well planned experiments on a small scale and with not the best of apparatus.

THE results point rather to the need of care in crushing and in accurate sizing than to any new features of concentration proper. Iron ore will not, of course, bear expensive handling in the final stages of concentration, except for the moderate amount of special ore for open-hearth work, and hence the greater necessity for well planned crushing to size, with the avoidance of fines.

IRON ores differ so much in character, and the local conditions are so variable, that general rules can hardly be applied. Enriching a lean ore and still keeping the phosphorus below the Bessemer limit, are the more common aims. Simple washing to separate earthy matter and to remove part of the phosphorus occurring in apatite, is a simple matter; but so much depends on the physical condition of the ore and its more or less intimate admixture with the gangue, and the relative sizes and forms into which the raw material breaks, that the technical question of concentration is a most interesting one, limited as it is by the commercial restrictions as to furnace size, richness, purity and economy.

IN this connection it may be well to suggest the advisability of using slot instead of wire or needle-punched screens in treating magnetic ores having a banded, slaty or gneissoid gangue, on the same principle as employed in cleaning small sizes of anthracite; while for middlings a partial separation of magnetite from specular and micaceous portions in mixed ores can be made when desirable.

IN the last issue of the ENGINEERING AND MINING JOURNAL it was suggested that a promising field is open in the concentration of soft manganese ores for "chemical" manganese dioxide. In this direction, owing to the higher value of the concentrates, as compared with the best Bessemer concentrates, there is room for more elaborate, delicate, and expensive treatment, especially as the fines have a higher market value than lump or coarse ore. It is to be hoped that the problem will be undertaken by some such systematic experimenters as the authors referred to.

TRANSPORTATION BY AERIAL CABLE ROADS IN EUROPE.

ANY one who has not followed the history of the growth of this system of transportation in Europe would be astonished now to see the great development it has taken of late years. It is no longer looked upon in any way as experimental, nor are its economical results doubted any more than would be those of an ordinary surface railroad. In nearly all the countries of Europe special laws have been promulgated, regulating not only the construction, but also the running of these cable roads. In fact, they have become one of the regularly acknowledged means of communication in all sections of the country where either natural difficulties presented by the contour of the ground to be traversed would render the construction of surface roads either too costly or altogether impracticable; or where, on the other hand, the service required is

less than enough to keep the rolling stock and personnel of a surface railroad fully employed. Some idea of the extent to which these roads are being built can be obtained from the German government mining statistics, which show that for each of the last three years the amount of wire cable used for the construction of the Bleichert patent cable roads alone was one third more by weight than the whole amount of wire rope consumed in every other department of mining throughout the country. In the last few years the firm of BLEICHERT & Co. have erected over 350 lines of their system alone, besides all those which have been constructed by other builders. One of the chief reasons that the Spanish iron ores can be shipped so cheaply to this country lies in the fact that by the use of lines of this system from their large open cut mines to the wharves where the steamers lie, practically no handling of the ores takes place, and consequently the cost of transportation is reduced to a minimum. From experience of the use of wire rope tramways in this country, heretofore they have not recommended themselves as an economical means of transportation, except in localities where the building of a railroad offered too many difficulties to make its construction pay. The cause of the same economical results not being obtained here as in Europe appears to be two-fold. First, all the efforts of cable tramway builders with us seem to have been in the direction of cheapening every part of the first cost of the lines at the expense of their ultimate durability, and second all their attention and ingenuity seem to have been concentrated on perfecting the old single rope roads, which are really the only types used or known here. In Europe it seems soon to have dawned on the engineers constructing these aerial lines that in order to make their application and utility more general, the first point to be attained should be their increased capacity for handling large individual loads. Most of the single rope tramways in this country are limited to individual loads of from 75 to 100 lbs. each. To increase these to any extent would be ruinous to the life of the rope. The first improvement they adopted, therefore, was the use of a double cable instead of a single one. One of these cables is stationary and carries the load, while the moving or traction cable, which is a very light one, furnishes the propelling power. In this manner they were at once able to increase the capacity of single loads to 1000 pounds or even 2000 pounds. Not only that—the use of stationary carrying cables allowed them to increase their spans to almost any extent, and there are many lines now running which have spans of over one thousand feet in length across rivers and valleys, and these on lines carrying seven or eight hundred tons of material per day. These improvements accomplished, their attention appears to have been concentrated on perfecting every detail of construction with such minuteness and care that the expense of operating and maintaining one of these lines appears to have been brought down to figures which would open the eyes of some of our best railroad men. We have before us the figures from the manager of one of the Bleichert tramways operating in the Saarbrücken coal district, which show that the cost of transportation is only $\frac{5}{100}$ cent per ton per mile. The length of this line is about four miles, and it is carrying 1000 tons of coal per day. If these results can be obtained in Germany, certainly our engineers ought to be able to equal them, if not surpass them, here. The problem of cheap transportation over short distances up to, say, eight or ten miles, and for comparatively small amounts per day, is one which, once solved, will enable hundreds of mines, quarries, or factories to be successfully operated, which, without such facilities, would be practically unprofitable. We understand that recently a well-known firm in this city, having a contract for the erection of the first section of a ten-mile line on this system in the Island of Cuba, had to import not only the patented portions, but also the special carrying rope used, as nobody was manufacturing it in this country. It is sincerely to be hoped that as the demand for these improved lines increases the regular manufacture of them will be undertaken and pushed to the extent it is in Europe, and to those who are first in the field we predict a rich harvest.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested. All letters should be addressed to the MANAGING EDITOR. We do not hold ourselves responsible for the opinions expressed by correspondents.

The Harney Peak Tin Mining Company.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: If any evidence were necessary to show that there is a desire in London to connect my name and approval with the statements of the Harney Peak (Dakota) Tin Company prospectus, it is found in the reception accorded to my protest and disclaimer which was printed in your columns, and was reprinted, I understand, in the *Financial News*, of London. Two, at least, of the London journals—the *Financial Times* and the *Industrial Review*—appear to be much aggrieved by this publication, and resort to unfriendly comments. The *Financial Times* charges a "change of feeling," if not of opinion, and the *Industrial Review* seeks also to show a change of front toward the tin interests of Dakota, not only on my part but by the ENGINEERING AND MINING

JOURNAL. Now there has been neither a change of feeling nor of opinion on my part, and I have failed to see any change in the attitude of the JOURNAL.

I thank the *London Review* for publishing my report entire. That report truthfully represents what I saw in 1885, and on reading it over I again assert that I have no reason to withdraw or to change it. That report limits my responsibility. There was then, and there continues to be, great promise of paying tin mines in the Black Hills. The discoveries required and fully justified enthusiasm regarding the prospective developments. New locations were made daily. The lodes found were in the condition of "prospects," as the miners say. Even the Etta had been opened upon the upper part only. There had been some ore taken out and piled up at this claim, and at some of the others, but no depth of consequence had anywhere been attained, and no calculations of ore standing could properly be made, and none were made by me. The report is in this respect, as in others, eminently conservative. Now, years after, comes a prospectus from London for the formation of a company citing extracts from my report, and giving in connection with these extracts hypothetical calculations by others, not by me, showing that the Etta mine would, under certain conditions, "yield upward of 24,000 tons of black tin" to a depth of 250 feet. The width of the vein at a depth of 175 feet is said to be "193 feet with tin throughout." It is also proposed to produce 9000 tons of ingot tin yearly from this and other properties. It is claimed that these statements are founded upon the reports. To this I object. My report does not justify such statements. I disclaim any responsibility for them. This reiteration would not be necessary were it not for the persistent attempts to saddle me with representations and opinions by others for which I am in no way responsible. To limit my responsibility to my own written statements can not be made to appear as any change of front.

I refrain from any general review or criticism of the prospectus, or of the history of the tin enterprise since 1885, but having made a survey of the region and a report on the properties up to that time, I am entitled to refer at least to the financial aspects of the enterprise, to cry *caveat emptor*, and to urge that the money raised and expended shall bear a just relation to what can in fairness be expected from the property. Any mining expert or authority whose opinion upon a property is sought and is given, is entitled to the expression of an opinion also as to the amount of capital and of plant requisite to obtain satisfactory results. Of the many properties examined by experts but few can be reported upon favorably. And out of these few many become wrecks and disappointment to investors, not because the properties are worthless, but by reason of extravagant capitalization, and the discounting of all possible profits for years by the inflated valuation of shares and the realization of profits in the market by the promoters and vendors. Disappointments, so caused, react upon the reputation of the expert, unjust though it may be, hence the expert has a right to the expression of an opinion not only as to the amount of capital required, but as to its expenditure. Respectfully yours,

MILL ROCK, March 28, 1888.

WM. P. BLAKE.

Continuous Lixivation.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Let me add my mite to the leaching question, especially as expounded by the articles pro and con in your paper on trough lixiviation.

Since 1885 I have employed at my works for experimental purposes, on ores that filtered slowly, owing to the clay contained therein, or to the fact that an extreme fineness was required of the pulp to insure a perfect chlorination, an apparatus briefly described as follows:

Two small keys running on hollow trunnions are connected as shown. The ore is charged continuously through the funnel, mixed with the necessary hot water, and passes through a series of barrels automatically from one to the other, as shown, and is finally discharged from the last barrel into an ordinary filter press. When dry and sweetened it is discharged, stirred into a running stream of hypo, which carries it through a second battery of barrels, which again discharge into a filter press. All other manipulations with the solutions, etc., remain the same as in practice at present where the Patena process is in use.

I find that the necessary handling of the ore in discharging the presses is much less than the handling of the ore in charging or discharging of the ordinary vats. Instead of cooling and moistening and shoveling into cars, and dumping into the vats, I cool and moisten mechanically (by a machine of my own construction), and drop the moistened and thoroughly triturated ore into a running stream of water which conveys it to the first series of barrels. From the first filter press it is raked into a stream of hypo which conveys it to the second series of barrels. (If necessary, an automatic mixer can be added after the first filter press.)

It may be asked, Why not take a pan instead of a barrel? I would answer, Yankee fashion, by another question. Have you ever had the pleasure of shoveling out a pan or settler that was "stuck"? No simpler or cheaper mixer do I know of than the barrel. Less cost, less power, and no getting out of order.

These barrels are fitted with a few ribs inside, so placed as to slightly crowd toward the discharge end while running.

Next it may be urged against this system that even the best filter presses will leave too much wash water or solution in the ore. Let us see. I find that from 1000 pounds to 2000 pounds of hot water per ton is necessary to properly convey, leach and extract all solubles from the ore. This water, as in the case of a very refractory ore (San Bartolo of the Cusi-huriachic Company), dissolves from one ton of roasted ore, on which 8 per cent of salt was used in roasting, 390 pounds of solids, of this 140 pounds are salt (unused).

On this ore the filter press leaves the ore still containing from 5 to 6 per cent of moisture (press working under 25 to 30 pounds pressure). This moisture, therefore, if 2000 pounds of water were used, still retains 24 pounds of solids per ton of ore, which might have been extracted. In such an extreme case two tons of water should have been used, one ton hot in the barrels and one ton cold as the ore goes into the filter press. In the latter case much less solids would remain unsolved than can be usually found in the ore in vats, after the most thorough washing.

Again, if it is urged that too much rich solution remains behind, after

expressing the solution of hypo by the second filter press, the following data will show how much:

If the tailing assays, which are dried directly, and which have invariably proved lower in value than from ordinary vats, did not demonstrate that the liquid contained therein was of no consequence, a little calculation as follows would:

Take, for example, a 50-ounce ore, and say that we have a chlorination of 90 per cent: 5 ounces of silver are therefore insoluble. Supposing, now, we had used a ton of solution per ton of ore, and that 6 per cent of the solution remained in the ore; this 120 pounds of solution would then contain $2\frac{7}{10}$ ounces of silver. This, plus the 5 ounces of insoluble silver, would give $7\frac{7}{10}$ ounces as the tailing assay: surely a result fully as good as could be expected by ordinary vats. On high-grade ores, of course, the quantity of solution must be increased, and beyond a certain point redissolution and a second final filter press may become necessary. Very recent trials with filter presses have led me to the belief "sweetening" water can be forced through the ore, after the hypo is expressed, with perfect success.

As every one practically acquainted with the Patera process knows, the possible loss of 6 per cent of solution is not fatal, as more than that is created anew by the precipitation of the silver with the polysulphide.

EXPERIMENTS ON THE ACCELERATION OF THE SOLUBILITY OF CHLORIDE OF SILVER IN HYPO BY MEANS OF MOTION.

To prove that this is the case, I have made the following experiments, in which time and motion were made as nearly alike as possible (many similar comparative tests can be found in the "Assay Book" of Kustel & Riotte, of 1879-80. San Francisco). I will state in advance that the "motion" trials were made in a glass bottle, and that the friction in a large mass revolving in a barrel was lacking. I also know that this fric-

tion is of the greatest help in dissolving the chloride, especially if larger pieces are formed in roasting, or exist in the ore before roasting.

1st Trial.—Ore roasted by a Stetefeldt furnace, in the Manhattan Mill, Austin, Nevada. Sent me by A. A. Curtis, Esq. Assay, 128.00 ounces Ag.

- a. Shaken with three times the weight of hypo solution for five minutes, leached and pressed, shows a chlorination of 87.8 per cent.
- b. Placed upon a filter, and after passing six times the weight in hypo, time one hour, the ore shows a chlorination of 87.8 per cent.
- c. Placed upon a filter, and after passing twelve times the weight in hypo, time two hours, the ore shows a chlorination of 91.2 per cent.

This ore is peculiarly adapted to leaching, there being almost no clay, and besides in roasting, due to the peculiar action in the Stetefeldt, the ore becomes "sandy" or "gritty."

2d Trial.—Ore roasted by a White & Howell furnace in the Cusi-huiriaehic Mill, Chihuahua, Mexico, by myself; assay, 56.3 ounces Ag.

- a. Shaken with three times the weight of hypo solution for five minutes, leached and pressed, shows a chlorination of 89.1 per cent.
- b. Placed upon a filter, and after passing four times the weight in hypo, time one hour, the ore shows a chlorination of 87.3 per cent. (No more hypo would go through the filter in the hour.)
- c. Placed upon a filter, and after passing nine times the weight in hypo, time two hours, the ore shows a chlorination of 89.8 per cent.

This ore contains much clay, as it occurs in porphyry, and filters very slowly.

Third Trial.—Ore roasted by a White furnace at the Columbus Mill, Colorado, by myself. Assay, 28.00 ounces Ag.

- a. Shaken with three times the weight of hypo solution for five minutes, leached and pressed, shows a chlorination of 89.7 per cent.
- b. placed upon a filter, and after passing three times the weight in hypo, time one hour, the ore shows a chlorination of 87.6 per cent.
- c. Placed upon a filter, and after passing six times the weight in hypo, time two hours, the ore showed a chlorination of 89.2 per cent.

In the last two experiments no more hypo would pass in the given time. The ore is very clayey, much decomposed porphyry breaking with the ore in mining.

I choose these experiments from a great number, owing to their typifying the extremes in leachability. Of course, if the assay values had been more alike the comparison would have been more perfect.

In No. 1 trial the agitator test would have been better if four to six times the amount of hypo had been used, or if sweetening had been practiced, as the solution retained must necessarily have been very rich.

Trial No. 2 is a very fair and characteristic test. Five minutes agitation with a reasonable quantity of solution gives nearly as perfect a result as two hours leaching with an unreasonable amount of solution.

Trial No. 3 shows a perfect result on an ore, which otherwise it is im-

practicable to leach, owing to the impossibility of passing the leach through a reasonable thickness of ore.

Filter presses are in daily use here in which from 50 to 100 tons of the finest clay are taken from a muddy water at the most trivial expense, compared to the cost of handling the ore into and out of the vats in the West.

I would finally apply this same system for leaching out the gold solution from ore chloridized in revolving barrels by Munger's method, as practiced in the Phoenix mine, N. C., and the Canada Consolidated in Ontario.

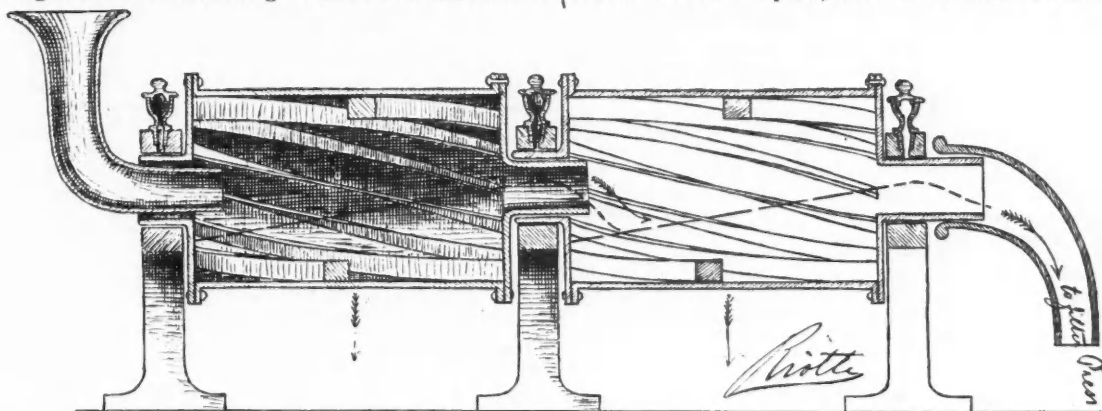
E. N. RIOTTE.

THE BRITISH MINING SHARE MARKET.

From Our London Correspondent.

My last letter left Alturas shares at nearly 30s.; my present finds them at 16s. after having been as low as 11s. 6d. In your columns considerable doubt has been thrown upon the genuineness of the returns from this mine, and that doubt has found an echo on this side.

Do any of your readers recognize in the new Consolidated mine the old South Aurora of which your Col. Stanford was the hero? The South Aurora Company was floated on this market about 17 years ago, and the large capital required was at once subscribed for. Did it not adjoin the old Eberhardt, which out of the Ward Beecher chamber declared a dividend of £1 per share, and the shares of which had been run up from £10 to £42? A valuable mill was put up on South Aurora. When doubts began to be felt as to the value of the mine, Col. Stanford, with more than the generosity that usually appertains to vendors, returned to the shareholders £30,000, which he asked should be spent upon the South Aurora property. The company at that time fell into the hands of a Mr. Spratt, and has remained in them to this day. Mr.



SKETCH FOR MIXER FOR CONTINUOUS LIXIVIATION.

Spratt, like the poet, had "an eye with a fine frenzy rolling," and, instead of going to work on South Aurora, cast about for other properties, which he found in localities as divided by distance as Corsica in the south and Canada in the north. Needless to say that none of these properties have done any good for the shareholders. All the money having been spent, the company was "reconstructed," a polite way of assessing the shareholders *volens volens* in a call. There is now £10,000 in hand.

The Last Chance mine has determined to erect concentrators to treat the poor ore which an expert who has been recently to see the property says is on the spot. Mr. Cullens has resigned, and Mr. Thomas Watwon now reigns in his stead. This gentleman is described as being "able and conscientious."

The price of copper remains firm at about £81, and the faith here in the syndicate is as strong as ever. Cape Copper paid a dividend of £2 as against one of 10s. for the corresponding quarter of 1887.

It is said that on your side a combination has been formed to force up the price of lead, and that American merchants have the call of the metal at £16 for the next three years. My own view is that such a combination would be a great success—greater in proportion than even that of either tin or copper. Tin is £166, with a firm market, though stocks are 2000 tons in excess of what they were two months ago.

There has been a great deal doing in diamond shares, but the market is mainly regulated by a Hatton Garden diamond clique of merchants who have their rendezvous in that quarter. The public have little faith in these shares.

I have only a word to say about Indian mines, but that word is important. Mysore mine has in about three and a half years returned the whole of its capital in the gold produced, but the shareholders have only had a small proportion of it in dividends. The most prominent mines are Nundydroog, Ooregum, Balagahat and Mysore. The *Mining World* states two important facts this week, that the crushings at Mysore from the commencement—three and a half years ago—have been 25,299 tons, producing 39,384 ounces of gold, and that of the 35 shafts now being sunk in the Mysore field all of them, without exception, are in gold quartz.

LONDON, March 12, 1888.

A Gun of 150 tons weight is now being constructed at Essen by Krupp; it is similar to the 120-ton gun, but is longer, and will have a much greater range.

German Coal Exports.—The exports of coal from Germany in the first eleven months of last year were 7,971,082 tons, as compared with 7,878,428 tons in the corresponding period of 1886. In the 7,971,082 tons representing the exports for the first eleven months of last year, the deliveries to the Low Countries figured for 2,787,587 tons, and those to Austria and Hungary for 2,427,174 tons.

ON THE DRESSING OF NON-BESSEMER ORES.*

By G. W. Maynard and W. B. Kunhardt.

The scarcity of Bessemer ore deposits in the Atlantic seaboard has led to continual large importations of foreign ore, and recently to heavy purchases of Lake Superior ore for Eastern steel-works. But the growing demand for Bessemer ore has also directed attention to raising the purity and richness of Eastern ores to the Bessemer standard by dressing. Where shorter or cheaper haulage to centers of consumption compensates for such treatment, the dressed ore can compete with rich native ores to the extent to which fine material can in present practice be introduced into the blast-furnace burden.†

As the highest admissible phosphorus limit in pig-iron destined for the acid Bessemer process is, generally speaking, 0.10 per cent., the phosphorus in the ore must not exceed 0.001 per unit of metallic iron. Several large steel-works keep to even lower limits. Greater latitude is permitted in fixing the sulphur content, since much of the sulphur is removed by proper furnace management; 0.005 S per unit of iron in the ore is frequently allowed. A high percentage of iron and low silica are also important desiderata. In strict parlance a Bessemer ore is one which, smelted alone, with reasonably pure flux, will make a uniform quality of Bessemer pig. *New Bed, Crown Point and Chateaugay* of Lake Champlain, and *Tilly Foster* of Putnam County, N. Y., have been the only large producers of such ore in the Atlantic seaboard. If we expand the definition so as to include the calcined Hudson River carbonate and the roasted sulphur and copper-bearing magnetite of Cornwall, Pa., both of which are largely used in admixture with other more strictly Bessemer ores, the list of undressed ores in the eastern territory of the United States which have contributed in any considerable quantity to the Bessemer industry is complete. Excepting this small number of active producers, to which might be added a few minor contributors and several well known, but hitherto scarcely developed, deposits of high-grade magnetite, none of the iron-ore bodies of the Atlantic States do in their crude condition satisfy Bessemer requirements. They are all either too lean or carry too much phosphorus—but not sufficient of the latter associated with a high percentage of iron, be it remarked, to yield any considerable output fit for basic Bessemer work. A wide and not unpromising field is therefore open for dressing enterprise.

The work that has been accomplished in this field is soon told. By means of simple sluice boxes, or washing trommels, sometimes supplemented by old-fashioned, slow-working jigs, the "washeries" which are dotted over many parts of New England and the eastern portion of the Middle States, separate gravel and ochery clay from limonite. The work is often carried on by farmers in a small way, but the aggregate of ore so dressed is large. The washed product carries, however, with but very few exceptions, too much phosphorus—frequently in the form of intimately associated vivianite—to fit it for Bessemer furnaces, so that the treatment requires only the briefest notice here.

The magnetites which during many years supplied the active bloomery forges of northern New Jersey and the Champlain district were always dressed. The demand for blooms, however, is steadily declining, and the advent of the basic open-hearth is destined to effect a still further and marked restriction in their use, so that capital refrains from investing in new mills to supersede the primitive plants which have so long been used for dressing the bloomery ore. The practice of forty years ago is that of to-day; the ore is partially calcined with wood in open heaps to make it friable, then it is stamped on a perforated cast-iron plate, and the fine broken stuff is sluiced, or jigged, without any attempt at previous sizing. This treatment enriches the ore from the 25 or 30 per cent of iron it contains in its crude state to 65 per cent of iron (= 90 per cent magnetic oxide) in the concentrate—of course, at the expense of no small loss of mineral in the tailings.

The first systematic concentration of iron ore in this country, so far as the writers know, was undertaken about fifteen years ago at Iron Mountain, Mo. The process there, which was an outgrowth of the simple hand-jigging of surface fines, has since been developed to an excellent degree of efficiency by Prof. W. B. Potter, of Washington University. The Iron Mountain "surface-ore" consists of decomposed porphyry carrying liberated grains and pieces of specular hematite. This surface-ore and the mine dumps, which contain all the refuse derived from spalling and grading the underground, or "mine-ore," are hydraulicked *in situ* on a large scale to wash out a great amount of clay. The gravel and fines produced by this operation are still further cleansed in cone-washers. All material coarser than 1½ inch is then hand-picked to form a finished product, while the finer stuff goes through sizing trommels which classify into ½, ¼, ⅓, ⅕, and 1 inch sizes for jigging. Bradford tray jigs are used on all sizes but the finest, for which the more expensive Hartz plunger jig is preferred. The proportions of iron and phosphorus in the dressing-ore fluctuate between wide limits; 300 tons of hydraulicked ore sometimes yield as high as 250 tons of concentrates, and, again, as low even as 50 tons. The separated ore runs about 65 per cent in iron and most of it is low in phosphorus, so that the dressing operation yields a Bessemer product. The phosphorus occurring as apatite in the gangue is washed away except where the apatite crystals are firmly imbedded in specular mineral, as is the case in some of the "spalls," when an actual enrichment of phosphorus has been found in the concentrates. The tail-

* From the *School of Mines Quarterly*.
 † Mr. E. S. Moffat, General Manager of the Lackawanna Iron and Coal Company, states in a communication to the writers:
 "For nearly three months we ran one of our Scranton furnaces on Chateaugay separated ore [one of which is coarser than quarter-inch size] to the extent of 25 per cent of the ore mixture in addition to the usual quantity of fines in the other ores. Subsequently we ran another furnace on 50 per cent separated Chateaugay for several weeks. In both cases this ore worked well and we had no trouble in using it. When working 25 per cent of separated ore we had the furnace on four fifths anthracite and one fifth coke; when working 50 per cent separated ore we used two thirds anthracite and one third coke. Chateaugay is the only separated ore we have used. I am not prepared to say how much dressed ore we could use with coke alone; I only know that we have worked 50 per cent of dressed ore with one third coke with good results, and are quite confident of being able to run continuously on that proportion."
 ‡ Through Prof. William B. Potter, of Washington University, it is learned that the Bessemer furnaces of the South St. Louis Iron Company have at times run altogether on Iron Mountain dressed ore; some of this, however, is of coarse egg size, while the average might be called half-inch stuff. This practice was always satisfactory; the high-blast pressure which was necessary promoted a large output.

ings carry from 10 to 25 per cent of iron, according to varying conditions. Much of this iron is finely disseminated through the porphyry, while some of it is, of course, chemically combined with the gangue minerals; an average of 15 to 18 per cent of uncombined Fe₂O₃ is, perhaps, as fair an average figure for the tailings as can be given. Three plants are now erected at different points of the iron property, with an aggregate 12-hour capacity of 600 to 900 tons (depending on the proportion of fines) of crude, hydraulicked ore. Each plant has two cone-washers with a corresponding set of screens, and for each screen there are two jigs. The cost of dressing, including hydraulicking (but without crushing, which is unnecessary), varies from 40 to 70 cents per ton of separated ore; the average is about 60 cents.

In 1882 a separator was erected at Crown Point, N. Y., for dressing the low-grade magnetite of the Crown Point Iron Co. The mill is referred to by Mr. A. F. Wendt, its designer, in an illustrated paper* describing a similar plant (now idle) at the Thael mine, Putnam Co., N. Y. The raw ore is crushed to ½ inch and sized for jigging, but it is remarkable that the sizing is confined to making only two classes of jigging ore—the coarser ranging from ½ to ⅓ inch, and the finer from ⅓ inch down. Unless the ore possesses an open texture, so that very few "mixed grains" (part mineral and part gangue) are formed in crushing, such limited sizing must presumptively either restrict the capacity, or lower the efficiency, of the jigs. The average working is exhibited in the following figures:

Proportions.	Crude ore.	Concentrates.	Tailings.
Percentage of iron.....	33-35	65-70	20
" " phosphorus.....	0 03	0 02	—

The annual output of the mill amounts to 5000 tons of separated product, each ton being obtained from 2.8-3.2 tons of crude ore.

Six years ago the Chateaugay Ore and Iron Company began erecting concentrating works at their mines at Lion Mountain, near Plattsburg, N. Y. Their latest plant, a large and well built mill, was put in operation in 1886. The lean dressing ore is a granitic rock carrying coarsely crystalline grains and aggregations of magnetite. Without any preparatory calcining it is broken down to ½ inch in Blake crushers and multiple-jaw fine crushers. The crushed ore, most of which is much finer than ½ inch, is concentrated on Conkling revolving tray jigs, without size classification of any kind. The results of the dressing are shown below: 3-3½ tons of crude ore yield by concentration one ton of separated ore:

Proportions.	Crude ore.	Concentrates.	Tailings.
Percentage of iron.....	35-0	65-5	18-22
" " phosphorus.....	0 025	0 015	0 033

At one time the concentrates were run up to 67 per cent iron, but the higher market price then obtained did not compensate for the increased loss of iron in the tailings. At present 63 per cent are guaranteed, and the product is kept slightly above that figure. The new mill has a 24-hour capacity of 600 tons of crude ore. It is furnished with two 20 x 15 challenge Blake crushers, feeding into four 30 x 5 machines, and these, after screening out the fines, deliver to six 60 x 2 multiple jaw crushers from which all ore finer than ⅓ inch passes to six Conkling revolving jigs, while stuff between ⅓ and ½ inch goes through two 15 x ½ seven-jaw crushers and then through rejecting screens to the jigs.

At Negaunee, Mich., a large costly concentrating mill was built five years ago to work the jaspery hematite of the Jackson mine. The extreme toughness of the ore was the cause of ruinously rapid wear in the crushers and rolls; besides this, the very intimate association of the mineral and gangue made any attempt at dressing the ore at best an extremely doubtful experiment. After a period of trials and failures the mill was closed, and it stands to-day a monument to the folly of embarking in a new enterprise of a technical character without submitting the vital question of feasibility to disinterested professional investigation.

This brief survey suffices to show that the field for economic high-grade concentration of iron-ores has scarcely, as yet, been more than prospected. Only one company in the East—that of Chateaugay—is regularly shipping "separated ore" to Bessemer furnaces in large quantity, but its signal success with a very lean ore is certain to stimulate the owners of other deposits, more especially as the field is broad enough to accommodate many workers without crowding.

(TO BE CONTINUED.)

OFFICIAL REPORTS.

Quincy Copper Mining Company, Mich.

The directors submit the following report of the business of the mine for 1887, and statement of the financial condition of the company.

The product of the mine as prepared for shipment was 6,743,510 pounds, or 2371½ tons of mineral, yielding about 83½ per cent, or 5,609,762 pounds of refined copper, for which has been realized the gross sum of \$658,332.94; realized from sale of silver, \$3772.12. Total, \$662,155.06.

The expenses of the year are as follows:

Running expenses at mine.....	\$315,246.34
Building construction and real estate account.....	75,586.78
Smelting, transportation and all other expenses.....	93,631.12
	\$484,464.19
Leaving as mining profit.....	\$177,690.87
There has also been realized during the year, from interest on loans.....	10,937.42
Making the income of the year.....	\$187,728.29
The statement of assets and liabilities in our last report showed a balance on hand, as of date,	
January 1st, 1887.....	\$548,781.46
Add earnings of 1887.....	187,728.29
	\$736,509.75
Deduct dividend of February 15th, 1887.....	\$160,000
Deduct dividend of August 25th, 1887.....	40,000
	200,000.00
Leaving balance of assets, January 1st, 1888.....	\$536,509.75

* Transactions American Institute of Mining Engineers, 1885, Vol. XIII., p. 35.
 † It may here be said that the use of the steam stamp for crushing certain classes of iron ores deserves consideration. The Ball stamp in its old form, as improved by Mr. Leavitt, has hitherto been used exclusively on the tough native copper ores of Lake Superior. Recent experiments with one battery in crushing the copper sulphuret ore of the Anaconda mine, Montana, have proved so satisfactory that the erection of nine more batteries is contemplated.

A dividend of \$4 per share, or \$160,000, payable February 15th, has been declared, which, with dividend of \$1 per share, paid August 25th last, makes total for the year \$200,000.

GENERAL SUMMARY OF RECEIPTS AND EXPENDITURES OF THE QUINCY MINING COMPANY FROM ITS ORGANIZATION TO DECEMBER 31, 1887.

EXPENDITURES.			
For expenditure on location previous to 1856.....	\$42,097.78		
Quincy vein, 1858, not now worked.....	55,000.00		
Openings and explorations on 3800 feet "east" or Pewabic vein, extending to Portage Lake, preparatory to future work.....	11,500.00		
Real estate and permanent improvements on same, including dwellings houses, stamp mill, machinery, steam engine, tram road, dock warehouse, and other buildings and roads.....	1,018,147.67		
Mining and surface labor, expenses of smelting and marketing copper, and all incidental expenses.....	12,374,885.06		
Balance carried down.....	5,146,509.75		
	\$18,648,140.46		
RECEIPTS.			
From capital stock paid in.....	\$200,000.00		
Proceeds copper and silver (93,853,639 lbs. copper).....	18,184,286.41		
Interest.....	126,286.46		
Profit on sale P. L. & R. Improvement Company stock, and other investments.....	79,637.16		
Sales of real estate, Hancock, Michigan.....	57,950.43		
	\$18,648,140.46		
By balance brought down, being receipts over expenditures.....	5,146,509.75		
Leaving dividends declared, Nos. 1 to 38 inclusive.....	4,610,000.00		
Deducting balance as per statement in detail.....	\$536,509.75		
ASSETS AND LIABILITIES, EXCLUSIVE OF REAL ESTATE, MINE PLANT, AND SUPPLIES IN USE, JANUARY 1, 1888.			
Assets.			
Loans on call.....	\$275,000.00		
Cash on hand at mine.....	8,234.13		\$538,713.24
Copper on hand, sold.....	232,539.97		
Liabilities.			
Drafts unpaid.....	\$40,377.24	Accounts payable at mine.....	20,843.34
Dividends unpaid.....	799.50		73,895.08
Accounts payable in New York.....	11,875.00		\$464,818.16
Add at mine, viz.: Supplies per inventory on file.....	\$63,088.50	Accounts receivable.....	28.60
Farm account (horses, wagons, etc.).....	8,574.49		71,691.59
Less dividend payable February 15th, 1888, \$4 per share, \$160,000.			\$536,509.75

SUMMARY FOR 1887.

Average force employed.....	447 men.
number of miners.....	142 "
wages of miners on contract, per month.....	\$48.40
Yield of mineral per fathom of ground broken.....	976 lbs.
refined copper per fathom of ground broken.....	781 "
Total rock mined.....	124,289 tons.
hoisted.....	96,370 "
stamp rock treated.....	94,250 "
Yield of rock stamped.....	mineral, 3.23 per cent.
Product stamp mineral.....	6,092,475 lbs.
masses.....	651,035 "
refined copper.....	6,743,510 lbs.
	5,609,762 "

Superintendent Harris in his report says: The general appearance and productiveness of the vein, in both the north and south portions of the mine, continued favorable throughout the year. No. 2 shaft was sunk from the thirty-fifth to the thirty-seventh level. This shaft is still several feet west of the main copper-bearing part of the belt, but during the last one hundred feet in sinking it passed through several bunches of vein matter carrying good stamp rock.

The drifting done from this shaft was at the thirty-seventh, thirty-sixth and thirty-fifth levels north. The thirty-seventh level was drifted a few feet south of shaft, and the thirty-sixth level was connected south with the drift from No. 4 shaft. Those openings showed a good average of productive vein, characterized by stretches of lean ground, low-quality vein, and blocks more or less rich in the different grades of copper.

The principal stoping done in this part of the mine was at different points at and between the thirtieth, thirty-first, thirty-second, thirty-fourth and thirty-fifth levels north, and in a block of rich ground at the thirty-third level south of shaft. Considerable good stoping ground is still available here and there between the twenty-eighth and thirty-fifth levels north and south of both shafts, while at and below the thirty-sixth level but little stoping at all has been done either at No. 2 or No. 4 shaft. No. 4 shaft was sunk from 50 feet below the thirty-fifth level to the thirty-seventh level. This shaft is also a little west of the main copper-bearing part of the lode, but showed, in sinking, occasional patches of good stamp rock. The drifting done from this shaft was at the thirty-seventh level north, the thirty-sixth level north and south, and at the thirty-fifth, thirty-fourth, thirty-third and thirtieth levels south. Most of the vein exposed in the thirty-sixth and thirty-fifth levels is very promising. The vein shown in the thirty-fourth and thirty-third levels is more bunchy, having stretches of alternating good and poor ground.

The vein in the thirty-second and thirtieth levels, while showing occasional bunches of paying ground, is narrow and of much poorer quality than it is in the lower levels.

The principal stoping done in this part of the mine was at and between the thirty-second, thirty-third, thirty-fourth and thirty-fifth levels north and south of shaft.

The man-engine shaft was extended and put in working order from the twenty-ninth to the thirty-first level, and is now being sunk towards the thirty-third level.

The diamond drill was not used much during the year. A few holes only were bored at the twenty-fifth level north of No. 2 shaft, but nothing of value was discovered.

Several unavoidable accidents during the year caused more or less serious delay both at the mine and the mill. Those mishaps, however, were mostly overcome in good time.

On the night of June 7th the rock-house and adjuncts, with nearly all machinery inclosed, were totally destroyed. The fire undoubtedly was caused by lightning, which struck the drum-house at head of main "incline," and the whole range of buildings was soon a mass of flames, which it was impossible to extinguish. Means were at once improvised, by erecting a temporary rock-house, for handling the rock and sending

it to mill, and regular running operations were resumed as soon as possible.

On the 24th of August the stamp-mill was closed down for some time on account of the breaking of both main-engine shafts. This caused the stoppage of the mill for about four weeks, and as the burning of the rock-house, drum-house, etc., necessitated a delay of about the same time, the total suspension of the stamp-mill covered a period of nearly two months.

During the summer the water pipes which supplied the mine boilers from the lake gave out, but no serious breakage occurred, and a new line of six-inch cast-iron pipes, some forty-four hundred feet in length, was laid and put in use. As the old pump at the mill was becoming inadequate to this service, it was replaced by a new compound one—size 14" x 7" x 12"—which makes this plant complete, and independent of the rest of the works, and sufficient for all probable contingencies.

The new rock house was ready for use about the middle of November. It stands several hundred feet north of the old one, being just opposite to No. 7 shaft. It is designed and equipped for doing the best possible service. Steam for operating it is taken from the main boilers at the mine.

For the transportation of rock a substantial trestle work was built for car tracks, over which the rock is sent from the shaft houses to the rock house.

From rock house to head of "incline" a second gravity road was built, and the old tram road was made new throughout, thus completing an entirely new outfit all the way from the stamp-mill to No. 4 shaft.

The fire plant for the mine was finished early in the season, and proved to be of great value, for by its use the other mine buildings were saved at the time of the rock house fire.

At the mine boiler house an additional railroad trestle for side track was built, and the coal yards, both at the mine and the mill, were considerably enlarged so as to hold the needed supply of fuel.

A new dump scow for the removal of stamp sand has been built, and will be ready for use next season.

Osceola Copper Mining Company, Mich.

The directors present the following report of the operations for 1887, and statement of the financial condition of the company:

The product of mineral was 4,184,432 pounds, which at 85.65 per cent gave 3,583,723 pounds of refined copper, for which has been realized the gross sum of..... \$424,936.85

From sale of building lots at Hancock..... 189.50

\$425,126.35

The costs have been: Running expenses at mine..... \$297,684.31

Smelting, transportation, and all other expenses of selling copper..... 56,462.63

\$354,146.94

Showing a mining profit of..... \$70,989.41

The balance of assets January 1st, 1887, was..... \$225,741.99

There has been expended in exploratory work..... \$6,513.03

There has been expended in mine plant during the year..... 4,702.22

Deduct dividend of February 15th, 1887..... 61,215.25

164,526.74

Making the balance of assets January 1st, 1888..... \$235,516.15

A dividend of \$1 per share, or \$50,000, payable January 16th, was declared from the earnings of last year.

There are no matters of interest or importance to record during the past year. The failure to find a paying lode in the cross-cut from sixteenth level was a great disappointment.

The directors say that while it should be remembered that the Osceola lode is bunchy and lean in character, it should not be forgotten that going south in depth it shows improvement, and that the greatest amount of ground is in this direction. They feel justified in indulging in hopeful anticipations for the future. A new shaft, No. 5, will probably be opened south on the Opechee property.

ASSETS AND LIABILITIES.

ASSETS.	
Cash in bank at Boston.....	\$15,608.36
Cash on hand at mine.....	339.49
Supplies on hand at mine.....	22,056.63
Fuel on hand at mine and stamp mill.....	20,205.96
Accounts receivable at mine.....	9,007.10
Bills receivable at Boston.....	90,916.28
Three thousand shares stock in Tamarack Osceola Copper Manufacturing Company.....	7,500.00
Two hundred and fifty shares Hancock & Calumet R. R. stock.....	25,000.00
Copper on hand, 724,002 pounds, since sold.....	109,958.52
Total assets.....	\$300,592.34
LIABILITIES.	
Drafts outstanding.....	\$13,892.89
Accounts payable at mine.....	31,880.30
Bills payable at Boston.....	20,000.00
Dividends uncalled for.....	303.00
Total liabilities.....	65,076.19
Balance of assets January 1st, 1888.....	\$235,516.15

STATEMENT OF RECEIPTS AND EXPENSES OF ALL KINDS FROM SEPTEMBER 25TH, 1873, TO JANUARY 1ST, 1888.

From capital stock, 50,000 shares, \$25 a share full paid.....	\$1,250,000.00
936,002 lbs. copper, 1874, at 23 37-100.....	\$218,796.92
1,330,313 " 1875, at 22 77-100.....	302,862.96
1,693,737 " 1876, at 20 57-100.....	348,933.25
2,774,777 " 1877, at 18 19-100.....	504,636.93
2,705,998 " 1878, at 15 53-100.....	420,340.14
3,197,387 " 1879, at 17 79-100.....	568,989.89
3,381,061 " 1880, at 19 15-100.....	647,487.19
4,179,782 " 1881, at 17 77-100.....	742,585.84
4,256,409 " 1882, at 17 70-100.....	739,458.26
4,247,630 " 1883, at 14 96-100.....	636,846.83
1,939,169 " 1884, at 12 82-100.....	544,651.02
3,560,786 " 1885, at 10 75-100.....	208,558.65
3,583,723 " 1886, at 10 51-100.....	374,144.13
" 1887, at 11 86-100.....	424,936.85
41,963,750 " total at 15 92-100.....	6,682,268.86
sales of silver to date.....	32,439.04
interest receipts to date.....	36,220.87
365 shares Hancock & Calumet Railroad stock.....	36,000.00
Total receipts.....	\$8,036,928.77

EXPENSES.	
Running expenses prior to 1887	\$5,130,925.73
Running expenses during 1887	354,146.94
	\$5,485,072.67
Construction expense prior to 1887	\$709,834.22
Construction expense during 1887	4,702.22
	714,536.44
Real estate	588,836.70
Dividends prior to 1887	\$972,500.00
Dividends during 1887	50,000.00
	1,022,500.00
Exploratory work	15,466.81
Total expenses	7,826,412.62
Balance of receipts, January 1st, 1888	\$210,516.15
Add 250 shares of Hancock & Calumet Railroad stock	25,000.00
Balance of assets, January 1st, 1888	\$235,516.15
DETAILS OF MINING EXPENSE.	
Shaft sinking, 462'3 feet at 12'26"	\$5,668.90
Wize sinking, 217'5 " 9'95"	2,165.10
Drifts, 3,820'1 " 6'58"	25,141.06
Stopping, 9502 fathoms at 9'91"	94,188.90
Tramming	27,147.41
Timbering, labor materials, and supplies	6,940.41
Extra work	1,391.56
Supplies, labor, fuel, etc., for air drills	26,852.99
Supplies, fuel, and labor for engines	27,383.81
Mining superintendence and company account labor	19,960.35
Blacksmith, machinist, and carpenter labor	2,558.82
	\$239,398.61
Less profit on supplies	29,284.50
	\$210,114.11
OTHER EXPENSES.	
Rock-house	\$18,136.80
Surface labor, supplies, etc	1,092.60
Incidental expense, including taxes	6,378.19
Office labor, supplies, etc	5,802.52
Transportation	22,641.29
Stamping	35,518.80
	87,570.20
Total running expenses	\$297,684.31
CONSTRUCTION COSTS.	
Dwelling houses at stamp mill	\$2,607.07
Compress-or, boiler-house, etc	32.98
Dwelling-houses at mine	2,516.83
School-house at mine	340.83
Transfer of engine from No. 3 to No. 4 shaft	289.45
Stamp-mill construction	1,665.00
	\$7,452.22
CREDIT.	
By boiler, engine, and dwelling-houses sold	2,750.00
Expenses of drifting cross-cut to Calumet conglomerate	6,513.03
	\$4,702.22
Total expended at mine	\$308,899.56
SUMMARY.	
Rock stamped	145,200 tons.
Product of mineral	4,184,433 lbs.
Product of refined copper	3,583,723 lbs.
Yield of refined copper per ton of stamp rock	2458 lbs.
Yield of refined copper per cubic fathom of ground broken	377-15 lbs.
Yield of mineral per cubic fathom of ground broken	440 lbs.
Percentage of mineral in stamp rock	1.44 per cent.
Percentage of refined copper in stamp rock	1.23 per cent.
Cost per ton of rock hoisted	\$1.74
Cost per ton of rock stamped	2.05
Refined copper, cost per pound at mine	8.31 cts.
Cost of smelting, freight, and all other expenses	1.57 cts.
Total cost per pound of refined copper laid down in New York	9.88 cts.

PRODUCTION OF SPELTER IN EUROPE AND UNITED STATES.

We have received the following statement from Messrs. Henry R. Merton & Co., London :

	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.
Rhine Dist. & Belgium	130,995	129,020	129,754	129,240	123,891	119,193	110,989	98,830
Silesia	81,375	81,630	79,623	76,116	70,405	68,811	66,497	64,459
Great Britain	19,339	20,730	23,099	29,259	28,061	25,581	24,419	22,000*
France & Spain	16,028	15,305	14,847	15,341	14,671	18,075	18,358*	15,000
Poland	3,580	4,145	5,019	4,164	3,733	4,400	4,000*	4,000*
Austria	3,506	3,760	3,890	4,470	4,672	5,094	4,270	4,400
United States	254,883	254,590	256,232	258,590	246,033	241,154	228,533	208,689
	45,530	38,072	36,321	34,415	32,921	30,147	30,000*	23,239
Total tons	300,413	292,662	292,553	293,005	278,954	271,301	258,533	231,928
Average price spelter ex ship London	£15 4	£14 5	£14	£14 8 9	£15 6 6	£16 19 9	£16 5 6	£18 7
Imports of spelter into England according to the Board of Trade returns	56,187	54,508	60,229	47,647	40,787	42,001	46,188	33,409

* Estimated.

Artesian Wells at Paris, France.—The artesian well which has been in course of construction at the Place Hébert, Paris, France, for the past twenty-two years, has just been completed. The water-bed lies at a depth of 719m. 20c. from the surface of the soil. Paris now possesses three artesian wells, viz., at Grenelle, Passy and the Place Hébert.

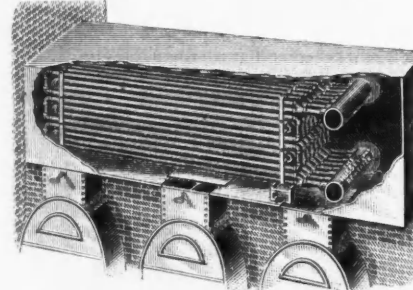
Large Decree for Violation of Patent.—The Supreme Court has just awarded R. A. Tilghman, of Philadelphia, Pa., \$320,000 damages for the infringement of his glycerine patent, deciding that an infringer who defies a patentee cannot, after legal defeat, escape by merely paying the license fees which a licensee has paid. The license fees would have amounted, without interest, to \$35,000, but the court awarded nearly ten times that amount as damages on the ground that an infringer is liable to account for all the savings and benefits derived from the wrongful use of the patent. Mr. Tilghman was once defeated in the Supreme Court by a vote of four to three. A new suit was brought and carried again to the Supreme Court. That court then reversed its former decision by a unanimous vote, and awarded him the amount above named.

THE HUSSEY RE-HEATER.

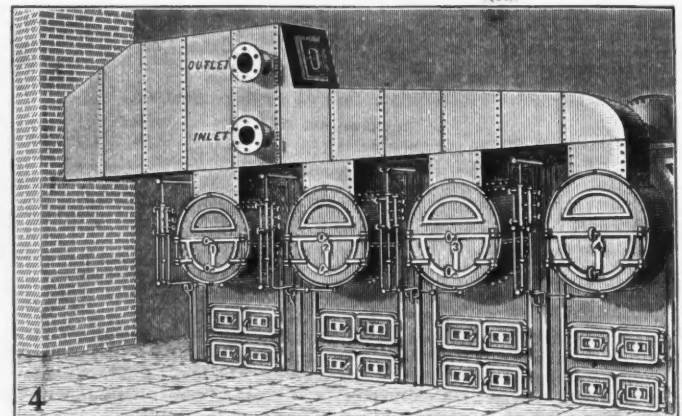
There is probably no industrial agent in the production and use of which there is more loss and waste, or a wider and more interesting field for the invention of devices for economising cost and increasing the efficiency, than is to be found in steam, and in the appliances connected with its use.

Two of the most important mediums of lost energy to which the use of steam is now subject, and which make the heaviest draughts on the furnace fires, are the waste gases of combustion escaping up the chimney, and the exhaust steam blown away into the air.

The Hussey Re-Heater has been devised to retain and convert to profitable use part of the energy hitherto lost through these two avenues. Its principal applications are to the re-heating of exhaust steam, the super-heating of live steam, the heating and circulation of air and the heating of water, and it is claimed to accomplish these various results without cost of fuel by an ingenious but simple and practical method of utilizing the heat conveyed in the gases of combustion on their way from the furnace to the chimney.



A Hussey Re-Heater in Position.



The Hussey Re-Heater in the Welles Building, New York.

It is well-known that these gases have a temperature in the furnace of from 2000 to 2500 degrees F., and it is a fact, not, perhaps so generally known, that they carry into the flue and retain for some distance from the furnace a temperature of from 400 to 600 degrees. The Hussey re-heater gathers up and imparts to the exhaust or live steam or air passing through it a portion of the heat of the gases in the flue, thus utilizing the waste heat without the use of additional fuel. The re-heater consists of a system or coil of pipes and connections disposed so as to offer a large heating surface. The illustrations given herewith show two of the modes in which it is applied—one in direct connection with the uptake from a three-boiler battery; the other as used in connection with the flues from a group of four boilers. In addition to superheating live steam, it can be also applied between the high and low-pressure cylinders of compound engines, or for reheating exhaust steam for use in detached secondary cylinders, and in a variety of ways, without, it is claimed, appreciable back pressure. The system is applicable in cases where the heat of the exhaust steam is employed in various processes requiring high and controllable temperature, such as in paper mills, print works, dyeing and bleaching establishments, hat factories, sugar refineries, breweries, etc., while where the steam is used almost exclusively for power, as in electric lighting, it is thought that the surplus could be advantageously distributed to neighboring buildings after reheating. In heating buildings by exhaust steam treated by the Hussey system a gain in efficiency and economy is claimed.

Duty on Petroleum in East India.—Our State Department has been notified that the East Indian Government has imposed a duty upon petroleum of about 1 1/4 cents per gallon.

Paper Chimney.—In Breslau, a chimney 54 feet in height has been constructed entirely of solid blocks of paper joined with a special cement. The chimney is non-inflammable, and by the nature of the material quite secure from lightning.

Ore and Metal Shipments from Spain.—The official returns of ore and metal shipments from Spain during the last three years are as follows :

	1885.	1886.	1887.	1885.	1886.	1887.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Calamine	34,075	26,624	22,841	Quicksilver	1,015	541
Pyrites	785,892	671,897	766,801	Pig lead	117,640	114,471
Iron ore	3,796,944	4,187,527	5,215,713			1,335
Pig-iron	18,250	49,420	115,359	Total	4,780,740	5,077,483
Precipitate	26,924	27,003	29,890			130,797

THE VELOCITY OF EXPLOSION IN GASES.

In the lecture room of the Literary and Philosophical Society, Newcastle, Prof. H. B. Dixon, M. A., of Manchester, lectured recently on the subject, "The Nature of Explosions in Gases." He said it was laid down by Bunsen that an explosion of hydrogen and oxygen, the most rapid known, occurred at the rate of 40 yards a second, and that, in most other gases—carbonic oxide and oxygen, marsh gas and oxygen—it occurred at a little over a yard a second. He thought it would be no difficult thing, therefore, to measure accurately the velocity of explosions. He began with carbonic oxide and oxygen, because he wished to test at the same time a theory he had formed on the mode of the propagation of explosions in these gases. He had found that absolutely dry carbonic oxide and oxygen would not explode at all; and, at the same time, that if one could put in small quantities of water, and then measure the rate, adding water and again measuring the rate, one would be able to tell whether really the water entered into the chemical reaction, for one would get in that case a greatly increasing velocity of the explosion. He put up an apparatus, consisting of a tube about 60 feet long, having attached to each end a glass tube. The two ends were brought together, one over the other; and he intended to photograph on a moving plate the flash of light as it occurred. The flash at one end of the tube would occur before the flash at the other end, and he thought that, with a slowly revolving plate, he could get two images on the sensitive paper, and thus be able to measure the velocity. He failed entirely, because the glass tubes were always fractured. But he discovered that the rate of the explosion of carbonic oxide and oxygen had been immensely underrated; he felt quite sure that it went some hundreds of times faster than Bunsen had stated, for the interval between the flashes was not more than about a tenth or an eighth of a second. He found also, that the rate of the explosion of hydrogen and oxygen was a little over 1000 yards a second—something vastly greater than had been stated. He had continued these experiments ever since, and proposed to give them some account of his work. His first experiment was with a mixture of coal gas and air. He had a glass tube put into an iron stand, and passed through the tube a mixture of coal gas and air, having a stopcock to regulate the supply of air, in order to get an explosive mixture. First of all, he turned on the gas full, and then gradually reduced it, in order to form an explosive mixture. He wished, he said, to draw their attention to the fact that the flame gradually altered as the explosive point was neared; and then, as they got close to it, the flame altered in size and in color, and sometimes passed down the tube with a regular, uniform motion, and then exploded. Sometimes the flame ran back to the top of the tube, sometimes it detonated at the bottom, and sometimes it hesitated, going backwards and forwards. Why this hesitation? It was very often accompanied by a singing noise; and it seemed to him that they had here a phenomenon precisely analogous to that which was found on what were called "singing flames." What happened? The sides of the tube cooled down the burning mixture, and made the flame go more slowly, so that the gas was thrown into a state of vibration; it went so slowly that diffusion between the burnt and unburnt gases took place to a considerable extent. Therefore, the flame widened out, and, as it touched one side of the tube more than another, it was cooled down and was thrown into a state of vibration. Owing to the vibrations in the flame considerable local pressure was applied to the gas, and he thought it was owing to the pressure produced in the vibration that the detonation was set up. Allowing gas to pass through a wire mesh, he lit it, causing a flame on the top side of the mesh, showing how vibrations were caused in the flame by the irregularities in the mesh. Then, by placing a long tube over the flame, he showed how the pressure drove the flame through to the under side of the mesh. They were, he said, only too familiar in mines with the driving of flame through a wire mesh by sudden pressure. The lecturer next showed the different effects produced by different modes of firing a mixture, in two separate tubes, of carbonic oxide and air. On applying a lighted taper to the first, a blue flame burnt down the tube with a uniform motion; and on passing an electric spark into the second tube the mixture exploded with a loud report. In conclusion, Professor Dixon dealt exhaustively with Berthelot's theory that the explosive rate of gas was determined by the molecular rate. He had fixed round the room some ninety feet of lead piping, and this he filled with a mixture of hydrogen and oxygen. In order to register the rate of the explosion, he displayed an apparatus on which were two electro-magnets, each connected through a battery with one end of the leaden tube, and each having an ordinary door-key attached to it. When the gas was fired at one end of the tube it broke the current, allowing the first magnet to fall; and when the explosion reached the other end of the tube the second current was broken, liberating the second key, and the interval between the falling of the keys thus gave the time occupied by the traveling of the explosion through the tube. He was inclined, he said, to accept Berthelot's molecular theory, with this modification: he believed that the velocity of the explosion depended not only on the steam molecules—the products of combustion—but also on the unburnt gases forming the unburnt layer in front. The lecture was profusely illustrated by means of experiments, and was listened to with great attention and interest.

A Railroad up Lookout Mountain, Tenn.—The first section of the broad-gauge railroad up Lookout Mountain has been completed and the first train was run up on the 25th inst. The entire road will be completed May 15th.

The Russian Oil Trade.—It is rumored, says the *Ironmonger*, that the Rothschilds syndicate have made arrangements to send 500,000 barrels of oil during the next twelve months to Lane & Macandrew, London, who have already chartered two tank-steamers, and have bought a third, for the purpose of carrying this oil, and are about ordering two more tank-steamers, of 3500 tons of oil capacity each, in connection with this arrangement. The oil will, it is said, be far superior to any other oil refined in Russia; and Lane & Macandrew, for the purpose of carrying on this trade in England, have already secured extensive tank storage for working both the London and Liverpool centers.

The Isolation of Fluorine.—The element fluorine has at last been

successfully isolated, and its chief chemical and physical properties determined. Many chemists, notably Faraday, Gore, Pflaunders and Brauer, have endeavored to prepare this element in the free state; but all attempts have hitherto proved futile. M. Moissau, after a long series of researches with the fluorides of phosphorus and the highly poisonous arsenic trifluoride, has finally been used to liberate fluorine in the gaseous state from anhydrous hydrofluoric acid by electrolysis. This acid in the pure state is not an electrolyte; but when potassium fluoride is dissolved in it, a current from nine Bunsen elements decomposes it, evolving hydrogen from the negative and fluorine from the positive electrode. The apparatus employed in this process is constructed of platinum, and is made in the form of a U tube, with fluorspar stoppers, through which the battery terminals, made of platinum iridium alloy, are led. The gas is liberated at about the rate of two liters per hour, and has very powerful chemical properties. It smells somewhat like hypochlorous acid, etches dry glass, and decomposes water, liberating ozone, and forming hydrofluoric acid. The non-metallic elements, with the exception of chlorine, oxygen, nitrogen and carbon, combine directly with it, evolving in most cases both light and heat. It combines with hydrogen, even in the dark, without the addition of any external energy, and converts most metals into their fluorides. Gold and platinum are not attacked in the cold, but when gently heated are easily corroded. Mercury readily dissolves the gas forming the protofluoride; iron wire also completely absorbs the gas, while powdered antimony and lead take fire in it. It is necessary in the electrolysis of the liquid hydrofluoric acid to cool the electrolytic cell by means of methylchloride to -50 degrees C. Fluorine appears to thus fully confirm the predictions which have been made by chemists concerning its properties. It is by far the most energetic of all the known elements, and its position in the halogen series is established by its property of not liberating iodine from the iodides of potassium, mercury and lead, and also of setting free chlorine from potassium chloride. With iodine it appears to form a fluoride. No compound with oxygen has yet been obtained.

DIVIDENDS PAID BY MINING COMPANIES DURING MARCH AND FROM JANUARY 1st, 1888.

NAME OF COMPANY.	Paid in March.	Since Jan. 1.	NAME OF COMPANY.	Paid in March.	Since Jan. 1.
Atlantic, Mich.	.....	60,000	Jay Gould, Mont.	36,000	76,000
Calumet & Hecla, Mich.	500,000	500,000	Hammoth, Utah.	.....	10,000
Central, Mich.	.....	40,000	Mary Murphy, Colo.	.....	35,000
Colo. Cent., Colo.	.....	13,750	Montana Lt., Mont.	.....	165,000
Cons. Cal. & Va., Nev.	108,000	324,000	Morning Star, Colo.	.....	25,000
Daly, Utah.	75,000	150,000	N. Belle Isle, Nev.	.....	50,000
Dunkin, Colo.	30,000	50,000	Ontario, Utah.	.....	75,000
Eureka, Nev.	12,500	50,000	Osceola, Mich.	.....	50,000
Franklin, Mich.	.....	40,000	Parrott, Mont.	.....	18,000
Granite Mountain, Mont.	200,000	600,000	Plymouth Cons., Cal.	.....	80,000
Homestake, Dak.	25,000	75,000	Quincy, Mich.	.....	160,000
Hope, Mont.	.....	25,000	Standard, Cal.	10,000	30,000
Idaho, Cal.	23,250	69,750			
Iron Silver, Colo.	.....	100,000	Total	1,169,750	3,071,500

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

PATENTS GRANTED MARCH 27TH, 1888.

- 379,923 and 379,924. Brick-Kiln. James C. Anderson, Highland Park, Ill.
- 379,925. Kiln for burning Brick, etc. James C. Anderson, Highland Park, Ill.
- 379,927. Brick-Kiln. James C. Anderson, Highland Park, Ill.
- 379,943. Ore-Pulverizer. Henry H. Eames, Columbia, Va., Assignor to John J. Kelly, Baltimore, Md.
- 379,944. Commutator for Dynamo-Electric Machines. Thomas A. Edison, Llewellyn Park, N. J.
- 379,956. Regulator for Dynamo-Electric Machines. Charles Heisler, St. Louis, Mo.
- 379,960. Manufacture of Refractory Carbon. Charles H. Land, Detroit, Mich.
- 379,974. Rolling-Mill Plant. Charles H. Morgan, Worcester, Mass.
- 379,975. Sectional Steam Boiler. Dr. F. Morgan, Akron, Ohio.
- 379,985. Corrugating-Machine. Thomas F. Rowland, New York, and Warren E. Hill, Brooklyn, N. Y., said Hill Assignor to said Rowland.
- 380,006. Ore-Crusher and Pulverizer. Louis Wammer, Elizabeth, N. J., Assignor of one half to Elias D. Smith, same place.
- 380,011. Wire-Rope Tramway. Earle C. Bacon, New York, N. Y.
- 380,025. Regulator for Pumping-Engines. Edward N. Dickerson, Jr., New York, N. Y.
- 380,035. Journal-bearing. George H. Helvey, Hamilton, Ohio, Assignor to the Hooven, Owens & Rentschler Co., same place.
- 380,037. Valve for Steam-Engines. William H. Hoffman, New York, N. Y.
- 380,040. Gas-Washer. August Klönne, Dortmund, Prussia, Germany.
- 380,051. Hand Rock-Drill. James O. Patridge, Wellston, Ohio.
- 380,054. Apparatus for Threading Wires or Cords through Flexible Tubes. William H. Sawyer, Providence, R. I.
- 380,055. Method of Lubricating Wire. William H. Sawyer, Providence, R. I.
- 380,067. Production of New Diamido Compounds and of Azo Colors Produced Therefrom. Arthur Weinberg, Frankfurt-on-the-Main, Prussia, Germany, assignor to Leopold Cassella & Co., same place.
- 380,100. Pyromagnetic Motor. Thomas A. Edison, Llewellyn Park, N. J.
- 380,101 and 380,102. System of Electrical Distribution. Thomas A. Edison, Llewellyn Park, N. J.
- 380,103. Conduit for Electric Railways. Stephen D. Field, Yonkers, N. Y.
- 380,109. Metallic Shingle. Hugh W. Harry, Fort Worth, Tex.
- 380,110. Steam Engine. Franklin P. Hawkins, Plano, Ala.
- 380,115. Alternating Current Dynamo-Electric Machine. Charles Heisler, St. Louis, Mo.
- 380,121. Rock-Breaker or Ore-Crusher. James H. Lancaster, New York, N. Y.
- 380,135. Rotary and Oscillating Apparatus for Distilling Metallic Ores. Wilhelm Richter, Eintrachthütte, near Schwientochowitz, and Rudolf Lorenz, Radzonkau, near Beuthen, Prussia, Germany.
- 380,144. Dynamo-Electric Machinery. Frank J. Sprague, New York, N. Y., Assignor to the Sprague Electric Railway and Motor Company, same place.
- 380,147. Metallurgical Furnace. William J. Taylor, Chester, N. J.
- 380,155. Valve Gear for Steam Hammers. Charles W. Willard, Chicago, Ill.
- 380,156. Coal Separator. Charles W. Ziegler, Scranton, Pa.
- 380,158. Manufacture of Electric Conductors. Edward G. Acheson and Benjamin F. Anderson, Pittsburgh, Pa.
- 380,161. Bath for Extracting Aluminum and Alloying it with other Metals. William A. Baldwin, Chicago, Ill., Assignor of one fourth to J. Clement Smith, James J. Sheehy and Ammi A. Thomas, all of Washington, D. C.
- 380,190. Coal Screening Mechanism. Ecklev B. Cox and Samuel Salmon, Drifton, Pa., said Salmon, Assignor to said Cox.
- 380,195. Air-Compressor. Cyrus S. Deane, Fort Erie, Ontario, Canada, Assignor to George W. Dean, same place, and Cyrus H. Woodruff, Buffalo, N. Y.
- 380,197. Steam Boiler Setting. William U. Fairbairn, Hyde Park, Mass.
- 380,229. Art of Treating and Calcining Iron Ores. William J. Taylor, Chester, N. J.
- 380,233. Ore Concentrator. Enes A. Wall, Salt Lake City, Utah.
- 380,243. Method of Making Nuts. Justin H. Burdick, Utica, Wis.
- 380,244. Nut-Making Machine. Justin H. Burdick, Utica, Wis.
- 380,245. Clay Pulverizer. Jonathan Creager and Harry M. Creager, Cincinnati, Ohio.
- 380,248. Table for Tinning Zinc and other Metals. James K. Crowley, Ansonia, Conn.
- 380,259. Reversing Mechanism for Rolling-Mills. Daniel B. Hicks, Pittsburgh, Pa., Assignor of one half to Edmund J. Evans, same place.
- 380,273. Pressure Regulator for Gas Machines. Orson W. Benne t, Washington, D. C.

THE METALLURGY OF STEEL.*

By Henry M. Howe.

(Continued from page 219.)

Some believe that, if the proportion of carbon, manganese and silicon be allowed to fall so low in the gradual decarburization of the bath in the open-hearth process that the metal becomes oxygenated, a tendency to form blowholes is established which, while it may be greatly lessened by subsequent deoxygenating additions of silicon, etc., can be fully eradicated only with great difficulty, if at all. Others deny this, admitting however that it is important to prevent oxygenation, since, if oxygen be absorbed, it is hard to ascertain how much is present, and how much silicon, etc., must be added to remove it.^a

D. *Influence of Pressure.*—Bessemer proved that the escape of gas from molten steel was governed by the existing pressure. The gentle ebullition of molten steel was rendered furious by lowering the pressure, and wholly stopped by raising it.^b Troost and Hautesfeuille observed that, after cast-iron had been long held fused in an atmosphere of hydrogen, bubbles of gas escaped if the pressure suddenly fell, though the metal remained perfectly tranquil as long as the pressure was constant.^c

But falling pressure does not always induce a rapid escape of gas. These observers found that phosphoric cast-iron would not boil on fall of pressure unless the previous exposure to hydrogen were greatly prolonged, and after highly silicious cast-iron had been fused in hydrogen they could only induce a visible escape of gas by cooling and solidifying the metal in a complete vacuum: even then it scattered but feebly. They had to resort to the same manoeuvre to induce a visible escape of gas from iron long held in fusion in an atmosphere of carbonic oxide.^c That pressure raises the solubility of gases in hot solid iron also has been abundantly proved by the absorption of hydrogen (and carbonic oxide?) when exposed to the hot metal, and their subsequent expulsion when it was heated in vacuo, observed by these chemists as well as by Graham and Parry. (See §§ 176, 188, 189, 190, p. 110.)

E. *Influence of Agitation and Solidification.*—Agitation expels gas from molten steel. Thus half-blown acid metal, oxygenated acid metal, and spiegel-re carburized basic ingot iron are comparatively quiet while lying undisturbed in the converter, but boil when poured from converter to ladle or from ladle to mould. In no case, so far as I know, does the opposite hold true. This may be attributed to the agitation due to pouring and enhanced by the rapid circulation of the metal, due to its contact with walls of the freshly entered vessel, necessarily much cooler than the metal: they cool it, locally change its density, and so induce circulation. As the walls grow hotter this effect diminishes. So, too, the bath in the open-hearth furnace is often made to boil by stirring, much as champagne is. Solidification also evidently expels gas from steel. Thus in certain cases acid Bessemer steel is perfectly quiet in the converter and for a few moments after pouring into the moulds: then, as solidification sets in, it begins to rise.^d It is possible that the boiling which some-

times follows transferring into the ladle is enhanced by temporary solidification of the metal against its cool walls. More conclusive is the fact that while slow solidification, by affording the gases which it expels time to escape, yields comparatively solid ingots, sudden freezing may under otherwise like conditions yield extreme spongy ones. Thus Brustlein found that steel, which when cast in the usual way gave pretty solid ingots,^e rose very much and formed a veritable sponge^f when cast in a water-cooled copper mold six inches in diameter. In harmony with this result are the explosions which often occur when a piece of cold iron is dropped into molten steel, a thin coating of steel momentarily solidifying on the surface of the cold lump,^g and the fact the less carbon steel contains the more does it tend to boil in the moulds, for the lower the carbon the higher the melting point and the more suddenly does the steel set, *ceteris paribus*. (§ 202 B.) But, though in harmony with Brustlein's result, I will not insist that these phenomena are due to the same cause.

That solidification does not always cause an important escape of gas is suggested by the fact that some varieties of iron neither scatter nor rise, and proved by the observations of Troost and Hautesfeuille, mentioned in § 202 D, and by the following experiment by Parry. Grey cast-iron was fused in an atmosphere of hydrogen: on solidifying it in vacuo without removal from the apparatus only a few bubbles of gas were obtained, though on reheating (in vacuo?) it was found to have absorbed much hydrogen.^h

F. *Protracted Escape.*—Gases, consisting as usual of hydrogen, nitrogen and carbonic oxide, escape from steel cast in the ordinary way, long after solidification is complete. Müller states that combustible gas may be obtained from ingots of compact Bessemer or even crucible steel 45 minutes after teeming, when they are probably completely solidified, if, as I understand, he refers to ingots of usual size cast in iron moulds. For, even within eleven minutes after teeming, Bessemer ingots fourteen inches square are so far solidified that they may be safely stripped, and after a four minutes more, or altogether fifteen minutes, they may be lifted with tongs. Even later, after the steel has been withdrawn and placed in soaking pits, it continues to evolve a large quantity of gas. (92, Table 55.)

H. W. Lash,ⁱ casting a large ingot with a thick high sinking head, in a mould surrounded with non-conducting material, enabled gas to escape from it for hours by opening a narrow hole lengthwise through the sinking head while it was soft. This hole of course remained open, permitting the escape of gas, but by its length and narrowness preventing rapid radiation of heat. It enabled him to watch the internal ebullition which continued for 2½ hours, and to remove with a rod any incipient scum which froze on the surface of the liquid mass. This device greatly increased the solidity of the ingot. It is not probable that the gas which thus persistently escaped was formed by the oxidation of the metal's carbon by the small quantity of air which, by diffusion and owing to its greater density, would gradually pass down through such a long narrow hole: for its oxygen was probably wholly absorbed by the incandescent metal through which its path lay. Being rapidly heated and lightened as it entered the hole, the action of gravity probably soon became unimportant, and the descent of the atmospheric

* Copyright by the Scientific Publishing Company, 1887.

^a Cf. Holley, *Metallurgical Review*, II., p. 211, 1878.

^b *Jour. Iron and St. Inst.*, 1881, I., p. 196: cf. § 188, C.

^c *Comptes Rendus*, LXXVI., p. 562, 1873. Before the fall of pressure the metal was not simply comparatively but absolutely tranquil. "On n'observe aucune projection, aucune dégagement gazeux."

^d Müller, *Iron*, Sept. 14, 1883, p. 244.

^e *Stahl und Eisen*, III., p. 251, 1883, No. 5. "Einen ziemlich gesunden Block."

^f "Glich der so erhaltene Block buchstäblich einem Schwamm."

^g Ledebur, *Handbuch*, p. 268.

^h *Journ. Iron and Steel Inst.*, 1874, I., p. 94.

ⁱ Private communication.

oxygen then became dependent on diffusion alone, a slow process.

The protracted escape of gas is discussed in § 214 B.

§ 203. THE EXTRACTION OF GAS IN VACUO.—Graham found that the rate at which iron evolved gas when heated in vacuo steadily diminished, iron wire becoming apparently nearly exhausted after seven hours heating. Parry, however, found that iron continued to evolve gas even for seven days, and that though the escape of gas gradually ceased when iron was exposed to a red heat, it started up again when the temperature was raised, and this continued up to the highest temperature attainable.^a A vacuum could be formed and maintained for hours by lowering the temperature to a point below that at which gas was being evolved.^b § 176, C, presents certain reasons for doubting whether the gas which escaped so persistently actually proceeded from the iron.

TABLE 72.—INFLUENCE OF TEMPERATURE AND LENGTH OF EXPOSURE ON THE VOLUME AND COMPOSITION OF GAS EXTRACTED IN VACUO.

Temperature Hours Vol. gas p.hr % CO % H	Case 1. Grey cast-iron.						Case 2. Grey cast-iron.			
	Red.	Red.	Red.	Red.	Red.	White.	Red.	White.	White.	White.
0@7	8@17	18@26	27@36	37@51	52@60	61@76	0@.9	20@28	29@46	46@52
3.2	2.66	1.4	1.37	1.08	1.37	1.41	0.87	3.83	2.80	3.39
30.4	36	43.8	46.2	38.2	38.2	68.1	30	57.1	52	64
66.1	64.1	55.9	52.8	61.3	61.3	31.9	66.2	43.9	47.0	35.5

Temperature Hours Vol. gas per hour % CO in gas % H	3. Grey cast-iron.			4. Grey cast-iron.			5. Grey cast-iron.				
	Dull red.	Red.	Full.	Dull red.	Red.	High.	Dull red.	Red.	High.		
0@12	13@17	18@59	0@9	10@24	25@36	0@3	4@19	20@24	0@12	13@17	18@59
5.9	20.4	1.66	4.96	1.57	1.88	3.4	0.15	0.17	7.7	91.2	
19	20	33.3	26	25.8	13	74	74	86			
78	80	66	74	74	86	74	74	86			

Temperature Hours Vol. gas per hour % CO in gas % H	6. Cast-iron.		7. Bessemer steel.			8. Wrought-iron.			
	0@128	129@165	Bright red.	Red.	High.	Red.	High.	High.	
0@128	129@165	0@24	25@48	49@60	0@2	3	4@5	6	7
1.4	1.3	0.32	1.4	1.3	0.32	4.5	2.2	0.6	0.2
67.7	41.8	8.4	29.7	37.5	90.1	4.5	2.2	0.6	0.2
29.7	37.5	90.1	4.5	2.2	0.6	0.2	0.1	0.1	0.1

Cases 1 to 4, grey cast-iron, Parry, Jour. Iron and St. Inst., 1874, I., p. 99. 3d and 4th wrapped in platinum. 5th case, grey cast-iron, Idem, p. 98. 6th case, grey cast-iron, Idem, 1881, I., p. 190. 7th case, Bessemer steel, Idem. 8th case, wrought-iron, Graham, Jour. Chem. Soc., 1867, XX., p. 285. These cases are given also in Table 56, Nos. 5 to 10, 20, and 26. In every case the volume of gas per volume of metal is referred to.

The absorption of hydrogen and of either carbonic oxide as such or of its dissociated elements has been measured directly and indirectly by several observers, as described in §§ 176 A and 190.

§ 205. QUANTITY OF GAS EVOLVED.

A. From Spiegel Reaction.—In the reactions of the acid Bessemer process described by Müller and King (Table 70 A), from .08 to .173% of carbon are removed. Assuming that this escapes as carbonic oxide accompanied, as in 93, Table 55, by 20% of other gases, from 15 to 33 volumes, measured at the ordinary temperature, would escape. I give these numbers for comparison with the quantity observed to escape from the moulds.

In a spiegel reaction at Joliet, in which molten spiegel was added in the usual manner to blown acid Bessemer steel, only 0.025% of carbon was oxidized, which with the same assumptions implies the escape of about 5 volumes of gas.^c

B. In Solidifying.—An ingot of non-rising acid Bessemer steel gave off between 1 and 1.5 volumes of gas during the first twenty minutes after casting, as measured by Müller with a crude meter at the ordinary temperature. Oxygenated metal evolved gas so rapidly that he was unable to measure it, but he was convinced that it gave off at least thrice its own volume.^d At 1800° C. these quantities became 7.6, 11.4 and 22.8 volumes.

In five cases Müller calculated that the gas which he

extracted on boring existed in the blowholes at a pressure of from 38 to 69 pounds per square inch (2.6 to 5 atmospheres). Hence, if this same quantity had been present as gas when the metal was somewhat below its freezing point, say 1400° C., its pressure would have been from about 191 to about 346 pounds per square inch. That the gas actually existed under considerable pressure in the cold metal is further indicated by his statement that, in some cases, gas escaped from the boring hollow as soon as the point of the drill penetrated the first blowholes.^e The high pressure which exists within the ingot shortly after teeming occasionally manifests itself by bursting the strongly fastened cover from the mould, and spurling the metal high in the air.

C. On boring under water, etc., the more porous the metal and the more finely it is comminuted by the drill, the more gas does it evolve in general. Thus Table 73 shows that the greatest quantity of gas per volume of metal which any specimen of only slightly porous steel evolves is smaller than the least quantity which is evolved by any very porous steel.

TABLE 73.—GASES OBTAINED BY BORING WITH SHARP DRILL.

Material.	Number of cases.	Number free from CO.	Composition.									Volume of gas per vol. metal.			
			Hydrogen.			Nitrogen.			Carbonic Oxide.			Minimum.	Maximum.	Average.	
			Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.				
Steel	22	11	52.2	92.4	85.98	5.9	48.1	13.42	0.2	2.2	.05	.73			
Very porous steel	1	2	78.1	90.3	85.98	9.3	20.5	13.42	0.1	65	.59	.73			
Slightly porous steel	4	3	54.7	86.4	68.60	12.7	45.3	30.97	0.4	10	.06	.22			
Solid steel	4	2	52.2	92.4	72.94	5.9	45.1	26.64	0.1	6	.61	.05	.21a		
Cast-iron	7	7	52.1	86.5	85.98	9.2	45.5	13.42	0.4	3	.085	.75			

a Omitting the result (11 volumes) obtained by boring with a dull drill.

0.75 volumes of gas is the largest quantity obtained by boring with a sharp drill; this is decidedly less than escapes during the solidification of molten metal, and very much less than may be extracted by heating in vacuo. With finer comminution six and even eleven volumes of gas per volume of metal have been extracted. The latter is probably far more than escapes during the solidification of most varieties of iron, and is about as much as any observer save Parry has extracted from commercial iron in vacuo.

From one and the same ingot Stead obtained 52 times as much gas on finely comminuting it with a dull drill as when it was cut into comparatively coarse chips with a sharp one: and from cast-iron a dull drill extracted eight times as much as a sharp one. (Nos. 16-17, 40-41, Table 54.) Still finer comminution, exposing still more of the minute pores, might set free a still larger volume of gas. It is not clear that the whole of the gas extracted by triturating with a dull drill was released thereby from simple mechanical retention, for this action might well liberate gas held in adhesion. (See § 170.)

D. On heating in vacuo Troost and Hautefeuille extracted in no case more than 0.42 volumes of gas, while Graham extracted in one case 12.55 volumes, and Parry 340 volumes: but we have seen reason for doubting his results.

(TO BE CONTINUED.)

NOTE.—The publishers of the ENGINEERING AND MINING JOURNAL will thank the readers of this article if they will promptly call attention to any inaccuracies they may observe in it.

^a Journ. Iron and Steel Inst., 1881, I., p. 189.
^b Idem, 1873, II., p. 429.
^c F. A. Emmerton, private communication, Feb. 4, 1888.
^d Iron, Feb. 15, 1884, p. 138.

^e Iron, January 19, 1883, p. 52.

PERSONAL.

Mr. Georges de la Bouglise, mining engineer of Paris, France, is now in this country on a professional visit.

Mr. Frank L. Sizer, Superintendent of the Empire Mining Company, Marysville, Mont., has tendered his resignation to the company, to take effect May 1st.

Mr. John H. Dennis has been appointed Melter and Refiner of the Mint at Carson, Nevada, in place of Mr. Tuttle, who has been transferred to the Philadelphia Mint.

Messrs. E. E. Olcott and Robert Peele, Jr., mining engineers, who have been examining mines in Colombia, South America, will return to this city the beginning of next month.

Mr. Alfred Hunt, President of the Bethlehem Iron Company, died at Jacksonville, Fla., on the 28th inst., aged seventy-two years. Mr. Hunt was traveling for the benefit of his health.

Mr. F. Richard Eichbold, son of the superintendent of Krupp's gun works at Essen, Germany, has been in Pittsburgh recently, inspecting the gun cast by the Pittsburgh Steel Casting Company and investigating iron and steel industries generally.

Mr. Theo. Wood Bunning, for many years Secretary of the North of England Institute of Mining and Mechanical Engineers, Newcastle-upon-Tyne, England, has resigned. His connection with the Institute will terminate at the end of this month.

Mr. Charles Latimer, for many years Chief Engineer, but lately Consulting Engineer, of the New York, Pennsylvania & Ohio Railroad, and one of the leading spirits in the International Institute for the Preservation of Weights and Measures, died in Cleveland on the 25th inst., aged sixty-one years.

Mr. Samuel Smith, one of the oldest manufacturers of Paterson, N. J., died on the 28th inst., aged seventy-three years. He started the locomotive works of Sarnhime, Smith & Co. in 1848. This was afterward incorporated as the New Jersey Locomotive and Machine Company, and Mr. Smith became the President. He was also one of the old firm of Rafferty, Smith & Co., machinists, and during the last years of his life he carried on the business of boiler making on a large scale.

FURNACE, MILL, AND FACTORY.

The Detroit Copper and Brass Rolling-Mills has just completed its new works at Detroit, Mich.

The opening of the Carbondale & Jermyn Electric Railway at Carbondale, Pa., occurred on the 28th inst. The motive power is of the Sprague system.

The charcoal blast-furnace now in course of erection by the Ashland Iron and Steel Company, at Ashland, Wis., is expected to commence operations the beginning of next week.

The basic process is now being used at two points, the Bessemer basic being run for some time at Pottstown, Pa., while experiments with the basic open-hearth are going on at Homestead, Pa.

The Birmingham Tack Works, Birmingham, Ala., will increase the capacity and start the manufacture of kegs, it is said, if the steel made by the Henderson process proves satisfactory as to quality and price.

The sale of the iron-works of the Gere Iron and Mining Company, of Port Leyden, N. Y., whose liabilities are \$112,785, has been ordered by the court to take place on May 4th, at Port Leyden, on a mortgage foreclosure of Fred. W. Barker, trustee.

The Centre Iron Company successfully started its new furnace at Bellefonte, Pa., on the 24th inst. Colonel W. M. Stewart, of Philadelphia, and Mr. Jones Wister, of Harrisburg; Hon. W. A. Wallace, Col. B. K. Jamison, and Hon. C. A. Maier, are interested in the new enterprise.

The works of the Leechburg Machine and Foundry Company, at Leechburg, Pa., caught fire from escaping natural gas on the 29th inst., and were totally destroyed. The flames spread so rapidly that the employes barely escaped with their lives, and several were slightly injured.

The rolling mills of the North Chicago Rolling Mill Company at South Chicago, Ill., which started up February 6th, after an enforced idleness of three months, may close again April 1. The cause is said to be over-production, and it is thought work will not be resumed before July 1st.

The Delaware Rolling Mill, Easton, Pa., closed on the 26th inst., because the night hands refused to make six shifts instead of five to hurry a contract that was to be completed on July 1. The increase in the shifts would mean increased pay, but the men said they were unable to do the work.

The Henderson Steel and Manufacturing Company, of Birmingham, Ala., will hold a meeting on April 24th to increase the capital stock from \$20,000 to \$1,000,000 for the purpose of enlarging the plant. Mr. Henderson informs us that the prospects look very hopeful to practical iron men who have visited the works, and several contemplate adding the Henderson steel furnace to their blast-furnace plant.

A company has recently been organized in Pittsburgh, Pa., for making cement, with a capital of \$50,000, and a site secured for the works on the line of

the Pittsburg Junction Railroad near the tunnel, which will have a capacity of 50 tons per day. The patentee of the process for making the cement is Mr. John Q. Everson, who is superintending the erection of the mill, and will have the management of it when completed.

The New York & New Jersey Power Company has been incorporated under the laws of New York, with a capital of \$3,000,000, for the purpose of manufacturing, selling, and renting boilers and machinery for obtaining power and heat and refrigeration under various letters patent. The trustees are David Dunham Withers, J. Coleman Drayton, John G. McCullough, James Larocque, Chester H. Davis, Robert Deeley, Richard L. Edwards, J. Cooper Clarke, and Samuel W. Boocock. The principal office is in New York.

Messrs. H. K. Porter & Co., of Pittsburg, Pa., report that orders are numerous. They lately shipped a small locomotive to the United States Government for improving the Columbia River in Oregon, and have now street motors under way for Tacoma, Milwaukee, St. Louis, and other places. These motors are inclosed to resemble street cars, and are smokeless and noiseless and much cheaper in first cost and for operating than electric roads or cable roads. The firm is also building a number of coke-oven and furnace locomotives for Southern companies, and logging locomotives for Louisiana. One locomotive under construction for a copper company in Arizona is for only twenty inches gauge of track, and with cylinders nine and one half inches in diameter. A standard-gauge locomotive, if built in the same proportion, would have cylinders 34 inches diameter.

The proposition of Andrew Carnegie to conduct the Edgar Thomson Steel-Works, at Braddock, Pa., upon a co-operative basis was made public on the 29th inst. After pointing out the difficulty of competing with Chicago steel companies, whose men work in two turns a day, while Carnegie's work in three, and declaring that the Edgar Thomson Works could run steadily through the year if placed on an equal footing with Western mills, he says:

"I wish our men and ourselves to become practically partners by paying them upon a monthly sliding scale based upon the price received for rails during the month preceding, this price to be reported by an agent chosen by the men each month at our expense, all documents bearing upon the subject to be handed over for his thorough inspection to our chief book-keeper, and also a member of the firm, to swear to the correctness of the statement.

"The men will have nothing to do with any losses whatever. The company is to run all risk of payment and pay the men for every rail made as heretofore. The prices paid in 1885 are to be made the basis, and the agreement is to stand until 1891."

Thus far the employes have taken no decisive action, but the sentiment is apparently unfavorable to the proposition. The works have been idle, owing to a 10 per cent reduction in wages, for three months past.

CONTRACTING NOTES.

Machinery and supplies wanted. See page xiv. Contracts open will be found on page xix. New contracts this week: No. 830, Sewerage; No. 831, Water-Works; No. 832, Extension of Breakwater; No. 833, Dredging; No. 834, Water-Works; No. 835, Construction of Lock and Excavation of Channel; No. 836, Iron Bridge Superstructure; No. 837, Street Railway; No. 838, Cast Iron Pipe; No. 839, Electric Lighting; No. 840, Bridge Repairing; No. 841, Engines.

GENERAL MINING NEWS.

ALABAMA.

RANDOLPH COUNTY.

We are officially advised that the Gold Ridge placer mines have started up under favorable auspices after lying dormant for some years.

ARIZONA.

The Arizona Central Railway Company has been organized for the purpose of building a system of railroads from Phoenix. One line will run to Prescott, one to Globe, and one to Yuma. The capital stock is \$750,000. It is said that over \$300,000 has already been subscribed.

The long talked of sale of the Monarch and Hercules mines in Cababi District has finally been effected. The mines were purchased by Chicago parties for \$50,000. A mill is to be erected on the properties.

Our correspondent, Mr. John F. Blandy, mining engineer, sends us the following from Prescott under date of the 10th inst.: Our winter weather still holds with unusual severity, so much so as to silence the "oldest inhabitant." It has very much impeded mining operations, and quite suspended the hauling of ores to the sampling works. It is "an ill wind that blows no one good," and so whilst the miner mourns the placer man smiles. To him it means a longer use of the sluice box and less rocker work. There are still a good many at work along the gulches that run down from Mount Union, and many of them will tell you of their work at Deadwood, Alder Gulch, Frazier River, California Gulch and the American Fork, for they have worked at all those places and finally made their camp in the gulches of Yavapai.

They live to some extent on the memories of the past, and delight in telling you how "they struck it rich" at this or that place. Ask them how much they get, and they will tell you "two to five dollars per day and sometimes a nugget," but they fail to count the

days they lay idle waiting for water or in getting ready for the water when it does come. They are the independent spirits, however, as shown by the answer I received one day when I asked one, when he was lamenting over his poor piece of ground, why don't you go to the mines, where you can get three or four dollars per day. "I would rather work for one dollar per day than be 'bossed' by somebody else for three or four dollars." Withall they turn out a good deal of gold in the course of the year from the bars and flats of Lynx, Big Bug, Hassayampa and Granite creeks, besides the many small gulches running across the gold ledges, all of which help to swell up the sum total as reported by Wells Fargo & Co. There is but one "hydraulic" to my knowledge in the country, and that is on Lower Lynx Creek, which is now making a very successful run, and judging from the amount of snow which has fallen this winter, their campaign will be an unusually long one this year. It seldom has lasted longer than six to eight weeks.

Good reports are coming in from all directions about the mines and new discoveries.

The most conspicuous at present is the Boggs mine in the Big Bug District. The latest report is that they are down 90 feet, vein 7 feet wide and no hanging-wall, all shipping ore. The following statement in reference to the value of the ore is from the Prescott Courier, March 3d, assays by J. J. Lynch, of the sampling works:

Copper ore—	Silver..24 ounces.	Gold.....	3 ounces.	Cu. 13 per cent
Copper glance—	Silver..24 ounces.	Gold..	2 8-10 ounces.	Cu..32 per cent
Black ore—	Silver..12 ounces.	Gold....	3½ ounces.	

The Sadie Belle, an extension of the Boggs, gave 4¼ ounces gold and 22 per cent copper.

Another mine of the same district, the Hackberry, gave \$15 gold and 33 per cent copper.

From this you will see that the Boggs is destined to be a leading mine in this country. I hear that a Colorado expert has reported very favorably upon it.

In this district is also located the Lottie mine. It has a 10-stamp mill which was erected last year. This mill was formerly at the Poland mine, a few miles further up the creek, and was built under the direction of John A. Church, M.E., formerly of Tombstone. The ores were concentrating lead ores, and the jigs and circular slime tables were very successful, but the ore gave out and hence the removal.

Not being suitable for the Lottie ores, it was a failure, and now, having provided some pans and settler, they are preparing for a new trial.

On the divide between the head of Big Bug Creek and Lynx Creek is the Middleton mine. There are two shafts, one 117 feet deep and the second 70 feet. The assorted ores, principally argentiferous galena, go \$90 to \$100 per ton, a good many tons of which have been shipped, and a large amount of low-grade ore, \$40 to \$50 per ton, lies on the dumps ready for concentration. All of these properties are in the hands of the original discoverers, and of course very active work can not be carried on upon them for want of means. There are many other claims within the district, but the above mentioned are the most prominent. More than half of the district is well wooded with pine, juniper and oak, and water for milling purposes can be had for most of the year.

The general news of the country is cheering and the people more sanguine of a lively time as the season advances. The starting of the United Verde this week is good news to all, especially the teamsters, as the freighting of coke and supplies in and copper bulhon out to the railroad will give them plenty to do. The building of the railroad has reduced the length of the haul about one half, or 30 miles. We are awaiting the report of the English experts on Copper Basin with the hope that all will be favorable to an early start of smelters at that point.

I have read with much pleasure your editorial and the two letters of "Blauvelt" and "Quartzite" in the March 3d number of the JOURNAL. You properly state the "difficult position in which one is placed as denouncer of such injurious schemes, but it is difficult to see how "ultimately his interest would be advanced" by such exposure. All he gets is a curse for not minding his own business. Experience shows that if you prove to be a would-be investor that he is being swindled, he will curse you for proving to him that he is making a fool of himself, and the would-be seller damns you for your interference. Between duty and such results it is difficult to choose. This section of country has had its examples. The game is the same every time and it is strange that investors do not "tumble to it." They begrudge the payment of a proper fee for a proper examination and report by some one competent and with knowledge, experience, and with sufficient honesty to make such a report. It is the old case of pay the man for doctoring your horse or dog at once, and don't dispute his bill, but let the family physician wait as long as possible and then discount for cash. At present I believe we are free from any such schemes, as choice properties go a begging. I have heard a rumor of an attempt to sell a so-called gold mine in St. Louis, but do not know whether true or not. Perhaps as soon as we become more active and more conspicuous as a mining district the "sharks" will make their appearance. I could refer to some of the old cases of this region, but there is no use raking up the dead.

When mining companies will send out men to take charge of mines and erect mills who never saw a mill or mill in their lives and don't know whether the ores need a smelter or a mill, let them pocket their loss and blame themselves, it does not shake the faith of mining men any more than a shipwreck does the business of navigation.

GRAHAM COUNTY.

DETROIT COPPER COMPANY.—This company is now running the 120-ton furnace regularly at its full capacity.

PIMA COUNTY.

GULF COAST MINING AND SMELTING COMPANY.—The company has completed its new smelting works at Crittenden in Southeastern Arizona. The plant is a fifty-ton Bartlett hot-blast furnace, built at Portland and furnished by F. L. Bartlett of that city. The smelter was expected to start up this month.

PINAL COUNTY.

CENTRAL SILVER MINING COMPANY.—This company, organized by St. Louis parties, has purchased the Horn-Silver, Silver Reef and Gray Eagle mines, situated twelve miles south of Casa Grande. Quite a large amount of development work had been done upon these properties prior to the sale. Now three shafts are being sunk, one of them to be carried down 400 feet and the others 300 feet each. Steam hoisting works and a twenty-stamp mill have been ordered and during the three or four months pending the construction of the mill at San Francisco the work of development will continue. The officers of the company are: Jno. Stephenson, President; Sig. Mayer, Vice-President and Secretary; Jno. Gaunt, Treasurer, and W. W. Ashby, Superintendent.

BRITISH COLUMBIA.

A correspondent sends us the following: The mineral developments are not likely to be handled with vigor by Canadians. British and American capitalists have a good field here, where capital is judiciously invested and property carefully handled and likewise examined. Large capital is required, and time is essential for making access to and from any of the recent discoveries. In two years hence good mines will be in course of development; in some local parts, adjacent to accessible points, perhaps within a year. The coal-fields are being dealt in, and fresh ones opened on Vancouver Island, Dunsuir & Sons having a large force on the Comox fields in sinking two shafts north of Nanaimo. Railway construction, same time, is being vigorously pushed fifty miles onward from Nanaimo, which will ultimately be carried further north, to a point for crossing the "Narrows" to the mainland, as a "trunk line" to Alaska Territory of United States, connected with the Southern Pacific from a point near Port Angles, in Washington Territory.

CALIFORNIA.

MONO COUNTY.

BULWER CONSOLIDATED MINING COMPANY.—The Superintendent's report, dated the 18th inst., states that the company has commenced suit against the Standard to acquire title to the ground in dispute.

STANDARD CONSOLIDATED MINING COMPANY.—The annual report for the year ending January 31st, 1888, shows: Receipts—balance February 1st, 1887—\$30,797.48; bullion product and miscellaneous receipts, \$317,850.61; total, \$348,648.09. Payments—due February 1st, 1887—\$18,130.95; mill, mine, etc., for 1887 \$226,388.69; total \$244,519.64; balance \$104,128.45. The payments, \$30,000 for dividends Nos. 66 to 70 inclusive—the first four having been five cents per share and the last ten cents per share. The gross value of the bullions produced during the year was \$304,247.59 and the net value at San Francisco \$302,207.80.

Official advices to us give the following report for the month of February, the first month of the new fiscal year:

February 1st—Balance on hand	\$88,891.70
Bullion product	21,810.42
Stable account returned on errors in January voucher	55 21,810.97
	\$110,792.67
Dividend No. 71	\$10,000.00
Expenses	15,416.49
March 1st—Balance on hand	\$85,836.27

NEVADA COUNTY.

EAGLE GOLD MINING COMPANY.—The sheriff sold the Eagle Gold mine of Washington District on the 20th inst., to satisfy judgment and costs in the case of Galbraith et al. vs. Eagle G. M. Co. Towle Bros. & Co. bid in the property for \$5022, which sum covered judgments prior to that obtained by Towle Bros. & Co. All the claims against the company approximate \$70,000.

CANADA.

PROVINCE OF ONTARIO.

The discovery of gold in the Nipissing District, township of Cartier, within one mile of the Canadian Pacific track, is reported.

COLORADO.

SAN JUAN COUNTY.

OLD LOUT MINING COMPANY, LIMITED.—This company has been organized in London with a capital stock of £105,000, shares £1 each, to acquire and work a number of silver-lead properties on the east slope of the Poughkeepsie Gulch, about seven miles from Ouray, on the Denver & Rio Grande Railway, namely, the Old Lout, Accidental, Michigan Girl, Sawtooth and Gipsy Queen lodes, comprising 54 acres. The workings hitherto have been chiefly confined to developing the Old Lout mine, from which has already been obtained and sent to market, it is reported, 1480 tons of high-grade ore, which, after deducting the cost of carriage and smelting charges, have yielded a net profit of \$245,000, showing an average of \$166 a ton, from which must be deducted the cost of mining, and this, it is estimated, will not in future, after the tunnel has intersected the vein, exceed \$10 per ton. No mills or expensive reduction works will be required, as the ore will be forwarded direct from the mine to various

smelting works. The venders, who have received \$39,000 in cash and \$35,000 in fully paid shares, have undertaken to retain their shares for at least 12 months from the formation of the company. The properties have been examined by Capt. James K. Harvey, M.E., and Mr. T. E. Schwartz, M.E. Mr. John Darlington is the consulting engineer.

SAN MIGUEL COUNTY.

BELMONT.—The sale is reported of this mine to Cincinnati capitalists for \$150,000. The *Telluride Journal* says that the mine has one of the largest and richest gold veins in this camp. It is explored only to a depth of 135 feet. The ore body varies in width from two to fifteen feet, with an average of at least six feet. It is very easily mined, and is perfectly free milling. Dr. Munson, of the Denver Mint, while here last season and in 1886, took samples from the crusher at the mill. The results of these tests varied from \$30 per ton to \$150 in gold, and the average of the several samples was, we believe, \$91 per ton.

DAKOTA.

LAWRENCE COUNTY.

IRON HILL MINING COMPANY.—The smelter has begun operations on custom ore. The local papers state that no Iron Hill ore is under treatment at present. Little or nothing can be learned of the mine. Day and night shifts are working in the Home Run.

IDAHO.

ALTURAS COUNTY.

QUEEN OF THE HILLS MINING COMPANY.—The United States land office in Haily has been advised from Washington that its decision was sustained by Acting Commissioner Stockslager in the case of the Queen of the Hills Mining Company vs. the Broadford Townsite Company. The townsite was located under the U. S. townsite-laws and afterwards the Queen of the Hills mining claim was located, overlapping it. The decision was in favor of the Queen of the Hills, on the ground that the evidence showed that the land was known to be mineral at the time of the townsite entry, which was illegal. The real effect of the decision is to confirm the Queen location.

SHOSHONE COUNTY.

The sale is reported of the Emma, Last Chance and Republican Fraction, located northerly from the Bunker Hill, and on the same vein, at Wardner. These mines, says the *Spokane Chronicle*, have been energetically developed during the past two years. All are covered by United States patents. A. M. Esler, representing the Helena syndicate; Charles Sweeney, of Wardner, and Frank Moore, of Spokane Falls, being the purchasers. It is said that it required \$75,000 to purchase the controlling interest in two of the mines alone—in the Emma and Last Chance mines. A. M. Esler has the management of the property. Mr. Esler has secured E. C. (Lum) Ray as his superintendent. It is the intention of the syndicate to erect concentrating works this season, and additional development work will be vigorously prosecuted.

KENTUCKY.

WHITLEY COUNTY.

NORTH JELICO COAL COMPANY.—This company, which owns about 2000 acres of coal lands near Woodbine, is about to begin active operations.

MEXICO.

The Mexican *Financier* reports the following: The Department of Public Works has authorized Mr. Thomas Braniff, by himself or a company he may organize, to proceed at his own cost in the exploration of mines of all kinds which may be found in the Puerto del Oro, Distrito de Mina, State of Guerrero, within a square of 20 kilometers on each side. The region is known to contain high-grade gold ores.

Mr. C. F. de Lander reports to the Department of Public Works regarding his recent exploration of the quicksilver deposits in the 10th Canton of the State of Jalisco. He recommends careful work there to ascertain if the deposits can be worked profitably. He thinks that by using diamond drills an economical examination can be made.

A concession has been granted to Messrs. Pedro Escarzaga & Co., for the exploration and working of mines of all kinds, gold placers, and coal deposits in the Mineral de la Sierra, Municipality of San Gregorio de Bosos, Partido de Santiago Papasquiaro, State of Durango, within a parallelogram 20 by 15 kilometers. A concession has been granted to Mr. Lauro Carrillo for the exploration and working of mines of all kinds and gold placers in the Mineral de Yoquibo, Canton Raton, State of Chihuahua, within a parallelogram 25 by 15 kilometers.

BATOPILAS MINING COMPANY.—Mr. Alex. R. Shepherd, general manager of this company, has just submitted to the directors the following condensed statement of the operations for the first four months of its existence, viz., November 1st, 1887, to March 1st, 1888:

Products from November 1st, 1887 to March 1st, 1887	\$248,009.25
Operating expenses	\$101,122.71
Retirements	5,118.60
Supplies	5,025.71
Gain	\$136,742.14

He says: "I am happy to inform you that the mines are to-day in better condition than I have ever known them. Roncesvalles, San Miguel and Camuchin yielding at last advices (March 10th) \$10,000 of first-class ore per week.

"The following quotation from a report of the superintendent of Roncesvalles is equally gratifying, as the shaft referred to is the one being sunk to meet the Porfirio Diaz tunnel when it shall have cut the Roncesvalles vein: 'No. 1 shaft (or Porfirio Diaz) is now 82 feet below the Penasquito tunnel, and has produced

large quantities of good, low-grade ore all the way down, also a fair quantity of native silver, some of it being of the most massive kind, well mixed with sack and ruby silver. The vein is six feet wide.'

"I have also to inform you that the compressors and drills to be used in the driving of the tunnel, the electric plant for lighting the first 2000 feet, other machinery for the works, and one year's stores and supplies are now being shipped to Mexico."

NEW SAN ACASIO MINE AND FREEHOLD LAND COMPANY, LIMITED.—This company has been organized in London, with a capital stock of £400,000, shares £1 each, for the purpose of purchasing or otherwise acquiring the San Acasio mine and freehold land near Zacatecas, in the State of Zacatecas, and the rights thereto, and to purchase or otherwise acquire other land, mines, or property in the same State, and to work the mines therein respectively.

SONORA MINING COMPANY.—In a circular issued to the stockholders, the Secretary announces that, by the sale of preference shares, the company has ample funds at its disposal, and is now enabled to order, in addition to the 10-stamp battery already in place for treating high-grade ores assaying 150 ounces to the ton, a 100-ton mill for the treatment of the lower-grade ores assaying 40 ounces to 60 ounces to the ton. The mill, which began crushing ore and turning out bullion on September 15th, 1887, was severely damaged by the cyclone of October, 1887, and was stopped in its workings until fresh portions of machinery, to replace the damaged parts, arrived from Chicago. The repairs having been completed, the mill started crushing again on January 30th, 1888, on the rich ores above referred to. There is now a large quantity of this ore lying at the mill ready for treatment, and a further large quantity at the mine ready to be transported to the mill.

MICHIGAN.

COPPER MINES.

COPPER FALLS MINING COMPANY.—Reports state that several more masses of copper recently have been taken out at the Owl Creek vein. Two heads of stamps are run at the mill, and it is probable that the other two heads will be put in operation shortly.

IRON MINES.

CHAPIN MINING COMPANY.—The company has discharged a large number of men. This step was made necessary, says the *Norway Chronicle*, by the fact that the company has sold no ore for this year's delivery, and that, having more than 100,000 tons in stock at the mine, it was not deemed advisable to increase the amount in as great a ratio as has been done so far this year.

MISSOURI.

BATES COUNTY.

KEITH & PERRY COAL COMPANY.—Dispatches from Rich Hill report that an explosion occurred in the Keith & Perry mine No. 6, at 12:10 o'clock P.M., on the 29th inst. The first information received reported a large loss of life, but dispatches to-day indicate that it was less serious than at first supposed, though at least three explosions occurred; and perhaps thirty miners were entombed, many of whom undoubtedly perished. Nearly every man of a rescuing party was burned. The miners were mostly negroes who came from Springfield, Ill., when the mine was opened less than a year ago. Rich Hill is a mining town of 5000 inhabitants, situated on a branch of the Missouri Pacific Railroad.

MONTANA.

MADISON MINING AND REDUCTION COMPANY.—This company has been organized with a capital stock of \$1,000,000, shares \$100 each. The main office of the company is to be located in Minneapolis, and the nature of business is the purchasing and development of mineral lands in this territory. The incorporators are George C. Rippey, A. B. Jackson and J. B. Atwater, of Minneapolis; C. K. Davis and E. T. Goodrich, of St. Paul; D. F. Morgan and Albert Lea, of Minnesota, and N. D. Johnson, Virginia City.

BEAVERHEAD COUNTY.

HECLA CONSOLIDATED MINING AND REDUCTION COMPANY.—The smelter at Glendale is now running two stacks, and as soon as the water season opens the full plant will be put in operation. The company has not been running full force for nearly two years. During the winter the company has been working a large force at the mines at Hecla, and has developed, besides furnishing sufficient ore to keep the plant running, a large surplus.

NEVADA.

The increase of business done at the Carson Mint is such, it is said, as to warrant Director Kimball, of the Mint, to say the orders for the discontinuance of work will be recalled, as an appropriation will undoubtedly be obtained to continue the work at the Mint.

ESMERALDA COUNTY.

BISMARCK MINING COMPANY.—The owners of the Bismarck mine, at Candelaria, have leased it to the Bismarck Mining Company, a California corporation, for one year. The company is to pay the owners 10 per cent of the gross yield of the mine.

STOREY COUNTY—COMSTOCK LODGE.

We take the following from the *Virginia City Chronicle*:

CHOLLAR MINING COMPANY.—The daily ore product averages 65 tons, extracted from the joint Potosi slopes. The main incline is now open down to the Suro Tunnel level.

CONFIDENCE MINING COMPANY.—The ore shipments from the Confidence 1100 development will be increased to 150 tons by the 1st of April. The average value of the ore is in the neighborhood of \$40 per ton.

CONSOLIDATED CALIFORNIA & VIRGINIA MINING COMPANY.—During the week ending the 17th inst. 1201 tons of ore were shipped to the Morgan mill and

1975 tons to the Eureka mill. The average assay value of all the ore worked at the above mills during the week, according to battery samples, was \$38.63. The bullion produced up to the 21st inst. amounted to about \$200,000.

GOULD & CURRY MINING COMPANY.—On the 250 level and 300 level prospecting for ore still continues; 50 tons of fair grade were extracted during the week ended the 17th inst.

SAVAGE MINING COMPANY.—Daily ore shipments of 50 tons are made to the Rock Point mill. The Vivian will also shortly run on ore from the mine. The February product was 4,116 tons of ore, yielding bullion valued at \$81,086.26. Explorations from the 400 to the 950 are adding to the ore area.

NEW MEXICO.
GRANT COUNTY.

FRANCKLYN MINING AND SMELTING COMPANY.—This company has been organized at Deming by H. C. Francklyn, Wm. Buckley, W. T. Giles, J. H. Quigley, Geo. W. Williams, Geo. C. Bentz, and A. L. Bassett, for the purpose of mining and smelting ores from the Contention, Antelope, Fraction, Llewellyn, Terror, Extension, Yellow Jacket, Chance, Cincinnati, Ohio, Plumb Line, Francklyn, Kangaroo, Sheridan and other mines in the Tres Hermanas District.

SOCORRO COUNTY.

MAGDALENA CONCENTRATOR COMPANY.—The company's works at Kelly have started up. This plant has a capacity of 50 tons a day.

NEW YORK.

MILLERTON IRON COMPANY.—This company of Irondale has purchased the iron ore mines formerly operated by the Dutchess Mining Company, the National Mining Company and the Riga Mining Company. It is the intention to add to the equipments so as to largely augment the output. The ores taken from the seven mines now owned by the company are of the brown hematite variety, unusually rich in iron, and some of them are close to the Bessemer limit of phosphorus. All the ores have been thoroughly tested in large quantities at blast-furnaces and have proven satisfactory.

NORTH CAROLINA.

The well-known firm of Henry R. Worthington, New York, is now building a large pumping plant for an English company in North Carolina which has recently purchased some mining property in that State. From the size of the machinery, the volume of water they will have at their disposal, as well as the magnitude of the plant in general, it is thought they will be in a position to make such a test of the gold deposits of that State as has not yet been done, and if it shall prove a success there will, no doubt, be a great revival in the mining properties of the section.

OHIO.

The tests made of Lima oil for fuel have demonstrated, says a correspondent of the *Pittsburg Times*, that it can be used successfully against coal for manufacturing purposes. The Standard Oil Company has spent \$500,000 finding a use for Lima oil, not including the cost of the large refinery erected by them in the Ohio oil field. For nearly two years they have been constantly making experiments, and for nine months a corps of men have been engaged in introducing Lima crude as fuel, mostly for manufacturing purposes, and it is stated that the company is now furnishing manufacturing establishments in 217 cities, covering 20 States and territories. Many hotels use it and it is likewise in use in some private houses. It is also stated that many of the rolling-mills in Chicago and St. Louis use nothing but Lima crude for fuel.

OREGON.

OREGON LAND AND INVESTMENT COMPANY.—This company has been organized at Portland, where the principal office will be, with a capital stock of \$100,000, shares \$100 each, by George H. Durham, H. C. Stratten and R. L. Durham. The objects of the company are to buy, rent and lease property of all kinds; contract for the construction of railways and other transportation lines; build and operate steamboats; develop mining properties, etc.

PENNSYLVANIA.

COAL.

It is reported that a large vein of cannel coal has been found at East Brady, Clarion County.

CAT'S RUN COKE AND IRON COMPANY.—This company has just been organized by Fayette and Westmoreland County capitalists. One hundred ovens are to be built and 300 more will be added in the summer.

LEHIGH LUZERNE COAL COMPANY.—This company's loan, which is due June 1st, 1888, will be exchanged by the Fidelity Trust Company, Philadelphia, for an equal amount of the Lehigh & Wilkes-Barre Coal Company's 5 per cent consolidated mortgage bonds. The exchange is now being made at the office of the Fidelity Trust Company, interest being paid on the Lehigh Luzerne Company's loan to January 1st, 1888, when interest on the new loan began.

PHILADELPHIA & READING COAL AND IRON COMPANY.—The gross receipts for February amounted to \$288,443.55, and the expenses were \$408,918.12, making an increase in expenditures over receipts of \$125,475.17.

OIL.

Exports of refined, crude, and naphtha from the following ports, from January 1st to March 24th.

	1888.	1887.
	Gallons.	Gallons.
From Boston.....	400,038	1,172,520
Philadelphia.....	23,039,002	28,679,790
Baltimore.....	965,514	1,894,689
Perth Amboy.....	3,310,491	3,365,516
New York.....	81,233,182	76,953,290
Total exports....	108,948,227	112,065,805

TEXAS.

INTERNATIONAL SMELTING-WORKS.—These works, erected at El Paso by C. C. Fitzgerald, were started up on the 24th inst. The capacity of the furnace is sixty tons, with facilities for increasing as business increases.

EL PASO SMELTING COMPANY.—The United States District Attorney has filed a suit against this company of El Paso under the statute forbidding the importation of labor under contract. The agent of the company last June went to Chihuahua and engaged a large number of Mexicans to work in the smelter for \$1 (Mexican money) per day and paid their fares to Paso del Norte. The officers of the company say the men were engaged before the existence of the law and claim that when they arrived at Paso del Norte they were given the option of remaining in Mexico or crossing the river to El Paso. Most of those engaged voluntarily crossed the river and accepted employment.

UTAH.

ALTA MINING AND SMELTING COMPANY.—This company has been organized by Charles M. Howard, Hamilton G. Howard, James F. Joy, James Joy and Henry B. Joy. The business will be mining and smelting copper in Detroit mining district. The company owns the Alto mine, the Keystone and Hardstone claims. The capital stock is \$150,000; shares, \$100 each.

SUMMIT COUNTY.

ONTARIO SILVER MINING COMPANY.—We are officially advised that the total product of this company for 1887 was \$1,785,630.47; dividends paid, \$900,000; surplus on hand, \$701,324.08 on January 1st, 1888. No. 2 shaft has been sunk to the 1200 level, and operations have already been commenced to run drifts on that level.

VERMONT.

WINDSOR COUNTY.

ELIZABETH MINING COMPANY.—We are officially advised that the mine owned by this company at South Stafford, and which has been idle for some time, has now started up in a moderate way, and it is thought that copper can be produced at as low, if not at a lower figure, than at any mine in the country, barring one or two in the Lake region. Work is near the surface. The property is situated about seven miles from Sharon, on the Vermont Central Railroad. There is apparently an unlimited supply of 6 per cent to 7 per cent sulphuret that can be mined at a cost of \$3 or less, and requires no fluxing in the water jacket furnace. Connellsville coke costs \$9 per ton, and wood \$3 per cord. Ordinary labor about \$1 per day.

VIRGINIA.

ROCKBRIDGE COUNTY.

It is reported that the Irish Creek tin mine property at Lexington has been sold to Northern parties.

WISE COUNTY.

PIONEER COAL AND COKE COMPANY.—This company, which is carrying on operations at Poteet Gap, near Buckeye station, K. & O. R.R., on Cross Mountain, is building a standard gauge railroad connecting with the K. & O. R.R. near Elk Gap Tunnel, thence along side of mountain through Poteet Gap to its coal openings, a distance of about 3½ miles. The coal which is entered on the New River side of mountain shows, it is said, a vein well opened, of 4 feet 7 inches thick. Some experimental tests made show that this coal will make good coke, and a few ovens of approved pattern for testing it practically, are now being built. It is expected to have the road completed early in July. The company will then have a mining capacity of 400 tons daily, and will push work vigorously.

It is reported that the South Atlantic & Ohio Railroad Company has contracted for the building of 300 coke-ovens at Big Stone Gap.

WASHINGTON TERRITORY.

Our special correspondent sends us the following: The "smelters" in this and neighboring territories make little progress in development, owing to inaccessibility of material and want of ore to smelt. Locating claims and waiting for speculative purchasing of them, and organizing companies, cripples smelting operations. Coal-fields are in a fair way of increased output and increased development in King and Pearce counties. The coming season will be sensational rumors and sensational booming of claims in Okanagan and Salmon River districts. The smelter being erected at Tacoma has not yet been fully graded. For some few months a dispute has arisen between interested parties which caused Dennis Ryan to stop work. The manager is retained, indicating a disposition to proceed with the work of constructing as soon as the dispute is settled, but that may not happen immediately. Meanwhile, the development of mining claims may get into a fair way to supply ore for such works as are here in contemplation, with substantial support.

The recent discoveries in Okanagan and Colville districts will soon be tested, and those across the "boundary line," in British Columbia, are so inaccessible, that very little development will be made for supply of ore, so that "smelters" can not look to purchasing regular supplies to keep large "smelters" going without having direct supply of mineral and a regular output for smelting. The Idaho mines in and around Coeur d'Alene will be insufficient, notwithstanding the booming of interested parties in mining ventures. There is an abundance of laborers for all industries.

WEST VIRGINIA.

HARRISON COUNTY.

FARLAND COAL AND COKE COMPANY.—This company has been organized with a capital stock of \$1,000,000 to mine coal and manufacture coke, etc., by Joseph T. Farland, of Clarksburg; William Stevenson,

Thomas W. Johnson and Robert M. Blundon, of Baltimore, and William C. Page, of New York. The company succeeds Joseph T. Farland.

COAL TRADE REVIEW.

New York, Friday Evening, March 30,

Statistics.

Production Anthracite Coal for week ended March 24th, and year from January 1st:

TONS OF 2240 LBS.	1888.		1887.
	Week.	Year.	Year.
P. & Read, RR. Co.	125,345	1,296,567	1,600,742
Cent. R. R. of N. J.	102,200	1,010,760	972,864
L. V. RR. Co.	143,925	1,572,043	1,491,508
D., L. & W. RR. Co.	137,036	1,555,044	1,250,109
D. & H. Canal Co.	91,391	1,027,235	987,621
Penna. RR.	58,316	783,927	693,336
Penna. Coal Co.	17,793	336,927	290,517
Total.....	676,006	7,582,503	7,292,697

Increase..... 289,806
Decrease..... 223

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

Production for corresponding period:
1883..... 3,396,308 | 1885..... 5,171,753
1884..... 5,371,710 | 1886..... 7,012,690

Production Bituminous Coal for week ended March 24th, and year from January 1st:

Tons of 2000 pounds, unless otherwise designated.

	1888.		1887.
	Week.	Year.	Year.
Phila. & Erie RR.	66,291	11,131	.....
*Cumberland, Md.	4,424	95,748	578,554
Barclay, Pa.	.....	44,882	58,345
Broad Top, Pa.	.....	.....	.....
H. & Broad Top, RR.	.....	95,748	105,451
Clearfield Region, Pa.	.....	.....	.....
Snow Shoe	2,884	36,049	43,871
Karhaus (Keating)	5,090	52,098	48,976
Tyrone & Clearfield	78,040	815,676	709,324
Nipton	1,314	11,549	.....
Allegheny Region, Pa.	.....	.....	.....
Gallatin & Mountain	16,467	228,639	195,296
Poconatas Flat Top Coal	.....	.....	.....
Norfolk & West, RR.	32,135	362,825	274,108
Kanawha Region, W. Va.	.....	.....	.....
Ches. & Ohio RR.	36,133	455,100	358,211
Total.....	242,778	2,844,267	2,372,130

* Tons of 2240 lbs. † Report not received.

WESTERN SHIPMENTS.

	1888.	1887.
Pittsburg Region, Pa.	.....	.....
West Penn RR.	6,054	95,215
Southwest Penn. RR.	1,910	26,495
Pennsylvania RR.	5,439	67,487
Westmoreland Region, Pa.	.....	.....
Pennsylvania RR.	41,078	371,097
Monongahela Region, Pa.	.....	.....
Pennsylvania RR.	4,328	73,480
Total.....	58,809	533,774
Grand total.....	301,587	3,478,041

Production of Coke on line of Pennsylvania RR for week ending March 24th, and year from January 1st, in tons of 2,000 pounds: Week, 66,338 tons; year, 896,976 tons; to corresponding date in 1887, 1,024,718 tons.

Anthracite.

Since the date of our last issue there have been two meetings of the managers of the anthracite trade to perfect arrangements for the conduct of the business for the current year, one in Philadelphia on Monday, March 27th, the other in this city on Wednesday last. The Philadelphia meeting seems to have been one of perfect harmony, and held out the promise of a hearty co-operation. At the New York meeting there seems to have been a unanimous opinion on the subject of prices, but, as we learn, the representative of one of the large companies was not in a position to declare that his company would consent to any abridgement of tonnage should it become necessary, if they had a market for their coal. The value of such an agreement, with so large a disturbing factor left unsettled, is not of a character to be entirely reassuring. The homely old adage about the penny and the cake was evidently lost sight of at this meeting. While the market for the week has been only fairly active, it has been mere a waiting market than a weak one. How much it will be strengthened when the true inwardness of the New York meeting has been generally made known remains to be seen.

Bituminous.

There is nothing new in this market. Several railroads are in the market, but, so far as we know, no contracts have been closed. There is no lack of coal since the embargo caused by snow has been lifted. Prices remain the same as they were given in our last issue: Free on board at Philadelphia, Norfolk Newport News, Baltimore and Georgetown, \$2.60 per ton of 2240 pounds. Free on board at South Amboy, Perth Amboy, Elizabethport, Port Johnson, Weehawken, Hoboken and Port Liberty, for shipment to points on the North River south of Fifty-seventh street, and to points on the East River west of Hell Gate, \$3.25 per ton. Delivered alongside in New York harbor south of Fifty-seventh street, North River, and on the East River west of Hell Gate, \$3.50 per ton; and \$3.15 f.o.b. to ports in the East.

Boston.

March 29.

[From our Special Correspondent.]

The anthracite branch of the coal market is very dull. Owing to the fact that receipts at tidewater have not been very heavy as yet, the market has not weakened in f.o.b. quotations to any material extent, notwithstanding the extremely light demand. As the

season is now closing, the tendency of prices is downward.

The bituminous branch continues to well-nigh monopolize the attention of this market. No great business is being done in this line, but there is some life and activity and outlook for a good movement. The nominal quotation of \$2.60 f.o.b. at all ports is still quoted, but the public are beginning to distrust it. No contract prices have yet leaked out, but it is becoming evident that \$2.60 f.o.b. is only the nominal price. The season freight contracts which the barge lines are making practically permits a large buyer to assure himself of a delivered price at the outset, something which could not be done last season. I hear that, on account of the terms or price, or both, at which a recent contract was taken, all is not so lovely in the Seaboard Association (as the pool is called) as it was, and there may be some developments. There is considerable hustling about among coal salesmen, and as the trade evince a willingness to buy, more contracts will be shortly reported.

To look at freight rates one would never suppose there was a vessel owners' association, and indeed, there is one only in name. No attempt is being made to make minimum rates, and shippers are going as they please, or better, as they have to. The situation wholly favors the shipper. Rates are lower than usual at this period. There appears to be no limit to the aggression of the barges. I learn that barge owners are making season contracts for delivery from Hampton Roads, said to be at about \$1 per ton. If rates are so low now, what will vessels get in the summer?

We quote, exclusive of discharging: New York, 70. @80c.; Philadelphia, 90c. @ \$1.00; Baltimore, \$1.05 @ \$1.10; Newport News and Norfolk, 90c. @ \$1.05; Richmond, \$1.15 @ \$1.25. Retail trade is very quiet. We quote delivered prices, 2000 pounds to the ton, as follows: Stove, \$6.75; Egg, \$6.50; Broken, \$6.25; Franklin, \$8.00; Lehigh Egg, \$6.75; Broken, \$6.50; Bituminous coal, on the wharf, \$4.50.

Buffalo. March 29.

[From our Special Correspondent.]

Tugs were busy during past forty hours breaking up the ice in our river so as to allow vessels to be moved from their winter quarters to the ship-yards for repairs, painting, etc. Last year tugs were navigating on March 17th. No signs of opening the lake yet observable.

In the River and Harbor bill \$200,000 are appropriated for Buffalo and \$10,000 for Tonawanda. The latter sum is for dredging as well as for destroying rocks in Niagara River to facilitate the passage of vessels.

With regard to opening coal freights, brokers and vessel owners are beginning to figure, and as the available tonnage now here is small, they consider that they will have their own way, and talk of 80c. to Chicago and Milwaukee. It is thought, however, that all the tonnage may be secured at 75c., the opening rate of last year; in 1886 and 1885 50c. only was obtained. Down freights on grain from Chicago to this port are low, only 2 1/2 c. for corn, 2 1/2 c. for wheat, and 1 1/2 c. for oats are the latest contracts, so that up freights must be high to make up a paying average.

It is computed that the tonnage capacity available for the start this year at Buffalo is about 60,000 tons, 10,000 tons less than last year. This estimate does not include the propeller line boats, nor a few lumber craft, which will probably go up light.

Charters for ore from Marquette to Wyandotte (near Detroit) have been made at \$1.67 @ \$1.70 per ton. The Parker & Millen fleet of about 20 vessels have been put in at these figures.

Nothing new in the anthracite coal trade at this port. Business of a hand-to-mouth character. Bituminous quotations said to be cut quite heavily, and a moderate demand manifested.

A new schedule may be expected next week, as it is understood that opening rates will be announced then. Coke easy and a shade lower. Trade moderate, about an average.

The rates of insurance fixed by the general agents and managers of the marine insurance companies at their meeting on the 25th inst. shows an advance, as compared with rates last year, from 25 to 50 per cent on coal, about 25 per cent on iron ore and pig-iron, and the same on freight. The season rates on up merchandise were left over for future action, as also was the formation of a hull pool. The advance was caused by the desire of the companies to recoup their losses during the disastrous months last fall.

Philadelphia. March 29.

[From our Special Correspondent.]

The conference of the leading coal procurers at Philadelphia, on the 27th inst. did not bring about, and was not so intended, a basis of future action. The purpose of Tuesday's meeting was to ascertain the sentiment of the anthracite presidents with reference to harmonious action in the direction of restriction. All the regions were represented, and it was decided to restrict sufficiently to maintain prices. A meeting was held at Bethlehem on Thursday, and steps taken to harmonize on tolls. The meeting to be held in New York next Tuesday will probably terminate negotiations. The Pennsylvania will maintain its customary position of apparent neutrality. The Lehigh Valley interests will be placated. The question of allotment at this writing is still open; but the figures have been thoroughly gone over and only the formal assent of the verbally contracting parties is needed to give the agreement force.

Pittsburg. March 29.

[From our Special Correspondent.]

The coal market since our last has undergone no quotable change. The Ohio River continues in good navigable condition. The tow-boats have all departed, leaving the wharf bare, something that don't occur often. Shipments west and south have been liberal. Prices in the lower markets are down to a low figure.

PRICE OF COAL PER 100 BUSHELS = 7600 LBS.
First pool..... \$4.75 Fourth pool..... \$3.25
Second pool..... 4.25 Railroad coal..... 5.00
Third pool..... 3.75

In Connellsville coke there is no market at present. We omit quotations, as they contain no information. Until the big fight is over the rates will range from \$1 up.

The conference between the coke syndicate and coke producers in Pittsburg on Tuesday resulted in the complete disruption of the syndicate. The latter wanted to advance prices to \$1.50 per ton, but the producers refused to consent unless they were conceded more advantageous terms for their product, and the meeting broke up without reaching a settlement.

FREIGHTS.

Southern Pig Iron Freight Rates.—The Southern Railway and Steamship Association has issued a new sheet of rates of freight on pig-iron from Birmingham and Chattanooga, which goes into effect on the 1st prox. It is based on a \$3.10 rate from Birmingham, and a \$2.60 rate from Chattanooga to Cincinnati, Louisville being \$2.85 and \$2.60; St. Louis, \$3.35 from both places; Chicago, \$4.35 and \$4.10; Cleveland, \$4.35 and \$3.85; and Pittsburg and Wheeling, \$5 and \$4.50.

The latest actual charters to March 29th, per ton of 2240 pounds:

From New York to:—Boston, .75*; Bridgeport, Conn., .55; Chelsea, .80*; Com. Pt., Mass., .80*; E. Boston, .80*; E. Cambridge, .80*3c.; Fall River, .75; New Bedford, .85; New Haven, .55; Newport, .75; Portsmouth, N. H., .90*; Providence, .75.

From Philadelphia to:—Boston, 1.05*; Charleston, 1.15; Charlotte, 1.30; Gloucester, 1.35*. New York, 90; Norfolk, 65 @ 70; Savannah, \$1.00; Washington, 85.
From Baltimore to:—Bangor, 1.00; Bath, 1.15 @ 1.20; Boston, 1.00; Bridgeport, Conn., .90 @ .95; Bristol, .95 @ 1.00; Brooklyn, .90; Charleston, .80 @ .90; Fall River, .90; Galveston, 3.15; New Bedford, .90; New Haven, .90; Newburyport, 1.20 @ 1.30; New York, .90; New London, .90; Portland, 1.00; Portsmouth, N. H., 1.10; Providence, .90; Quincy Point, 1.25; Salem, 1.00; Savannah, .90 @ 1.00; Somerset, .90; Williamsburg, N. Y., .90 @ 1.00; Wilmington, N. C., 1.00.

* And discharging, 3c. per bridge extra.

MARKETS.

NEW YORK, Friday Evening, March 30.
Prices of Silver per ounce troy.

Mar.	Sterling exchange	London Pence.	N. Y. Cents.	Mar.	Sterling exchange	London Pence.	N. Y. Cts.
24	4.87	43 3-16	94 1/2	28	4.87	*	93 3/4
26	4.87	43 3-16	94 1/2	29	4.87	43†	93 3/4
27	4.87	43 3-16	94 1/2	30	4.87	...	...

* 43 @ 43 1-16. † Nominal.

Market shows no animation, and as supplies are coming in freely, prices are lower.

Foreign Bank Statements.—The governors of the bank of England at their weekly meeting made no change in its rate for discount, which remains at 2 per cent. In the past week, the bank lost £548,000 bullion, and the proportion of reserve to liabilities fell from 44.81 to 37.69 per cent, against a decrease of about 1 per cent to 48.57 at the corresponding date last year when the rate of discount was 3 per cent. The change in the proportion of reserve is not unusual at this season, on account of dividend and similar payments. The weekly statement of the Bank of France showed an increase of 1,550,000 francs in silver.

Copper.—The past week has been devoid of any special interest, and the movements have been very insignificant and transactions moderate. Very little stimulus has been given to our market by the European markets, as the approaching Easter holidays always interrupt business there to some extent for 8 or 10 days. In spite of the fact that several parcels of second-hand copper have recently been pressed on our market, this pressure was well sustained, and every lot offered was readily taken up at 16c. by the larger dealers, as a scarcity of spot copper is already felt in some quarters. We quote: Spot, 16c.; April, 16c.; May, 16-05; June, 16c.; July, 16c.

It will no doubt interest our readers to peruse the following extract from the last annual report of the Société Industrielle et Commerciale des Metaux, the President of this society (M. Secrétan), being the prominent head of the much commented on French copper syndicate. The balance sheet of the company is as follows:

	Assets.	F.	C.
Cash in hand and three per cent. Rentes.....		62,483.77	
Cash at bankers.....		20,674,993.22	
Cash at works.....		35,968.80	
Goods in warehouses and depots at Paris.....		5,969,369.53	
Various debts.....		11,742,638.58	
Goods at works and elsewhere.....		20,827,368.41	
Provisions, etc., at works.....		382,690.25	
Works, material and investments.....		21,850,916.55	
Buildings and new material.....		5,996,207.06	
Industrial investments (commandities).....		2,625,000.00	
Deposits and advances.....		178,782.83	
Dividend (1887) on account.....		1,000,000.00	
Total.....		91,846,439.00	

	Liabilities.	F.	C.
Running credit accounts.....		2,812,451.61	
Bills payable.....		13,869,648.55	
Various creditors.....		12,081,290.00	
Goods in depot.....		6,269.34	
Funds on hand for distribution for 1887.....		321,626.13	
Capital.....		25,000,000.00	
Bonds.....		18,480,000.00	
Statutory reserve.....		357,340.78	
Industrial "provisions".....		800,000.00	
Bonds redeemed on mortgage of works and material.....		1,520,000.00	
Supplementary mortgages.....		500,000.00	
Balance stocktaking, 1886.....		54,690.54	
Unappropriated balance for division for 1887.....		16,043,122.05	
Total.....		91,846,439.00	

The stock of metal was taken at the end of 1887 at £64, as compared with £39 18 s. on December 31st, 1886. This alone accounts for 6,000,000 francs out of the total profit of over 16,000,000 francs. Adding to this 800,000 francs of revenue, the board put 2,000,000 francs into a supplementary sinking fund, add 8,000,000 francs to a contingent fund, deduct the legal reserve, 6,443,122 francs, pay 6 per cent to preferred shares, or 1,500,000, give 1,166,666 francs to the directors and management. Then 75 per cent is left for the shareholders, which requires 3,500,000 francs. Of this a second dividend of 8 per cent takes 1,500,000 francs, and under Article 43 of the "Statutes" the balance of 2,000,000 francs is held in reserve for the shareholders. These further deductions leave a balance of 408,989 francs to be carried forward. A dividend of 20 francs having been distributed on January 2d, the balance will be paid on July 1st next. The meeting afterward voted an increase of the capital from 25,000,000 francs to 50,000,000 francs, by the creation of 50,000 new shares of 500 francs at 750 francs, the premium of 250 francs to be carried to the reserve. The reserves will then amount to 27,600,000 francs, against a total share capital of 50,000,000.

From the report of the Board of Directors we take the following passage: "We thus found ourselves in presence of stocks which were available or to come to hand, which might exceed the requirements of our manufacturers, as also those of customers drawing their supplies of raw material from ourselves. Although this situation was not such as to cause uneasiness, your board, from a feeling of prudence, sought to set the company beyond the reach of any unfavorable contingency. With that view it asked itself whether the company should not get rid of a portion of its contracts and stock while realizing a profit. M. Secrétan offered us the means of realizing this desire. He undertook—thus manifesting his confidence in the future of an operation due to his initiative—to buy back from the company, at a price remunerative to itself, a portion of its surplus stocks, while agreeing to return them to the company without increase of price in proportion to its needs."

From the above it will be noticed that after the proposed increase in capital has been completed, this society will have a share capital of 50,000,000 francs and about 18,500,000 francs in bonds, and about 27,500,000 reserve fund. This capital would place the society in a perfectly independent financial position for all kinds of legitimate business; but, of course, this may be quite a different matter for the large speculative enterprises in which they are now involved, although the name of their president has been put forward from motives of prudence, as the interested party. The gigantic scheme of manipulating the copper supplies of the world is a very serious matter and involves very serious consequences, and the explanation of the board of directors to their shareholders, as printed above, may safely be left to the judgment of the public who are interested in the question, and we shall simply content ourselves with the remark that the principal financial and economical authorities have found themselves unable to approve of such operations.

The exports of copper from New York during the week were as follows:

To Liverpool—	Copper matte.	Lbs.	\$14.000
By S. S. The Queen.....	Sacks 1,918	191,800	48,000
" The Queen.....	Sacks 7,872	927,448	18,400
" Britannic.....	Casks 90	112,560	18,400
" Britannic.....	Casks 90	115,850	18,500
" The Queen.....	Bars 916	87,117	14,592

To Havre—	Copper matte.	Lbs.	\$14.000
By S. S. La Gascogne.....	Casks 70	87,500	12,200
" La Gascogne.....	Pigs 114	39,062	6,000
By S. S. Numham.....	Casks 69	87,500	14,000
" Numham.....	Bars 797	224,500	36,000

To Hamburg—	Copper matte.	Lbs.	\$14.000
By S. S. Rhaitia.....	Bars 11	6 1/2 bullion	1,300

The exports of copper from January 1st, 1888, to date, were as follows:

	Copper matte.	Copper.
	Pounds.	Pounds.
To Liverpool.....	16,443,861	9,446,999
" London.....	.....	6,507,306
" Havre.....	.....	6,068,744
" Bordeaux.....	.....	694,010
" Rotterdam.....	45,000	405,349
" Antwerp.....	.....	181,076
" Hamburg.....	.....	117,093
" Leghorn.....	.....	1,789,782
Total.....	16,488,861	13,360,580

The Metal Exchange has issued the following statement, giving the exports of copper from all ports of the United States from February, 1887, to February, 1888. Exports during 1887 were as follows: Ore and matte, 25,506 tons, valued at \$2,768,873; ingot bars, etc., 12,062,536 pounds, valued at \$1,344,806; sheets, 88,266 pounds, valued at \$17,555. All other manufactures were valued at \$89,700, making a total value of

\$4,220,934. Exports during January and February, 1888, were as follows: Ore and matte, 11,891 tons, valued at \$886,144; ingot bars, etc., 10,247,587 pounds, valued at \$1,609,550; sheets, 1,626 pounds, valued at \$418. All other manufactures valued at \$21,188.

According to cable advices from Messrs. Henry R. Merton & Co., the statistics of the visible supplies of copper for the second half of March are again estimated, to show an increase of 2400 tons.

The following statement, compiled by Messrs. Henry R. Merton & Co., of London, will be of interest to our readers, showing as it does the principal copper supplies of the world and the sources of such supplies for the years 1886 and 1887:

COUNTRIES.	1887.	1886.	COUNTRIES.	1887.	1886.
EUROPE.	Long tons.	Long tons.	S. AMERICA.	Long tons.	Long tons.
G. Britain..	a1,500	a1,471	Chili.....	29,150	35,025
Spain and Portugal..			Bolivia.....		
Rio Tinto....	a28,500	24,700	Corocora...	a1,300	1,100
Tharsis.....	a11,000	11,000	Peru.....	.....	75
Mason & Barry.....	a7,000	7,000	Venezuela:	50	.....
Sevilla.....	a2,300	2,135	N. Quebrada	2,900	3,708
Portuguesa..	a856	1,258	Argentine Republic..	170	180
Other mines	a4,400	3,560	Total South America..	33,570	40,088
Germany: Mansfeld..	13,025	12,595	AFRICA.		
Other German..	a1,850	1,870	Algeria.....	150	110
Austria.....	a700	733	C. of Good Hope.....	7,250	6,015
Hungary.....	a500	500	Total Africa	7,400	6,125
Sweden.....	500	520	ASIA.		
Norway.....	1,450	2,220	Japan.....	a11,000	12,000
Italy.....	a2,500	2,100	Total Asia..	11,000	12,000
Russia.....	5,000	4,875	AUSTRALIA.		
Total Europe..	81,081	76,537	Australia..	7,700	9,700
N. AMERICA:			Total production..	224,490	319,370
U. States....	79,109	69,805			
Canada.....	1,400	1,440			
Newfoundland:					
Bett's Cove..	1,180	1,125			
Mexico: Boleo Co....	1,950	850			
Other Mexican.....	100	250			
Total North America..	83,739	74,920			

Average of visible supplies on the first of each month during the year: 54,200, 61,314, 55,220, 45,912, 50,111, 51,417, 59,703, 64,154, 60,129. Visible supply 31st March, 1887, 57,023 tons. Price, £39 10s. Visible supply 29th February, 1888, 52,593 tons. Price, £78 17s. 6d.

a Estimated.

Tin.—At the beginning of the week the tendency of this market was again downwards, but later on a little spurt was given on higher quotations from Europe, and our prices advanced somewhat. The market closes rather firm at Spot, 36½; April, 31½; May, 29½; June, 28½. Consumers orders are being received with regularity, but the quantities taken are very small. London quotes £166 spot cash, £125 3 months prompt.

Lead.—Since we last reported, this market has continued firm, and about 1000 tons more have been bought by the speculators. On a continuance of flat reports and weak quotations from Europe, our market could not resist the influence, and we close rather flat at spot, 5'10; forward, 5½ to 5'15. Consumers are still holding aloof to a great extent. Spanish lead in London, £14 5s.; English, £14 10s.

Messrs. John Wahl & Co., of St. Louis, telegraph to-day as follows:

During the early part of the week the market was strong and active, emanating principally from speculators. Common sold freely on the basis of 4'85 to 4'87½c., and Refined Corroding at 4'87½ to 4'90c., but lately speculators seem to have withdrawn from the market, and prices to-day are nominally 4'80 to 4'82½ for Common and 4'82 to 4'85 for Refined.

Messrs. Everett & Post, of Chicago, telegraph to-day as follows:

Absence of buyers is effecting a decline, and the market is very dull. Prices are a shade weaker at nominal quotations of 4'90 asked.

Spelter.—Dull. Domestic, 5@5½; foreign, unaltered. The quotations in London are £19 5s. for ordinaries, and £19 10s. to £19 15s. for specials.

Antimony.—Unchanged. Hallett's, 10½@11; Cookson's, 14@14½.

Chemicals.—The fertilizing chemical market is beginning to show signs of weakening, as most of the manufacturers are now receiving contract goods. The business of the past week has been largely of a jobbing character.

We continue to quote sulphate of ammonia at 3'35 @3'40c.; Dried Blood, high grade, 2'20@2'25c.; Dried Blood, low grade, 2'15@2'20c.; Refuse, bone black, \$17 per ton. High grade tankage is worth \$21.50 per ton, low grade \$18.50@19.

Muriate of Potash continues in good demand without change in prices, which are: April steamer shipments, 1'77½; future sail shipments, 1'72½; material on the spot brings 1'77½@1'80.

Double manure salt continues quiet; near-by lots and goods on the spot are held at 1'20; futures at 1'12@1'15.

Kaimit is in good demand, with very little available

on the spot. We continue our quotations of 11'50@12'00.

Brimstone continues dull, with the market still in favor of the buyer. We continue to quote \$20.50 as the price for best seconds on the spot. Futures are quoted at \$19.50@20, though we hear of some sales in a small way at 1'25@1'27½.

English sal soda is not in much demand, though the small stock on the spot and the difficulty of getting shipments from the other side, on account of the prevailing high freight rates, render the market very steady. We quote 1@1'15 for goods on the spot. Bleaching powder is reported to be a trifle firmer in sympathy with the English market. Newcastle bleach may be had at 1'80@1'85, but best Liverpool brands bring 1'87½@1'95 according to seller and quantity.

Acetic acid is moving fairly in accordance with consumers, current wants. Prices still vary within the limits of 2¼@2½c.

Sulphuric acid 66° is in fair demand without change in our former quotations of .90@1.10, according to seller and quantity.

Oxalic acid continues fairly active, with no break in the quotations, which remain at 7@7½c.

The situation in the chemical market during the past week is characterized by one prominent dealer as "stale, flat and unprofitable." Very little business of moment has been transacted, and no orders are placed beyond those necessary to supply current wants.

Carbonated Soda Ash, 48 per cent., continues scarce. The demand, though moderate, is steady. We report no change in the quotations of 1'25@1'27½. High test is not wanted to any extent. The quotations are entirely nominal, and remain at 1'12½@1'15.

Caustic soda ash, 48 per cent., is entirely without animation. We can quote no change in the prices given in our last. High test is in entirely the same situation as last week, "down in the dumps."

Caustic soda is without quotable change. The demand continues fair.

Refined alkali, 36 per cent. is very dull, and the quotations of 1'12½@1'15 are entirely nominal; 48 per cent goods are also without much animation.

Nitrate of soda is easier and the market dull. Goods are offering, ex vessels in port, at 2'10; ex store, 2'12½@2'15.

Quicksilver is dull and quiet at 63@65c.

IRON MARKET REVIEW.

New York, Friday Evening, March 30.

There is no change to note in the general condition of the iron market, which continues very dull, with buyers apparently utterly indifferent. Mr. B. G. Clarke, President of the Thomas Iron Company, announced on Tuesday the following prices for Thomas iron at tidewater: No. 1, \$20; No. 2, \$19; Gray Forge, \$17. These prices are in accordance with the company's usual policy of "taking the market," and will make the sale of their total production, with its established reputation, a matter of course. On the other hand, the Thomas Company have just begun making No. 1 iron, after a break of several months, occasioned chiefly by the poor supply of coal. They are behindhand in their deliveries, and not from them or from any one else can any large quantity of No. 1 iron be promptly obtained. Small lots of No. 1 continue to be quoted at \$21.50, and there have been sales on that basis.

A decidedly weaker tendency is noticeable in prices of Southern and Ohio irons, which are sold in small lots generally at concessions to secure trade.

Scotch irons continue dull, with little demand. They are weaker in Glasgow. Our cable prices are those of yesterday, no business being done to-day on the Glasgow Exchange.

No new business is reported in steel rails, although there are several large orders known to be on the market.

The demand for structural iron continues very good, and the mills are busy. Old Rails are very dull, Tees being freely offered at \$21. No new business is reported.

Louisville, March 28.

[Reported by HALL BROTHERS & Co.]

For some days past the demand seems to have changed from comparative dullness to activity, and a good round business is being done. Some of the buyers are still apprehensive, and feel a lack of confidence in the market, and are buying only for immediate requirements; but nevertheless it is a fact that large orders are being placed, principally by the larger buyers, who think prices are low. The demand for charcoal iron is improving. There have been some good orders booked for quantities ranging from 400 to 600

IMPORTATIONS AT NEW YORK DURING WEEK ENDING MARCH 23, AND FROM JAN. 1 TO SAME DATE.

Spelter.	Week. Tons.	Year. Tons.	Pig-Iron (Cont'd).	Week. Tons.	Year. Tons.	Steel Sheets, etc.	Week. Tons.	Year. Tons.
American Metal Co., Lt.	55	208	Sanderson & Sons.	2	2	Wetherill & Co.	2	2
Friedensville Zinc Co.	24	24	Stetson & Co., G. W.	730	4,800	Wolf, R. H.	54	54
Naylor & Co.	23	23	Williamson & Co., Jas.	100	1,300	Total	240	1,975
Total	55	254	Total	1,455	13,613	Corres. date 1887	20	21,584
Corres. date 1887	175	734	Corres. date 1887	2,595	16,972	Old Rails.		
Nickel.	Lbs.	Lbs.	Steel & Iron Rods.	Tons.	Tons.	Brown Bros. & Co.	668	668
McCoy & S.	5,400	46,080	Abbott & Co., Jere.	24	2,390	Crossman & Bro. W. H.	1,005	1,005
Total	5,400	46,080	American Screw Co.	70	433	Frankfort, M.	100	100
Tin Plates.	Boxes.	Boxes.	Bacon & Co.	109	300	Geisenheimer & Co.	100	100
American Metal Co.	1,990	1,990	Carey & Moen.	51	210	Henderson Bros.	200	200
Bruce & Cook	4,239	20,105	Cohn, M.	60	60	Neumark & Gross.	1,912	1,912
Byrne, I.	1,990	7,195	Dana & Co.	200	565	Stetson & Co., Geo. W.	230	230
Central Stamping Co.	1,699	7,515	Downing & Co., R. F.	23	23	Waltam & Co.	300	300
Coddington & Co., T. B.	4,590	39,965	Galpin, S. A.	35	1,139	Total	300	4,515
Corbierre, Fellows & S.	248	27,691	Heyn, A.	35	968	Corres. date 1887	2,700	42,519
Cort & Co., N. L.	1,865	27,691	Hugill, Chas.	3	3	Bar-Iron.	Tons.	Tons.
Cons. Fruit Jar Co.	837	12	Jacobus, E. Y.	12	12	Abbott & Co., Jere.	3	1,069
Crooks & Co., Robert.	1,577	15,457	Leng, J. S.	17	3	Abeel Bros.	3	3
De Mill & Co., H. R.	597	3,090	Lundberg, Gustaf.	115	115	Bacon & Co.	13	13
Dickerson, Van Dusen & Co.	1,111	58,777	Milne & Co., A.	1,031	5	Lilienberg, N.	5	5
Lalance & Gro-jean Mfg. Co.	215	2,060	Montgomery & Co.	38	38	Lundberg, Gustaf.	112	112
Lombard, Ayres & Co.	2,060	2,060	Muller, Schall & Co.	150	95	Milne & Co., A.	25	95
Merchant & Co.	356	9,081	Naylor & Co.	403	4,572	Naylor & Co.	25	25
Mersack & Co., C. S.	349	1,880	N. Y. Barb Wire Co.	20	20	Page, Newell & Co.	20	20
Morewood & Co., G.	410	2,363	Page, Newell & Co.	10	10	Philip, C. M.	12	12
Naylor & Co.	1,412	7,235	Pierson & Co.	10	10	Wallace & Co., W. H.	20	20
Phelps, Dodge & Co.	1,057	94,631	Pioiditch, F. S.	11	11	Wilson, J. G.	7	7
Potts, W. A., Son & Co.	573	37,839	Roebling's Sons, J. A.	549	549	Totals	1,381	1,381
Pratt Mfg. Co.	1,543	37,839	Walschid C. A.	5	10	Corres. date 1887	302	1,841
Shepard & Co., Sidney.	150	150	Washburn Mfg. Co.	35	35	Scrap-Iron.	Tons.	Tons.
Taylor, N. & G.	5,828	35,311	Whittemore & Co.	1,000	1,000	Brown Bros. & Co.	20	20
Thomson & Co., A. A.	5,828	13,652	Wolff & Co., R. H.	433	1,119	Burgess & Co.	172	172
Whittemore & Co., H.	375	3,804	Total	2,330	15,503	Crossman, W. H. & Co.	47	47
Wolff & Reising.	1,370	165	Corres. date 1887	1,710	28,866	Geisenheimer & Co.	565	565
Wright & Sons, Peter.	165	165	Steel Sheets, Blooms, Billets, etc.	Tons.	Tons.	Muller, Schall & Co.	15	15
Total	30,735	396,126	Abbott & Co., Jere.	13	194	Neumark & Gross.	36	36
Corres. date 1887	74,325	374,975	Arkell, Jas.	17	17	Purdon & W.	75	75
Tin.	Tons.	Tons.	Bowker, C. F.	12	12	Trowbridge & Co., D.	75	75
Abbott & Co., Jere.	471	2,419	Carey & Moen.	24	24	Wallace & Co., J. E.	100	100
American Metal Co.	16	16	Cohn, M.	34	34	Total	75	1,105
Crooke Smelt. & Refin. Co.	80	80	Crooks, R. & Co.	30	37	Corres. date 1887	3,078	3,078
Dickerson, Van Dusen & Co.	10	10	Downing & Co., R. F.	49	49	Sheet Iron.	Tons.	Tons.
Hendricks Bros.	71	71	Henderson Bros.	10	10	Coddington & Co.	98	457
Muller, Schall & Co.	279	190	Hondolette & D.	4	4	Newton & S.	4	4
Naylor & Co.	91	554	Hugill, Chas.	6	17	Wagner, W. F.	40	40
Phelps, Dodge & Co.	112	325	Lalance & G. Mfg. Co.	60	60	Whitney & Co.	5	5
Schwartz Bros.	7	7	Leng, J. S.	6	10	Total	147	604
Thomson & Co., D.	47	47	Mersack & Co.	26	502	Corres. date 1887	51	590
Total	960	4,509	Milne & Co., A.	2	2	Spiegeleisen.	Tons.	Tons.
Corres. date 1887	3,305	3,305	Montgomery & Co.	2	2	Abbott & Co., Jere.	5	5
Pig-Iron.	Tons.	Tons.	Muller, Schall & Co.	10	10	Crocker Bros.	26	432
Abbott & Co., Jere.	500	500	Manas, J. & Son.	5	5	Dana & Co.	51	51
Baldwin Bros. & Co.	100	100	Naylor & Co.	17	63	Geisenheimer & Co.	28	28
Bartlett & Co., N. S.	300	1,700	Newton & S.	4	8	Jansen, J. A.	700	8,423
Crocker Bros.	200	2,900	Ogden & Wallace.	25	87	Naylor & Co.	100	646
Crooks & Co., R.	300	300	Phoenix Steel Co.	20	20	Pierson & Co.	1,035	1,035
Dana & Co.	300	300	Pierson & Co.	25	104	Total	826	10,620
Drum'nd, McCall & Co.	10	10	Pliditch, F. S.	5	35	Corres. date 1887	1,802	19,401
Henderson Bros.	100	510	Power, C. W.	13	236	Iron Ore.	Tons.	Tons.
Lee & Co., James.	100	100	Prosser, Thomas.	73	98	De Flores, R.	1,582	1,582
Milne & Co., A.	796	796	Roebling's Sons, J. A.	40	40	Earnshaw, A.	2,663	2,663
Pierson & Co.	15	15	Saunders & Son.	15	15	Ennis & Co.	1,021	1,021
			Shotta Iron Co.	7	7	Naylor & Co.	2,344	2,344
			Strouse & Co.	2	2	Wright, Chas. L. & Co.	500	500
			Temple & S.	16	16	Total	8,110	8,110
			Union Bridge Co.	30	150	Corres. date 1887	289	7,403
			Wagner, W. F.	5	5			
			Walschid, C. A.					
			Wallace, W. H. & Co.					

WEEKLY REGISTER OF CURRENT QUOTATIONS.

CHEMICALS.

Table listing chemical prices: Acid-Acetic, Muriatic, Nitric, Sulphuric, etc.

Table listing chemical prices: Alum-Lump, Aqua Ammonia, Ammonia-Sulph., Arsenic, etc.

Table listing chemical prices: Barytes, Asbestos, Asphaltum, etc.

Table listing chemical prices: Borax, Bromine, Cement, etc.

Table listing chemical prices: China Clay, Chrome Yellow, Cobalt, etc.

Table listing chemical prices: Copper, Cream of Tartar, Emery, etc.

Table listing chemical prices: Feldspar, Fuller's Earth, Gypsum, etc.

Table listing chemical prices: Kaolin, Lead, Litharge, etc.

Table listing chemical prices: Magnesia, Manganese, Mercuric Chloride, etc.

Table listing chemical prices: Sal, American, Nitrate, Strontium, etc.

Table listing chemical prices: Tannin, Vermillion, Vitriol, etc.

Table listing chemical prices: Zinc Oxide, Antwerp, Paris, etc.

Table listing chemical prices: * Spot, Building Material, Bricks, etc.

Table listing chemical prices: Building Stone, Granite, Slate, etc.

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Table listing chemical prices: Building Stone, Granite, Slate, etc.

Table listing chemical prices: Dalmellington, Bessemer Pig, etc.

Table listing chemical prices: Steel Blooms, Steel Nail Slabs, etc.

Table listing chemical prices: Iron Plates, Merchant Steel, etc.

Table listing chemical prices: Cast-Iron Pipe, Wrought-Iron Pipe, etc.

Table listing chemical prices: Boiler Tubes, Nail Fastenings, etc.

Table listing chemical prices: Wrought Scrap, Cast Scrap, etc.

Table listing chemical prices: Old Car Wheels, Old Rail, etc.

Table listing chemical prices: Nails, Hot Blast Irons, etc.

Table listing chemical prices: Forge Irons, Car Wheel and Malleable Irons, etc.

Table listing chemical prices: Louisville Prices, Hot Blast Irons, etc.

Table listing chemical prices: Tank Iron, Skep Iron, etc.

Table listing chemical prices: Steel Nails, Old Rails, etc.

Table listing chemical prices: STOCK MARKET QUOTATIONS, Baltimore, Md.

Table listing chemical prices: STOCK MARKET QUOTATIONS, Birmingham, Ala.

Table listing chemical prices: STOCK MARKET QUOTATIONS, Pittsburgh, Pa.

Table listing chemical prices: STOCK MARKET QUOTATIONS, Foreign Quotations.

Table listing chemical prices: Foreign Quotations, London, March 17.

Table listing chemical prices: Foreign Quotations, London, March 17.

Table listing chemical prices: Foreign Quotations, London, March 17.

Table listing chemical prices: Foreign Quotations, London, March 17.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns: NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS, DIVIDENDS, NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS. Lists various mining companies and their financial details.

Gold, S. Silver, L. Lead, C. Copper. * Non-assessable. † This company as the Western, up to Dec. 10th, 1881, paid \$1,400,000. Non-assessable for three years. ‡ The Deadwood previously paid \$276,000 in dividends and the Terra \$76,000. Previous to the consolidation of the Terra \$76,000. †† Previous to the consolidation of the Copper Queen with the Atlanta, Aug. 1878, the Copper Queen had paid \$1,350,000 in dividends.

NEW YORK MINING STOCKS QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns for Name and Location of Company, dates from March 24 to March 30, and Sales. Lists various mining companies like Adams, Alice, Argenta, etc.

*Dealt in at the New York Stock Ex. Unlisted Securities †Dealt in at the Metal Ex. ‡Assessment unpaid. Dividend shares sold, 25,435. Non-dividend shares sold, 61,960. Total New York, 87,395.

BOSTON MINING STOCK QUOTATIONS.

Table with columns for Name of Company, dates from March 23 to March 29, and Sales. Lists various mining companies like Atlantic, Bodie, Bonanza, etc.

Boston: Dividend shares sold, 8,666. Non-dividend shares sold, 8,300. Total Boston, 16,966.

COAL STOCKS.

Table with columns for Name of Company, Par val. of sh's, and dates from Mar. 24 to Mar. 30. Lists coal companies like Cameron, Ches. & O. RR, Chic. & Ind. Coal RR, etc.

San Francisco Mining Stock Quotations.

Table with columns for Company, and dates from March 23 to March 29. Lists mining companies like Alpha, Alta, Belcher, etc.

**Of the sales of this stock 104,625 were in Philadelphia, and 436,983 in New York. Total sales, 762,768.

and 1000 tons, and also some good-sized orders for coke irons ranging from 50 to 500 tons of foundry grades, and 500 tons and upward of mill iron. Car-wheel irons are also in good active demand, the most urgent requests being for the higher grades, which are scarce. It is said that one of the leading car-wheel furnace companies has recently oversold, and in consequence the deliveries are falling short, and buyers have had to cover such delays by placing orders with other companies at higher prices. Quotations for cash f.o.b. cars at Louisville will be found in our weekly register of prices.

Pittsburg. March 29.
[From our Special Correspondent.]

We have to report a dull and very unsatisfactory market, with a wide difference in the views of buyers and sellers. We regret to say the past week failed to show any improvement as regards prices or the volume of business, so far as relates to the iron trade. The contest has been fully inaugurated between capital and labor, together with another one, as to whether the mill owners shall have anything to say in regard to the management of their own business. The Black Diamond Steel Works and the Solar Mill show no signs of giving up the contest. Both have all the men employed they want, and assert their ability to manage their own affairs. With pig-iron at current prices, the furnace men assert that with labor, ore freights and other materials at present prices, it is simply a matter of impossibility to continue business, that more furnaces will be banked and so remain until the cost is reduced or iron advanced.

In regard to trade generally there is evidently a lack of confidence, as a furnace man remarked, we intend to "bank" as soon as we can procure sufficient money to pay expenses. Certain sales of iron reported show a further weakening in value. The big Edgar Thomson steel works idle, and seven of Carnegie & Co. furnaces out of blast or banked, is not very pleasant reading. The next question is how long is this condition of affairs to continue?

We noted in our last the unsettled condition of the coke market; at present the breach between the coke manufacturers is widening, with no immediate prospect of a settlement. Coke has now no fixed value. Each manufacturer will fix his price, and very cheap coke will be the result. One leading manufacturer remarked there will be no more syndicate arrangements. The whole trouble, in a nutshell, is the result of the H. C. Frick Coke Company paying the advance last summer, after umpire John B. Jackson had decided that the operators were right in refusing the employees' demand.

SALES SINCE OUR LAST REPORT.
Coal and Coke Smelted Lake Ore.

500 Tons Bessemer	17.25 cash.
500 Tons Gray Forge	15.50 cash.
500 Tons Gray Forge	15.75 cash.
500 Tons Gray Forge	16.00 4 mo.
500 Tons Gray Forge	16.00 cash.
500 Tons Bessemer	17.50 cash.
500 Tons Mill Iron	15.75 cash.
250 Tons Bessemer	18.00 4 mo.
50 Tons No. 1 Foundry	18.00 cash.
50 Tons No. 2 Foundry	17.00 cash.

Coke, Native Ore.

250 Tons Gray Forge Storage	15.00 cash.
100 Tons Gray Forge	17.75 cash.
60 Tons No. 1 Foundry	18.00 cash.
45 Tons Silvery Extra	19.00 cash.
25 Tons No. 2 Foundry	17.00 cash.

Charcoal.

400 Tons No. 1 Foundry	24.25 4 mo.
50 Tons Cold Blast	26.00 cash.
40 Tons Warm Blast	30.00 cash.

Slabs and Billets.

400 Tons Steel Slabs	28.50 cash.
350 Tons Billets	29.00 cash.
500 Tons Billets	28.75 cash.

Muck Bar.

500 Tons Muck Bar	27.00 cash.
500 Tons Muck Bar	27.00 cash.
500 Tons Muck Bar	26.65 cash.
500 Tons Muck Bar	27.00 cash.

Old Iron Rails.

1000 Tons American Ts.	23.50 cash.
1000 Tons American Ts.	23.25 cash.
700 Tons Light Ts.	22.75 cash.

Scrap Material.

200 Tons Short Steel Rails	Gross 18.00 cash.
150 Tons No. 1 Wrought Scrap	Net 19.50 cash.
125 Tons No. 2 Wrought Scrap	Net 18.50 cash.
100 Tons Wrought Iron Turnings	Net 14.00 cash.
100 Tons Cast Scrap	Gross 17.00 4 mo.

Philadelphia. March 30.
[From our Special Correspondent.]

Steps were taken this week by the bar-iron manufacturers to harmonize methods of selling extras. The interchange of views had showed the matter was practicable. Differences will be arranged by committees. The influence of pending tariff legislation on the market can not be concealed. The stronger probability of the passage of the Mills Bill in the House is causing no small degree of uneasiness, and it is either the real or assigned reason for inaction among buyers. Withal, it is observable that the current crude iron requirements are larger than thirty days ago for two reasons; first, there is more new business coming in, and second, because stocks are almost exhausted. A strong feature has been developed since Monday, viz., inquiries for large supplies for future delivery. Furnace companies have under consideration large offers for forge iron particularly. The purpose of buyers seems to be to secure options which they can take up when it suits them. Makers and brokers say that were the tariff bill to fail of passage and the agitation thrown aside, they would be able to sell everything they could deliver in 90 days. Quotations are not changed. Muck bars are dull and weak. Foreign material has not been ordered, and is only occasionally inquired for. The home production of slabs and plates is on the increase. No improvement is probable

for the present in the bar iron demand, and Western makers are able to control a portion of the Eastern trade. Interior bar mills have been booking some good orders and local mills are running with barely enough to keep going at card rates in small lots. There is a disposition to shade prices all over the State for back log orders. The bloomeries have work enough to keep going. Nail manufacturers booked a good deal of new business since Monday, but at the lowest rates. Iron and steel makers generally are more concerned about business to keep going than about margins.

A couple of plate ironmakers closed some long-pending business this week. In a general way but little business is coming or is offered. On the other hand, agents speak of a heavy consumptive demand as not far off. The structural ironmakers are working with as much mill capacity as ever, though they give a gloomy market report. The aggregate of railroad bridge building and of iron work for buildings will be large. Steel rail orders have been taken in a small way at \$32. An offer or two is under consideration at \$30.50 for a large lot. Two or three old rail sales have been made at 50 cents off recent asking price, viz., \$21.50. The scrap yards are again filling up. Quotations will be found in our weekly register of prices.

FINANCIAL.

NEW YORK, Friday Evening, March 30.

The mining stock market has been dull, and owing to the intervening holiday, the business for the week has been small. Prices fluctuated but little.

The stock of the Cleveland Tin Mining Company of Dakota made its first appearance at the Consolidated Stock and Petroleum Exchange yesterday.

The Exchange, in issuing the notice that the stock had been listed, states:

"While this Exchange, through its appropriate committee, makes every effort to obtain the fullest information in regard to the organization of a mining company, the title to its property, and its prospects, yet the public should clearly understand that in placing a stock upon its 'list' it in no wise and to no extent guarantees or indorses its value."

The price opened at \$1.50, and during the day advanced to \$1.60. The sales amounted to 300 shares. The company has a capital stock of \$1,000,000, shares \$2 each, unassessable. Ex-Gov. A. B. Cornell is the president of the company, and S. C. Williams the secretary. The company is now selling 250,000 shares of the stock as working capital.

Homestake shows one sale at \$1. Caledonia one at \$1.75. Father de Smet a few at from 40 to 44c.

Phoenix Lead, a reorganization of the Bull-Domingo Company, which was listed at the Consolidated Stock and Petroleum Exchange in the early part of 1887 (see ENGINEERING AND MINING JOURNAL, February 26th, 1887), appeared on the list Wednesday. A sale of 100 shares was made at 45c. per share. Little Monitor came out once at 11c. Lee Basin shows a small business at 56c., and Denver City at 9c. Cashier showed considerable activity at from 10@15c. Robinson also attracted some attention at from 60@72c. Iron Silver shared in the general decline of all the stocks, and sold as low as \$3.50. Bassick was dealt in to the extent of 400 shares at from 10@13c.

Rappahannock remained firm at 19c.

Copper stocks were neglected in this market, and no sales were made.

Horn-Silver is again neglected and shows a few sales at \$1. Stormont appeared after a long absence at 5c. Ontario continues to hold its own at \$28.50.

Alice, which last week sold at from 55 to 60c., shows an advance this week, selling at 70c.

Consolidated California & Virginia is weak. The last sale was made at \$14.50. The other Comstock shares, on the whole, are neglected. Sierra Nevada shows a few transactions at from \$5.50 to \$6. Savage one at \$6.75. Ophir at \$11.88. Gould & Curry at \$4.65. Chollar advanced from \$7.13 to \$7.75. Union was steady at \$4.75. Mexican declined from \$6.25 to \$5.63. Julia from 75 to 70c. Best & Belcher sold at \$6.50, and Alta at \$2.40.

Eureka Consolidated shows some transactions at declining prices, going from \$13@12.

Martin White advanced from 85c. @1.

Among the Tuscarora stocks Navajo showed considerable activity, with an advance from \$2@2.60. North Belle Isle shows one sale at \$7.25, Belle Isle a few from 69@86c., and Tornado at 75c.

El Cristo shows a further advance, going from \$2 to \$2.50. The transactions were large, amounting to 5810 shares. San Sebastian on Monday was quoted at 25c., and on Wednesday at 75c.

Proustite shows a decline, and for the first time in many weeks it has gone below the \$2 mark. Sales yesterday were made as low as \$1.90. Castle Creek attracts no attention, selling at 8c. The same may be said of Holyoke, which is quoted at 6@7c. Phoenix of Arizona shows a small business at from 25@30c.

There is nothing new from the mines of the Plymouth Consolidated Gold Mining Company. The price of the stock remains firm and a few sales were made at from \$10.13@11.50.

Brunswick shows an upward tendency and attracted some attention. The price advanced from 21@24c.

Elsewhere we publish extracts from the annual report of the Standard Company, which shows only one sale at \$3.50. Bodie received more attention and was dealt in to the extent of 1600 shares at from \$2.55 to \$2.76. Bulwer fluctuated between 90c. and \$1.05, and Mono declined from \$2.05 to \$1.80.

Quick-silver Preferred shows a transaction at \$34.00. Amador was on the upward move, going from \$1.50 to \$1.70. Middle Bar remained firm at from 51 to 58c.

Meetings.

The annual and special meetings of the following companies will be held on the dates given:

Centennial Copper Company, No. 1 Broadway, Room 124, New York City, April 2d, at twelve o'clock noon.

Copper Queen Mining Company, No. 37-39 Wall street, New York City, April 9th, from twelve o'clock noon to one o'clock P.M.

Delaware & Hudson Canal Company, corner of Cortland and Church Streets, New York City, May 8th, at twelve o'clock noon. A plan will be submitted for applying a portion of the undivided profits or surplus fund to the part payment of the bonds falling due in 1891.

Ozokerite Mining Company, No. 280 Broadway, Room 155, New York City, April 2d, at twelve o'clock noon.

Standard Oil Trust, No. 26 Broadway, New York City, April 4th, at eleven o'clock A.M.

Dividends.

Boston and Colorado Smelting Company, of Colorado, has declared a quarterly dividend of two and one half per cent.

Granite Mountain Mining Company, of Montana, has declared a dividend, No. 40, of fifty cents per share, or \$300,000, payable April 10th, in St. Louis.

Hazelwood Oil Company has declared a quarterly dividend, No. 33, of seventy-five cents per share, or \$6000, payable April 1st, at Pittsburg, Pa.

New Central Coal Company, of Maryland, has declared a dividend of one per cent, payable April 10th, at Room 57, No. 1 Broadway, New York City.

Assessments.

COMPANY.	No.	When levied.	D'l'nq't in office.	Day of sale.	Am't per share.
Alaska, Cal.	7	Feb. 21	Mar. 26	Apr. 16	10.00
Anchor, Utah.	4	Feb. 7	Mar. 10	Mar. 31	.20
Andes, Nev.	33	Feb. 25	Apr. 2	Apr. 23	.25
Belcher, Nev.	34	Mar. 13	Apr. 17	May 7	.50
Bodie Cons., Cal.	8	Feb. 13	Mar. 20	Apr. 26	.50
Bullion, Dak.	4	Feb. 4	Mar. 10	Apr. 2	.00
Cent. Eureka, Utah.	1	Feb. 24	Mar. 27	Apr. 13	1.00
Crocker, Ariz.	5	Feb. 5	Mar. 27	May 1	.25
Day, Nev.	16	Feb. 8	Apr. 9	May 7	1.00
Equitable, Utah.	33	Feb. 14	Mar. 30	May 9	.15
Exchequer, Nev.	25	Feb. 7	Mar. 13	Apr. 4	.20
Golden Fleece, Cal.	12	Jan. 28	Mar. 15	Apr. 10	7.00
Gould & Curry, Nev.	58	Mar. 12	Apr. 15	May 10	.50
Heath, Idaho.	3	Feb. 8	Mar. 19	Apr. 13	.05
Homeward B'd, Dak.	5	Mar. 24	May 21	June 21	.001
Idaho, Utah.	1	Mar. 15	Apr. 20	May 10	.40
Iron Hill, Dak.	12	Mar. 5	Apr. 7	Apr. 26	.07
Kennedy, Cal.	3	Feb. 20	Apr. 2	Apr. 23	.10
Keyes, Nev.	1	Feb. 15	Mar. 20	Apr. 16	.20
Merrimac, Mich.	1	Feb. 29	Apr. 2	.....	.15
Mutual, Dak.	4	Feb. 17	Mar. 21	Apr. 7	.01
North Peer, Nev.	4	Feb. 24	Mar. 28	Apr. 23	.05
Omaha, Cons., Cal.	1	Feb. 20	Mar. 24	Apr. 26	.35
Pet Gravel, Cal.	3	Mar. 1	Apr. 2	Apr. 17	.10
Phil Sheridan, Nev.	3	Mar. 7	Apr. 14	May 5	.10
Pittsburg, Cal.	20	Feb. 15	Mar. 17	Apr. 6	.75
San Francisco, Cal.	2	Feb. 3	Mar. 10	Apr. 3	.40
Seabury-Calkins, Dak.	8	Mar. 6	Apr. 7	Apr. 26	.01
Spanish, Cal.	2	Jan. 4	Mar. 10	June 2	.04
Spring Valley, Cal.	2	Jan. 11	Mar. 17	Apr. 16	.50
Taylor-Plumas, Cal.	3	Feb. 20	Mar. 31	.....	.03
Virginia Creek, Cal.	5	Feb. 28	Apr. 4	May 1	.05

* The delinquent day and day of sale were postponed to dates given above.

† Stockholders who paid the voluntary assessment No. 2 will be credited with the same on surrendering the company's obligation to repay said assessment out of the first earnings of the mine.

‡ Under the resolution levying the assessment, each shareholder is credited as paid on this assessment, the amount paid to the company by him on his shares on and since August 9th, 1887.

Pipe Line Certificates.

Messrs. Watson & Gibson, brokers, 49 Broadway, report for the week as follows:

Market this week has been on the down grade. Several large wells came in to discourage holders, but the depressed feeling in railway stocks was the most potent influence. Since the squeeze in certificates outside traders have held aloof more than ever from the market, and hence any attempt to sell oil is followed by a bad break. The news from Lima may have something to do with the alarm which seized holders this week, as our correspondent there says the Standard owns 4,000,000 barrels of Ohio oil; that they are steady buyers of it at about 15 cents; that they run 20 six-hundred barrel stills refining it and that the refined product sells for 6 cents per gallon.

The fact is the sentiment among speculators is not favorable to the purchase of anything, and therefore we believe oil will go lower.

The following tables give the quotations and sales:

CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.					
	Opening.	Highest.	Lowest.	Closing.	Sales.
Mch. 24	89c.	90 1/4c.	88 1/2c.	90 1/4c.	1,183,000
25	90 1/4	91 1/4	89 1/2	90 1/2	1,704,000
26	90 3/4	91 3/4	90	90 1/2	1,405,000
27	89 1/2	90	84 1/2	85 1/2	3,418,000
28	85	87 1/2	85	87 1/2	2,856,000
29	85	87 1/2	85	87 1/2	.....
30	.....	.....	.....	.....	.....

Total sales in barrels.....10,566,000

NEW YORK STOCK EXCHANGE.					
	Opening.	Highest.	Lowest.	Closing.	Sales.
Mch. 24	89c.	90 1/4c.	88 1/2c.	90 1/4c.	248,000
25	90 1/4	91 1/4	89 1/2	90 1/2	660,000
26	90 3/4	91 3/4	90	90	780,000
27	89 1/2	90	84 1/2	85 1/2	641,000
28	85	87 1/2	85	87 1/2	873,000
29	85	87 1/2	85	87 1/2	.....
30	.....	.....	.....	.....	.....

Total sales in barrels.....3,200,000