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THE mineral production of Canada in 1887, official statistics of which are given on another page, was estimated to have a spot value of nearly \$13,000,000. This amount is insignificant when compared with the vast mineral resources of the Dominion, but it is increasing, and if "the powers that be" were to adopt a somewhat more enterprising policy in making known to the outer and financial world what these resources are, this increase would be much more rapid.

We note with great pleasure this evidence of increased usefulness in the Geological Survey of Canada, which for many years has been looked upon as more or less ornamental, because its practical usefulness was not very apparent. During the past few years, however, the survey has issued several useful papers on the mineral resources of different parts of the Dominion. And this early publication of the present report is a further and welcome indication of this new departure in the policy of the Geological Survey.

THE STATISTICS OF LEAD AND SPELTER PRODUCTION.

In the ENGINEERING AND MINING JOURNAL of January 7th last we published our reports of the production of lead, spelter, and copper in 1887, and in introducing these reports we said "never before in the history of this or any other country have reports of the production, markets, consumption, and stocks of mineral products been obtained so promptly and

so fully as those for the year 1887, which we herewith present to our readers."

The value of these statistics has been widely recognized, and in only a very few cases was their accuracy questioned, and then, apparently, only from incredulity that accurate reports could be obtained so promptly.

Last week, or just three months after we had published our reports, we were enabled to publish the official figures of the production of lead and zinc collected for the Department of Mineral Statistics of the United States Geological Survey, and our readers will recognize the remarkable fullness and accuracy we were enabled to attain in these reports published within a very few days of the close of the year 1887:

	Tons of 2000 pounds.	
	Lead.	Spelter.
ENGINEERING AND MINING JOURNAL.		
Published January 7th, 1888	160,000	51,000
U. S. Geological Survey. Reports published three months later, April 7th, 1888	160,700	50,340

The difference between our early reports and the recent geological survey reports was, in the production of lead, considerably less than one half of one per cent, and in that of spelter but very little more than one half of one per cent. In other words, the statistics which the courtesy of our smelters and refiners enabled us to publish in the very first week of the year were as full and accurate as those obtained three months later through the machinery and with the prestige of the "United States Geological Survey."

THE COURTS AND THE STRIKERS.

The clear and firm utterances of the United States judges in the West have profoundly affected the conditions of the Burlington engineers' strike and its collateral "boycotts" and "tie-ups." The community owes them a debt of gratitude for their forcible exposition of the law, which has reduced a vast and dangerous conspiracy to insignificant proportions.

One of the strongest of these opinions is that of Judge J. McLOVE, of the District of Iowa, granting an injunction to restrain a connecting road from refusing to receive and transport Burlington Railroad freight. We extract a few sentences as examples of its tone:

"These defendants have appeared by counsel and admitted the truth of the allegations of the bill, and they do not deny that they are required by law to receive and move the complainants' cars. They admit that they have refused to perform this duty, and they give as a reason for their refusal that if they receive and haul the complainants' cars their firemen and locomotive engineers will abandon their places and leave them without the means of operating their lines. * * *

"Now, the question is, What shall be obeyed—the law of the land or the order of the Chief of the Locomotive Engineers? Shall a railway company refuse obedience to the express provisions of the statutory law because some of its employes threaten to quit its service and thus stop the running of its trains? Shall the court presume that they will carry out such threats, and deny relief to the complainant upon that presumption? No temporary inconveniences to the defendant company or the public whom it serves are in my judgment for one moment to be compared with the fatal consequences which must ensue from a precedent by which it would be established that a railway company may, in violation of the law of the land, refuse to receive and haul the cars of a connecting line at the command of any irresponsible persons or from its own belief and apprehension that its employes will leave its service and stop the operation of its lines. Such an excuse as this is wholly inadmissible, and it must be set aside.

"If, in this case, the refusal of the defendant corporation to move the cars of the complainant be sustained, it will follow that whenever in the future the locomotive engineers and firemen shall enter upon a struggle with any one road, all other corporations having connecting lines will, in violation of law, be warned not to interchange cars with the offending road and compelled to obey the behests of their employes. Thus may the transportation of vast regions of country covered by connecting lines be controlled and paralyzed at the arbitrary will and pleasure of the Brotherhood of Locomotive Engineers. Indeed, it seems to-day to be by the grace of the leaders of this association that the various corporations owning the vast network of railways west of Chicago are permitted to operate their lines. The people of this vast region may at any moment be deprived, by the arbitrary fiat of the association in question, of all railroad facilities. Is this a power fit to be assumed and wielded by any set of irresponsible men under the sun?"

When the Interstate Commerce Act was passed, there was much uncertainty as to its effect. The legislators who made it could not agree as to its meaning. Administered by prudent commissioners, who have freely used their discretionary power of suspending its operations in special cases, it has produced less disturbance than was feared. But the party that was most clamorous for this governmental control of railroad business, now stands aghast to find that one effect of the new law is to

give the United States courts jurisdiction over the subject, and to bring into full view of the penitentiary, the ingenious gentlemen who lay schemes to "tie up" common carriers. Surely Providence watches over this favored land, when even its most hasty, ignorant and ill-considered legislation turns out to be so "good for something else."

The surprise of the originators of the Interstate law over its unexpected operation reminds us of the ancient story of a rural funeral with military honors. The village band was playing a requiem at the grave, *pianissimo*, when suddenly there burst from the trombone a tone so loud, so long, so terrible, that clergyman, mourners, hearse-horses, sexton, musicians, fled in fear, leaving nobody except the deceased—and the trombone-player, who gazed alternately at the score mounted upon the barrel of his instrument and then up into the blue sky, and ejaculated, "Wall, by thunder! I thought she was a note, and she was a hoss-fly. But I played her!"

THE REORGANIZATION OF PUBLIC WORKS.

The Executive Board of the Council of Engineering Societies on National Public Works, has issued the first part of a report under the above title, namely, a pamphlet of 74 pages on "Proposed Legislation," containing information bearing upon that subject, compiled from various sources.

Without intending to enter at this time upon a detailed examination of the essential portion of this pamphlet, to wit, the legislation which it explains and advocates, we offer here one or two comments, suggested by a first reading of its pages.

There are practically two different bills here presented, namely, the Cullom-Breckenridge bill, presented in the two houses of Congress simultaneously on the 16th of January, and a revision amounting to a substitute, approved in March by the Executive Board aforesaid, and embodying presumably their latest and most mature conclusions. Our remarks will apply to the latter only; and we shall not pause to indicate the points in which it differs from the former.

The bill provides for a Bureau of Harbors and Water-ways under the War Department, to be officered by a Corps of United States Civil Engineers. The organization and discipline of this bureau appear to be planned after the model of the present Engineer Department of the Army, and of the existing Corps of Engineers. The principal changes effected by the bill, therefore, as compared, for instance, with a bill enlarging the present Corps of Engineers would be, that there would be two corps instead of one; that the government would not educate the members of the civil corps; that it could not command their services for military operations in time of war; and that it would pay them salaries much larger than those now received by engineers of the army performing the same duties. Some of these changes might be improvements; it is questionable whether this could be said of all of them.

Take the salary question, for instance. The bill provides that the new civil corps shall have a Chief, at \$10,000 per annum; four Associate Chiefs, at \$7500; nine to eleven Department Engineers, at \$6000; fifty Division Engineers, at \$4000; not more than one hundred Resident Engineers, at \$2700; not more than two hundred First Assistant Engineers, at \$1800; and not more than two hundred and fifty Second Assistant Engineers, at \$1200. All above the \$1800 grade are "officers," and must be at the age of sixty-five, retired on half pay.

The full corps would thus comprise 614 persons, with an annual payroll of \$1,236,000; while under the present system (taking the figures for 1885, when operations on public works were active), there were 713 persons employed, at a total annual cost of \$1,164,208. Or, deducting the pay of 99 persons employed at the lowest rates (recorders, receivers of materials, rodmen, etc.), we have for 614 persons under the present system, \$1,073,815; under the proposed system, \$1,236,000. These are, however, rough comparisons. A more equitable method is to compare the total pay of the 70 officers of the Corps of Engineers on river and harbor duty in 1885 with that of the 70 officers of the new corps, who, it may be supposed, would replace them. Such a calculation shows that the pay and quarters commutation (the latter by no means always paid—never, we believe, when quarters belonging to the United States are available) of one brigadier, four colonels, eleven lieutenant-colonels, nineteen majors, twenty-four captains, and eleven first lieutenants, amounted to \$259,728; while the salaries in the new corps of one chief, four associate chiefs, eleven department engineers, fifty division engineers, and six resident engineers would amount to \$322,200.

These differences are, however, not serious from the standpoint of the public interest, and may well be approved if there be any corresponding gain to be secured in efficiency of operation. They become somewhat more serious in another aspect. The bill provides that officers from the Corps of Engineers, U. S. A., may be assigned to temporary duty in the new corps, but without increase of their military pay. An officer assigned as chief must be at least a colonel; the assigned associates must be at least lieutenant-colonels; the department engineers at least majors; the division engineers at least captains, and the resident en-

gineers at least first lieutenants. The following table shows the result of this arrangement:

	Pay of civilian appointee.	Pay of army engineer, who may be assigned to the same place and duty.
Chief.....	\$10,000	\$5,220
Associate.....	7,500	4,736
Department.....	6,000	4,036
Division.....	4,000	3,232
Resident.....	2,700	2,376

This looks like an unjust distinction, intended to discourage army engineers from accepting assignments to the civil corps. But other provisions of the bill not only limit the number of such assignments, but also the period of service under them. If we correctly understand the "revised" bill, it permits such assignments only at the establishment of the new corps, and requires that all officers so assigned shall at or before the end of three years from the passage of the act elect whether to return to the army, or resign from it and be commissioned in the civil corps.

The pamphlet before us says (p. 29) that "the Chief of the Corps of Engineers, U. S. A., at the time this organization is initiated, should occupy the position of Chief Engineer, and should continue such occupancy during his term of active service in the United States Army. This would amount to more if the present Chief of Engineers were not certain to be retired in a few months; but whatever it amounts to, it is abandoned in the revised bill, which leaves the new chief to be either appointed or assigned, as the President may see fit.

So much for the proposed bureau and corps. Whatever may be the defects of the plan, it is far more consistent and complete than any of the crude schemes which have preceded it. It is not supported by unjust attacks upon the army engineers; and it is worthy of candid, serious consideration.

After all, the central question involved is, whether the government would do better in educating its own civil engineers, or in selecting for its service the graduates of any technical schools, or even of none at all. This question we pass for the present.

But we can not finish this article without expressing our pleasure to find in the revised bill of this Executive Board an attempt to remedy the fundamental evil of our present system. As we have often declared, all schemes for the management of national public works are vain, so long as the annual appropriations of money are made by Congress with the combined extravagance and penuriousness, compounded of whim and dicker, which characterize the River and Harbor bills. The manner in which the bill before us proposes to meet this evil, we will discuss in another article.

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.

Proposed New U. S. Assay Office, New York.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: As U. S. Assayer I have no comments to make, leaving that to the wisdom of my superior officers in the Treasury Department, but as a citizen of New York City I desire through your columns to draw the attention of bullion dealers and producers to the plans set forth in the report of Mr. Wm. J. Fryer, the Superintendent of Repairs U. S. Public Buildings.

For many years the present Assay Office building has been inadequate for the large business there transacted, besides being dark and unstable. The trembling of the floor with every passing cart tends to put the delicate scales used in assaying out of adjustment; the height of the surrounding buildings is gradually increasing, and even now on all dark days the delicate operations of the assay have to be done by the aid of electric light.

The requirements of the daily routine business have almost crowded the experimental laboratory out of existence. This state of things may be set right by the plan proposed by Mr. Fryer.

In brief this is to purchase a new site, preferably near the battery, and erect thereon large and well appointed buildings for the appraiser's stores, custom house, sub-treasury and assay office. He states that much more room for these buildings could be obtained there and at less cost than the value of the present sites. Also that the place in question would be near the money center and in a position to be easily protected by the army and navy in case of local trouble.

In a properly constructed assay office and refinery the work could be done more rapidly and with less discomfort to the working force.

It is to be hoped that in the near future this plan, or something like it, may find favor both in Washington and New York.

Yours, etc.,

H. G. TORREY.

Sound Steel Castings.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The great need of a simple method of making sound steel castings, especially for heavy ordnance, is now met in the processes invented by Mr. Wattman, of Pittsburg, and myself. Mr. Wattman uses a small quantity of sand applied near the end of the process in the Bessemer converter, and has made a steel cannon from a single casting, which is said so far to have stood all the tests. I apply the sand on the hearth of an open-hearth furnace by spreading it loosely upon it, after the hearth has been hardened and prepared for receiving the metal, immediately after

charging the sand and before it has had time to set, pig-iron is charged, and when the iron has melted the sand has become fused to the bottom, and by the time the iron has become decarbonized the sand has boiled up through it, removing the oxide of iron in the metal, producing, thereby, sound castings and using less manganese than where the sand is not added. Spoon-ladle samples show less red shortness, and occasionally a sample was not red short, although no manganese had been added.

I made this invention in 1884 while working Cornwall pig at Bellefonte for a syndicate of iron manufacturers, where a large quantity was treated in this way and the steel was not red short; this is the only way that the sand can be effectually applied in the open hearth as if stirred in from the top, but a small portion of the metal can be reached by it and it is not effective.

About 60 pounds of sand per ton of pig has produced good results, and that a little lime or clay mixed with it assists its fusion. The same pig-iron, treated on the usual sand lining, is not affected, as the lining becomes a silicate of iron, whereas the sand charged upon the bottom according to my plan, acts directly as silica. I feel sanguine of being able to turn out sound steel castings up to 100 tons each. If so, our puzzled army and navy heavy gun sharps will have a load of anxiety taken from their shoulders, though we shall miss the pretty drawings of the built-up guns.

I put my process in public use in 1884, and applied for patents, but their issue is still pending.

The compression of the liquid steel by the expansion of gases in a closed mold above the liquid metal, invented also by me, causes about six tons pressure to the square inch, which condenses the steel and increases its tensile strength four fold, or to about 224,000 pounds per square inch, with 9 per cent elongation.

BIRMINGHAM, Ala., April 3, 1888.

JAMES HENDERSON.

A Supposed Oxycarbide of Iron.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: On examining the black residue which most classes of unhardened steel leave when dissolved in dilute hydrochloric or sulphuric acid with exclusion of air, Messrs. Morrell and Coffin, of Johnstown, find indications that it contains, besides silica and a phosphide of iron, an oxycarbide of definite composition, $Fe_3C_2O_2$. They now think it probable that this oxycarbide exists as such in the steel itself; that it contains all the oxygen present in steel when carbon is in excess, and conversely, all the carbon present in steel when oxygen is in excess. They find that the composition of this oxycarbide is the same in the case of steels of widely different composition, and when the total percentage of oxycarbide varies widely.

It will be remembered that Abel, on dissolving steel in sulphuric acid and bichromate of potash, and Müller on dissolving it in dilute sulphuric acid, obtained residues corresponding approximately to the formula Fe_3C . These residues, like that of Morrell and Coffin, are found chiefly in annealed steel, hardened steel yielding but little and tempered steel an intermediate quantity.

The residue which the latter observers obtain, while it probably springs at least in part from the same substance in the steel itself, to wit, cement carbon combined with iron, differs not only in composition but in properties from the residue of Abel, and is probably quite a different substance. For it is immediately resolved by dilute sulphuric acid and bichromate of potash into sulphate of iron and carbon.

Messrs. Morrell and Coffin regard their present results as preliminary, and they consent to their publication only to call the attention of other investigators to this important question, and to stimulate inquiry. Their present endeavors are directed to ascertaining, first, whether the oxycarbide actually exists in the steel before solution in acid, as it is of course quite possible that the cement carbon of the annealed steel combines during solution with oxygen derived from the solvent; and, second, whether what they have thus far regarded as two equivalents of oxygen, actually consists solely of oxygen. They have shown qualitatively that the residue in question contains oxygen, and, while they have not directly proved that the whole of the undetermined residue is oxygen, no other element seems to them a probable component.

They add the following theoretical points: "We have two pieces of steel which give very different quantities of oxycarbide. No. 1 contains '97 per cent total carbon, and when annealed gives '20 per cent of oxycarbide. No. 2, with '47 per cent total carbon, gives 1'30 per cent oxycarbide.

"When hardened, by quenching from full redness, the steel yields hardly any of the oxycarbide residue, and the carbon has, to all appearance, combined in the usual form for hardened steel. On annealing again the substance reappears in the quantity first found. This can be repeated many times with the same result.

"Now the non-hardening carbon in No. 1 annealed, seems to be soluble in dilute sulphuric acid, while for some reason it or a part of it has become insoluble in No. 2 annealed. If annealing produces different non-hardening carbides in the two steels, the carbon when combined must be in different hardening forms.

"To account for the phenomena we are obliged to accept one of two theories.

"The first supposes the existence in hardened steel of two different hardening carbides, which exist in different steels in very different proportions. We will call one m, the other n. The effect of annealing the steel is to cause these hardening carbides to pass into correspondingly different non-hardening carbides, which we will call m' and n'. If we again harden the steel m' passes invariably to the hardening carbide m, and never to n; and n' to n, and never to m. Also one of the non-hardening carbides is soluble in dilute H_2SO_4 , or HCl, while the other is not. There is also the added fact that this insoluble carbide has appropriated oxygen from the solvents at the moment of liberation from the steel.

"The other theory supposes the existence of some element in very different quantities in different pieces of steel, and by its union with the iron and carbon (at the temperature at which carbon passes from the hardening to the non-hardening condition) limits the amount of residue left on solution of the steel.

"Of the two theories, we prefer the latter, and regard the oxygen of the compound as the probable limiting element."

H. M. H.

THE BRITISH MINING SHARE MARKET.

From our London Correspondent.

The share market here has been uneventful, save from its diamond side, since I last wrote. There is a general feeling that the scheme of the Chancellor of the Exchequer for the conversion of the national debt will lead to a wider diffusion of investments, and that in the common benefit mining will participate. The excitement in diamond shares has continued, but there has for the time been a relapse of £5, in De Beer's from £50 to £45, and the fall in Kimberley Central has been even more marked. If the Hatton Garden lique had not stood well to their guns, the fall would have been still greater. The copper market is, if anything, a shade weaker. Indian shares were improving, until a circular from the Mysore directors simply played havoc with the market, and left these descriptions both boneless and nerveless. I have mentioned in several previous letters that the Mysore has made enormous returns, running up sometimes to about £7,000 in a single month. Now add to this fact that two years ago the capital was increased from £135,000 to £150,000, so that the directors might have ample resources with which to develop the mine, and you may judge the disappointment shareholders feel that the question of dividends is entirely ignored.

The satisfactory point is that the leases are stated to have been extended for 50 years, and that Captain Plummer is likely to return to his duties after his holiday in England. The latter announcement will now be practically received with general satisfaction.

DEATH OF A SHAREHOLDERS' CHAMPION.

I may tell you that on Friday night, quite suddenly, there died from apoplexy Mr. William Abbott, who was well known on your side and who was here a strong advocate for a change in the management of the Mysore mine. I saw him at his offices the day he died, and though then ill I never imagined that his end was so near. Mr. Abbott was a stock broker and posed at meetings as the champion of the rights of share holders. Rightly or wrongly, he believed that Captain Plummer was working the Mysore mine for posterity, and as truly remarked "what has posterity done for us?" It was Mr. Abbott who, to a large extent, was the means of creating a revived interest in the La Plata Mining and Smelting Company. At his own expense he employed some one on your side to investigate into the state of the accounts and also of the mine. He infused fresh heart into the shareholders, but it must be confessed that the numerous promises made to him by experts have not since blossomed into dividends, and the shares to-day are at a few shillings each and almost unsalable. Mr. Abbott spoke at almost all the mining meetings held in London, and recently came within measurable distance of upsetting Sir Edward Watkin, of Southeastern notoriety, and who meddled (to his own sorrow and that of the shareholders) some years since with Erie affairs. Mr. Abbott added to a handsome appearance a style of address that was at once forcible and persuasive. Even in the hurry and worry of London commercial life men pause and think with regret of a familiar face and voice that will be seen and heard no more.

AMERICAN MINES.

The Montana company has issued a magnificent report, and yet, strange to say, the market for the shares has declined. The balance of net revenue account for the half-year ended the 31st of December last is £92,528, out of which two quarterly dividends have been paid absorbing £82,500. On account of expenditure, which would have been charged to capital account, had not that account been definitely closed, £5828 have been paid out of revenue, and there is a balance to be carried forward of £4200. The reserve fund is £24,000. A first quarterly interim dividend for the half-year ending June next has been declared at the rate of 20 per cent per annum, increasing the total amount of dividend to date to £413,307. The report of Mr. Bayliss, the resident director, shows that the mine is in a splendid position, and comparing 1886 and 1887, the result is in every respect favorable to the latter year. The development of ore for the year has been over 90,000 tons, of which 75,000 tons have been treated in the mill. There was in sight at the close of last year ore reserved to the extent of 213,255 tons, against 203,670 tons on the corresponding period of the former year.

The work of raising more capital and of reconstruction goes merrily on. Eberhardt is submitting to the first process and Flagstaff to the second. Let me speak of the Eberhardt first. I remember the time when the £10 shares were sought after at £42, but last week a friend of mine sold a lot of them at 1s. 10½d., and finding that he had oversold bought some back two days later at 1s. 7½d. Until two years ago the Eberhardt Company was exploring by means of a tunnel under Treasure Hill. For years and years it was managed by Capt. Frank Drake, and his brother Oliver also had a finger in the pie. At last the shareholders grew tired, and determined that they would end the Eberhardt or mend it. Capt. Frank Drake was equal to the occasion. He knew of the Monitor mine, some distance off, of which he presented a eulogistic report, and from which he said that large returns would be made. The Eberhardt Company bought the Monitor property and found it practically a shell. It might have been rich before, but it was miserably poor when it came into their possession. A long course of development was what the shareholders had to face, but still they did not lose faith in Capt. Frank Drake. They believed that he had deceived them because he had been deceived himself; but their views with regard to this gentleman have undergone a change since he suddenly left them and went off to Palmarco mine in Mexico, whither he seems to have subsequently been followed by his brother Oliver, whom he had left in charge of Eberhardt. I do not know how such conduct is viewed on your side, but it was strongly condemned at the meeting held here last week. At the same time it should be said that both Frank and Oliver Drake stand in the register of the company as the holders of a large number of shares. I do not think the name of Drake is one to charm the English public now. The present capital of the company being £260,000, it is proposed to raise it by an issue of £40,000 in preference shares, such shares to be offered to the shareholders at 5s. each. I do not think they will be taken up, in which case Eberhardt will go through the form of reconstruction once more. There is a lingering faith here, both with regard to Eberhardt and Emma, that these mines will justify the tenacity with which

the English have held to them, and I trust that this may be the case, for it would certainly give a tremendous lift up to American mining, as it is viewed from these shores.

Flagstaff, despite the benedictions pronounced upon it by Professor Vincent, is once more in straits for money, and it is proposed to reconstruct it. There has been a demand for Callao Bis and Alturas. Callao Bis have approached 30 shillings and Alturas (par £1) after being as low as eleven shillings. Empires have fallen on the circulation of malicious rumors and false anonymous circulars which have frightened timid holders. The Colombian hydraulic profit for February was £1300, and that of Orita £300. The Carlisle Company held a most successful meeting the other day. The balance to net revenue reported was £21,436, after placing £4000 to reserve. It was stated that there are 20,000 tons of ore accumulated in the mine which will produce £56,000, and the property was described as rather resembling a "quarry" than a mine. The mill run for January and February gave £9540. Sixty stamps are running, and no doubt is felt that these can continue to be kept supplied. Dividends have already been declared, and handsome returns for 1888 are said to be secured.

LONDON, March 27.

OFFICIAL REPORTS.

Alloues Copper Mining Co., Mich.

The directors present a summary of the receipts and expenditures during the year 1887, and statement of the assets and liabilities of the company at the close of the year 1887, showing a balance of strictly available assets of \$48,497.97.

The parties to whom the mine was leased for a term of three years from June 1st, 1885, became unable to continue working the mine as agreed, and, after struggling along and making a limited production during the early part of 1887, they finally succumbed to the pressure of the 10 cent copper market, and in July their property was attached by creditors and work was stopped. The revenue from royalty on the copper produced was therefore small.

Possession of the mine was resumed by the company in September. The low price of copper then ruling did not warrant any action looking toward working the mine, neither was such a course practicable under the dilapidated condition in which the surface plant was left by the lessees; but steps were at once taken to protect the buildings and machinery, and to keep the mine free from water and guarded from injury. As the copper market improved, the directors determined to commence opening new ground to some extent, and are now sinking and drifting at some of the most promising points, and preparing for active production so soon as the machinery and buildings can be repaired and put in proper condition for economical operation. This work can not be undertaken to any considerable extent until the snow has gone, and by the time it can be completed, the mine will be put into condition to fully supply the stamp-mill, provided the stockholders decide upon such a course.

The directors are of the opinion that the present condition of the copper market, and the prospect of a continuance of fair prices, warrant the resumption of work and the outlay necessary to put the mine and surface plant in good working condition.

RECEIPTS AND EXPENDITURES FOR THE YEAR 1887.

<i>Receipts</i>		
Copper sold.....	85,640 lbs., av. 10 38 cents..	\$8,896.93
Balance of interest account.....		709.51
<i>Expenditure.</i>		\$9,636.44
Freight and other charges on copper.....		\$368.42
Office and other expenses.....		1,230.34
At mine: Less rents received.....		5,708.13
Add amount due by lessees—not collectable.....		4,028.08
		11,334.97
Excess of expenditure over receipts.....		\$1,738.53
The balance of assets reported December 31st, 1886, was.....		\$50,870.89
<i>Deduct.</i>		
Accounts receivable—old debts not now collectable.....	\$451.58	
Amount transferred from "mining supplies" to "Mining plant," being tools and implements on hand at time of closing work, May, 1885.....	9,192.81	
		9,644.39
		50,226.50
		\$48,497.97

ASSETS AND LIABILITIES, DECEMBER 31st, 1887.

<i>Assets.</i>		
Cash in Bank and Trust Company.....		\$42,984.00
Accrued interest on deposit in Trust Company.....		538.88
<i>At mine:</i>		
Cash in bank.....	\$639.62	
Fuel and supplies.....	1,940.06	
Standing timber on 345 acres of land, purchased for mine use, cost.....	4,833.94	
Accounts receivable.....	28.51	
		7,442.13
<i>Liabilities.</i>		\$50,985.01
Due employes and others at mine.....	\$1,765.19	
Agent's draft outstanding.....	609.26	
Sundry accounts payable.....	92.59	
		2,467.04
Net balance quick assets, December 31st, 1887.....		\$48,497.97

Kearsarge Copper Mining Company, Mich.

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

The product of mineral was 27,874 pounds, which, at 76 19 per cent, gave 21,237 pounds of refined copper, for which has been realized the gross sum of.....	\$3,408.92
From interest receipts.....	2,551.13
From assessment No. 3.....	40,000.00
Add balance of assets, January 1st, 1887.....	73,627.45
\$119,587.50	
The costs have been:	
Running expenses at mine.....	\$46,991.02
Smelting, transportation, and sundry other expenses.....	1,515.63
\$48,506.65	
There has been expended in mine plant during the year.....	14,601.29
63,107.94	
Making the balance of assets, January 1st, 1888.....	\$56,479.56

Operations thus far have been confined wholly to opening the mine preparatory to stoping and producing copper.

The directors say: "We are now in a position to test our mine, and have good reason to believe that the developments in the near future will show gratifying results, and that we shall be classed among the regular-producing mines. We can arrange with the Osceola mine to stamp for us what rock may be available for the present, and until we can feel warranted in erecting a mill of our own."

<i>ASSETS.</i>		
Cash in bank at Boston.....	\$16,634.61	
Cash on hand at mine.....	139.89	
Supplies on hand at mine.....	561.39	
Fuel on hand at mine and stamp-mill.....	2,151.16	
Accounts receivable at mine.....	1,552.42	
Bills receivable at Boston.....	3,910.00	
Assessment No. 3.....	15,576.10	
250 shares Hancock & Calumet Railroad stock.....	25,000.00	
Copper on hand, 21,237 pounds.....	3,408.92	
Total assets.....		\$68,934.39

<i>LIABILITIES.</i>		
Drafts outstanding.....	\$5,283.05	
Accounts payable at mine.....	7,171.78	
Total liabilities.....		12,454.83

Balance of assets, January 1st, 1888..... \$56,479.56

<i>RECEIPTS.</i>		
From capital stock, 50,000 shares, \$12 a share, paid in.....	\$650,000.00	
" 21,237 pounds copper, 1887, at 16	3,408.92	
" interest receipts to date.....	3,648.95	
Total receipts.....		\$657,057.87

<i>EXPENSES.</i>		
Running expenses prior to 1887.....	\$20,361.72	
Running expenses during 1887.....	48,506.65	
		\$68,868.37

Construction expense prior to 1887.....	\$13,922.21	
Construction expense during 1887.....	14,601.29	
		28,523.50

Real estate.....	474,000.00	
Total expenses.....	600,578.31	

Balance of receipts, Jan. 1, 1888..... \$56,479.56

ORE-SORTING.

Written for the Engineering and Mining Journal by F. L. Bartlett.

To my mind there is not attention enough given to the sorting of ores by hand. Mine managers as a rule imagine that hand-sorting is too slow and expensive, and look to the highly complicated mechanical concentrators for relief. While it is true that there are a few good mechanical dressing machines to be had in the market; it is also equally true that for every success in this line there are five failures. A really good, simple, cheap, compact and durable system for mechanical dressing has not yet been discovered. The patent office swarms with inventions for separating ores from the worthless rock; but not one in fifty is ever heard from after the first trial. All sorts of claims, with possibly the exception of perpetual motion, are made by the sanguine inventor. All kinds of principles are represented, from an old-fashioned "long tom" to the most marvelously complicated affairs, with more cranks, pulleys, pistons and mechanical motions than the renowned "Keely motor." Most of them, like the motor, will not "mote." It looks mighty easy—this little problem of separating such stuff, for instance, as galena from the much lighter rocky material; but many a novice has butted his head against it in vain. However, this paper does not purport to discuss concentrating machinery, but rather to take up the much neglected subject of hand-sorting.

Every miner, with rare exceptions, on opening up his mine, soon finds himself cornered, as it were, on the question of what he shall do with certain mixed classes of ores which encumber the dump. Often he is too poor to erect concentrating works; often his ore is of such a character that it can not be concentrated. Breaking by hand and picking the ore as it comes up daily is at best slow and expensive; but for all that, it is the only way in which many rich ores can be sorted. The thoughtful man can not help believing that there must be some happy medium between the high-cost dressing-works and slow hand-sorting. As I have been through an experience that many others will start upon, I propose to describe as plainly as possible my course of treatment and its results.

In opening and starting the Mian mine in 1882, it was found desirable, in order to get the market for pyrites, to produce this mineral in a very pure form. The run of the mine was a mixture of cupiferous iron pyrites, very massive, with rich copper ores, zinc-blende and galena. More or less slate and quartz had also to be taken care of. It was essential that fine clean separations of the ores should be made. The pyrites especially, if sold for acid-making, must be free from zinc and lead, and comparatively free from copper. Moreover, the galena was rich in silver, and the better copper ore was abundant and suitable for smelting on the spot; so that sorting was at once forced upon us.

A fair trial of three months at hand-breaking and sorting on the floor of the shaft-house convinced me that it cost too much and was altogether too slow. Concentration was out of the question, because we could neither sell finely crushed pyrites nor separate the copper, galena and zinc, if we put up concentrating works. The following scheme was adopted and tried and proved a perfect success.

A Blake crusher was put in having a jaw opening 10 inches by 17 inches, and set to crush at 2 inch gauge. A link belt elevator carried the crushed ore up some 16 feet, and discharged it upon the upper end of an inclined shaking-table. The cuts Figs. 1 and 2 show the construction of this table. The table proper is 52 inches wide and 18 feet long. The upper end has a punched steel screen with quarter-inch holes. This screen is 30 inches wide and 4 feet long. The remaining 14 feet of the table is divided up into troughs or shoots by means of No. 14 sheet-iron, screwed to the wooden frame of the table. The main or central shoot is 18 inches wide, and there are three on each side, each 5 inches wide. The shoots end over a set of bins, which are placed just outside the building and directly over the tramway-track, so that cars can be placed

under either of the bins, and by pulling a slide, either of them can be discharged into the car.

At the upper end of the table is the shaft, on each end of which is an eccentric, having a thrust of exactly 2 inches. Connecting rods run along each side of the table and connect with it 6 feet from the end. A fixed pulley on the shaft gives motion to the table; another pulley runs loose on the shaft and has a pin-clutch connecting with the sprocket-wheel which carries the elevator. The lower end of the table strikes two heavy rubber buffers on the downward stroke for the double purpose of easing the motion and jarring the ore along over the table. The table is set at an inclination of 1 to 9, and the motion is 200 oscillations per minute. The elevator is run at 6 revolutions per minute. Above the screen, at the upper end of the table, is fixed a 2-inch water pipe with a row of 1/4-inch holes on each side, for the purpose of washing the ore as it passes along underneath. On the floor of the building, and directly under the screen, is arranged a tank 6 feet wide and 8 feet long, with sides 2 feet high. A large sheet iron-lined spout directs the water and fine ore passing through the screen into this tank. A platform extends along each side of the table for the men or boys to stand upon. In working the table the crushed

or, in case of fine silver ores, an endless belt can be used, similar to the Frue vanner.

After using this arrangement for five years, and handling upon it thousands and thousands of tons of ore, I am convinced that it is not only an economical method, but a good one, and applicable to many classes of ore. There may be something similar to it in use, perhaps something better; but if so, I am not aware of it. It was simply a product of necessity with us, and was got up, not to "fill a long-felt want" of the art generally, but to assist in producing cheaper and quicker work at our particular mine.

After various trials it was found that the only thing suitable for screens on our table was punched iron (No. 8) with counter-sunk holes on the upper side, this being necessary in order that the broken ore may slide easily along over the screen, and not catch by sharp edges.

It has been customary in working our table to run in the central shoot of the table whatever was in the greater proportion in the ore. If more than half rock then the ore was sorted out into the side shoots, and the waste run down the center; *vice versa*, if the ore was in excess.

The jerking motion of the table constantly turns the ore; and if a

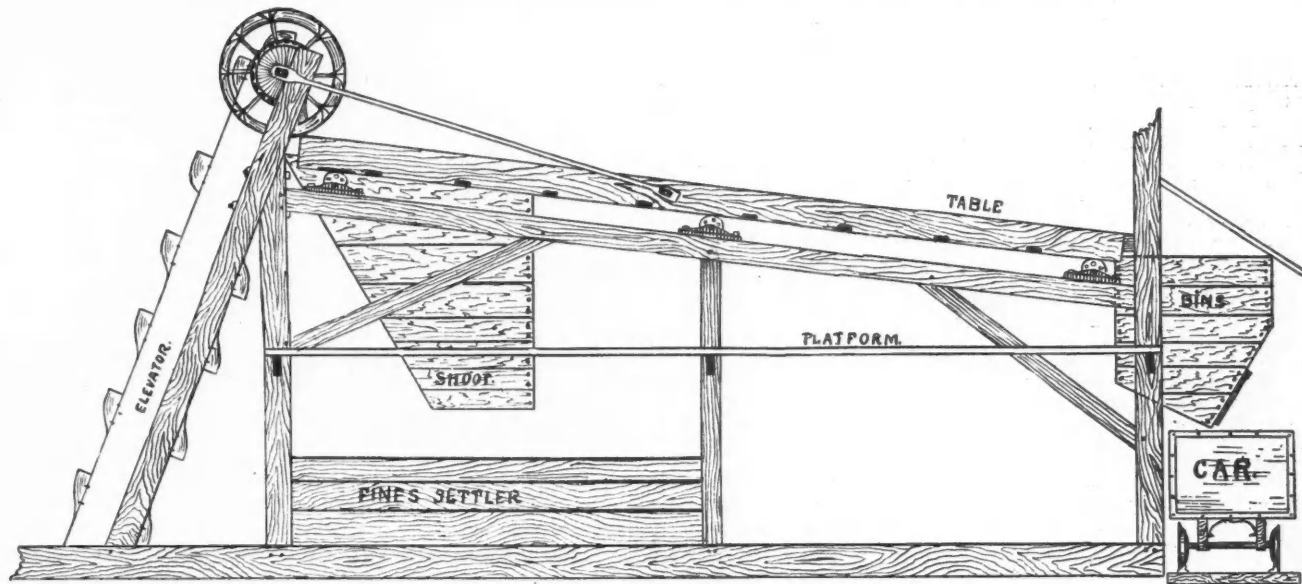


FIG. 1- ELEVATION

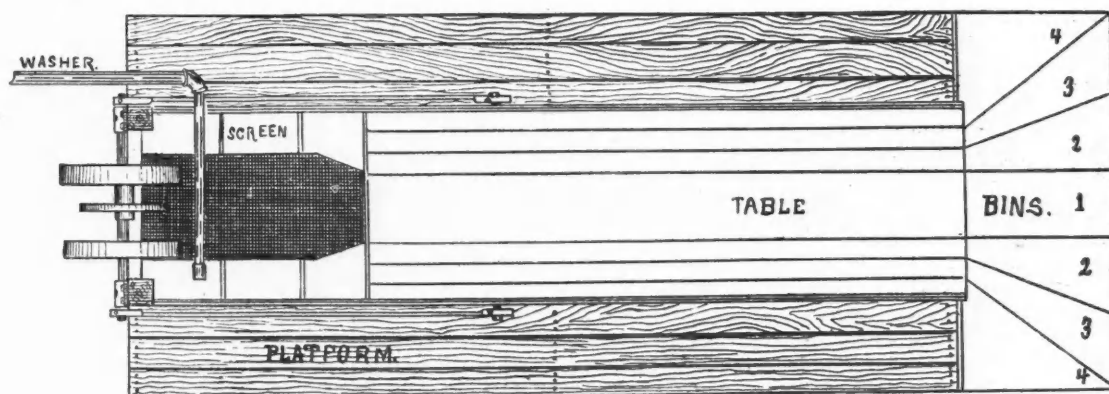


FIG. 2.

BARTLETT'S ORE-SORTING TABLE.

delivered by the elevator on to the screen at the upper end, and is washed by the water jets. The fine stuff goes through the screen into the tank below, while the coarse ore travels along by successive hitches towards the lower end of the table. Boys stand on either side, their fingers protected by steel thimbles, and sort the ore as it passes along. Waste rock goes into the first trough on each side; the other troughs carry, respectively, galena, copper and zinc, while the now thoroughly cleaned pyrites continues on down the central shoot. A bright boy will learn to sort in a week, and will in a short time become surprisingly expert at the business. The number of boys worked at the table varies according to the class of ores; as many as ten can work at the table, but we rarely work more than four or five.

The amount of ore which can be handled on this table depends upon its quality. If half rock and half ore, 5 tons per hour will be good work; with cleaner ores, 8 or even 10 tons per hour have been run. Our daily average for 10 hours has been, on year's runs, 75 to 80 tons. The saving resulting over the old hand method is enormous. Where it cost us 75 cents per ton by hand-work to break and sort, the crusher and automatic table brought the cost down to 15 cents per ton. The saving in handling is very great. Through the use of the table, the ore is not handled again after it is thrown into the crusher; its movement is automatic until it is finally dumped into the tram-cars. The fine stuff which passes through the screen is considerably concentrated, since the constantly overflowing water washes out all the lighter rock. It is, however, very easy to rig up a simple jig under the screen and make a first-class concentration;

powerful stream of water is let in at the head, it is thoroughly and completely washed so that there is no difficulty whatever in detecting with the eye the differences in kind and quality.

This system of ore sorting will not do for all kinds of ores, especially for decomposed ores; but there are many varieties upon which it will work, and it will be found a cheap, easy system of dressing.

While on this subject I can not close without a word of warning to mine managers upon the subject of closer attention to the underground work. In many mines thousands of tons of worthless rubbish are annually sent to the surface to be dressed out which should have been left in the mine. A little extra care on the part of the foreman in pointing holes, and a complete understanding with the men, that great care shall be exercised in not disturbing the walls of the vein until the ore has been taken out and sent up, will result in vastly less work on the surface. As a rule, miners care little what is sent to the surface, and no pains whatever are taken in keeping the ore clean and free from worthless material. Again, superintendents and mining captains often desire to make a big show and send up anything which can be made to swell the "ore-pile."

Probably the most noteworthy case of hand-picking without the use of any machinery whatever is to be found around Joplin, Mo., where the "gophers" or miners are engaged in mining galena and blende. Here two or three men join interests and dig a hole, out of which is obtained more or less mixed ore consisting of masses and bunches of galena and blende. By means of rude hand-screens the ore is washed and sorted. Not a fragment is allowed to escape. At night these miners have each a

pile of clean galena and blende, so free from impurities that the ore is invariably sold by looks, no assay ever being thought of. Elaborate dressing-works have been tried in this region, but have always proved more expensive and unreliable than hand-work. It may be said that the peculiarity of this lies in the nature of the ores and the unusual conditions obtaining in this section. Still, this does not alter the fact that the natives have become extremely expert at hand-sorting, so much so that they can successfully compete with machine work.

I believe that hand-sorting, assisted by the use of simple devices, is a much neglected art in this country, and one that deserves attention from the small miners especially. I am aware, too, that there are some pretty good systems of machine-sorting or concentrating coming into use. Progress is constantly being made in this line. But they are expensive, and need skilled men to run them; hence hand-sorting is not to be despised.

THE MINERAL PRODUCTION OF CANADA IN 1887.

We have received from Mr. E. Coste, of the Geological Survey of Canada, the following statement of the mineral production of Canada in 1887:

NAME OF PRODUCT.	No. of returns (a).	1887.	
		Quantity (b).	Value (c).
Antimony ore..... tons.	1 + N. S.	434	\$18,960
Arsenic..... "	1	30	1,260
Asbestos..... "	11	4,573	227,716
Baryta..... "	N. S.	400	2,000
Brick..... thousands.	210	139,185	725,094
Building stone..... cub. yds.	90 + N. S.	223,835	450,934
Cement..... bbls.	6	63,843	81,909
Charcoal..... bush.	6	1,610,900	88,823
Chromic iron ore..... tons.	1	38	570
Coal..... "	23 + N. S. & B. C.	2,368,041	5,208,439
Coke..... "	N. S.	86,244	86,244
Copper (d)..... lbs.	4	3,260,434	342,345
Flagstone..... sq. ft.	4	110,925	10,811
Gold (e)..... oz.	6 + N. S. & B. C.	62,289	1,111,877
Granite..... tons.	11	15,118	98,995
Graphite..... "	1	300	2,400
Grindstone..... "	5 + N. S.	2,772	35,398
Gypsum..... "	9 + N. S.	154,008	157,277
Iron (f)..... "	8	31,527	1,087,728
Iron ore..... "	10 + N. S.	76,330	146,197
Lead (fine, contained in ore)..... lbs.	1	204,870	9,216
Lime..... bush.	102 + N. S.	2,303,667	289,369
Limestone for iron flux..... tons.	3	17,171	17,500
Manganese ore (g)..... "	3 + N. S.	1,630	39,672
Marble and serpentine..... "	2	242	7,845
Mica..... lbs.	3	22,083	29,816
Miscellaneous clay products..... "	7	78,670	78,670
Ochre..... tons.	1	100	1,500
Petroleum (h)..... (bbls. of 35 imp. galls.)	1	594,411	463,641
Phosphate (i)..... tons.	16	23,690	319,815
Pig-iron..... "	3	24,827	366,192
Platinum..... ozs.	1	1,460	5,600
Pyrites..... tons.	2	38,043	171,194
Salt (j)..... "	18	60,173	166,394
Sand and gravel (exports)..... "	1	180,800	30,307
Silver (k)..... "	2	7,357	322,002
Slate..... tons.	2	100	800
Soapstone..... "	2	100	800
Steel (l)..... "	5	7,326	331,199
Sulphuric acid..... lbs.	4	5,477,950	70,679
Superphosphate..... tons.	3	498	25,943
Tile..... thousands.	69	8,355	136,112
Whiting..... bbls.	1	500	600
Total.....			\$12,959,073

(a) These numbers show the number of mines, quarries, or works producing in 1887, and of which returns have been received. They are believed to represent very nearly the total number of the producers in every case, except for coal, iron and steel, marble, building stone, lime, bricks, tiles, and cement. A return of the total quantity of each mineral produced in the Provinces of Nova Scotia and British Columbia has been furnished by the Department of Mines of these Provinces. The number of producers was not stated and the letters N. S. and B. C. indicate where the returns are included.

(b) Quantity marketed except when otherwise specified. The tons are of 2000 pounds. (c) Market value less charges of transport from point of production. Nova Scotia and British Columbia values have not been received but are estimated as above, except for grindstones.

(d) Quantity of fine copper manufactured from the ore of Capelton plus fine copper contents calculated from assay value in the other returns. (e) Nova Scotia gold is estimated at \$19.50 an ounce and British Columbia gold at \$17 an ounce.

(f) This includes 6 rolling mills, 1 forge and also the Londonderry Iron Works. The returns from the 4 Montreal rolling mills and from another mill at St. John, N. B., have not been received and unfortunately render this statement incomplete.

(g) The value of the Nova Scotia ore is estimated at only \$25 per ton, as the returned quantity is thought to include a certain amount of low grade ore used in making paint.

(h) Crude equivalent of the quantity (7,905,666 imp. gallons) of refined oils inspected calculated at 100 gallons crude for 38 gallons refined. The direct returns received from thirteen refineries gave the quantity of illuminating oils and benzine and naphtha manufactured during the year as: 10,732,395 imp. gallons, worth \$1,022,739, and the actual corresponding consumption of crude returned as 763,933 barrels.

(i) Direct returns; the value is taken at an average of \$13.50 a ton at the mines. This production is divided as follows:

From Ottawa County mines.....	18,955 tons
From Ontario mines.....	4,735 "
Total.....	23,690 "

which agrees very nearly with the Customs Department figure of export, which is for the calendar year 1887: 23,152 tons, with a declared value of \$433,217.

(j) In barrels of 280 pounds it would be 429,807 barrels. The value is that of the salt alone, exclusive of packages.

(k) Export returns plus \$116,318 estimated silver contained in the copper pyrites of the Capelton mines—altogether the total production is probably from six different mines.

(l) Return probably not quite complete.

MODERN AMERICAN METHODS OF COPPER SMELTING.

The *Mining Industry*, of Denver, Colo., in its issue of the 23d inst. says: "Dr. Edward D. Peters has produced a work bearing this title that is well nigh a model of its kind. It contains much that is not found in any single work published, and that much is of value to the practical man in metallurgical work, because it is put so plainly that he who runs may read. The valuable practical facts it gives are plainly stated, and not left to be understood as the natural sequence of certain proved scientific facts. There is, too, scarcely a thing in the book which is not valuable to smelters of gold and silver as well as copper ores, because metallurgi-

cal truths are the same the world over. The chapter on the treatment of copper bearing gold and silver ores, though brief, contains some facts that are of interest to those who delight in speculations upon 'secret processes.' The work is a valuable contribution to metallurgical literature."

SPIRALLY WELDED TUBING.*

By J. C. Bayles, New York City.

(Concluded from page 252.)

Spirally-welded pipe does not depend upon new uses for its introduction, but, being entirely practical for all purposes, enters the market as a competitor with lap-welded pipe. The advantages inherent in a pipe formed by winding a plank spirally, are obvious. All tests of rolled iron show that it is materially stronger with the "grain" than across it. Fairbairn's well-known experiments prove that the difference is fully 10 per cent. on the average. Skelp-iron, of which all forms of wrought-iron pipe are made, must of necessity be slit into bands in the direction of its fibers. If the pipe is formed by curving the strip of skelp over a mandrel of any sort, and finishing it by a longitudinal "lap" or "butt weld," an inherent structural weakness is inevitable. A bursting-strain, exerted circumferentially, brings upon the iron a stress which which it is much less able to resist than it would be if the fibers and weld ran the other way. A bursted wrought-iron pipe, butt-welded or lap-welded, is always found to be split lengthwise, usually along the line of the weld, which is never as strong as the body of the stock from which the pipe is made. It is usually possible with a wooden plug, driven into the end, to split such a longitudinally welded pipe along the line of the weld without serious difficulty. In a pipe formed spirally, the bursting strain is exerted largely in the direction in which the fibers of the iron run; and the spiral weld, instead of being a line of structural weakness, is a reinforcement, giving the pipe added stiffness, and making it when finished stronger to resist bursting- or crushing-strains than the stock of which it is made would be in any other form. This kind of pipe admits of the use of very much lighter stock than can be employed in other forms, and gives great strength with gauges of iron which, if heated to the welding temperature prior to forming, would collapse and defeat all efforts to form or weld them.

When steel is used, the advantages incident to spiral winding are less conspicuous than in the case of iron, but owing to the greater strength of the material it can be used of so much lighter gauge that a very important economy is secured, both in first cost and in transportation and handling. Concerning the spiral weld it is enough to say it is a perfect weld. Every known test has been applied to it, and the results have been, in every instance, fracture in the body of the stock and not in the weld.

The strengths attainable in light pipe, if the material is used to the best advantage, are quite surprising. A 6-inch pipe made of No. 14 gauge iron of good average quality, showing under test 33,000 pounds elastic limit, and 50,000 pounds ultimate strength, has a proof strength of 913 pounds per square inch, and an ultimate strength of 1383 pounds per square inch. A 12-inch pipe of the same stock has a proof strength of 456 pounds, and an ultimate strength of 691 pounds. If a good grade of soft steel is used instead of iron, the 6-inch pipe will carry 1106 pounds pressure without deformation, and will not burst under 1800 pounds; the 12-inch pipe can be tested to 475 pounds and will carry 900 pounds without fracture. This is very practical pipe. Using the same diameters and gauges of stock for comparison, we find that the 6-inch spirally welded pipe weighs 5.2 pounds per foot against 18.77 pounds per foot for standard lap-welded pipe, and 28.28 pounds for medium cast-iron pipe; the 12-inch spirally welded pipe weighs 10.46 pounds against 54.65 pounds for lap-welded and 77.36 for medium cast-iron. I give below tables of strength and weights.

PROOF STRENGTH OF SPIRALLY-WELDED STEEL TUBES.
Ultimate strength of stock 40,000 pounds per square inch.
Ultimate " " " 65,000 "

Diameter of pipe.	Gauge.	Proof strength per sq. in.	Ultimate strength per sq. in.	Diameter of pipe.	Gauge.	Proof strength per sq. in.	Ultimate strength per sq. in.
4	18	980	1,593	16	18	245	398
	16	1,300	2,113		16	325	528
	14	1,660	2,697		14	415	674
5	18	784	1,274	10	12	545	886
	16	1,040	1,690		10	670	1,088
	14	1,328	2,158		8	825	1,341
6	18	653	1,062	18	18	218	354
	16	866	1,408		16	289	469
	14	1,106	1,798		14	369	599
8	18	490	796	8	12	484	787
	16	650	1,079		8	596	988
	14	830	1,371		8	733	1,192
10	18	392	637	20	18	196	319
	16	520	845		16	260	422
	14	664	1,079		14	332	539
12	18	326	531	24	12	436	709
	16	433	704		10	538	871
	14	474	809		8	660	1,073
14	18	280	455	22	18	178	289
	16	371	603		16	236	384
	14	474	771		14	302	490
14	18	280	455	8	12	396	644
	16	371	603		10	487	791
	14	474	771		8	600	975
14	18	280	455	24	18	163	265
	16	371	603		16	216	352
	14	474	771		14	277	449
14	18	280	455	8	12	363	590
	16	371	603		10	446	726
	14	474	771		8	550	894

* A paper read before the American Institute of Mining Engineers, at the Boston meeting, February, 1888.

SPIRALLY-WELDED IRON TUBES.
Proof strength of stock 33,000 lbs. per square inch.
Ultimate " " 50,000 " " " " " "

Diameter of pipe.	Gauge.	Proof strength per sq. in.	Ultimate strength per sq. in.	Diameter of pipe.	Gauge.	Proof strength per sq. in.	Ultimate strength per sq. in.
4	18	809	1,225	16	18	202	306
	16	1,072	1,625		16	263	406
	14	1,369	2,075		12	342	518
5	18	647	980	18	12	449	681
	16	858	1,300		10	552	837
	14	1,096	1,680		8	680	1,031
6	18	539	816	20	18	179	272
	16	715	1,083		16	238	361
	14	913	1,383		14	304	461
8	18	404	613	22	12	399	605
	16	530	813		10	491	744
	14	684	1,037		8	605	917
10	12	899	1,392	24	18	162	245
	10	1,105	1,675		16	214	325
	8	1,361	2,061		14	274	415
12	18	323	490	22	12	360	545
	16	429	653		10	442	670
	14	548	830		8	544	825
14	12	719	1,090	24	18	147	221
	10	884	1,340		16	195	296
	8	1,089	1,650		14	249	377
16	18	269	408	24	12	377	495
	16	357	544		10	492	609
	14	456	691		8	495	750
18	12	599	908	24	18	175	204
	10	737	1,117		16	179	271
	8	907	1,375		14	228	346
20	18	231	350	24	12	299	454
	16	306	464		10	369	558
	14	391	593		8	454	687
22	12	512	779				
	10	632	967				
	8	774	1,179				

COMPARATIVE WEIGHTS OF PIPES PER LINEAR FOOT, WITHOUT COUPLINGS OR HUBS.

Diam. of pipe.	Spirally-welded steel or iron.						Lap-welded iron.	Cast-iron.		
	No. 18.	No. 16.	No. 14.	No. 12.	No. 10.	No. 8.		Stand-ard.	1/2 In. thick.	3/4 In. thick.	1 In. thick.
In.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.				
4	2.06	2.73					10.72	22.05	28.28	34.94
5	2.58	3.42					14.56	26.94	34.24	42.38
6	3.09	4.10	5.20				18.77	31.82	40.56	49.6
8	4.13	5.47	6.98				28.25	41.64	52.68	64.27
10	5.18	6.83	8.72	11.44	14.08		40.64	51.46	65.08	78.99
12	6.18	8.20	10.46	13.74	16.90	20.80	51.65	61.26	77.33	93.7
14	7.22	9.57	12.40	16.22	19.72	24.86		71.07	89.61	108.46
16	8.25	10.93	13.95	18.30	22.54	27.72		80.87	101.82	123.12
18	9.28	12.30	15.69	20.69	25.35	31.19		114.1	137.84	161.9
20		13.66	17.44	22.28	28.16	34.68		126.33	152.53	179.92
22		15.03	19.14	25.27	30.98	38.12		138.6	167.24	198.46
24		16.40	20.92	27.43	33.80	41.60		150.85	181.92	218.28

The question of durability in service is one which naturally suggests itself when light steel or iron pipes are discussed. Experience on the Pacific Coast seems to have settled this question, as the cheap expedients adopted for water-conveyance, during the days when hydraulic mining was most extensively conducted, have been followed ever since in permanent engineering works. The best attainable data on this subject which I have found, are presented in a paper read by Hamilton Smith, Jr., before the British Iron and Steel Institute, and printed in Vol. I of the Journal for 1886. Much of the information contained in this paper is quite surprising, especially in the case of the two mains across Humboldt Cañon. These pipes were laid in 1868. They are of 26 inches diameter, 1194 feet long, of common iron 1/4 inch in thickness, single-rieveted. During all this time they have been delivering water under 120 feet head, and Mr. Smith gives the maximum tensile strain in pounds on the metal per square inch as 11,500. (Rankin's formula for this head, thickness and diameter gives about 10,900 pounds.) Riveted pipe in its best estate labors under the disadvantage of inherent structural weakness, and liability to rust between the overlapping edges and around the rivets. Pipes of this character on the Pacific Coast are very roughly tarred in position, and the coating is quite liable to be pulled off by the adobe clay in which most of them are laid; but they have a record of useful life since 1853, and many towns are supplied with water under considerable heads from pipes of this kind which have been more than twenty years in service. A welded pipe carefully coated with asphalt should, with fair treatment, have at least as good a record, and probably one much better.

The coupling of light-pressure pipes involves no difficulties, but it entails new methods. These are convenient and inexpensive and make perfectly tight joints. The couplings are chiefly of cast-iron, and their form depends upon the service in which the pipe is to be employed. Steam, water, petroleum, compressed air and gas, all present different problems in couplings, but no difficulties which have not yet been fully met. The couplings are as practical as the pipe.

The field of pre-eminent and unique advantage which belongs to spirally-welded pipe is in the large sizes. The present practical diameters in lap-welded pipe are 20 inches and under; the lengths are dependent upon the size of the heating furnaces. Spirally-welded pipe can be made of any diameter required, and of any length which can be handled in transportation. Its uses are too varied for enumeration. They include all the operations of hydraulic mining, mine-draining and ventilation, the conveyance and distribution of water, natural gas, illuminating gas, steam, compressed air and petroleum. There is a large and unsatisfied demand for sizes of wrought-iron and steel pipe for uses in which cast-iron is too costly or cannot be trusted, which seems to be fully met by the spirally-welded tubing. Perhaps the most interesting fact in connection with its manufacture is the number of new and unexpected uses opening for it, in short lengths from 12 inches to 4 feet. These seem

great enough in the aggregate to absorb the production of more machines than one mill of convenient proportions will hold; and they have a special interest for the manufacturers, in that they seem to obviate all danger of waste from accidents resulting in defects disclosed in the testing of long tubes. Experience contradicts prophecy in this respect; and it is found that the problem is not how to make long pipes, but how to cut long pipes into short pieces to the best advantage.

Waste Silk for Steam Pipe Covering.—Experiments on the relative advantages of different covering material for steam pipes, recently made at Saint Denis, proved waste silk the most effectual of all non-conducting compositions, and it is stated that notwithstanding its high price this material is greatly used.

A New Thermo-Electric Couple.—Some foreign papers state that a new thermo-electric couple having an E. M. F. as high as 0.18 volt, and a resistance as low as 0.009 ohm, has been constructed by M. Heimele. The importance of these figures becomes evident when it is pointed out that the thermo-electric couple best known in this country, that of Clamond, has an E. M. F. of only 0.02 volt with a resistance of 0.02 ohm.

Proposed Canal Connection of Paris with the Sea.—The proposal to connect Paris with the sea by a canal is again being pressed forward. The canal would be through level country, and it is thought not to be impossible to make such a water-way remunerative. Government assistance is not invoked for the project, all that the promoters ask being the right to levy a toll at so much per ton. This abstention from demands on the government is not an habitual thing in France.

Welsh Semi-Anthracite Coal Dutiable.—Under an appeal from an assessment of duty on Welsh coal, the Treasury Department says: "The appellants claim that the coal embraced in said importation was anthracite coal, and therefore was not subject to any duty. It appears, however, that upon an examination of the samples of said coal one of the lots in question was found to be strictly bituminous coal and the other semi-anthracite, which is designated in England as anthracite, but is equivalent to a species of coal known in the United States as hard bituminous. Your decision, imposing duty on 'bituminous coal' is hereby affirmed."

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

The following is a list of the patents relating to mining, metallurgy, and kindred subjects, issued by the United States Patent Office.

- PATENTS GRANTED APRIL 10TH, 1888.
- 380,692. Metal-Planing Machine. Lucius W. Pond and Frederick E. Norton, Worcester, Mass., Assignors to Henry C. Fish, same place.
 - 380,702. Dynamo. Henry B. Slater, Detroit, Mich., Assignor to the Detroit Motor Co., same place.
 - 380,706. Limekiln. John H. Wallstrom, Rockford, Ill.
 - 380,710. Metallic Socket Connection for Stone Coping. William Williams, Huntingdon, Pa.
 - 380,719. Grate and Furnace for Steam Boilers. Geo. Gulickson, Chicago, Ill.
 - 380,726. Process of Making Hydrogen. Wilhelm Majert, Grunau, near Berlin, and Gustav Richter, Falkenberg, near Grunau, Prussia, Germany.
 - 380,743. Automatic Gas-Governor. Frederick Bredel, New York, N. Y.
 - 380,756. Apparatus for Casting Ordnance. Richard J. Gatling, Hartford, Conn.
 - 380,757. System of Electrical Distribution. William H. Hart, Brooklyn, and James T. Gouffeloew, Troy, N. Y., Assignors to William Hampden Johnson, Philadelphia, Pa.
 - 380,759. Metal-Rolling Machine. Daniel E. Kempster, Boston, Mass.
 - 380,775. Process of Obtaining Sodium, etc. Orlando M. Thowless, Newark, N. J.
 - 380,776. Apparatus for Obtaining Sodium, etc. Orlando M. Thowless, Newark, N. J.
 - 380,777. Tub-Cutter. James R. Vance, Geneva, N. Y.
 - 380,788. Rotary Fan. Robert B. Gissel, Elizabeth, Assignor, by direct and mesne assignments to the Backus Water Motor Co., Newark, N. J.
 - 380,795. Water-proof Paint. Matts Fred. Hancock, Mich.
 - 380,818. Nail-Making and Distributing Machine. Freeborn F. Raymond, 2d, Newton, Mass.
 - 380,820. Method of Preserving Submerged Timbers. Hiram L. Ricks, Eureka, Cal.
 - 380,821. Crus-mill. A'pheus E. Rice, San Francisco, Cal., Assignor to Tatum & Bowen, same place.
 - 380,822. Manufacture of Planished Sheet-Iron. William Rogers, Pittsburg, Pa., and William H. Rogers, Wheeling, W. Va.
 - 380,824. Electrical Speed Indicator. Frederick W. Schlegel, Charleston, S. C.
 - 380,825. Steam Engine. Elmer S. Smith, Buffalo, N. Y., Assignor of one half to Ray V. Pierce, same place.
 - 380,842. Apparatus for Examining Ores. John R. Williamson, Seattle, W. T., and William W. Hickley, Oakland, Cal.
 - 380,483. Ore-Pulverizer. David Barstow, Murphy's, and William P. Stevenson, Douglas Flat, Cal.
 - 380,845 and 380,846. System of Electrical Translation. Reginald Balford, Pittsburg, Pa., Assignor to the Westinghouse Electric Company, same place.
 - 380,848. Speed Governor for Motors. Elijah B. Bonham, Holyoke, Mass.
 - 380,849. Valve for Multiple-Cylinder Engines. Elijah B. Bonham, Holyoke, Mass.
 - 380,860. Water-Trap for Gas-Mains. Alexander Chambers, Toledo, Ohio.
 - 380,879. Electric Locomotor. Stephen D. Field, Yonkers, N. Y.
 - 380,880. Electric Locomotive. Stephen D. Field, Yonkers, N. Y.
 - 380,882. Steam Actuated Valve. James H. Fogarty, New York, and Frederick M. Wheeler, Montclair, N. J.
 - 380,884. Wire-Barb. Merritt Greene, Marshalltown, Iowa.
 - 380,910. Apparatus for Cleaning Charged Gas-Pipes. Patrick McGee, Providence, R. I.
 - 380,911. Hydraulic Main for Gas-Works. George A. McIlhenny and Thomas G. Laundon, Washington, D. C.
 - 380,917. Machine for Shaving Heads of Bolts, Nuts, etc. Henry Minter, Worcester, Mass.
 - 380,918. Steam-Engine Indicator Attachment. Joseph R. Mitchell, Oakland, Cal.
 - 380,920. Method of Chloridizing Finely-Divided Auriferous Materials. James C. Newberry and Claude T. J. Vautin, London, England.
 - 380,940. Check-Valve. Louis Schutte, Philadelphia, Pa.
 - 380,941. Device for Operating Valves and other Mechanisms. Louis Schutte, Philadelphia, Pa.
 - 380,942. Electric Indicator. Oliver B. Shallenberger, Rochester, Assignor to George Westinghouse, Jr., Pittsburg, Pa.
 - 380,943. Volt-Ammeter. Oliver B. Shallenberger, Rochester, Assignor to the Westinghouse Electric Company, Pittsburg, Pa.
 - 380,944. Electrical Pressure Indicator. Oliver B. Shallenberger, Rochester, Assignor to the Westinghouse Electric Co., Pittsburg, Pa.
 - 380,950. Appliance for Manipulating Large Forgings. George Siddell, Sheffield, County of York, England.
 - 380,970. Apparatus for Manufacturing Compound Plates of Iron and Steel. Alexander Wilson, Sheffield, County of York, England.
 - 381,971. Construction of Stationary and Itinerant Electrical Batteries. James T. Armstrong, London, England.
 - 381,004. Apparatus for Forming Sheets of Nickel or other Metal by Electrolysis. Moses G. Farmer, Eliot, Me.
 - 381,013. Packer for Oil and Gas Wells. Isaac N. Hoadley, Bradford, Pa., Assignor to the Hoadley Packer Co. (Limited), same place.
 - 381,053. Machine for Tapping Steam, Gas or Water Fittings. Albert M. Burritt, Waterbury, Conn.
 - 381,055. Stop Valve. John A. Creelman, Rochester, N. Y., Assignor of one half to George H. Graham, same place.
 - 381,082. Boiler Furnace. George W. Parketon, Laurens, Assignor of one half to Daniel P. Goggans and Frank P. McGowan, both of Laurens County, S. C.

THE METALLURGY OF STEEL.*

By Henry M. Howe.

(Continued from page 255.)

A. *The boring gases* from cast-iron contain slightly more carbonic oxide than those from steel, viz.: from 2.5 to 4.3% against 0 to 2.2%. Those from forged steel (9, 10, 12 Table 54) contain much less hydrogen and consequently much more nitrogen than those from most of the unforged steels, and, in the sole case in which the blowholes gases have been collected from the same steel both before and after forging, those from the forged piece contained but 73.4% of hydrogen against 92.4% in those before forging. (11 and 12 id.) This may be accidental, or it may mean that the more diffusive hydrogen has more fully escaped during heating and forging.

When the same steel was attacked with both dull and sharp drills, (16, 17, id.) the dull drill released gas considerably richer in hydrogen than the other, viz.: 88.7 vs. 67.1%. This, however, was probably accidental, perhaps due to boring different portions of the ingot: for, a piece of cast-iron evolved gas of almost exactly the same composition when attacked by a dull as when bored by a sharp drill (40, 41, id.).

The composition of the gases obtained by boring the blisters which occasionally form on both weld and ingot iron, differs very strikingly from that of the other boring gases, containing 27.2 and 70.42% of carbonic oxide (33 and 34, Table 54).

The vacuum extracted gases from cast-iron have already been shown (Table 75, § 207, D) to hold less nitrogen than those from other classes of metal: but beyond this all is uncertain. Parry indeed repeatedly stated that the higher the temperature the larger the ratio of carbonic oxide to hydrogen in those gases. He states that at dull redness, and in one place that even at full redness pure hydrogen is evolved, and that with further rise of temperature a continually increasing proportion of carbonic oxide escapes from both cast and wrought-iron.^a In a careful study of his published results, however, I find little support for these assertions. Thus, in Table 72, we note that even at dull redness a large proportion of carbonic oxide escapes, and that in two out of the six cases in which the same piece of iron is successively exposed different temperatures (the higher always following the lower) the proportion of carbonic oxide is lower at the higher temperature. Nor can a more constant relation be traced between the proportion of carbonic oxide and the progress of exhaustion. There are ten sets of cases in this table, each giving the composition of the gas evolved during two successive periods at constant temperature. In four the ratio of carbonic oxide to hydrogen is higher, in five lower and in one the same in the later as in the earlier period. Troost and Hautefeuille moreover found this ratio higher in case of cylinders of cast-iron and steel, and lower in case of a cylinder of wrought-iron, in the early than in the later portion of their exposures to a vacuum: or, as they put it, wrought-iron retains carbonic oxide more tenaciously than hydrogen, while with cast-iron and steel the reverse is true.^b To generalize from such scanty data would be extremely rash.

§ 210. WHAT CAUSES BLOWHOLES? We have seen that they are gas bubbles mechanically retained by the pasty

metal, or held by capillarity to the surface of the solidifying metal. Their formation requires first a metal of the proper consistency to retain them mechanically, or one whose surface in solidifying retains them by capillarity: and second the evolution of gas within it. Why certain classes of metal which evolve gas during or at least just before solidification do not acquire blowholes while others do, we cannot now and perhaps never can tell. Little is recorded even of the changes in consistency which different classes of metal undergo: as to the capillary retention of gas by different classes of iron we are completely in the dark.

Three sources of gas bubbles have been suggested: 1st, the mechanical retention of air drawn down with the stream of metal while teeming: 2d, the formation of carbonic oxide at the instant of its escape by chemical reactions: 3d, the gasification of substances which had existed in some non-gaseous state (solution, chemical union) and which had earlier been formed by reaction or acquired from the atmosphere or the furnace gases. Pourcel would explain all the phenomena by the second cause, while Müller victoriously champions the importance of the third. Indeed, we are indebted to his zeal and eloquence for most of the evidence and reasoning which now render the solution theory well-nigh impregnable if taken in its modified form, as holding solution as an important cause of blowholes. He has really built it up, maintaining it almost single-handed, with vigorous defense and brilliant attack, against his numerous and well equipped opponents.

The discussion which occupies the remainder of this chapter leads to the conclusion that blowholes are chiefly due to hydrogen and nitrogen escaping from solution: that carbonic oxide co-operates, probably also escaping at least in part from solution but perhaps partly and possibly wholly from immediately preceding reaction: and that the retention of air mechanically drawn down in teeming contributes but slightly in those cases which have been thoroughly studied and described. Let us first note that, besides the gas escaping from within the metal, carbonic oxide may be formed by superficial action between the metal's carbon and the oxygen of the atmosphere or of the containing vessel.

§ 211. THE MECHANICAL THEORY holds that a large quantity of air is drawn down by the falling stream of metal, just as it is by the falling water in the trompe, and that the metal is so mucilaginous that the air bubbles are imprisoned.^c Some air may be thus drawn down, and it may under certain conditions contribute, and perhaps largely, to the porosity of the metal.

It is, however, easy to exaggerate the importance of this action. It is the liquidity of the falling stream of water in the trompe that enables it to split up into many fine streams, which collectively offer great surface, and thus by their friction drag down great volumes of air. If the steel is liquid it may indeed drag down much air, but should quickly release it: and that blowhole forming steel often is liquid when teemed is certain. If it is thick and mucilaginous, it will hold in teeming to a single contracting stream with but little surface, and hence will drag but little air with it. There may, however, be intermediate cases in which the steel is highly liquid while falling through the air, and so drags much air with it, yet, becoming mucilaginous shortly after, may retain the

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^a Jour. Iron and St. Inst., 1873, II., p. 429, 431: Idem, 1874, I., p. 93. Comptes Rendus, LXXVI., p. 564, 1873.

^c Proc. U. S. Naval Inst., XII., 3, pp. 379-382: Trans. Am. Inst. Mining Engrs., XIV., p. 123, 1886.

air thus dragged down before it has time to escape; or having become mucilaginous it may entangle air bubbles drawn down by later falling portions of highly liquid steel. Under such special conditions it is not improbable that blowholes may be in large part due to mechanical action. But in many important cases this combination of circumstances does not exist, yet blowholes abound.

Quite independently of this, however, six collectively sufficient reasons, which I now detail, demonstrate that air mechanically drawn down is not a chief cause of blowholes in those cases which have been most carefully studied and most fully described.

1. The gases escaping before and during solidification and those found in the blowholes on boring the cold metal consist chiefly of hydrogen: their composition cannot be readily explained by mechanical retention.^a

II. Air escaping from mechanical entanglement would form spheroidal cavities, while blowholes are usually lenticular or tubular, with horizontal axes perpendicular to the cooling surfaces, and arranged in concentric vertical layers often of decided regularity.

III. It is inconceivable that the addition of silicon, which often instantly and totally stops the escape of gas bubbles, should mechanically prevent the escape of mechanically held air.

IV. Mechanically held air would escape continuously, in gradually and regularly diminishing quantity, while in many cases steel lying perfectly tranquil for a time, only begins to evolve gas after freezing reaches a certain point (§ 202, E.).

V. Increase of pressure completely arrests the evolution of gas from molten metal: it might retard but it certainly could not completely stop the escape of gas which was simply mechanically entangled and insoluble. Conversely, a fall of pressure causes a lively escape of gas from previously perfectly tranquil molten metal, which could not have remained tranquil had it held mechanically suspended gas. (§§ 188, C.; 202, D).

VI. It is inconceivable that molten steel should hold purely mechanically anything like the quantity of gas which it evolves in solidifying. It is generous to admit that the highly fluid metal could hold mechanically one tenth of its own volume of gas as gas, even for an instant: yet Müller found that even comparatively quiet steel evolved in the moulds between 7.6 and 11.4 times its own

volume of gas, measured at 1,800° C., while oxygenated metal evolved about 23 times its own volume. (Cf. § 205, B.) The mechanical theory then breaks down quantitatively as well as qualitatively, and we must call on chemistry or physics or both. Some of the reasons which support the reaction and solution theories further weigh against the mechanical hypothesis.

The fact that the top of the ingot is more porous than the bottom is adduced to support the mechanical theory. But from whatever source gas is evolved, whether from mechanical retention, solution or reaction, that which is not held down mechanically or by capillarity will of course rise to the upper part of the ingot.

Pasty metal would also flow down from the top to feed contraction cavities. In a freezing ice bottle, though the water be absolutely free from bubbles, the ice formed from it is porous, and under certain conditions the pores are much more abundant above than below. Moreover, if the gases evolved by iron escape from solution, the ferrostatic pressure at the bottom of the ingot would tend to retain them in solution.

Let us now turn to the other sources of gas.

§ 212. THE REACTION AND SOLUTION THEORIES.^b

Numerous analyses of the gases escaping from iron under a great variety of conditions show that those which form blowholes escape in large part from previous solution.

(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.

^b Many may hold that, in the ultimate analysis of our phenomena, all gases which escape from molten liquids, save the trifling quantity held by capillary attraction, are formed at the instant of escape by chemical reaction of one kind or another: that before their escape they had been held, if partly or even chiefly by physical forces, still at least partly by chemical ones; that in escaping the gas breaks its chemical bonds, which in itself implies a chemical reaction. Indeed, even those who regard chemical union and solution as radically different are sometimes puzzled to draw the line, and some of them class apparently typical cases of solution as instances of chemical union: *e. g.* holding that carbonic anhydride (CO₂) is not absorbed as such by water, but enters it through a chemical reaction, CO₂ + H₂O = H₂CO₃, and that it is generated at the instant of its escape from soda water by the reverse reaction. In this view all the gases emitted by molten iron, save the slight proportion mechanically held, are generated by reaction at the instant of escape. Others again may consider that hydrogen and nitrogen are held by purely physical bonds, and hence that no chemical reaction is directly connected with their escape, and that this may be true of a portion of the carbonic oxide evolved, while another may be generated by reaction at the instant of escape. Still others may hold that nitrogen and hydrogen are in typical chemical union with the metal, or alloyed with it, but that carbonic oxide cannot be, and that it may either exist in and escape from a state of purely physical solution, or escape while being formed by reactions.

In the first view the important question is "are blowholes due to hydrogen and nitrogen, or to carbonic oxide?" In the second and third views this question remains, and a second one arises, "If by carbonic oxide, does this gas escape from previous solution, or is it generated at the instant of escape by reaction?" The subject admits different lines of treatment corresponding to these different standpoints; but space forbids this. Practically I believe that the convenience of a plurality of readers will be complied with by assuming that hydrogen and nitrogen, except in so far as they are held mechanically or by capillarity, exist in iron in solution, if at all, and hence if they escape it must be from solution, employing this word purposely in a vague generic sense, including all the non-gaseous states, whether chemical or physical, chemical union, alloying, adhesion: and by admitting that it is quite different with carbonic oxide. It is certain that this gas may escape from immediately preceding reaction: but we must for the present treat it as an open question whether it can also exist in solution. This plan of treatment has its manifest drawbacks, but, with the existing limitations of space and language I see no better.

The most ardent advocate of the solution theory must admit that it is conceivable that carbonic oxide may escape from solution. For if this gas dissolves, still if its formation is continued the metal must eventually become saturated with it, and should more form it must escape as fast as formed.

These questions are of practical importance, for the means of preventing the escape of a previously dissolved gas may naturally be expected to differ from those appropriate for preventing the oxidation of carbon and the new formation of carbonic oxide; and the means for preventing the absorption and evolution of carbonic oxide on the one hand and of hydrogen and nitrogen on the other may be expected to differ.

^a To reconcile the absence of oxygen from the blowhole gases with their supposed atmospheric origin, it has been supposed that the atmospheric oxygen has been consumed in oxidizing the iron: while the atmospheric moisture has been assumed to be the source of their hydrogen. But the ratio of hydrogen to nitrogen in these gases is far greater than in air saturated with moisture. This ratio can only be accounted for by supposing that part of the atmospheric nitrogen has been absorbed by the metal: but the moment this is admitted the theory ceases to be mechanical, and nearly coincides with that of solution, which supposes that the gases evolved during solidification were originally of atmospheric origin.

One cubic metre of air saturated with moisture at 10° C. holds 9.74 grms of aqueous vapor, containing 1.08 grms of hydrogen, which if set free would occupy 12.09 litres. The air would hold about 790 litres of nitrogen or about 65.3 volumes of nitrogen to one of hydrogen. The gas evolved by iron during solidification contains in exceptional cases as much as 58.3% by volume of hydrogen with but 0.5% of nitrogen, or 116.6 : 1. Hence this gas holds 116.6 × 65.3 = 7,614 times as much hydrogen per unit of nitrogen as saturated air does.

But we need not turn to exceptional compositions. The ratio of hydrogen to nitrogen in the gases evolved from iron and steel is usually from 1.5 : 1 to 6 : 1, or from about 100 to 400 times as great as in air saturated with moisture at 10° C. (§ 207, C.) At higher temperatures air can hold more moisture than at 10° C. At 35° C. (95° F.) it can hold about four times as much: but even then its ratio of hydrogen to nitrogen is only from one twenty-fifth to one one-hundredth of that usual in the gases from iron: and, moreover, the air is very rarely saturated with moisture except in the most moist climates.

It is hardly supposable that the hydrogen arises from moisture in or around the moulds, for in many cases these were of iron, and water if present would have been visible; we can hardly believe that Müller would be so grossly careless as to allow his work to be thus completely vitiated.

PERSONAL.

The American Society of Mechanical Engineers will hold its seventeenth meeting at Nashville, Tenn., from May 8th to 11th.

General Manager George A. Merchant, of the Buffalo, Rochester & Pittsburg Railroad, has been appointed a director and the president of the Rochester & Pittsburg Coal & Iron Company. Mr. Franklin Platt was the predecessor of Mr. Merchant.

Through a regrettable mistake the name of Mr. Leonard D. Sivyver, the author of the articles on "The Geology of the Aspen, Colorado, Ore Deposits," which recently appeared in this paper, was printed Siver instead of Sivyver. We trust the error has not deprived Mr. Sivyver of the credit he deserves for his interesting communications.

The Agricultural Experiment Station of the University of Tennessee, at Knoxville, has been reorganized with the following officers: Director, Charles W. Dabney, Jr., Ph. D.; Assistant Director (in charge of field and feeding experiments), Charles S. Plumb, B. S.; Botanist and Horticulturist, F. Lamson Scribner, B. S.; Chemist, Winthrop B. Stone, B. S.; Entomologist, Henry E. Summers, B. S.; Assistant in field and feeding experiments, Charles L. Newman, B. S.

FURNACE, MILL, AND FACTORY.

The Coalton Foundry & Machine Works, at Columbus, Ohio, were destroyed by fire on the 8th inst.

Works are to be built at Chattanooga, Tenn., for the manufacture of "Emmensite" the new powder.

The charcoal blast-furnaces of the Asbland Iron and Steel Company, Ashland, Pa., have been started up.

The Daft Electric Light Company, of New York, is considering the question of the advisability of moving its factory from Greenville, N. J., to New York.

The Russia mill of the Falcon Iron and Nail Company, at Niles, Ohio, has been closed down temporarily, owing to dull trade and close prices on sheet iron.

Mr. Andrew Carnegie declines to receive any more committees from the employes of the Edgar Thomson Steel Works, Braddock, Pa., in reference to the existing strike.

The Glendon Iron Company, at Easton, Pa., on the 7th inst. discharged all its men except those employed at one furnace, and put board roofs on all its idle furnaces.

The employes of the Lochiel Iron Works, at Harrisburg, Pa., have accepted the Philadelphia scale, \$3.85 for puddlers, with a corresponding reduction for all other employes.

It is stated that Geo. W. Chambers has broken ground for one of the iron furnaces to be built by English parties at Talladega, Ala. The capacity is reported to be 100 tons. Coke-ovens will also be built.

A mortgage has been recorded at Ironton, Ohio, for \$350,000, against the Etna Iron Works, by A. Pluemer, president of the company. The Etna Iron Works plant comprises Etna, Sarah and Vesuvius furnaces.

The Cedar Point furnace, Port Henry Furnace Company, Port Henry, N. Y., has blown out preparatory to making repairs. This stack has been in blast for over one year, and will resume with a favorable market.

Work will be resumed at the Delaware Rolling-Mills, Phillipsburg, N. J., on the 16th inst. Work was stopped on account of labor troubles. The company finally withdrew its demands, and work will be resumed on the old basis.

The Lomas Bridge & Forge Company, Cincinnati, Ohio, made an assignment on the 9th inst. to Charles Anderson. The liabilities are said to be \$50,000, and assets \$75,000. The company claims that its embarrassment is only temporary.

The Smith-Hill Foundry and Machine Company has been incorporated at Quincy, Ill., with a capital stock of \$75,000, for the manufacture of engines, boilers, pumps, elevators, etc. The incorporators are Ceylon Smith, Thomas Hill, and Pliny B. Williams.

The Hanika Iron Fence Company, Springfield, O., made an assignment on the 12th inst. The liabilities are about \$40,000; assets, \$25,000. Preference of chattel mortgage was given to Gen. Spence and William Burns for \$20,000. The failure was caused by poor business and slow collections.

Special circulars of air-compressors for elevating acids, working pneumatic riveters, and sinking caissons for piers of bridges, also of vacuum pumps for sealing incandescent electric lamps, have been issued, and can be had by addressing the Clayton Air-Compressor Works, 43 Dey street, New York.

It is announced that Matthew Addy & Co., Cincinnati, Ohio, have secured the sole agency for the sale of the product of the Thomas furnace of the Birmingham Mining and Manufacturing Company, near Birmingham, Ala. One stack is completed, with a capacity of a little over 100 tons daily, and another stack will soon be built.

The Post Steel Tubular Company will build works at northeast Minneapolis, Minn. The works will con-

sist of a main building 450x60, with wings on each end 500x50. Between the two wings will be located other buildings, including the engine-house, which will supply power to the entire plant. It is estimated that \$250,000 will be required to erect the works.

The suspension is announced of Messrs. Tyler Brothers, manufacturers of steel tubes, of Boston and New York, who had mills at South Boston, Mass., for tube manufacturing. They claimed to have invested about \$200,000 in the plant and stock, and claimed a capital of \$250,000. They were the owners of half the stock in the Christiana Rolling Mill, at Wilmington, Del. It is said they have no liabilities in New York.

The Baldwin Locomotive Works, Philadelphia, turned out 70 locomotives during March. Their output now averages two per day, which, from the number of orders on hand, seems likely to be maintained for some time. Their small locomotives for use in the mines are giving great satisfaction, sharing the popularity of the Porter locomotives which have long been in use in the coal mines of Pennsylvania, Virginia, and other States.

It is stated that a rolling mill company is being organized at Trinidad, Colo., to manufacture merchant iron. The mill is to cost about \$80,000 and is to be completed in four or five months. The Lewis Manufacturing Company, of Pittsburg, has the contract for furnishing the machinery. Trinidad is situated in the vicinity of extensive coal-fields. Screened coal, it is stated, will be furnished to works for manufacturing purposes at \$1 per ton and coke at a proportionate rate.

The creditors of Graff, Bennett & Co. have been requested to meet at the office of Graff, Bennett & Co., 97 Water street, Pittsburg, Pa., on Saturday, April 14th, 1888, at 10 o'clock A. M. The assignee is desirous of consulting with them as to what disposition he shall make of the two rolling mills of the firm, and what steps he should take as to the mortgages now on the property. These properties constitute such a large proportion of the assets of the firm that he is anxious to obtain the advice of the creditors in reference to the same.

The Elba Iron & Bolt Company, Limited, and the Continental Tube Company, of Pittsburg, Pa., have suspended payment. Liabilities, \$527,000; total assets over \$1,000,000, according to an appraisal just made by experts. The failures were due to the depressed condition of the pipe business, and to the fact that labor troubles have kept the works closed for more than fourteen weeks. It is said that the matter would have been satisfactorily settled within the past week if holders of about \$30,000 worth of paper had not demanded immediate payment. It is the intention of the companies to ask for an extension for two, three, four, and five years, creditors to be secured by a mortgage on all of the property of the concerns.

The Amalgamated Association of Iron and Steel Workers is growing in numbers. Heretofore none but skilled workmen were eligible to membership, but after the last convention it was decided to admit others. It has been decided to take in the following class of workmen in the rolling mills who have been barred since the organization was formed in 1876: Dragouts and hookers on muck rolls, stackers, chargers, drawers, water tenders, and everybody employed around a rolling mill except common laborers. If necessary, it is claimed by those in authority, provision will be made for the latter. It is stated that the tube-workers would be admitted, and were anxious to come into the organization.

The estate of The Steel Company of Canada, Limited, has been transferred to the Londonderry Iron Company, Limited, who will continue the business heretofore carried on by the Steel Company at Londonderry, N. S., and elsewhere in Canada. A. T. Paterson is Chairman of the Provincial Directors, and John Sutcliffe is General Manager. The production for 1887 was as follows: Pig-iron made, 19,499 tons; bar iron, nail plate, and car axles made, 1470 tons; puddled bar made, 2,128 tons; scrap bar made, 445 tons; casting and car wheel's, 134 tons; ore mined, 48,563 tons; limestone used, 15,860 tons; coal and coke used, 77,437 tons. Disbursements: Wages, \$171,000; fuel, etc., \$118,500; flux, \$14,800; railway freights, \$114,000.

The suit of Samuel Huston against E. W. Clark, William Sellers and John Sellers, Jr., which concerned the Midvale Steel Company, at Nicetown, Pa., and involves a claim of several hundred thousand dollars, came up in the Court of Common Pleas, at Philadelphia, Pa., this week. It appears that the William Butcher Steel Works was organized in 1867, but the corporate name was changed in 1872 to the Midvale Steel Works, and it was thus continued down to the fall of 1880, when the Midvale Steel Works was sold out by the sheriff under foreclosure proceedings. The property was bought in by William Sellers and a new company was organized, bearing the title of the Midvale Steel Company. The present litigation, however, concerns an agreement entered into between the parties and bearing date May 13, 1873. On January 10th, 1870, Mr. Huston was elected president of the William Butcher Steel Works, and he continued in that office until May 10th, 1873, when he was succeeded by William Sellers as president, the company, as already stated, having changed its name to the Midvale Steel Works. Mr. Huston, between 1868 and 1873, advanced in cash, for the benefit of the company, over \$300,000. Then there was a settlement, by which he received stock and bonds of the company for the advances, and subsequent to this, on May 13th, 1873, came the agree-

ment which is the governing factor in the present litigation. Under this agreement Mr. Huston handed his securities to the defendants, and it is the value of these, which he says went into the new company, that he seeks to recover. When the defendants became the purchasers of the works in the sale of 1880 they purchased the property, the plaintiff contends, for his behalf as well, and he is therefore entitled to share in the new corporation, which is doing a prosperous business. The Master sustained this contention. The answer of the defendants is, in brief, that all the securities they received from Mr. Huston under the agreement of May 13th, 1873, have been fully accounted for, and as the plaintiff contributed nothing to the new company he is entitled to no interest whatever in that concern.

CONTRACTING NOTES.

Machinery and supplies wanted. See page xiv. Contracts open will be found on pages xiii and xiv. New contracts this week: No. 855, Railway Grading; No. 856, Railway Grading; No. 857, Iron and Stone Work, Excavating, etc.; No. 858, Iron and Stone Work, Excavating, etc.

We are officially advised that the City of Chicago, Ill., awarded the contract officially to Messrs. Edward P. Allis & Co., of Milwaukee, Wis., for five new triple expansion condensing pumping engines, of the same design as the new "West Side Plant," recently built by that firm for the city of Milwaukee, which were the first engines of their type constructed in the country. The capacity of the Chicago engines will be 15,000,000 gallons of water per twenty-four hours each—a total of 75,000,000 gallons a day. The total cost will be about \$400,000. The competition for this contract was very sharp, but the Commissioners, after careful investigation, decided to award the contract to Messrs. Edward P. Allis & Co.

GENERAL MINING NEWS.

The Central Vermont Railroad is to build a branch line from Chateaugay to Chateaugay Chasm, and ultimately to the Canadian frontier at Hinchinbrook. A charter has just been granted for a line from this point to Valley Field, Quebec, the two making a direct route between the St. Lawrence River and the Adirondack iron mines.

The following statement gives gold bullion deposited at the United States Mint, Denver, Colo., during the quarter ending March 31st:

	Gold.	Silver.	Total.
Colorado.....	\$282,491.05	\$2,834.80	\$285,325.85
Arizona.....	29,593.9	365.34	29,959.24
Idaho.....	77.96	.17	78.13
New Mexico.....	6,641.71	171.31	6,813.02
Wyoming.....	192.70	1.27	193.97

Total states and territories.....\$318,936.61 \$3,372.89 \$322,309.50

TENNESSEE COAL IRON AND RAILROAD COMPANY.—At the annual meeting recently held at Nashville, Tenn., the following officers were elected: N. Baxter, Jr., President; T. T. Hillman, First Vice-President; J. P. Williams, Second Vice-President; E. Ensley, Chairman of the Executive Committee; A. M. Shook, General Manager; J. Bowron, Secretary and Treasurer. The annual report shows that the earnings of the company for last year, after the payment of interest on the bonded debt, amounted to 4½ per cent on the entire share capital, out of which one dividend of 1 per cent had been paid and the remainder employed in extensions and improvements. Furnace No. 3, the property of the company at South Pittsburg, commenced operations March 8. It was the first to commence work of the new furnaces that have been and are being built in the South as the result of the great Southern boom last year. It was reported that the filling was being put in the first of the four large furnaces of the company at Ensley City, Ala., and that the furnace was about to go in blast.

ALASKA.

LAKE MOUNTAIN MINING COMPANY.—The *Alaskan* of March 17 states that the stamp mill purchased by this company for its mine near Sitka has been transported to its destination and is now ready to be put in position at the mine. Governor Swineford and several of his friends are interested in this company.

ARIZONA.

GILA COUNTY.

OLD DOMINION COPPER COMPANY.—Surface work was greatly retarded during March by stormy weather, says the *Globe Silver Belt*. Sinking with windlass was abandoned at a depth of 80 feet, and preparations made to fit one compartment of the shaft with cage, to facilitate the work. The power to run the cage is to be transmitted from the hoisting works, distant 1002 feet, by a wire cable which runs on sheaves and rollers just high enough to clear the ground. It is thought this arrangement will work satisfactorily and be adequate for the work required, for some time to come at least. It is contemplated, at some future time, should the new shaft become the chief artery for the hoisting of ore from the mine, to erect hoisting works on the spot. Sinking was to be resumed. Tunnels are being driven to tap the shaft on the fourth and fifth levels, at depths of 158 feet and 230 feet, respectively. This shaft is the most important work undertaken at the old Globe mine for several years, and it will greatly facilitate the opening up of new ground. The product of one furnace for the month of March was about 210 tons of copper bullion.

CALIFORNIA.

LOS ANGELES COUNTY.

PETROLIA, ASPHALTUM AND OIL COMPANY.—This company has been organized to work the enormous deposits of asphaltum reported to be just north of Carlton. The land belonging to this company, located about 20 miles east of the City of Los Angeles, consists of about 580 acres of low rolling hills and mesa or low table lands. On the latter lands and in the gulches and ravines are large deposits of asphaltum and oil springs. The Los Angeles Herald says that on one of the deposits an oil well has been sunk to a depth of 380 feet, running through strata of asphaltum all the way. This well, now abandoned, has been pumping several barrels of oil per diem for over twelve years. There are also in the immediate vicinity wells that are now pumping from 25 to 50 barrels per day.

PLUMAS COUNTY.

CONSIGNEE GOLD GRAVEL MINING COMPANY.—This company has been prospecting during the past ten years. In search of the channel, a tunnel was run 2200 feet. About 400 feet from the mouth of that tunnel, a shaft was sunk 370 feet deep, encountering a large volume of water, indicating that an extensive channel has been reached, which the company propose to tap with a tunnel 2000 feet long, from the river.

PLUMAS EUREKA MINING COMPANY.—The 60-stamp mill is kept busy all the time on high-grade ore, which is taken from a recent development. The present yield is about \$40,000 per month. At present about 250 men are employed. It is said that the company has sent to England for a large pump to use in a shaft, which is being sunk below the Eureka tunnel, the lowest in the mine. It appears to be the intention of the management to prospect the ore-bodies below any of the present and past works. If the developments justify, a lower and lengthy tunnel will probably be run to tap these ore-bodies which have proven so rich above.

SAN DIEGO COUNTY.

In the suit of John S. Doe against Casper Sanger brought for the excavation of ore from the Lawn Level or Central mine, the jury gave a verdict of \$25,000 for damages.

CANADA.

PROVINCE OF BRITISH COLUMBIA.

We have received from Mr. N. E. Linsley, of Colville, W. T., the following particulars concerning the new Kootenai district in British Columbia, just north of the Idaho line, which has attracted great attention, and is likely in the future to attract still further the attention of mining men: During the summer of 1883, a party of ten or twelve men left Colville for the purpose of prospecting the country between the Pend d'Oreille River and Kootenai Lake, and about twenty-five miles east of the Columbia River. On their way home, in October, and while crossing the mountain between Kootenai Lake and the Columbia River, they discovered an immense ledge of ore, very showy, having been highly colored with carbonate of copper. They were looking for placer diggings, but this immense showing induced them to bring samples of the ore to Colville. On the last day of October a Mr. Brown, of Marcus, gave me a piece of ore, saying that it came from British Columbia, and that if it was of value there was plenty of it. Upon assaying the ore a few days later, I found it to contain 184 ozs. of silver and a trace of gold. About sixty days later the parties making the discovery brought me two samples of the ore to be assayed. The result was 211.41 and 99.63 ozs. silver and a trace of gold. The delay in having assays made was from the fact that the deposit was so large that the discoverers considered it valueless, and when they learned its value winter was on, and it was in May, 1887, before the property was located. The main lode is traceable and located over a mile each way from discovery on the line of the lode. The summer of 1887 and the winter of 1887-88 have proven this discovery to be the most important one made since the finding of the famous Comstock. About forty locations have been made, mostly by men from Colville and vicinity. The "Silver King" is the original and prior location.

The last year's work has developed, the fact that the vein is thirty-one feet wide, averaging about 60 ounces silver, while the ore can easily be sorted so as to run 300 ounces. Locations one mile from this discovery on the same lode, show eight feet of ore equally as good as the original discovery.

The ore is all of the same character in the district. Carbonate of copper, gray copper and copper pyrites, carrying silver in the form of a sulphide, and highly colored with oxide of manganese; gangue stone gray quartz.

The country-rock appears to be porphyry shale, with belts of limestone in the vicinity.

At no time since the Frazer River excitement has British Columbia been blessed with so much attraction as at the present time. From all points on the Pacific slope and Montana preparations are being made for an early immigration to this new and wonderful Eldorado. The Kootenai District is in British territory, and about twenty-five miles north of the line.

Approaches: From Colville to the mines, about 100 miles; from Sand point on the N. P. R. R. via Bonners Ferry and the Kootenai River and Lake, about 160 miles, thirty miles by wagon to the Kootenai River and the balance of the distance to within six miles of the mines by steamer on the river and lake, as fine boating as any portion of the Mississippi below St. Louis. But as the Canadian Pacific Railway and the Dominion government are closely allied, there will be a strong pull for the business over the Canadian Pacific and via the Columbia River and Arrow Lakes to the mouth of the Kootenai on the Columbia. This would bring them to within 25 miles of the mines. We un-

derstand from reliable sources that the Ainsworth party, of Portland, Ore., have renewed their application to the British Columbia government for a land grant to build a railroad from the mouth of the Kootenai River to the Kootenai Lake, about 25 miles, and to commence operations inside of sixty days. There is hardly a doubt but that this bill will pass, as it is now referred to a special committee; and if passed the Kootenai country, with its known worth and future possibilities, will within a few years become a second Butte.

COLORADO.

The charge of \$2 per thousand on gold bullion shipped from the Branch Mint in Denver to Eastern mints has been abolished, and shipments will hereafter will be free.

LAKE COUNTY.

LITTLE PITTSBURG VS. LITTLE CHIEF MINING COMPANIES.—The case of the Little Pittsburg vs. the Little Chief mining companies, of Leadville, was decided by the State Supreme Court last week, as already mentioned in our issue of the 7th inst. The suit was originally brought by the Little Pittsburg, seven years ago, to recover the value of ore taken from the ground of the plaintiff company by the defendant, and judgment was obtained for \$32,000. The Little Chief set up a counter claim of \$70,000 for ore taken from its ground by the Little Pittsburg, and on the appeal this claim is allowed, causing a judgment of about \$40,000 in favor of the defendants against the plaintiffs.

SMALL HOPES CONSOLIDATED MINING COMPANY.—The Blaine, Elkins, Emmet, and Result shafts of this company have closed down. The cause of the shutting down is stated to be because the president does not wish to incur further expense until the directors can visit the mine, ascertain its exact condition and decide upon future action.

PITKIN COUNTY.

ENTERPRISE.—Important developments have recently been made in this mine. South No. 4 level had been run in the blue lime, which is heavily impregnated with lead, 280 feet, when a cross-cut was run striking a body of high-grade spar and lead ore. A chamber has been cut in this about twenty feet square and twelve feet across, with ore showing on all sides. The level is being extended south and an upraise is being made with both faces in solid. The spar is heavily copper-stained. The mine is shipping about twenty-five tons of ore per day. A peculiarity of the output is that it runs from 10 to 20 ounces in native silver, making settlements very difficult.

SMUGGLER MINING COMPANY.—This company, when work was commenced two months ago, was some \$20,000 in debt. The rich ore uncovered has liquidated this amount, says the Aspen Sun, and next month a dividend will be declared. The ore is in the No. 1 level; after passing through some 30 feet of zinc ore they have come on to 15 feet of high-grade ore free from zinc, and have just got the foot-wall for the first time.

DAKOTA.

LAWRENCE COUNTY.

IRON HILL MINING COMPANY.—Operations have again been suspended at the smelter. The last run continued twelve days, during which 400 tons of ore were treated, and bullion valued at \$11,000 produced. It is probable that operations will again be resumed before the end of April. In the meanwhile work of developing and prospecting the mine, and exploring for new ore-bodies continues uninterruptedly.

SNOW STORM MILL.—Mr. Thomas H. White, owner of this mill, expects to have every thing in readiness for operations by June 1st. The plant will do custom work, operating principally on ores of mines situated in Whitewood Gulch.

IOWA.

HARDIN COUNTY.

It is reported that a vein of soft coal, of good quality, was struck near Lawn Hill last week at a depth of 230 feet.

KANSAS.

LEAVENWORTH COUNTY.

Reports state that petroleum has been struck at Leavenworth, at a depth of 1807 feet.

MICHIGAN.

COPPER MINES.

The Tamarack-Osceola copper rolling mill at Dollar Bay is completed, and were started up on the 9th inst.

NATIONAL MINING COMPANY.—The stamp-mill to be erected at the National mine will be located at the Creek shaft, and the water will be pumped from the Ontonagon River. The machinery is now being constructed and will be ready for shipment by the opening of navigation; other machinery has been purchased from the Nonesuch Co.

TAMARACK MINING COMPANY.—No. 2 shaft was sunk 80 1/2 feet during March. For the force employed and the character of rock sunk through, the Tamarack people consider this the best sinking ever done in the copper country. Superintendent Daniell has made a standing offer of \$100 to be divided among the force whenever 80 feet can be sunk in a month. The Rand Drill Co., of New York City, offered \$100 premium for the first 80 feet. The machines in use are Rand slugging drills. At a meeting of the stockholders held in Boston on the 7th inst., they approved by a unanimous vote of 33,413 shares out of a total possible of 40,000, not counting treasury stock, the action of the directors in organizing the Tamarack, Jr., company, setting off the new mine, etc.

TAMARACK, JR., MINING COMPANY.—The No. 1 shaft is now down 20 feet and in rock. No. 2 is down 10 feet.

GOLD AND SILVER MINES.

MICHIGAN GOLD COMPANY.—The company will

resume work on its property to the northwest of Ishpeming; on the fifteenth of next May.

IRON MINES.

CLEVELAND IRON MINING COMPANY.—The shaft being sunk by this company, on the north shore of Lake Angeline, has reached a depth of 250 feet, it going down at an angle of 55 degrees to the horizon. The Ishpeming Iron Ore states that it is in soap rock all the way, and will be continued about 30 feet further when a drift to tap the ore-body under the lake will be started. It was first thought to start the drift at about 250 feet, but it was decided to leave a little heavier back to prevent the possibility of trouble from the surface water. It will be some time before ore is reached.

MISSOURI.

BATES COUNTY.

KEITH & PERRY JOAL COMPANY.—Seven mules, it is reported, were found in the Keith & Perry coal mine No. 6 on the 9th inst., eleven days after the explosion of gas or coal dust reported in the ENGINEERING AND MINING JOURNAL on the 31st ult. It is said that all of them were in fine condition, having had access to an abundant supply of grain and water.

MONTANA.

SILVER BOW COUNTY.

VOLUNTEER MINING COMPANY.—This company has been organized in Butte with a capital stock of \$400,000, shares \$1 each assessable to work the Volunteer mine. The trustees are W. R. Kenyon, B. Tibbey, L. R. Maillet, G. W. Irvin, John Branagan, Michael Carroll and John F. Forbis.

NEVADA.

ELKO COUNTY.

Our Tuscarora correspondent sends us the following: The developments made in this district in the last two years, and now being made, are attracting much attention. The greatest drawback at present is the lack of reduction facilities. This will soon, however, be overcome by the erection immediately of very extensive works by the North Belle Isle Company, which will have capacity sufficient to handle the ore from all that company's mines. When these new works, along with the mills already working, begin operations the production will astonish men. In order that there may be no more assessments levied, some of the companies will ship their ores to Salt Lake City for reduction until the new works are completed.

The North Belle Isle is the only company in the district paying dividends at present, a monthly one of 50 cents, equal to \$50,000, and this from the production of a small 10-stamp mill belonging to the Navajo Company, leased for a term from the latter company. This is said to be an unprecedented output from 10-stamps, as to pay that dividend the mill has to produce over \$100,000 a month. The Navajo mine, which has produced largely in the past, has now accumulated large quantities of rich ore, and is again in a position to pay dividends, which it is the intention of the company to do just as soon as it can get its mill into its own hands. This mine has been for the last three years opening up old and new ore-bodies.

Nevada Queen, Commonwealth, and Grand Prize are now all in bonanza. The latter would now be running the mill had the fuel not given out.

The Navajo Queen, adjoining the North Belle Isle, is looking extremely well, the vein being the same that is producing so largely in the North Belle Isle. [On the 200-foot level the ledge is over four feet wide, showing some fine ore.

The Tuscarora Consolidated Mining Company's mine lies immediately south of the Navajo Queen. On this property a double compartment shaft is being put down to cut the same ledge, which assays over \$500 a ton close to the surface, on its ground.

There are quite a number of flattering prospects being developed, perhaps the best of them being the property owned by the East Grand Prize Company, a San Francisco incorporation. This is the extension of the Grand Prize ledge and immediately adjoins the latter mine on the east.

FOUND TREASURE MINING COMPANY.—The company has closed down the works pending the litigation now in progress, referred to in our last issue.

NORTH COMMONWEALTH MINING COMPANY.—Upon motion of the Found Treasure Mining Company, Judge Bigelow vacated the order theretofore made by him appointing a receiver in the case of the North Commonwealth Mining Company against the Found Treasure Mining Company, referred to in our last issue, and discharged the receiver.

HUMBOLDT COUNTY.

ADELAIDE COPPER COMPANY.—The property of this company, to the organization of which we referred in our last issue, is located near Galconda and the Overland Railroad. We are officially advised that the vein is large and carries a large percentage of gold and silver, it is a free smelting ore, carbonate and red oxide. A 30-ton water jacket plant is nearly completed, with sufficient power to run another 30-ton. The furnace is 600 feet from the mine. Double railroad track connects the two. Ore can be mined and delivered to furnace for \$2.50 per ton.

LINCOLN COUNTY.

YUBA MINING AND REDUCTION COMPANY.—This company has been organized in Salt Lake City, where the principal place of business will be, by William S. Godbe, Benjamin Hampton, J. N. Tileman, Henry W. Lawrence and O. J. Hollister, with a capital stock of \$2,500,000, shares \$10 each. The property owns the mining claim known as the Yuba, in Ely Mining District, together with all machinery, hoisting works, buildings and all other mining appliances.

STOREY COUNTY—COMSTOCK LODGE.

We take the following from the Virginia City Chronicle:

The total product of the lode for March

will foot up about \$725,000, which is \$25,000 below the estimate. Next month it will exceed \$750,000, and when the stamps of the California mill are in operation next May it is estimated the monthly product will exceed \$1,000,000. The Gould & Curry and Ophir will then be added to the list of bullion producers.

ALTA MINING COMPANY.—The Alta mill stamps are in operation again, crushing the ore accumulated in explorations in the Alta mine, of which there are about 1000 tons on the dump of an average assay value of above \$25 per ton. The crushings are run over concentrators—about 40 tons being concentrated into one. These concentrates will be shipped to smelting works for reduction into bullion, as they contain a large per centage of base metal.

CHOLLAR MINING COMPANY.—The vein cut on the 650 level shows, it is said, a total width of 30 feet, 12 of which carries ore of average value of above \$90 per ton. The first 12 feet of the vein passed through on the east side by the northwest drift is identical in character with Con. Cal. & Va. ore, while the west is dark red in color. This indicates that there are two separate stratas. The management is of opinion that the main body of the east vein lies further south, and to determine this a lateral drift will be advanced in that direction to strip the ore.

CONFIDENCE MINING COMPANY.—Ore shipments to the Brunswick mill have been increased to 170 tons daily, pulp assays showing an average value of \$39 per ton. The bullion product for March was \$53,000.

CONSOLIDATED CALIFORNIA & VIRGINIA MINING COMPANY.—During the week ended the 31st ult. 1266 tons of ore were shipped to the Morgan mill and 2060 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 \$35.52.

HALE & NORCROSS MINING COMPANY.—Ore shipments for the week ended the 31st ult. aggregate 1600 tons, pulp assays showing a value of \$36.50 per ton. The March product will reach \$160,000.

SAVAGE MINING COMPANY.—Preparations are making to stope ore in the 300 level south drift. Ore shipments to the Rock Point mill average 60 tons daily.

SUTRO TUNNEL COMPANY.—The case came up at Carson on the 2d inst., and was postponed until May 8th, when it will probably come up for trial in San Francisco.

NEW JERSEY.
The annual report of the State Geologist of this State just issued shows that the output of iron ore was 547,839 tons in 1887, against 500 501 tons in 1886. The output of the zinc mines was 50,220 tons, as compared with 43,877 tons in 1886.

NORTH CAROLINA.
EGYPT COAL COMPANY.—This company has been organized with a capital stock of \$250,000, for the purpose of working coal mines near Greensboro, which, it is said, were operated during the late war by the Confederate government, and supplied the blockade runners at Wilmington. Some 40,000 to 50,000 tons were mined. The coal is said to make good coke, and has been tried at the gas-works at Greensboro. A test was also made on the Richmond & Danville Railroad, and proved satisfactory.

OREGON.
CHLORIDE CONSOLIDATED MINING COMPANY.—This company's property is situated in Eastern Oregon, eleven miles from the railroad. The Chloride mine, owned by this company, was only located last July, and already sufficient work has been done to demonstrate that it is a rich and extensive property. The company has a capital stock of \$100,000. Of this only \$42,500 was reserved to pay for the property, including three quartz claims, eighty acres of placer and fine timber, two water-rights and five acres for mill site. In May the company will be able to ship large quantities of high-grade ore. The vein is opened on the surface for a distance of 200 feet, with six cross-cuts. The ores are all free milling, and from nineteen assays made from the different openings, the highest sample was \$417.10 and the lowest \$12.15.

PENNSYLVANIA.
The great combination of oil producers in Pennsylvania, organized last December, with the design of restricting the quantity of oil thrown on the market, was under examination last week at Washington by the House Committee on Manufactures. Henry Webster, of Bradford, Pa., a contractor for drilling oil wells, and member of the Oil Drillers' Union, testified that the agreement entered into December 22d, 1887, provides that the Producers' Association shall pay to the Well Drivers' Union the profits on 1,000,000 barrels of oil and the residue on another million barrels that may remain after adjusting and paying the other classes of labor injured by the shut-down movement, the cost price of the oil being 62 cents per barrel on November 1st, 1887, and subject to interest, storage, and fire loss charge from that date. The association shall advance upon the prospective profits \$1 per day, Sundays included, to each member of the Well Drivers' Union for each day the member is out of employment during the continuance of this agreement. The entire oil shall be sold before December 1st, 1888, and the residue of profits, after deducting the advances provided for, shall be paid to the Well Drivers' Union, to be paid by them to the members entitled thereto pro rata in proportion to the time they have been out of employment, and also to compensate contractors for loss and interest on their drilling outfits. Mr. Webster denied that the union used any means except persuasion to prevent wells being drilled. It was not responsible in any way for the attempts that had been made to blow up oil rigs.

PENNSYLVANIA GRAPHITE MINING AND MANUFACTURING COMPANY.—The suit of William Young against James T. Reber, which was before Judge Arnold and a jury in Court of Common Pleas No. 4 at Philadelphia, ended in a verdict in favor of Mr. Young for \$39,390. The litigation arose from a purchase by Mr. Young of the stock of this company, whose property is situated in Pickering Valley, Chester County. It appears that Mr. Reber was a stockholder of the company and held twenty shares. These he sold to Mr. Young for \$2200. The latter bought over 400 shares—nearly the entire issue—from other stockholders and paid in all about \$50,000 for the stock. This money he sought to recover back, and he based his claim on the allegation that Reber and the other stockholders conspired together to cheat him, by inducing him by false representations to buy stock at a price largely in excess of its value.

These representations, it was alleged, were that the ore was rich in plumbago, that the supply was practically inexhaustible, that the business of the company was good, and that there was always a ready market for the output. Instead of these things being true, the reverse, it is alleged, was the case, and the plaintiff was obliged to abandon the mine. The defense was that all the representations made in 1881, the date of the purchase, were true then and are true to-day, and that if the mine had been properly worked the same good results would have been obtained as those secured by the original stockholders.

It was claimed that Young was more anxious to buy than the defendants to sell; that he bought upon his own investigations; that the defendant concealed nothing, acted in entire good faith in the whole matter and handed over the books to Young before the purchase; that Young, even after his purchase, was offered by another party what he had just put into the mine; that there was plenty of ore in the mine at the time of the purchase in 1881, and it is there still, and that the stock was then worth what was paid for it, and is worth the same now.

Judge Arnold, in charging the jury, explained to them that the plaintiff, in this form of action, had the right to sue all the stockholders, or he could pick out one and sue him, and the latter course the plaintiff had pursued.

COAL.
WM. PENN COAL COMPANY.—This company contemplates the sinking of a shaft and the erection of a new coal breaker at Shenandoah. The shaft when put down will have a depth of 900 feet, and will cut the coal measures at the base of their dip, allowing the mineral to be mined and drawn at a great deal less expenditure of time and money than at present. The breaker will be of large capacity, and have all the latest machinery.

NATURAL GAS.
Gas has been struck on the Degroff farm, one mile and three quarters from Charters station, on the Allegheny Valley Railroad. The flow registered 540 pounds to the square inch. The territory is a new one, no other well having been struck within ten miles of this one on the same side of the river.

A cylinder of natural gas has been shipped from Pittsburgh to the National Museum in Washington, D. C. The order was given by Dr. David T. Day, of the Museum, who wrote that it was wanted for some experiments that are now being made there. The cylinder is made of steel and will sustain a pressure of about three hundred pounds. The gas is pumped into the cylinder under a compression of about eight atmospheres. The art of compressing gas has been very highly developed recently, and at the present time it looks very much as though bottling and shipping gas might become one of the important industries of Pittsburgh.

BADEN GAS COMPANY.—The Safe Deposit in Pittsburgh will shortly sell the company's lines and outfit. The plant was sold, as referred to in our issue of March 17th, on an order of court to satisfy creditors' claims, to the Pennsylvania Tube Company, which is a large holder of first mortgage bonds. The price was \$10,000, subject to \$196,000 of first mortgage bonds at 10 years, with interest at 6 per cent. The interest has not been paid on these bonds since September last, hence the sale is to be made to satisfy them. If the property is sold for more than enough to satisfy the bonds, the residue will go to the Pennsylvania Tube Company.

PEOPLE'S NATURAL GAS AND PIPEAGE COMPANY.—The Allegheny Heating Company, acting as the agent of the Philadelphia Company, has bought the controlling interest in this company, of Allegheny, at the rate of 28 per cent on its capital stock of \$200,000. The plant will hereafter be operated by the Philadelphia Company. The negotiations have been under way for some time.

PHILADELPHIA NATURAL GAS COMPANY.—This company has encountered some very favorable indications of both gas and oil at Layton station, on the Baltimore & Ohio Railroad. Both the Gantz and Gordon sands were struck at a depth of 1645 feet. This is new territory, and if it develops well will be, it is said, of great benefit to Connellsville, West Newton and other Baltimore & Ohio towns.

oil.

Exports of refined, crude, and naphtha from the following ports, from January 1st to April 7th.

	1888.	1887.
	Gallons.	Gallons.
From Boston.....	421,336	1,560,030
Philadelphia.....	29,604,726	31,140,055
Baltimore.....	965,514	1,894,689
Perth Amboy.....	4,470,491	4,319,415
New York.....	91,171,496	89,316,677
Total exports.....	120,633,563	128,230,863

SOUTH AMERICA.
VENEZUELA.
The judgment of \$2,194,586, taken by default by George Wilson last November against Guzman Blanco, the President of Venezuela, and referred to in our issue of March 17th, was set aside by Judge O'Gorman, of the Superior Court Chambers of New York, on the 10th inst. As already mentioned, Mr. Wilson sued under an alleged land contract with Venezuela, and served a summons on Gen. Blanco while he was in New York on his way to France as Venezuelan Minister. Judge O'Gorman quotes the rule that an Ambassador, the representative of his Sovereign, can not be sued on passing through a friendly country, and he applies it to a Minister Plenipotentiary and Envoy Extraordinary, such as republics send around.

UTAH.
SALT LAKE COUNTY.
HANAUER SMELTING-WORKS.—Extensive improvements are now being made at these works by the addition of one stack and two reverberatory roasting furnaces. This will increase the capacity of the smelter at least 33 per cent., and make it the largest in Utah.

SUMMIT COUNTY.
ANCHOR MINING COMPANY.—The drain tunnel is in about 300 feet, or half way; the work was begun a little over seven months ago. The average progress of nearly 100 feet per week is made, and at present the men are driving ahead in wet, though not very bad working ground.

APEX MINING COMPANY.—During the winter, active and profitable developments were carried on, and considerable ore will shortly be sent to market. The stock is held at 25 to 30 cents a share.

CRESCENT MINING COMPANY.—The company has been working fifty men all winter, and regular average shipments of first-class ore have gone to market. All the openings in the mine are looking well and a large amount of ore is exposed, particularly in the lower workings. No work has been done in the big incline shaft for several weeks, and sinking will not be resumed until pumping machinery can be got in place, because there is some apprehension about trouble from water. The concentrator will start up about May 1st, and then the working force will be doubled. The stock is quoted at 31 to 32 cents a share.

MASSACHUSETTS MINING COMPANY.—As soon as coal and other supplies can be hauled the work of sinking the shaft 200 feet further, to the 600 level, will be pushed faster. The new compressor and drills will shortly be in place.

SAMPSON MINING COMPANY.—The company has a considerable force of men getting things in readiness for a long and successful run. The mine openings, it is said, are now well adapted for advantageous and effectual working. As soon as the condition of the roads permits ore shipments begin.

TOOELE COUNTY.
SILVER KING.—In this mine at Stockton a rich galena ore deposit is reported to have been struck at a depth of 700 feet. A big pump will be put in to drain the new level.

WASHINGTON COUNTY.
VENTURA LEACHING-WORKS.—A movement is on foot at Silver Reef tending toward the re-operation of these works. It is claimed that they can be operated at a small cost if proper conditions can be introduced.

VIRGINIA.
LOUDON COUNTY.
It is reported that H. C. Stuart, of New Orleans, La., has secured an option on the Eagle copper mines, and will organize a company to develop them.

WYOMING.
ALBANY COUNTY.

CARBON MINING COMPANY.—This company has been organized in Milwaukee with a capital stock of \$100,000. The incorporators are Ephraim and William Mariner and Samuel Dixon. The objects of the company include the mining of, prospecting for, and sale of minerals and the acquiring of lands in Albany County. An office will be established at Douglas, and operations will be chiefly conducted in that vicinity. It is probable that the new company will develop some of the placers along the Platte River.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, April 13.

Statistics.
Production Anthracite Coal for week ended April 7th, and year from January 1st:

Tons of 2240 lbs.	1888.		1887.
	Week.	Year.	Year.
P. & Read. RR. Co.	162,025	1,016,600	1,008,019
Cent. R. R. of N. J.	119,632	1,249,123	1,159,302
L. V. RR. Co.	16,708	1,888,521	1,811,161
D. & W. RR. Co.	101,481	1,815,35	1,428,034
D. & H. Canal Co.	59,211	1,200,614	1,110,934
Penna. RR.	119,792	967,059	810,419
Penna. Coal Co.	31,071	286,900	359,913
Total.....	754,924	9,115,951	8,597,802
Increase.....	105,339	527,149	.....
Decrease.....	.....	.....	.....

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.....	7,226,941	1885.....	6,284,353
1884.....	6,908,011	1886.....	8,152,041

Production Bituminous Coal for week ended April 7th, and year from January 1st:
Tons of 2000 pounds, unless otherwise designated.

EASTERN AND NORTHERN SHIPMENTS.

Week.	1888.		1887. Year.
	1888.	Year.	
Phila. & Erie RR.....	74,017	16,831	682,331
*Cumberland, Md.....	5,726	861,657	66,276
Barclay, Pa.....	7,923	50,600	123,419
Broad Top, Pa.....	120,163	41,692	51,034
Clearfield Region, Pa.....	2,729	57,078	57,765
Snow Shoe.....	1,249	970,446	834,500
Karthaus (Keating).....	73,978	13, 73	.....
Tyrone & Clearfield.....	1,105	262,471	229,133
H. & Broad Top RR.....	392,724	277,971	277,971
Alleghany Region, Pa.....	43,637	498,737	400,108
Gallitzin & Moun'ain.....	227,282	3,288,580	2,722,627
Pocahontas Flat Top Coal.....	.....	.....	.....
Norfolk & West. RR.....	.....	.....	.....
Kanawha Region, W. Va.....	.....	.....	.....
Ches. & Ohio RR.....	.....	.....	.....

Total..... 227,282 3,288,580 2,722,627
* Tons of 2240 lbs. † Report not received.

WESTERN SHIPMENTS.

Pittsburg Region, Pa.....	8,384	109,803	90,721
West Penn RR.....	1,691	30,766	47,122
Southwest Penn. RR.....	4,612	79,041	63,073
Pennsylvania RR.....	31,335	451,303	422,057
Westmoreland Region, Pa.....	.....	85,227	96,515
Pennsylvania RR.....	9,199	756,140	719,488
Monongahela Region, Pa.....	.....	.....	.....
Pennsylvania RR.....	.....	.....	.....
Total.....	279,413	4,044,720	3,442,115

Grand total..... 279,413 4,044,720 3,442,115
Production of coke on line of Pennsylvania RR, for week ending April 7th, and year from January 1st, in tons of 2,000 pounds: Week, 68,921 tons; year, 1,042,495 tons; to corresponding date in 1887, 1,207,766 tons.

Anthracite.

Reviewing the condition of the anthracite market has become a trifle monotonous. The facts are the same as recited last week, so that little remains to be said unless the fancy be largely drawn on. Every thing seems to indicate that the companies are determined to maintain the market, even at the cost and in convenience of holding in stock such product as can not be readily moved at present prices, which can not but give the market a greater degree of stability. These sentiments were also firmly held at Wednesday's meeting of the sales agents. What shading of prices has been easily traced to individual shippers, who are, of course, always ready with abundant justification for little lapses from virtue. We hope to be able to review a more active market next week.

The weakness and dullness of the market is undoubtedly due, in a great degree, to the fear of difficulties among the companies when it comes to the distribution of the tonnage.

Experience has not inspired implicit confidence in the assurances that those who control the great coal companies, having acquired wisdom, will, without difficulty or wrangling, arrange the distribution of the output among them. There are, indeed, already disquieting rumors floating in the air that the Delaware, Lackawanna & Western wants its quotations increased, and that things are not quite as harmonious in the Reading as they might be. These and other disquieting rumors are not founded on any very substantial basis, and we believe that the matter will be amicably arranged; but it is certain that at present the fact that the question is kept open and is apparently avoided in the council, is exerting a very injurious influence on the market, and the sooner it is settled the better it will be for the trade.

Bituminous.

This trade is between "wind and water," as a prominent producer puts it. No business of any importance has as yet been closed, but a number of contracts are expected to be closed ten days hence. Several railroads have been in the market for a few weeks. Large quantities of coal are required and prices are well sustained. The best grades are bringing full prices. Prices remain the same as heretofore, namely: Free on board at Philadelphia, Norfolk, Newport News, Baltimore, and Georgetown, \$2.60 per ton of 2240 pounds. Free on board at South 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. April 12.
[From our Special Correspondent.]

There is no demand for anthracite coal worth mentioning. While f.o.b. prices remain nominally unchanged the market is, nevertheless, weak on account of the offering of individual coal, so called. There is a good deal of this to be had at prices to sell it, but not much harm is done the general market in this way, because there is so little coal moving at any price. Boston retailers almost all take account of stock in April, and like to strike the assessors on May 1st with as little coal on hand as they can get along with. This is one cause of the great dullness, and would be operative in this market whatever f.o.b. prices were.

The movement in bituminous coal is not so large as it sometimes is at this period, but a fair amount of business has been placed. Of the larger contracts recently placed are the Fitchburg all rail contract for a round hundred thousand tons. Several shippers have a slice of this contract, The Hamilton and Appleton Mills, of Lowell, have bought. They use about 15,000 tons together. As for prices, it is more difficult than ever to quote. Some parties insist that they have sold no coal below \$2.60 f.o.b., but nevertheless, it is not

right to quote this price as compared with \$2.50 last year. The matter is fixed in freights or in some way. It is reported that the bituminous pool have had some unpleasant meetings of late, as some contracts have been discussed, and that matters have gone so far that an investigation into certain transactions has been ordered. Charges of cutting have been met with counter charges. I therefore quote \$2.60 f.o.b. now, as before, as a nominal figure, which the close buyer will be apt to improve upon.

Freight rates remain low. 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 stagnant, and naturally so at this time. The dealers' association met lately, but decided not to reduce prices till a little later. A large reduction will then have to be made, however, and prices are weak.

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.

An all round reduction of good extent has been made in pocket prices and the new circular rates now are:

	Broken.	Egg.	Stove.	Nut.	Pea.
Hard White Ash.....	\$5.10	\$5.25	\$5.35	\$5.10	\$4.00
Free	4.85	5.10	5.35	5.10	4.00
Lykens Valley.....	5.75	6.25	6.50	.....	.....

Buffalo. April 12.
[From our Special Correspondent.]

Anthracite coal unchanged in price, and the only sales are for immediate requirements in retail lots. The opening season's quotations will be fixed on the 18th in your city, but whether they will be in force on that day or May 1st has not been decided.

Bituminous coal dull and the market heavy, with apparently about 30@35c. per ton lower quotations. Stocks large on side tracks.

Coke nominally unchanged; business light. Connellsville quoted at \$3.75@\$4.00 per net ton on track in car lots here.

Rail freights on and after the 16th instant on anthracite coal are as follows: From the mines to Chicago, \$4; from mines to Buffalo, \$2, and from Buffalo to Chicago \$2 per gross ton.

Great fields and a very large quantity of broken ice have been running down Niagara River from Lake Erie for several days. Heavy rains have weakened the winter barrier outside our port quite extensively, but the opening of navigation will not take place for some days.

The momentous question of "what the coal freights by lake quotations" would be at opening was settled yesterday. Many thousand tons engagements were made, principally by the Delaware, Lackawanna & Western people, at 75 cents per net ton, to Chicago and Milwaukee (the opening rate of 1887). Charters were also made for Toledo at 50 cents.

On Monday, April 16th, tenders will be received by the Toronto Water-Works for about 14,000 tons of large egg, Scranton or Pittsburg anthracite coal, well screened and delivered to pumping stations and the reservoirs in the city free of all charges. Forms of tender can be obtained upon application.

The Welland Canal lock tenders have been ordered to report for duty April 15th. This waterway is said to be in good condition for business excepting lock 27, on which a few days work is necessary.

The Buffalo, Rochester & Pittsburg Railroad is negotiating for the lease of the whole of the eastern front of the third canal on the Tift farm, and if this is obtained, the company will at once utilize it for ore and bituminous coal docks. The length of the structure is nearly half a mile. The company expect to obtain several important and large contracts, hence the necessity for extraordinary accommodations.

Pittsburg. April 12.
[From our Special Correspondent.]

There is a continued good demand for coal. Leading dealers and shippers inform us that the demand is fully up with the supply.

The following statement shows the shipments by water for the three months of January, February and March in each of the last four years:

	1885.	1886.	1887.	1888.
To Cincinnati and Louis-ville, ..bu.10,541,000	29,857,000	21,849,000	43,648,000	

The rates are:
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

Connellsville Coke.—The misunderstanding that has existed among the coke men continues. The nominal rates are blast-furnace coke f.o.b., \$1; to dealers, \$1.10; foundry, \$1.25. Rumor says it can be bought below these figures. How long this state of affairs will continue is more than can be found out. The demand is reported light. Freight rates per ton to Pittsburg 84 cents; Mahoney and Shenango Valleys, \$1.57; to Cleveland, \$2.10; to Chicago, \$3.15; to other points in the same proportion.

FREIGHTS.

Lake Superior Iron Ore Freights.—The Milwaukee & Northern Railroad Company has announced a reduction of 25 cents per ton in the freight on iron ore from Republic and Champion, in the Lake Superior region, to Chicago. This makes the all-rail rate from mine to furnace \$2 per ton.

Reports from Cleveland state that tonnage has been offered to carry ore from Ashland to that port for the season to September 1st at \$1.40, and for the whole season at \$1.50 per ton. Many ship owners deny the statement, and affirm that no charters have been made at any figure. If this is a positive fact the situation as to ore carrying and selling remains in statu quo.

The latest actual charters to April 12th, per ton of 2240 pounds:
From Philadelphia to:—Cambridgeport, \$1.10*; Charlestown, 1.00* 3c.; Com. Pt., Mass., 1.05*; East Boston, 90* @ 1.05*; Galveston, 2 90; Gloucester, 1.05*; Lynn, 1.10*; Marblehead, 1.05*; Milton, 1.18*; New York, 91* †; Norfolk, 60; Richmond, Va., 70; Savannah, 90; Washington, 85.

From Baltimore to:—Bath, Me., .75*; Boston, 1.05; Bridgeport, Conn., 1.00; Brooklyn, .90; Charleston, .80; Charlestown, 1.05; Fall River, .95; Galveston, 3.15; New Bedford, .95; New London, .95; Portland, .60; Portsmouth, N. H., 1.10; Williamsburg, N. Y., 1.00.

From New York to:—Bath, Me., .75*; Beverly, 80*; Boston, .75*; Bridgeport, Conn., .55; Cambridge, Mass., .75* 3c.; Cambridgeport, 75* 3c.; Chelsea, 75*; Com. Pt., Mass., .80*; E. Boston, .75*; E. Cambridge, 75* 3c.; Fall River, .75; New Bedford, .80; Newburyport, 91* †; New Haven, .55; New London, .75; Newport, .75; Portsmouth, N. H., .85*; Providence, .75; Salem, 75*.

* And discharging. 3c. per bridge extra. † Alongside.

MARKETS.

NEW YORK, Friday Evening, April 13.
Prices of Silver per ounce troy.

Apl.	Sterling exchange	London Pence.	N. Y. Cents.	Apl.	Sterling exchange	London Pence.	N. Y. Cts.
7	4.87	4:9/8	92 3/4	11	4.87	42 3/4	93 3/4
9	4.87	4:9/8	93 3/4	12	4.87	42 3/4	92 3/4
10	4.87	.....	.....	13	4.87	.....	.....

* 4:3/4 @ 43. † 42 3/4 nominal. ‡ 92 3/4 @ 92 3/4.

The advance during the middle of the week was not sustained, owing to the free selling of the Indian Council on Wednesday.

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. The bank lost £578,000 in the week, but the proportion of reserve to liabilities was raised from 36.06 to 38.74 per cent, against an advance from 45.51 to 50.01 per cent at the same date last year, when the rate of discount was reduced from 3 to 2 1/2 per cent. The weekly statement of the Bank of France showed a decrease of 4,750,000 francs in gold and 3,975,000 francs in silver.

Copper.—As we anticipated in our last report, the firmer tendency of prices and the stronger tone of the copper market has been continued, and even made further progress during the past week, and although the highest quotations touched since we last reported have not been quite retained, the market remains in a very satisfactory condition. During the last two days it has been observed that certain operators in "shorts" who were lately busily engaged in buying in to meet their commitments have again resumed the selling of futures, and these bear sales have produced a somewhat weaker feeling, which, however, may prove of very temporary duration, and as the covering of these shorts brought about the recent sharp advance, it is very likely that the same state of affairs will be repeated again when the short sales now being made have in due time to be covered. Beyond the market operations just alluded to, the healthy position of the copper market remains unchanged, and both as regards stocks and demand, it is in a very satisfactory condition.

The stock of copper in New York may be roughly estimated at about eight million pounds, but as these stocks are in the hands of strong people, we would not be surprised to see higher prices again within a few days. As a proof that the stocks are well held it may be mentioned that spot cash and early delivery copper now command better prices than the later deliveries, and as the sales of futures now being made are not on account of actual producers or holders, but on account of operators who are selling short and will ultimately have to come into the market to buy back again, it is very likely that in May or June considerable scarcity of cash copper will still be experienced. During the past week consumers have been buying more freely, and pretty large contracts have been made by them at full market prices. The total amount of business done during the week has been about 1 1/2 million pounds. Our to-day's closing prices for Lake copper are: Spot, 16.70c. May, 16.70c. June, 16.60c. July, 16.45c., being about 20 points below the highest price of the week on Wednesday. Outside brands are still in excellent demand at 15 1/4 c., the closing quotation being 15 1/4 @ 16c.

In London the market for Chili bars opened last Monday at £80 2s. 6d. for spot, and £79 5s. for three months, and the closing prices to-day are spot £80, and three months forward £78 5s. The demand on all sides is improving for furnace material (which had not previously advanced in the same proportion as Chili bars), and this may be owing to the fact that smelters have advanced the price of best selected to £82.

We hear from Valparaiso that there are no signs of any increase in the production there, as there is a great scarcity of laborers, etc.

The agreements between the several Lake Superior copper companies and the French Syndicate, it is announced, have been finally confirmed. The Quincy acting with its usual deliberation, delayed somewhat the final passing of the contracts.

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

Table with columns: To, Copper matte, Lbs., and value. Includes entries for Liverpool, London, Havre, Bordeaux, Rotterdam, Amsterdam, Antwerp, Hamburg, and Leghorn.

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

Table with columns: To, Copper matte, Copper, Pounds, and value. Includes entries for Liverpool, London, Havre, Bordeaux, Rotterdam, Amsterdam, Antwerp, Hamburg, and Leghorn.

Tin.—The market is still very flat and business has been almost at a standstill during the week, the few transactions which have taken place being at reduced prices.

Lead.—The lead market has become rather steadier in tone, but the amount of business done has been very limited, pending the settlement of certain outstanding contracts.

Messrs. John Wahl & Co., of St. Louis, telegraph to-day as follows: There is nothing new to report. Business continues very dull, with but little prospect of any immediate improvement.

Messrs. Everett & Post, of Chicago, telegraph to-day as follows: Market very dull. Absence of buyers is effecting a decline. Offerings are very light, but sufficient for all requirements.

Spelter remains dull and present quotations are: Domestic, 5; Foreign, 5 1/2 @ 5 3/4.

Antimony is unaltered and prices to-day are Hallett's, 10.50; Cookson's, 14. The London quotation for Hallett's is £46.

THE NEW YORK METAL EXCHANGE COMPILES THE FOLLOWING MOVEMENT OF BONDED METALS, PORT OF NEW YORK, MARCH, 1888.

Table with columns: METALS, Imports, Exports, Stocks, and values for various metals like Iron ore, Pig-iron, Old rails, Scrap-iron, Steel blooms, etc.

Chemicals.—"Business, how do you spell it?" was the answer of a prominent dealer when asked how business had been for the past week.

Carbonated soda ash, 48 per cent, is not wanted to any extent; there is nothing on the spot and very little

obtainable for forward delivery. The light demand prevents any advance in prices, which remain at 1'25 @ 1'27 1/2.

High test is improving slightly; the stock on the spot is very small. Small lots from second hands bring from 1'17 1/2 @ 1'25.

Caustic soda ash, 48 per cent, still remains inactive. We note no sales of importance, all business being of a jobbing character.

Bleaching powder is without change. The demand may be called fair, but holders are apparently not anxious to sell.

Caustic soda continues in fair demand, though no large sales are reported; high test (70/74 per cent), 2'18 1/2 @ 2'27, according to quality.

Acetic acid is moving steadily on contract orders, but little is done outside of these.

Sulphuric acid, 66 degrees, is in fair demand at unchanged quotations. Chamber acid is moving fairly in accordance with the wants of consumers.

Oxalic acid is weaker. The combination which practically controlled the market is apparently broken up.

Fertilizing chemicals are in fair demand considering the season. Dried blood, high grade, is quoted 2'25 @ 2'30; low grade, 2'15 @ 2'30.

\$21.50; low grade, \$18.50. Fish scrap is \$25 per ton f. o. b. factory. Refuse bone black is worth \$16.50 @ \$17 per ton.

Sulphate of ammonia is weaker, owing to increased production and lack of proportionate demand. \$3.20 @ \$3.30 per cwt. is now asked, being a drop of 10 to 15 cents.

Kaimit is firm and continues scarce; for small lots ex store \$11.50 per ton is asked, \$8.50 @ \$9 for future shipments.

Nitrate of soda has been fairly active, though the price still continues at 2c. on account of overstock. Goods ex store are quoted at 2'05c., and futures are nominal at 1'85 @ 1'95c.

Brimstone is entirely without animation. There is plenty offering at \$21.50 per ton, but this figure apparently does not tempt buyers.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, April 13. There is little change to note in the iron market, except that there is rather more of a disposition to secure orders by making concessions.

Although production has been so materially curtailed, yet consumers are able to obtain what iron they want. Stocks are light, but demand is also light.

Western and Southern irons especially are pressed for sale in small lots, even down to single car loads. This state of things adds to the reluctance of foundrymen to contract ahead.

Scotch irons are quiet. The low prices in Glasgow

IMPORTATIONS AT NEW YORK DURING WEEK ENDING APRIL 9, AND FROM JAN. 1 TO SAME DATE.

Large table with multiple columns: Spelter, Pig-Iron, Steel & Iron Rods, Old Rails, Bar-Iron, Scrap-Iron, Sheet Iron, Steel Sheets, Blooms, Billets, etc. Includes sub-sections for Tin Plates and Pig-Iron.

WEEKLY REGISTER OF CURRENT QUOTATIONS.

CHEMICALS.

Table of chemical prices including Acetic, Muriatic, Nitric, Oxalic, Sulphuric, and various salts and acids.

Table of metal prices including Sal. American, Nitrate, Strontium, Sulphur, and various ores.

BUILDING MATERIAL.

Table of building materials including Bricks, Haverstraw, Front bricks, and various stones.

THE RARER METALS.

Table of rarer metals including Aluminum, Barium, Bismuth, Cadmium, and various other elements.

METALS.

Table of various metals including Aluminum, Copper, Lead, Tin, Zinc, and others.

IRON AND STEEL.

Table of iron and steel prices including American Pig-Iron, Scotch Pig, and various grades.

Table of iron and steel prices including Dalmellington, Eglinton, and Bessemer Pig.

Table of iron and steel prices including Foreign, nominally, and Domestic.

Table of iron and steel prices including Spiegel Eisen, German, and English.

Table of iron and steel prices including Ferro Manganese, Steel Plates, and Steel Billets.

Table of iron and steel prices including Steel Nail Slabs, Steel Wire Rods, and Steel Rails.

Table of iron and steel prices including Heavy sections, at mill, and Light.

Table of iron and steel prices including Structural Iron and Steel, Bridge Plate, and Tees.

Table of iron and steel prices including Steel Plates, Tank and Ship, and Boiler Shell.

Table of iron and steel prices including Iron Plates, Common tank, and Refined tank.

Table of iron and steel prices including Merchant Steel, American tool, and Special grades.

Table of iron and steel prices including Cast-Iron Pipe, According to size, and Wrought Iron Pipe.

Table of iron and steel prices including Bolt and Nut, and Nail Fastenings.

Table of iron and steel prices including Wrought Scrap, Foreign, ex store, and No. 1 yard to vessel.

Table of iron and steel prices including Cast Scrap, Old Car Wheels, and Old Rails.

Table of iron and steel prices including Nails, In car-load lots, and From store.

Table of iron and steel prices including Louisville Prices, Hot Blast Irons, and So. Coke.

Table of iron and steel prices including Forge Irons, Neutral Coke, and Cold Short.

Table of iron and steel prices including Car Wheel and Malleable Irons, Southern (standard brands), and Lake Superior.

Table of iron and steel prices including Pittsburgh Prices, Coke or Bituminous Pig, and Foundry No. 1.

Table of iron and steel prices including Charcoal, No. 1, and No. 2.

Table of iron and steel prices including Foundry No. 1, Foundry No. 2, and Cold-Blast.

Table of iron and steel prices including Warm-Blast, 20 p. c. Spiegel, and Muck-Bar.

Table of iron and steel prices including Steel Blooms, Steel Slabs, and Steel Crop Ends.

Table of iron and steel prices including Steel Bloom Ends, Steel Billets, and Old Iron Rails.

Table of iron and steel prices including Old Steel Rails, No. 1 W. Scrap, and No. 2 W. Scrap.

Table of iron and steel prices including Steel Rails, light sections, and Bar Iron, nominal.

Table of iron and steel prices including Nails, \$1.90 usual discount, and Two per cent off for cash.

Table of iron and steel prices including Philadelphia Prices, Foundry No. 1, and Foundry No. 2.

Table of iron and steel prices including Bessemer Pig, Steel Rail Blooms, and Foreign Bessemer.

Table of iron and steel prices including Spiegel Eisen, Scrap, Selected, and No. 1.

Table of iron and steel prices including Cargo Scrap, Muck-Bars, and Merchant Iron.

Table of iron and steel prices including Plate Iron, 2.00@2.15.

Table of iron and steel prices including Tank Iron, Skep Iron, Angles, Beams and Channels, Nails, Steel Rails, and Old Rails.

STOCK MARKET QUOTATIONS Baltimore, Md.

Table of stock market quotations for Baltimore, Md., including Atlantic Coal, Big Vein Coal, and various other stocks.

Birmingham, Ala.

Table of stock market quotations for Birmingham, Ala., including Ala. Conn. C., Bir. Min. & Imp., and various other stocks.

Pittsburg, Pa.

Table of stock market quotations for Pittsburg, Pa., including Allegheny Gas, Bridgewater Gas, and various other stocks.

Foreign Quotations. London. March 31.

Table of foreign stock market quotations for London, March 31, including Alturas Gold, Arizona Copper, and various other stocks.

Paris. March 24.

Table of foreign stock market quotations for Paris, March 24, including Boleo, El Callao, and various other stocks.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns for Name and Location of Company, Capital Stock, Shares, Assessment, Dividends, and Date and amount of last payment. It lists numerous mining companies and their financial details.

G. 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 \$275,000 in seven dividends, and the Terra \$75,000. Previous to the consolidation in Aug., 1884, the California had paid \$31,320,000 in dividends, and the Con. Virginia \$4,300,000. Previous to the consolidation of the Copper Queen with the Atlanta, Aug., 1875, the Copper Queen had paid \$1,350,000 in dividends.

NEW YORK MINING STOCKS QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table of New York Mining Stocks Quotations, divided into Dividend-paying and Non-dividend-paying mines. Columns include Name and Location of Company, dates from April 7 to April 13, and Sales figures.

*Dealt in at the New York Stock Ex. Unlisted Securities. †Dealt in at the Metal Ex. ‡Assessment unpaid. Dividend shares sold, 21,450. Non-dividend shares sold, 49,750. Total New York, 71,200.

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, listing company names, dates from April 6 to April 12, and sales figures.

* Ex dividend. Boston: Dividend shares sold, 6,839. Non-dividend shares sold, 9,065. Total Boston, 13,954.

COAL STOCKS.

Table of Coal Stocks, listing company names, par values, and prices for various dates from April 7 to April 13.

San Francisco Mining Stock Quotations.

Table of San Francisco Mining Stock Quotations, listing company names and closing quotations for dates from April 6 to April 12.

* Assessment paid. **Of the sales of this stock, 120,999 were in Philadelphia, and 399,484 in New York. Total sales, 638,602.

* Ex dividend of 50c.

and low freights have not stimulated business. Bessemer pig and spiegel are very quiet, and quotations are nominal. Wire rods are rather weaker, but quotations are unchanged, at \$41 for early delivery and \$4.50 for shipment. There have not been any large recent sales of steel rail. Some of the Eastern mills are out of the market, having sold all of their additional allotment. The business for many Western roads is at a standstill, and will remain so until the labor troubles are adjusted.

Plates are a little lower, and not in quite such active demand.

Scrap iron is likewise weaker, although there is a fair business doing.

Old rais are again almost demoralized, and there have been considerable sales of late, among them 500 tons of Tees at about \$20.50, and 500 tons of Doubles at less than \$21.50.

The manufacturers of barb wire have issued a circular naming 3/4 c. for painted and 4c. for galvanized, with 1/2 c. discount for car-load lots.

Louisville. April 10.

[Reported by HALL BROTHERS & Co.]

There is but little change to report in the situation. A fair amount of business has been done but at slightly lower prices. Some furnaces are indifferent about selling for forward delivery at present prices, but the developments of last week would indicate that buyers have but little difficulty in placing orders at reduced prices. Offers that were declined by some furnaces have been accepted by others. There is fully \$1 per ton difference in the views of the furnace men. Some few buyers are placing orders ahead, but the majority are buying only for the immediate or near future requirements, expecting later on to place larger orders at lower figures. Some extraordinary low prices have been made on iron in storage yard belonging to speculators; the situation would be much more hopeful if such lots were wiped out of the market. The better brands of car-wheel irons are still in good demand, and it is believed that prices on the best chilling grades will be higher before they are lower on account of their scarcity and the urgent demand, which is likely to continue for some months to come. Quotations for cash f.o.b. cars at Louisville will be found in our weekly register of prices.

Philadelphia. April 12.

[From our Special Correspondent.]

The aggregate of business done since Monday is disappointing to those who have been predicting an early hardening of prices. Every condition seems right for a better demand, and the backwardness of buyers, many of whom are almost out of stocks, is an enigma to those who have been keeping close watch of the market. There is an occasional inquiry for a one thousand-ton lot of forge iron, and an occasional offer for as much, but very little is being done at any price. The outlook has not improved. Buyers will, no doubt, continue this hand to mouth course for as long as they can. The furnaces that have blown in have been offset by others blowing out. The Schuylkill Valley production is not increasing, and there is but little inducement elsewhere to add to the output. The committees appointed by the Easton Convention are at work. They have gone over the ground very thoroughly, upon which they propose to ask for a reduction of rates. A very strong argument has been made in writing, and the railroad managers have promised to give the subject their serious consideration. After all, we do not expect much to come from it, as the railroad men will look upon the present depression as a temporary one, and one which a little reduction in freight rates would not alleviate. At least this is anticipated by the iron-makers, as the consideration that will move them to return an unfavorable answer, yet we hope for the best.

Sales of ordinary forge have been made at \$16 and \$16.50. Some brands are selling below these figures. The best makes are high and scarce, and when sales are made they are simply by way of renewing of contracts. A few lots of No. 1 Foundry sold yesterday at \$18.50. No. 1 Foundry is moving at \$20@21. Very little of the best iron is heard of. Foreign material is about neglected. Bessemer is quoted at the usual figures. Importers are not anticipating any expansion of demand just at present. The increase in imports which was expected to take place this month, so far at least as orders are concerned, has been disappointing. Large consumers of slabs and billets have not made any offers, and are not in any urgent need. The bloomeries throughout the State, both anthracite and bituminous, are doing a fair spring business. The demand for muck bars has not improved, and the makers are not able to name any lower prices. No improvement has taken place in bar iron demand in general, although three or four mills have booked orders for car iron this week, and according to statements of agents there is a large amount of car iron business yet to be placed. Prices remain substantially as heretofore quoted. The plate iron makers report some additional demands in small lots, sufficient to keep mill capacity engaged, and their agents have business in view which in all probability will keep mills running up to midsummer.

It is understood there is a good deal of business in boiler and steel plate and tank iron for various purposes to be disposed of. The nail makers are selling a good many nails, and are in better shape. Prices unchanged. The condition of business at the sheet mills has not changed, and there is a fair amount of work coming in in a retail way. Galvanized is still in better request than other kinds. In structural iron, a goodly number of small orders have been placed, and bridge builders and others are slow to anticipate any requirements. The best advices to-day from steel

rail makers are that there is a larger demand for small lots, and that the aggregate of business is improving. Some inquiries have been received this week, which make it appear that an additional allotment will be necessary soon. No change in prices. A few lots of old rails are selling, but there is an indifference on the part of consumers. The arrivals for the next thirty days are about contracted for, so that there will be but little to throw on the market. Selected scrap is in good demand, and there are several buyers in the market this week, but wanting only small lots for present use.

Skelp iron is dull. The pipe mills expect a good deal of business during the rest of the month. The steel mills are picking up considerable business in a small way. The general tone of the market is weak. Quotations will be found in our weekly register of prices.

Pittsburg. April 12.

[From our Special Correspondent.]

Raw iron business continues very dull, and there seems but little prospect of any decided improvement soon. While most of the mills are nearly bare of stock, they are buying very lightly, only to supply immediate actual wants, and the probability is that this policy will be closely adhered to until the market for the product gets into better shape, and some definite understanding in regard to the labor question has been arrived at. Common stock is exceedingly dull and liberal inducements are being offered to buyers, but the principal inquiry appears to be chiefly for the better descriptions.

The stock of raw iron in mill yards is down lower than it has been for a number of years, and commission men are also carrying less. However, while stocks are light, so is the demand, and the tone of the market is weak and favorable to buyers. Producers complain that current rates are unsatisfactory, scarcely covering actual cost of production. While consumers, on the other hand, aver that the raw article is higher relatively than the products. On the whole, it may be said that while prices are nominally about as previously quoted, it is very hard to make sales unless in a limited way. Apart from this every thing seems dull and weak, with indications of lower prices before any large amount of business can be done. The fact remains that prices have been cut down much more rapidly than reduction in cost, and even if there be no further decline, it will take a good deal of time to effect an adjustment to present market values. Hence it may be pretty confidently asserted that there will not be much money in the iron trade during 1888. Still, there is a good deal of work going on, with prospects of its continuance, and possibly of its further enlargement later on in the season. Every thing will depend on the satisfactory adjustment of the tariff question and the labor difficulties. At a meeting of the Western nail manufacturers, held in Pittsburg on the 11th inst., the basis of a scale of prices was fixed to go into effect on June 1st. Heretofore the card has been based on the price of 10 to 60-pennies, smaller sizes making an advance in price of 25 cents a keg for each 2-pennies of decrease in size. It was decided to change the card basis to 20 to 60-pennies, placing 10 pennies in the ascending list. Instead of 25 cents per keg advance for smaller sizes, the addition will be only 10 cents a keg. This means that nails under 10-pennies will be cheaper, but those from 10 to 20-pennies will be higher. The fixing of prices was left over until the new card is printed in accordance with the changed classification. The basis will remain \$2 for 20 to 60-pennies.

Quotations will be found in our weekly register of prices.

SALES SINCE OUR LAST REPORT.

Coke and Coal Smelted Lake Ore.

1100 Tons Gray Forge	15.50 cash.
750 Tons Gray Forge	15.50 cash.
500 Tons Bessemer	17.25 cash.
500 Tons Bessemer	17.75 4 mo.
500 Tons Gray Forge	15.50 cash.
300 Tons Gray Forge, all Ore	16.75 4 mo.
250 Tons No. 1 Foundry, all Ore	18.00 4 mo.
200 Tons Close Gray Bessemer	16.50 cash.
50 Tons No. 1 Foundry	17.00 cash.
17 1/2 Tons No. 1 Foundry, all Ore	17.50 cash.

Coke, Native Ore.

200 Tons Gray Forge	16.00 cash.
200 Tons Gray Forge	15.50 cash.
100 Tons Gray Forge	15.75 4 mo.
50 Tons Silvery	18.00 4 mo.
100 Tons Gray Forge	15.50 4 mo.
100 Tons No. 2 Foundry	16.75 4 mo.
150 Tons No. 1 Foundry	17.50 4 mo.
60 Tons No. 2 Foundry	15.75 cash.

Charcoal.

150 Tons Cold Blast	26.00 4 mo.
50 Tons No. 1 Foundry	25.00 4 mo.
50 Tons No. 2 Foundry	24.00 4 mo.
50 Tons No. 1 Foundry	27.00 cash.
25 Tons No. 1 Foundry	23.00 cash.

Steel Slabs and Billets.

2500 Tons Billets	28.50 cash.
400 Tons Slabs	28.50 cash.

Muck Bar.

500 Tons Spot	27.00 cash.
500 Tons May	27.00 cash.

Steel Wire Rods.

1000 Tons American	41.00 cash.
1000 Tons American	41.00 cash.

Old Iron Rails.

500 Tons American Ts	22.50 cash.
300 Tons American Ts	22.40 cash.
250 Tons short pieces	21.65 cash.

Scrap Material.

200 Tons No. 1 Wrought Scrap	Net 19.00 cash.
200 Tons No. 2 Wrought Scrap	Net 18.00 cash.
200 Tons Wrought Iron Turnings	Gross 15.50 cash.
100 Tons Car Wheels	Gross 19.00 cash.
100 Tons Cast Scrap	Gross 16.50 cash.
100 Tons Cast Bor ngs	Gross 12.75 ca. h.
100 Tons Steel Rail Ends	Gross 18.50 cash.

FINANCIAL.

NEW YORK, Friday Evening, April 13.

The mining market remains dull, and mining shares are attracting little attention. Prices on the whole remain unchanged, and only in few instances show an advance.

Colorado stocks were neglected. A few transactions were reported in Security at from 45c. to 55c. Monitor at 12c. Lee Basin at 56c. Excelsior at 50c. Denver City at 9c. Cashier at 9c. to 10c. Little Chief at from 24c. to 28c. Leadville at 25c. to 26c. Dunkin at from \$1 to \$1.10. Bassick at 11c. Brunsvick was quiet at 19@20c. Hector shows one sale at 20c.

The boom in Quicksilver stocks has been revived. Preferred, in consequence of a dividend of \$2 per share, declared this week. The price opened at \$35 and advanced to \$38, closing at \$36 and \$37, with sales of 2255 shares. Common advanced from \$9.75@10.25; the sales amounted to 760 shares.

The Bodie stocks were neglected. Bodie Consolidated was dealt in on Saturday at \$2.65, and again to-day at \$2.80. Bulwer shows one sale at 95c. Standard opened at \$3.30, declined to \$2.90, and advanced again to \$3.10. Mono was firm at \$1.70.

Amador shows a declining tendency this week, and went from \$2.50 to \$2.30. Middle Bar was active at 54c and 55c.

Taylor Plumas sold at 1c. More interest has been shown in Proutside, and in consequence the price advanced from \$1.85 to \$2.15; the transactions amounted to 7300 shares. Castle Creek was only dealt in on Thursday, when a few sales were made at 9@10c. Holyoke was quoted at 7c.

El Cristo opened at \$3.05, but during the week declined to \$2.75, selling to-day at from \$2.90 to \$2.95. The sales amounted to 4550 shares.

Silver King shows considerable business, at prices ranging from \$4.50 to \$5.25.

Cleveland Tin was advanced by the manipulators in the beginning of the week from \$1.60 to \$1.90, but to-day declined to \$1.60. The transactions in the stock only amounted to 3400 shares. Homestake was quiet at from \$11 to \$10.50. Deadwood Terra at \$1.65, Caledonia at from \$2 to \$2.05. Father de Smet was more active and shows transactions at from 35c. to 44c.

Official advices state that the Plymouth Consolidated Gold Mining Company has not attempted to open the mine since about the first of March. At that time smoke was found to issue from it, and it was hurriedly closed. The company does not intend to open the mine until it is reasonably safe to do so, and it is thought the fire will be smothered about the first of May, at which time the mine will likely be opened. The stock has been actively dealt in during the week at from \$8.25 to \$9.50, the sales amounted to 1040 shares.

Sutro Tunnel was quiet at 12@13c. Consolidated California & Virginia declined from \$15 to \$13.88. The transactions in the other Comstock shares were small, and show but little change in price.

Belle Isle shows a decline from 73@55c. Navajo from \$1.85@1.65. North Belle Isle from \$6.75@6.50. Found Treasure from \$2.10@2. Tornado from 75@70c.

Eureka Consolidated also shows a declining tendency, and went from \$11.75 to \$11.38.

Ontario shows a few sales at from \$27.50 to \$28. Horn Silver was neglected, at \$1. Stormont continues to decline, and this week sold as low as 4c.

Carupano continues sales at \$2. The stock was daily dealt in.

Alice shows one sale at 60c. Rappahannock has declined from 18@16c. The stock was dealt in to the extent of 5600 shares.

Meetings.

Glendon Iron Company, No. 18 Post-Office Square, Boston, Mass., May 2d, at eleven o'clock A.M.

Dividends.

Chartiers Valley Gas Company, of Pennsylvania, has declared a dividend, No. 6, of three per cent, or \$90,000, payable April 26th, in Pittsburg.

Delaware, Lackawanna & Western Railroad has declared a dividend of one and three quarters per cent, payable April 20th.

Golconda Gold and Silver Mining Company, of Idaho, has declared a quarterly dividend, No. 2, of sixty cents per share, or \$60,000, payable May 1st, at No. 245 Broadway, New York City.

Hope Mining Company, of Montana, has declared a quarterly dividend, No. 3, of twenty-five cents per share, or \$25,000, payable April 10th, at Room 36, No. 204 North Third street, St. Louis, Mo.

Idaho Gold Mining Company, of California, has declared a dividend, No. 222, of seven dollars and a half per share, or \$23,250.

Philadelphia (Natural Gas) Company has declared a monthly dividend, No. 30, of one per cent, or \$75,000, payable April 25th, in Pittsburg.

Manufacturers' Natural Gas Company has declared a monthly dividend, No. 3, of three quarters of one per cent, payable May 1st, at the Germania Bank Building, Pittsburg, Pa.

Quicksilver Mining Company, of California, has declared a dividend of two dollars per share, or \$86,000, payable April 30th, at No. 20 Nassau street, New York City.

Swansea Gold and Silver Mining Company, of Colorado, has declared a dividend, No. 6, of two and one half cents per share, or \$1,500, payable April 1st, in St. Louis.