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MR. G. W. MAYNARD, of this city, is about to leave for Colorado. In his absence, letters should be sent to his New York address, No. 35 Broadway.

FROM Spain, it is reported that there is quite an excitement over the discovery of lead mines in driving a tunnel on the Reus Ebro Railroad, at Argentero. It looks as though there is little hope for any marked improvement of the European lead market.

IN reply to a resolution of the House of Representatives of January 31st, Mr. JOSEPH NIMMO, Jr., Chief of the Bureau of Statistics, has prepared a report on the commerce between Mexico and the United States, which is unique in its kind. Besides giving full statistical data, it presents a good summary of the population, climate, and agricultural and mineral resources, discusses such momentous questions as the security of life and property in our sister republic, the permanency of its government and its disposition toward the cultivation of closer commercial relations with the United States. A particularly valuable part of the

report is that relating to the different recent railroad enterprises and the probable traffic of the roads now in course of construction. The pamphlet is accompanied with a map showing the routes and the differences of elevation in Mexico. Mining men in the United States, having acquired so great an interest in that country, will do well to thoroughly examine Mr. NIMMO's report, which is remarkably complete, considering the fact that it has been compiled in little more than a week.

WITH the beginning of the year, come the annual reports of those of our leading mining companies whose officers value public opinion. The officers of most of the mining companies, however, apparently deem silence judicious, and they can not be coaxed or frightened by shareholders into giving an account of their management of the interests intrusted to them. For frankness and fullness of detail, the reports of the Lake Superior copper mines, always excepting the Calumet & Hecla, stand foremost. We print elsewhere a few figures from the report of the Quincy. Among the Western mining companies, the Horn-Silver has always been remarkable for elaborate annual reports, the only one approaching it being the Standard, of Bodie.

The clamorings of the dissatisfied stockholders have at last wrung from the Alice management quite a voluminous document. The report has its various short-comings, and the management has been sharply attacked by a Butte newspaper, on the ground that it had entered into a contract for the supply of wood at an excessive price with a firm which had taken off its hands an unprofitable supply store. We have endeavored, in our abstract of the report presented elsewhere, to examine the figures with the view of throwing light upon the immediate future of the mine.

The anthracite coal trade will peruse with great interest the data taken from the reports of the four coal companies under the management of the Pennsylvania Railroad Company. They are models of what such documents should be, and are highly creditable to the officers.

One point that we are convinced will strike engineers who study the financial statements of the different companies is the generally heavy amounts needed for permanent improvements, dead-work, and general expenses. If the chief value to those not directly interested in the success of a company lies in an examination of its work with the view of drawing from it hints that may be of use in estimates for new enterprises, the teaching of those before us this week should be that it is dangerous not to make liberal allowances for sums not needed directly in the extraction of ore. Even with a well-equipped plant and economical management the drain upon the treasury of an enterprise is very heavy. How many promising mines have been swamped during the past few years because disappointment followed in wake of "extraordinary expenses," unforeseen and unprovided for in the estimates of cost of the engineers upon whose advice capital embarked in the venture!

THE MEETING OF THE INSTITUTE.

The Cincinnati meeting of the Institute of Mining Engineers, last week, proved a notable success, in spite—we might almost say, because—of the flood in the Ohio. It is true that many members were thereby hindered from coming whose absence was generally deplored; but those who did gather in the temporary "Venice of America" comprised a good many of the old members and constituted a compact and sociable body, recalling the days when the Institute was young and small, and every body in it knew every body else. On the other hand, the unfavorable circumstances surrounding the meeting braced every body to the determination to make the best of every thing; and every thing was so good, *per se*, that making the best of it was simply adding enthusiasm to satisfaction.

Certain changes, of course, became necessary in the programme. Some works and mills which members had been invited to visit were under water, and (the water being muddy) could not be seen, even subaqueously. But to offset this disappointment, the flood itself was interesting; and the vigor, courage, and cheerfulness of Cincinnati in the presence of such a disaster were not less than inspiring. It should be recorded here, that the officers of the Institute, disinclined to impose burdens of hospitality upon its friends at a time of gloom and special labor, had offered to postpone the main sessions (holding a first session for business at some other place, and adjourning the remainder of the meeting to Cincinnati, at a later date), or to hold the meeting at Cincinnati without festivities of any kind, or even to give it up altogether. But the earnest reply of the Local Committee overruled these suggestions; and all who attended the meeting confessed that the result vindicated the wisdom of that course. Too much credit can not be given to Mr. L. E. WARNER and his associates on the Local Committee for their perseverance and pluck, and particularly to the lady whose house was thrown open for the Reception, and whose courage carried the day at the critical moment when all the rest were ready to hesitate, at least.

The formal banquet which was to have been tendered to the Institute was

given up at the request of the visiting members; but in its place a dinner party at the hotel was extemporized, and passed off with so much *éclat* as to well-nigh shake faith in the necessity of more elaborate preparations. The success of this occasion was chiefly due to the Cincinnati ladies, who graced the occasion in goodly numbers. The same benign co-operation conferred charm and luster upon the railroad excursion and the opera party. Really, if one could always be assured of such local resources in the way of feminine beauty and wit, one might consider the advisability of leaving one's own ladies at home! How would you like that, mesdames? Don't be alarmed at this playful query: there is no danger that the mining engineers can resist your entreaties (when you are sisters) or disobey your commands (when you are wives), and leave you at home. Only once in a while, when a flood scares you out of your plans, you ought to rejoice that in your absence there are other gentle spirits to give ample consolation!

Professionally, the meeting was certainly up to the average, if not beyond it. Not only were several papers of exceptional interest and importance presented, but several new men came forward with contributions, the value of which placed their authors at once in the front rank of the Institute. Among the more important papers we may mention particularly those of Mr. HARRIS (on the Beneficial Fund of the Lehigh Coal and Navigation Company), Mr. ABBOTT (on Improvements in Physical Tests), Mr. STUTZ (on Improvements in Coal-Washing Machinery, etc.), Mr. SALOM (on Analyses and Tests of Steel), and Dr. DUDLEY, of Cincinnati (on the Metallurgical Treatment and Commercial Uses of Iridium). Dr. T. STERRY HUNT's paper on the Phosphate Deposits of Canada; Mr. PERRY's account of a curious new mineral, Ramosite; and many chemical and brief practical papers, to say nothing of a considerable number, read by title only, the titles of which promise much interest, complete what seems to us an extraordinary list. Mr. ABBOTT's paper was illustrated with the lantern, which proved to be much more satisfactory than diagrams, as usually employed. The only objection to the lantern is that, giving one view at a time, it does not permit cross-references from one diagram to another. But for a large room, it is certainly better than any thing except very large and coarse diagrams, expressly made for such conditions.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

Diascopography.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: It is due to Professor Comstock's very appreciative remarks on page 98, to say that I used the term *diascopography* in order to limit the meaning to a branch of topography, not topography itself, which has reference to surface contours, etc., but to the immediately underlying geologic structure and accidents thereto. The term *geognosy* (meaning a general knowledge of the earth's structure) has too entirely general a meaning for what it was desired to express where the word *diascopography* was used. I must admit the word is unsatisfactory in appearance, but I don't know of any thing else that will answer except we say "geological section mapping."

W. GEORGE WARING.

Pyrites Acid vs. Brimstone Acid.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: I was not aware until a short time ago that you and the editors of several other valuable journals had done me the honor to publish a comparative statement of the cost of making sulphuric acid from brimstone and pyrites, prepared by me and published in the circular of our Sulphur Mines Company in 1882; and as it was done without any solicitation on our part, I presume it was with the view of benefiting the chemical trade of this country.

I propose, therefore, if agreeable to you, to write further on the subject, and reply to some criticisms of that statement published in *Dingler's Polytechnisches Journal*, vol. 85, page 248.

I suppose that I ought to consider myself further honored in having my statement published and criticised by so distinguished an authority on this subject as the great Dr. G. Lunge, Ph.D. and F.C.S., and I should have so considered it, if he had contented himself with simply pointing out what seemed to him to be errors in my paper, and giving his reasons why I was wrong; but instead of that, he contradicts my statement with his simple *ipse dixit*, and volunteers to add "that Mr. Crenshaw's calculations are not at all in accordance with facts, and in short such exaggerations would have a tendency to tempt a credulous public to pay enormous prices for the purchase of the pyrites beds, the chief temporary advantage being reaped by a few speculators, and the industry depending on the use of brimstone being temporarily and unfairly crippled."

Now I submit that Dr. Lunge had no right to characterize my estimates in such a manner, or to assume that such was my object in making them, and I am charitable enough to believe that, if he had read my circular, of which these estimates formed a portion, and had known all the facts, he would not have done so; for in that circular I said:

"Each manufacturer is entirely competent to make his own calculations of the comparative cost of burning pyrites and brimstone. For our own satisfaction, and for your criticism, we have made an estimate, based on our knowledge of the subject, which we hand you below. You

will see that we provide in our estimate for the fact that chambers of a given capacity will condense more fumes from brimstone than from pyrites, and will therefore make more acid, but yet the profit on the smaller quantity from pyrites is so much greater than from brimstone that this difference is not worth consideration.

"It is also said that the lead of a chamber will have to be renewed two or three years sooner when burning pyrites than brimstone; but the difference in profits is so much greater than that, even if we have to put new lead on the chambers every year, it ceases to be a matter of any importance.

"We think the facts herein set forth will convince you that this subject is worth examination; and as we believe that we have the largest quantity of pure and uniform pyrites in this country, and that we can put it into the market at the least possible cost, we shall be glad to confer further with you on the subject.

"We beg leave also to advise you that we have secured the control of the patent in this country of Mr. Peter Spence's automatic furnace, in which our pyrites was burned at Manchester last year, and by which there is actually less labor incurred in burning our pyrites than in burning brimstone. We are prepared to arrange for the building of this furnace when it is wanted."

I propose now to consider in detail the five points or objections he tries to make to my comparative statement, and reply to each:

1st. He says: "The difference in the cost of the plant for the manufacture of pyrites acid and that for brimstone must be much higher than \$2000. Even taking into account the lower percentage by one fifth of the former, it is impossible to obtain pyrites breakers, burners, etc., for that amount."

Answer. The difference of lower production from pyrites is distinctly stated by me, and very fairly, as is proved by his own words; for I assume, in my comparative statement, that, with 110,000 cubic feet capacity in your chambers, with brimstone you can produce 4950 tons chamber acid (50 degrees Baumé) while with pyrites you would only produce 4050 tons, or 18 per cent less—as you see, very near his estimate of 20 per cent—considering that I am neither a practical nor theoretical chemist, but rather a merchant who deals in round figures, and only hoped to be approximately correct, "for our own satisfaction and for the criticism of the chemical trade," to whom it was addressed.

Now as to cost. Two double Spence furnaces, referred to above, will, to my own knowledge, burn over 50 tons of pyrites a week, which is 2600 tons a year. Therefore my estimate of 2100 tons is quite low enough. Then two double Spence furnaces can be bought, with engine to run them, f. o. b. at Liverpool, for £472, say \$2360. The duty under the tariff existing when I wrote in 1882 was 35 per cent, say \$826. Freight by steamer and insurance, \$150—total, \$3336. Tile, brick, and labor of construction will certainly not carry it in all to more than \$4200. Will Dr. Lunge say that a brimstone furnace can be put up in this country to burn 1000 tons of brimstone for less than \$2200? If so, how much less?

2d. He says: "The consumption of niter is exceedingly high, evidently from the lack of the employment of Gay-Lussac and Glover towers. The difference in consumption between pyrites and brimstone ought, however, under these circumstances, to be much greater than is here shown."

Answer. The saving of niter by the use of Glover and Gay-Lussac towers I have no experience with, and therefore assumed the same percentage in each case; but in a communication published in the ENGINEERING AND MINING JOURNAL last year, over the signature of J. D., Jr., recognized as one of the most eminent engineers in this country, and thoroughly acquainted with sulphuric acid-making, it is insisted that pyrites uses a much less proportion of niter because it is difficult to get the fumes from brimstone hot enough to run the towers to advantage. I do know the fact that very few sulphuric acid manufacturers in this country use the Glover, and nearly every one who does has put them up recently in changing his plant from brimstone to pyrites. When doctors disagree, who shall decide? On this point, I am no doctor, having for eleven years burnt brimstone, and nearly one year pyrites, both without a tower; but I know at least three burners of pyrites who assure me they use less than 2½ per cent of niter to the sulphur burned.

3d. He says: "It is absurd to put the wages as equal in case of brimstone and pyrites. In the latter case, they might be twice or three times as high as in the former, breaking of the ore and removing the burnt ore included."

Answer. Now I do know that two men, one on duty in the day and one at night, will attend the double furnaces of Spence's patent with less labor than they will the brimstone burners, provided the pyrites is landed, as it ought to be, from the cars on a level with the top of the furnaces. With pyrites, they only have to fill the hoppers twice in four hours, and between times can wheel away the cinder; while with brimstone, they must open and charge one furnace every hour.

As my statement refers solely to fine pyrites, or smalls as they are called in Europe, no breakers have to be bought, as Dr. Lunge wants to add to the cost of furnaces, and no men have to be hired to break up the pyrites. Our company gets out of its mines a great deal in this condition, which we screen and deliver ready to go into the furnaces. At the time my paper was written, we thought that we only had fine ore; but on sinking further shafts, we find that we have millions of tons of both hard lump ore and the fine ores. Samples of our fines were sent to Germany, and we are offered a contract for delivery there at sixpence per unit.

My comparative statement made full allowance for additional coal to furnish steam to run the engine which does the work of stirring and dropping, instead of doing it with the labor of men.

4th. "The repairs and general cost for the pyrites plant ought unquestionably to be stated considerably higher than those of brimstone plant."

Answer. Why? It is easy enough to say it ought—but why? Does he give any reason for it? There is nothing about the furnace to get out of order. Mr. Peter Spence, who has been working the furnaces for years, says that £5 will cover the annual cost of repairs to each double furnace. How much less are the repairs to brimstone furnaces?

5th. "The price of pyrites acid can not possibly be the same as that of brimstone acid; the value of the former, on account of its containing arsenic and iron, is always less than that of the latter."

Answer. Here he jumps to the conclusion that our pyrites has arsenic in it; but I think the evidence of Dr. A. Voelcker, of London; of Mr. M. C. Hope, chemist of Messrs. Charles Tennant & Co., in Glasgow; of Mr. Peter Spence's chemist, in Manchester; of six different analyses by

Messrs. Ledoux & Ricketts, of New York; and fifty other analyses we have had made, with special reference to finding arsenic and antimony, and by all pronounced pure; and the test made of the sulphuric acid produced from our pyrites proving that it is entirely clear of these objectionable impurities, are entitled to more reliance than Dr. Lunge's *ipse dixit*; and also the letter we have in our possession from an eminent chemist in Great Britain, saying that our "pyrites is splendid stuff for making acid, being so pure;" and from another chemist in England, who says: "This pyrites can be burnt instead of Sicilian sulphur for giving vitriol free from arsenic."

Now, I think that you and the public will do me the justice to acknowledge that Dr. Lunge is at fault on every point that he tried to make against my statement, and therefore, that his inferences are unfair and unjust, and that he himself will do me the justice to come out frankly and say so.

As I have not offered our pyrites mines for sale, and do not propose to offer them for sale, that was not my object in writing this comparative statement; but it was to induce the chemical trade to look into the subject, believing, as Dr. Lunge himself wrote years ago, that "it is only a question of time when the United States must change and use pyrites instead of brimstone," and thus give us a market for ore from our mines, which we think is pure, rich, abundant, and convenient to market. As only two concerns in the United States were burning pyrites when my statement was first published in 1882, and now we can count up eighteen which are burning or getting ready to burn pyrites, may I not hope that my publication may have had the desired effect of inducing the trade to look into the matter, and thus hasten the fulfillment of Dr. Lunge's prediction that the change must come here; and with these eighteen firms burning pyrites and making pure sulphuric acid, what chance is there for the rest to make money burning brimstone from Sicily? I have said nothing in the comparative statement about the value of the cinder as iron ore, after the sulphur is burnt down to or below one per cent, as can be done in the Spence furnace; but it is readily worth \$4 per ton, as I have seen one firm who have recently sold all they had, some 1200 tons, at this price. If this is divided between the sulphuric acid manufacturer and the miner of pyrites, even Dr. Lunge will admit that I failed in the comparative statement to do justice to the value of pyrites in this country.

In conclusion, allow me to repeat from the first page of my circular containing the comparative statement, already referred to so often, a comment upon a quotation from Dr. Lunge as follows:

"When Lunge wrote as above, he evidently did not know that any of our ore was entirely free from arsenic, and therefore suitable for manufacturing sulphuric acid absolutely pure for chemical purposes. This fact has only been proved in the last few months." Nor did he know that we had an ore, taken from the mines as fine as sand, containing over 52 per cent of sulphur, practically a pure sulphide of iron; nor did he know that Spence's patent furnace will burn the ore down to less than one per cent of sulphur, leaving it ready to make into iron, all at the least possible expense; for if he had, I am certain he would never have drawn the conclusions that he did.

I hope you will consider, as I do, that the importance of this subject, Pyrites vs. Brimstone for making sulphuric acid, justifies the length of the communication. I remain, yours truly,

48 WALL STREET, NEW YORK. WILLIAM G. CRENSHAW,
Pres. Sulphur Mines Company of Virginia.

OFFICIAL STATEMENTS AND REPORTS.

THE HORN-SILVER MINING COMPANY, FRISCO, UTAH.

The usual elaborate annual report of this company, of which Mr. Charles G. Francklyn is president; Mr. Frank G. Brown, vice-president; W. S. Hoyt, secretary; and W. F. Van Pelt, treasurer, has been published. Major Harry C. Hill, the general manager, submits a general statement which is, on the whole, encouraging. We may add that it is understood that the latest developments in the mine are said to be favorable in their character. The upper levels have caved in; but on the other hand, the sixth and seventh levels have been opened, though the work of extraction so taxed the machinery that development-work could not be kept well ahead. It has been decided, therefore, to sink a new shaft with heavier machinery. Mr. A. Raht, superintendent of the Francklyn furnaces, has resigned; Mr. George Murray, well known in connection with smelting in Leadville, having become his successor. From Mr. Raht's statement of the amount of materials smelted, and the items given in detail in the disbursements, we compile the following:

SMELTING AT FRANCKLYN FURNACES—42,663 TONS OF ORE.

	Total amount.	Quantity per ton.	Total cost.	Cost per ton.
Labor, supplies, and expenses..	12,251	0.287	\$181,877.48	\$4.263
Iron ore	22,263	0.522	81,704.43	1.915
Limestone	332	0.008	37,301.37	0.874
Charcoal	2,907	0.068	6,441.58	0.151
Coal	15,188	0.365	14,350.74	0.337
Coke .....	.....	.....	244,129.32	5.722
General expenses .....	.....	.....	6,000.00	0.141
Total .....	.....	.....	\$571,804.92	\$13.403

The effect of cheaper fuel, through the completion of the Denver & Rio Grande Railroad, is shown by the fact that, during the first six months, the monthly cost ranged between \$14.40 and \$17.28, while in the last six months it varied between \$10.29 and \$12. The average assay of the ore smelted was 36.83 per cent of lead and 27.15 ounces of silver, the bullion produced averaging 75.05 ounces of silver. Mr. Raht figures out a loss of lead in smelting of 5.92 per cent, and 0.07 per cent of silver. The ore is reported to be more siliceous than formerly.

The ore-production of the mine was taken from the different levels as follows:

	Amount.	Tons.	Lead.	Per cent.	Silver.	Ounces.
First level	85	61	45.7		30.5	
Second "	3,469	13	34.5		29.4	
Third "	6,322	82	43.2		23.4	
Fourth "	3,103	82	40.5		16.3	
Fifth "	3,272	73	32.0		45.3	
Sixth "	14,806	17	37.7		15.0	
Seventh "	8,780	24	32.8		50.5	

In the refinery, which is under the management of Mr. Frederick

Honkamp, 15,374 tons of bullion were refined at a cost of \$36,198.56 for fuel, \$57,878.30 for labor, and \$28,862.34 for general expenses; or \$2.36 for fuel, \$3.72 for labor, and \$1.87 for expenses—a total of \$7.95. The loss in refining is figured out as 4.233 per cent, while the silver is fully accounted for. The average net rate of lead sold at Chicago was 3.984c. per pound, while the average received for the silver was in New York \$1.104 per ounce.

The following is a summary of receipts and expenditures:

Receipts on hand January 1st, 1883, per last report:			
Supplies on hand at Frisco	\$2,308.97		
" " Francklyn	53,482.37		
" " Chicago	8,828.81	\$64,620.15	
Call loans due company	501,913.47		
Company's store, Frisco	34,263.95		
Suspense account	17.49		
Utah Central Railroad Comany	1,744.57		
Cash on hand	44,902.82	582,842.30	
Lead sales per detailed statement	1,193,330.61		\$647,462.45
Silver sales	1,324,651.63		
Interest account on call loans, New York	33,824.87	2,551,807.11	
			\$3,199,269.56

Disbursements:	
Mining	\$197,018.72
Smelting at Francklyn	571,804.92
Freight on ores, Frisco to Francklyn	235,380.70
General expenses	55,031.40
Chicago refinery	398,401.08
New York office	15,346.91
Accounts due company	509,787.99
Construction accounts	2,777.46
Supplies on hand at Frisco, Francklyn, and Chicago	51,086.16
Utah Central Railroad open account	16,164.63
Mining claim purchased	14,597.00
Dividends	1,100,000.00
Cash on hand	31,872.59
Total	\$3,199,269.56

THE QUINCY MINING COMPANY, LAKE SUPERIOR, MICHIGAN.

The directors of the Quincy copper mine, the most productive on the lake, after the Calumet & Hecla, have just issued their report on the business of the mine during the year 1883, which compares with the previous year as follows: The shipment of the season was 7,305,970 pounds of mineral in 1883, against 6,853,660 pounds in 1882. It has been smelted, and yielded about 82.3 per cent, or 6,012,239 pounds of refined copper, in 1883, against about 82.67 per cent, or 5,665,796 pounds of refined copper in 1882. The product of the mine for the year, as prepared for shipment, was, in 1882, 6,874,230 pounds, or 3437,230 tons of mineral, of which 6,508,410 pounds were stamp copper, and 365,820 pounds mass; for which, estimating copper on hand in New York at 18 cents per pound, and the product left over at the mine at 82 per cent yield and 15 cents per pound, has been realized the gross sum of \$970,363.27, to which must be added \$3142.83, realized from sale of silver, making a total of \$973,506.10. In 1883, the product of the mine was, as prepared for shipment, 6,741,150 pounds of mineral, of which 6,535,045 pounds were stamp and 206,105 pounds were mass copper, for which, estimating copper on hand at 15 cents per pound, and the product left over at the mine at 82 per cent yield, there have been realized in 1883 \$828,300.04 to which must be added \$2482.96 realized from the sale of silver, making a gross total of \$830,783. It will be seen, therefore, that, in spite of the fact that the shipment was greater by nearly 350,000 pounds, the gross revenue fell off by \$132,717.10 as the result of the lower price of copper.

The expenses of the years 1882 and 1883 were:

	1882.	1883.
Running expenses at mine	\$381,010.82	\$398,377.32
Building and construction account	63,427.63	21,782.57
Smelting, transportation, and all other expenses	96,969.13	119,878.58
	\$541,407.58	\$540,038.27
	973,506.10	830,783.00
Which deducted from gross earnings leaves as mining profit	\$432,098.52	\$290,744.73
There has also been realized from interest and (in 1882) from sale of stock	16,455.33	5,286.38
Total	\$441,553.85	\$296,031.11

The statement of assets and liabilities in the report for 1881 showed a balance on hand, as of date January 1st, 1882, \$735,313.79, to which add earnings of 1882, \$448,553.85, or \$1,183,867.64. Deducting the dividend of February 20th, 1882, of \$320,000, and the dividend of August 21st, 1882, of \$200,000, a total of \$520,000, leaves a balance of assets, January 1st, 1883, \$663,867.64. Adding to this the earnings of 1883, \$296,031.11, a total of \$959,898.75 is reached. Deducting the dividend of February 15th, 1883, \$240,000, and that of August 15th, 1883, \$140,000, a total of \$380,000, a balance of assets of \$579,898.75 is reached January 1st, 1884. A dividend of \$4.50 per share, or \$180,000, payable February 20th, has been declared, which, with the August dividend, makes the return for the year 1883 \$320,000 against \$440,000 for 1882. The total dividends paid to date aggregate \$3,890,000 on an actual paid-in capital stock of \$200,000.

In the statement of assets, we find that the copper on hand is valued at \$276,448.20, equivalent to 1,842,988 pounds. In addition to this, there is at the mines mineral equivalent to 397,671 pounds of refined copper.

The following is a brief summary for the years 1882 and 1883:

	1882.	1883.
Average force employed	438 men.	453 men.
" number of miners	152 "	165 "
" wages of miners on contract per month	\$48.83	\$46.02
Yield of mineral per fathom of ground broken	970 lbs.	1,035 lbs.
Yield of refined copper per fathom of ground broken	800 "	850 "
Total rock mined	120,377 tons.	117,171 tons.
" hoisted	109,751 "	101,415 "
" stamp-rock treated	101,327 "	97,100 "
Yield of stamp-rock treated (3.21 per cent)	6,508,410 lbs.	6,535,045 lbs.
Product mineral	6,874,230 "	6,741,150 "
" refined copper	5,682,663 "	5,549,087 "

The report of the agent, Mr. F. G. White, shows that the mine was in a satisfactory position. Mr. White has resigned and Captain Samuel B. Harris has been appointed in his stead.

THE SUSQUEHANNA COAL COMPANY, THE MINERAL RAILROAD AND MINING COMPANY, THE SUMMIT BRANCH RAILROAD COMPANY, AND THE LYKENS VALLEY COAL COMPANY.

A very interesting series of reports gathered in one pamphlet has been made concerning the business of a number of anthracite coal mining companies closely identified with the management of the Pennsylvania Railroad Company. They are particularly valuable, because, in contradistinction to many similar documents, they give itemized details of cost of mining and preparation, which we have tabulated as follows, the names of the companies reported being the Susquehanna Coal Company, the Mineral Railroad and Mining Company, the Summit Branch Railroad Company, and the Lykens Valley Coal Company. The expenses as given in the reports were as follows:

	EXPENSES PER TON OF ANTHRACITE COAL.							
	Susquehanna C. Co.		Mineral R. M. Co.		Summit Branch RR.		Lykens Valley Coal Co.	
	1882.	1883.	1882.	1883.	1882.	1883.	1882.	1883.
Outside:								
Insurance	0.41	0.34	0.53	0.46	0.34	0.24	0.70	0.56
Legal expenses	0.08	0.02	0.8	0.13	0.33	...	0.18	...
Live stock	2.17	1.44	1.39	2.31	2.53	1.87	5.34	4.84
Office expenses, rent, etc.	0.20	0.13	0.55	0.56	0.39	0.31	0.48	0.37
Preparing coal	12.41	12.32	14.44	15.97	15.95	14.93	15.85	18.79
Repairs and general expenses	14.46	6.63	15.22	18.16	10.52	9.86	15.03	21.27
Royalties	5.60	2.71	39.80	9.78	...	...	...	...
Shops and repairs	0.24	0.21	2.99	2.74	5.15	2.37	0.53	1.18
Stable expenses	4.74	4.02	7.11	6.39	8.13	5.67	15.14	11.8
Stationery and printing	0.15	0.12	0.22	0.19	0.24	0.17	0.32	0.26
Stock coal expenses	0.91	0.91	0.13	...	...	...	...	...
Superintendence and clerks	2.25	1.87	2.09	3.01	4.82	3.48	1.11	5.50
Taxes	1.05	1.09	2.70	2.37	1.97	1.12	6.77	1.54
Inside:								
Air and gangways	4.81	4.04	14.50	20.59	18.43	20.68	13.72	16.21
Cars, slope, and drift	2.62	1.81	1.86	1.61	1.37	2.05	4.08	7.33
Cross-headings and chutes	2.91	3.37	7.63	8.85	9.14	6.55	9.58	5.39
Exhaustion of lands	8.08	7.78	...	...	5.14	4.13	...	...
Hoisting and pumping	...	...	4.82	4.23	14.22	9.65	25.08	21.84
Mining coal	48.20	50.90	48.71	53.17	55.69	46.84	56.24	60.92
Repairs and general expenses	41.57	31.79	22.12	25.78	55.16	48.98	76.94	75.15
Timber and props	5.18	6.10	9.27	10.81	9.33	9.66	29.29	23.53
Improvement and General:								
Breakers	...	...	0.07	1.31	...	...	0.21	...
Cars	...	...	0.38	0.78	1.34	0.81	3.50	6.22
General improvements	...	12.15	15.49	15.55	19.83	7.26	24.07	19.07
Houses	...	...	1.7	0.94	0.56	0.43	...	0.0
Railroad iron, ties, etc.	...	...	2.73	4.23	2.72	1.0	11.33	4.04
Slopes	...	...	4.61	5.02	...	...	...	...
Shops and telegraph	...	...	...	0.09	...	...	...	...
Total cost:								
Average cost per ton at mine	\$1.56	\$1.50	\$2.23	\$2.15	\$1.96	\$1.98	\$3.16	\$2.97
Average receipts per ton at mine	\$1.81	\$1.85	\$1.99	\$2.07	\$2.58	\$2.68	\$2.52	\$2.58

It will be noticed that the outside expenses are fairly uniform, the only heavy difference being that the royalties paid by the Mineral Railroad and Mining Company in 1883 have disappeared. The following figures relating to the quantities put through the breakers and the quantities of the sizes shipped will prove of interest:

	Susquehanna		Mineral R.		Summit B.		Lykens V.	
	1882.	1883.	1882.	1883.	1882.	1883.	1882.	1883.
Cost of preparation	12.41c.	12.32c.	14.44c.	15.97c.	15.95c.	14.93c.	15.86c.	18.79c.
Tons shipped	9 2,092	1,099,049	416,130	439,824	317,914	3,39,942	167,785	178,315
Per cent.	12.1	8.5	0.12	...	...	...	...	...
Lump	...	...	0.38	0.06	...	...	...	...
Steinboast	...	...	7.18	4.45	5.2	9.1	13.3	14.0
Broken	11.1	9.4	14.38	15.86	27.9	22.4	22.0	16.8
Egg	13.3	13.7	37.85	39.00	27.2	27.7	23.5	5.5
Stove	3.1	36.1	22.50	17.4	17.0	16.7	17.0	...
Chestnut	19.1	20.3	18.01	15.6	17.3	11.3	13.7	...
Pea	11.1	12.0	6.9	6.4	10.3	10.1	...	...
Buckwheat	...	...	0.2	0.1	...	...	...	...
Mixed	...	...	...	...	...	...	...	...

The commissions paid to sales agents were 15-36 cents in 1883, against 15-43 cents per ton in 1882, in the case of the Susquehanna Coal Company; 12-78 and 13-02 cents respectively for the Mineral Railroad and Mining Company; 17-13 and 17-01 for the Summit Branch; and 16-86 and 17-02 for the Lykens Valley Company.

The gross receipts from sales, the shipping expenses, commissions, and freights were as follows, the net profit or loss on the coal being added in 1882 and 1883:

	1882.	Susquehanna	Mineral	Summit Branch	Lykens Valley
Gross receipts from sales	\$2,316,486	\$1,412,520	\$1,360,827	\$717,689	
Freights, shipping expenses, etc.	1,513,921	524,521	505,707	276,066	
Profit (+) or loss (-)	+342,940	+100,471	+193,293	-93,572	
1883.					
Gross receipts from sales	\$4,046,368	\$1,478,658	\$1,522,404	\$769,078	
Freights and shipping expenses	2,021,260	583,335	602,113	304,988	
Profit (+) or loss (-)	+463,907	+14,039	+241,514	-76,691	

The Susquehanna Coal Company assumes a charge of 10 cents a ton for exhaustion of land for all sizes above pea mined from freehold lands, equivalent to an average of 8-8 cents per ton on the production from freehold lands, and 7-83 cents on all coal mined. Since 1877, the exhaustion charge has reduced the real estate account by the aggregate amount of \$407,581.82. Deducting incidental expenses from incidental receipts, and adding them to mining profit, a total profit of \$557,006.34 is reached, equivalent to a profit of 49-76 cents a ton on the 1,119,320 tons mined, or, after providing for interest on bonds, about 20-4 per cent on the capital stock, which is \$2,136,800, the bonded debt being \$2,000,000. The construction expenditures were, during the year, \$128,628.46, of which \$58,471.49 were outside, including by the way, a ten-ton locomotive, and \$70,156.97 outside. The entire amount invested in plant to date is \$1,287,194.18, an investment per ton of annual productive capacity of \$1.15, while \$2 had been the standard originally estimated. The company has paid a dividend of six per cent on the capital stock, amounting to \$128,208, taxes paid.

The company has begun to open a new colliery, the Newport, under the direction of Mr. C. B. Rossell, promoted to be "manager" of the company. The sinking of a shaft has begun, and the driving of a tunnel to get out the coal above water-level.

The Mineral Railroad and Mining Company has paid out for construction, charged to cost of mining, \$119,613.02, the chief part of the expenditures being for the Pennsylvania and Hickory Swamp collieries, both virtually new. The estimate for this year is \$257,100, of which \$90,400 are to go to the Pennsylvania and \$87,300 to the Hickory Swamp colliery, both of which must be the chief source of production in a few

years. The income account shows an apparent loss of \$22,569.02, more than covered, however, by the increased value of coal on hand, produced and paid for but not sold. A dividend of six per cent on the capital stock of \$100,000 was paid for 1883.

The Summit Branch Railroad Company made an expenditure of \$32,133.52 for improvement and construction. During the year, there was completed, at a total cost of \$48,550.90, the work began several years ago, of running a flue-way from the bottom of No. 3 level through White's vein to the top of the mountain, 760 yards long, and an excavated boiler-room with eight boilers. The breaker made the remarkable record of 303½ days, so that, not counting Sundays and legal holidays, it was idle only 4½ days in the whole year. The net earnings were \$256,912.56, from which deducted \$91,000, for interest of funded debt (\$1,300,000), \$66,981.92 for loss on operations of Lykens Valley Coal Company, advanced to protect its interest in it, and \$46,182.50 appropriated to sinking fund, and adding taxes received, \$7060.28, leaves a balance of \$59,808.42.

The loss on the operation of the Lykens Valley Coal Company during 1883 was \$71,038.41, as against \$111,426.70 in 1882. This is due to the fact that the company is exhausting the remnants of old workings, and is opening simultaneously new sources of production without violent changes in the monthly production, which would create "idleness and waste of plant, disorganization in labor, increased cost of mining, irregularity of movement, greater cost in transportation, and embarrassing interruption in sales." All the construction account, \$41,615.26 in 1883, and \$65,300, estimated in 1884, for opening new collieries, is charged to mining, which makes them abnormally large.

The four companies are under the same management—Mr. G. B. Roberts, president, Isaac J. Wistar, vice-president, Alfred Mordecai, secretary, T. P. Haviland, treasurer.

THE IRON SILVER MINING COMPANY, LEADVILLE, COLORADO.

Though very brief, there is a good deal of interest in the report of the Iron Silver Mining Company, of which John S. Newberry, of Detroit, is president. W. H. Stevens, chairman of the managing committee, and W. Arens, superintendent. The total receipts of the year were \$1,484,936.02, while the expenditures were \$1,059,261.79, leaving a profit for the year 1883 of \$425,674.23. Adding the surplus of the preceding year and deducting the dividends of 1883, \$300,000, there remained a surplus on the 31st of December, 1883, of \$276,828.01, of which \$247,427.37 was cash. Since then, a dividend of \$100.00 has been declared. The total ore product was 92,271 tons dry weight, the average moisture having been 12-25 per cent. The total product was 1,405,176 ounces of silver and 22,712 tons of lead, thus making the average of the ore 15-23 ounces of silver and 24-6 per cent of lead. Taking the average market value at New York of the lead at \$80 per ton and of the silver at \$1.10 per ounce, this product represents a total market value of \$3,362,656.90. Roughly, therefore, the spot value at the mine was only 43 per cent of the value of the metal in the ore in the New York market. Eighty-three thousand nine hundred and seventy-one tons of ore mined by the company realized \$16.01 per ton, while the cost aggregated \$11.51, leaving therefore only a profit of \$4.50 per ton. How important a matter the price of lead is to the Iron Silver Company may be gathered from the fact that a decline of 1 cent would cause a falling off in the profit of the mine of \$246 per ton. As the largest lead producer in this country and the second largest in the world, the fortunes of this company more than any other influence the market. If the ore should main aim its present grade or should materially in character as an excellent smelting ore, the Iron Silver mine would not succumb even if lead declined to less than 3 cents a pound, although of course its profits would shrink. The following is the cost of the ore itemized. We have changed the order of the figures grouping them so that mining expenses, cost of permanent improvement and development, and general expenditures are brought nearer together:

Mining labor	\$6 0300
Mining supplies	0.9275
Timber account	1.2 75
Hauling ore	0 7150
Stable account	0 1500
Mining cost	\$9 06
Permanent improvements	0.2575
Meyer shaft	0.7725
New machinery	0.3150
New mining property	0 1575
Railroad surveys	0.0075
Improvements and development	\$1.51
Taxes	0.0425
Insurance	0.0125
Legal expenses	0.4525
New York office	0.0650
Office and general expenses	0.3675
General expenses	\$0.94
Total	\$11.51

The mining cost, of course, in this case includes all dead-work, with the exception of the sinking of the Meyer shaft.

A very suggestive series of figures is submitted in regard to the advisability of working isolated ground by the tribute system. Tributaries in the Iron Silver mine produced 8300 tons of dry ore, realizing \$137,243.99, or \$16.32½ per ton. Of this, the tributaries received \$11.17½ per ton, while the company's share was \$5.35½ per ton. It might appear that the company gets more for tribute ore than for its own. In reality, the charges against company ore with which tributaries have nothing to do aggregate \$1.44½, so that the profit actually earned on company ore is in reality 28½ cents per ton better than tribute ore—not 58½ cents, as the report erroneously makes it. In spite of this, the managers deem it advisable to continue the tribute work.

THE ALICE GOLD AND SILVER MINING COMPANY, WALKERVILLE, BUTTE, MONTANA.

After a good deal of hesitation, which has not favorably impressed the stockholders and the public in general, the report of the Alice Company has finally been issued. In some respects, the information given is satisfactory. The mine is undoubtedly a valuable one, and there is much encouragement in the reports of the superintendent, Mr. William E. Hall, who is recognized as a good miner, and of Mr. J. E. Clayton of

Salt Lake City, who is thoroughly familiar with the Summit Valley District and with the mine. On the other hand, the management is not quite free from blame for the manner in which the enterprise has been conducted. There is no doubt that it has paid dividends too long, and the purchase of the Magna Charta and Valdemere mines, however justified by their later development, has involved the company in an indebtedness from which it is not yet entirely free. Stockholders will not care to inquire further into the past; to them, the principal point is to obtain from the data submitted a guide for future work. With that end in view, we may undertake an analysis of the financial statement submitted, of which the following is a summary for the period from May 15th, 1880, to January 1st, 1884:

RECEIPTS.			
Bullion yield, etc.:			
May 15th, 1880, to January 1st, 1882.....	\$1,688,765.76		
January 1st, 1882, to January 1st, 1883.....	917,139.61		
January 1st, 1883, to January 1st, 1884.....	1,169,555.87		
Total.....	\$3,775,461.24		
Less discount on silver.....	468,765.05		
Less expressage on silver.....	71,571.74		
Net receipts.....	\$3,235,124.45		
DISBURSEMENTS.		Total.	Per ton.
Permanent improvements:			
M. C. and V. hoisting-works.....	\$13,071.11		
Alice and M. C. tramway.....	4,083.28		
M. C. and V. shaft.....	6,999.73		
Fire department.....	1,975.50		
Mine permanent improvement.....	94,921.08		
Mills permanent improvement.....	66,367.94		
Machinery.....	70,208.36	\$258,227.00	\$3'053
Prospecting and dead-work:			
Labor.....	\$225,036.26		\$2'660
Supplies and freight.....	21,375.19		0'253
Powder and fuse.....	6,790.94		0'080
Fuel.....	41,559.56		0'492
Timber.....	3,322.85		0'063
		\$300,084.80	\$3'548
Ore-extraction:			
Labor.....	\$521,153.42		6'164
Supplies and freight.....	41,583.65		0'491
Powder and fuse.....	12,444.74		0'147
Fuel.....	84,404.49		0'998
Timber.....	14,213.29		0'168
Assay materials.....	2,314.78		0'027
		\$676,114.35	\$7'995
Ore-reduction:			
Labor.....	\$321,136.59		\$3'791
Supplies and freight.....	72,926.97		0'862
Salt and freight.....	304,798.89		3'602
Quicksilver.....	71,490.49		0'845
Fuel.....	272,556.78		3'222
Assay materials.....	4,629.57		0'055
		\$1,047,539.29	\$12'378
Expense account:			
Salaries.....	\$35,507.09		
General expense.....	6,131.85		
Legal.....	8,721.70		
Office.....	5,459.43		
Traveling.....	4,485.25		
Stable and ore-hauling.....	12,143.10		
Insurance.....	12,127.94		
Taxes.....	24,567.69		
Interest on notes.....	35,984.97		
Stationery and printing.....	1,882.59		
Postage and telegrams.....	972.80		
Professional services.....	4,174.00		
Registrar's fees.....	2,450.00		
Advertising.....	280.04		
		\$154,888.45	\$1'831
Cord-wood.....	16,590.00		
Lode claims purchased.....	204,186.40		
Bullion reclamations.....	7,706.31		
Paid on account company's notes.....	166,833.49		
Dividends.....	400,000.00		
Cash.....	2,953.86		
Total.....	\$3,235,124.45		\$38'247

The statement of the secretary puts the discount on silver among the items of disbursements. We have deducted it and the expressage on bullion from the "bullion yield." It seems absurd to compute the value of a product of a mine at a fictitious price, and charge the excess as a "discount." It is a practice only too frequently indulged in by Western mining companies. Their silver is a commodity subject to fluctuations in price like any other. It should be valued at what it will fetch in the markets, and not at a standard.

In order to get at some idea of the cost per ton, we have computed the figures we have added on the basis that 84,586 tons net dry weight have been worked during the period under consideration. The outlay for permanent improvements has been large, although not excessive, and has not equaled the amount spent for prospecting and dead-work. From the reports of Messrs. Hall and Clayton, it appears that there are now immediately available for stopping 135,271 tons, or fully 5 1/4 years' supply of ore, at the rate of milling in the past. The cost of this dead-work, paid out of the earnings, was \$3.55 per ton. We have in the past and do still insist upon the necessity of such work; but it does seem that it will be expedient in the near future to spend as much money in development. The managers can consistently run along for at least a year and a half without adding materially to the reserves. They would do better to provide for a cheapening of the ore-extraction by providing a good drill plant, the machinery for which, twenty Rand drills complete, will not cost, f. o. b. New York, much more than \$25,000. They will thus be placed in a position to reduce the heavy labor account for mining, which, it will be noted, is \$6.16 per ton of ore milled. The heaviest item of the cost of milling, comparatively speaking, is the salt. This is due principally to the fact that until recently the railroads insisted on the extortionate charge for freight of \$30 per ton. It is now reduced to \$20 per ton, which represents a saving of fully \$1 per ton. The mills, we understand, are not in the very best condition, nor are they doing as good work as some of their neighbors. It is stated that the Alice management has done some experimenting with leaching. In the expense account, the heaviest item is that of \$35,984.97, a legacy of the former error of excessive dividends. Allowing \$3 per ton for fur-

ther mine and mill improvements, \$1 per ton for dead-work, \$8 for ore-extraction, \$11.50 for ore-reduction, and \$1.75 for expense account, the total cost of working should not exceed \$25.25. With ore the silver yield of which is worth \$39 per ton in the market, the mine should produce from 20,000 tons, with present milling facilities, fully \$250,000 per annum. It has a debt of \$225,000, against which there is an offset, it is true, of \$103,041.43 in supplies and cash. But the latter must be maintained at fully that figure. Without, therefore, unduly stinting the management in its expenditures for improvements and dead-work, setting aside \$80,000 for that purpose, it should be easy to pay the debt during the current year without taking more than one sixth from the reserves. Neither Mr. Hall nor Professor Clayton furnishes any estimate of the average grade of the mineral in reserve; but we presume that they would be willing to accept \$38 per ton, net, as a conservative figure. Professor Clayton, touching upon the question of increasing the milling facilities, states that such a movement must be preceded by the sinking of the two shafts to a depth of 1000 feet, in order to provide for the necessary water. With a debt unpaid, and exceptionally large reserves, the management should not incur further outlay for improvements until it has wiped out all outstanding claims. It may then, if the reserves are as ample as they are stated to be, put aside a fair proportion of net earnings, say one half, to accumulate funds for such work, and pay the rest to the stockholders in the form of dividends. If the managers of the Alice Company have sinned in the past, it was in the unusual way of providing too liberally for the future and too scantily for the immediate requirements of the outside stockholding interest.

THE CINCINNATI MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

THE THIRD SESSION

of the Institute was opened by the reading of a paper by Mr. Edward Gridley, of Wassaic, N. Y., on a

GRADE OF IRON MADE FROM CARBONATE ORE.

At the Roanoke meeting, Mr. Gridley called attention to charcoal pig-iron of unusual strength, made from carbonate ore, from a mine at Amenia, New York, in the Wassaic furnace, which is 32 feet high by 9 feet 2 inches at top of bosh. The fuel is a mixture of hard and soft charcoal, and the furnace is blown through three 3 1/2-inch tuyeres, at a pressure of from 0.5 to 0.75 pounds, the air being heated to from 400 to 600 degrees Fahr., by an iron stove on the top of the stack.

The analysis of the roasted carbonate is: Silica, 8.240; peroxide of iron, 77.202; alumina, 2.763; oxide of manganese, 3.005; lime, 1.650; magnesia, 1.167; phosphoric acid, 0.275; sulphur, 0.224; and loss by ignition, 5.684. The last week of the run on one third Chateaugay and two thirds carbonate ore, only No. 3 and No. 4 were made; but as soon as the ore-charge was changed to all carbonate, the iron produced was nearly all No. 4. Mr. Gridley wishes to know why they do not make soft iron, and what should be done to produce it. Additional tests of the iron showed a tensile strength of 43,003, 42,450, and 48,400 pounds, the average of 16 tests being 41,962 pounds.

Mr. S. Stutz, of Pittsburg, well known as a leading authority on coal-washing machinery, presented a paper, fully illustrated, on his Improvements in Coal-Washing Machinery, Elevators, and Conveyors. Having special reference to a series of drawings, we defer a presentation of this paper until the necessary engravings have been completed.

Prof. N. W. Lord, of the Ohio State University, Columbus, read notes on the Occurrence of Lithia in Ohio Fire-Clay, and on the Composition of Two Samples of Ohio Pig-Iron.

This was followed by Mr. J. S. Harris's paper on the Benefit Fund of the Lehigh Coal and Navigation Company, of which we printed a full abstract last week, together with the note bearing upon the same subject by Mr. Schellenberger, of the Westmoreland Coal Company. In an animated discussion, in which Captain Jones, President Hunt, J. D. Weeks, Dr. R. W. Raymond, William Kent, and J. F. Holloway took part, a number of interesting and conflicting views were brought up. Captain W. R. Jones, of the Edgar Thomson Works, closed the session with a talk on Experiments with Natural Gas.

In the evening, the members and a large party of guests were entertained at a reception tendered by Mr. and Mrs. Aldrich.

THE FOURTH SESSION.

Mr. Joseph D. Weeks, of Pittsburg, being called upon, spoke briefly to correct the opinion, too generally held, that pig-iron was first made with coke as a fuel at Colebrookdale, England, in 1735. He inclined to the belief that Scrivener is nearer the truth when he places the date at 1713, Mr. Weeks bringing forward evidence to sustain his views.

After a few remarks by Dr. Raymond, Mr. W. Kent, and Dr. Egleston, Dr. A. A. Springer explained the torsion balance first devised by Professor Roeder, and since improved and adapted to all capacities. Dr. Springer's statement that the scales worked without any friction was called in question by a number of members. He did, however, succeed in convincing the meeting of the exceptional accuracy of the new system, which promises to become at an early date one which will deservedly attract general attention.

The annual report of the Council was then submitted, showing that the receipts during the year were \$17,598.25, while the expenditures were \$13,866.29, thus leaving a surplus of \$3711.96. Since the balance of the last annual statement was \$5028.52, and \$4961 have been invested during the year in United States bonds, the actual surplus of receipts over expenditures is \$3644.44. The Institute is in a flourishing condition, having a membership of three honorary members, 50 foreign members, 1134 members, and 154 associates.

Upon the recommendation of fifteen members, indorsed by the Council, the latter urged the election as an honorary member of Dr. T. M. Drown, of Easton, Pa., who has so long, faithfully, and skillfully filled the office of secretary.

Dr. W. L. Dudley, of Cincinnati, then delivered an extremely interesting address on

FUSING AND PLATING WITH IRIIDIUM,

describing the development of an industry started four years ago by Mr. John Holland, and now carried on by the American Iridium Company.

Iridium is found principally alloyed with other metals, notably with platinum and osmium, the principal source of supply being the Russian gold mines, small quantities only coming from California and from the gold placers in other States and territories. Its presence in gold-dust proved a great annoyance to the workers in gold, and special precautions are taken at the mints to keep it out of the more precious metals. The process adopted at the mints is to smelt the gold and allow it to stand for a certain time in a fluid state. The heavier iridium settles in the lower portion of the crucible, and the greater part of the pure gold can be poured off. Iridium alloys are generally found in the form of a fine powder, the large pieces, rarely met with, being of the size of a pea. The metal was principally used for tipping gold pens, and the points had to be selected from the material at hand separately. This took a good deal of time, so that a skilled man rarely selected more than a pennyweight per day of ten hours, the metal being worth from \$75 to \$100 an ounce.

Four years ago, Mr. John Holland, of Cleveland, took a contract to furnish the pen-points for the McKinnon Pen Company, which had to be of more than ordinary size, because a hole had to be drilled through their center. He soon found that it would be practically impossible to collect a sufficient number of large pieces, and, being held to the terms of his contract, was forced to look about for some means of providing the necessary material. This marked the beginning of a long series of experiments, in which he met with little encouragement, until the thought occurred to him that phosphorus might help him out. He carried a quantity of the osmium-iridium alloy to a white heat, and added a stick of phosphorus, and found that he could pour the compound thus formed. It proved to be a phosphide of iridium, a stable compound, containing from 5 to 7½ per cent of phosphorus, which could be re-melted, retaining its phosphorus. This method afforded him the means of overcoming the drawback of being limited to the size of the grains of the raw material, and permitted the production of masses of the alloy as required. The metal is now simply melted together with the necessary amount of phosphorus, poured upon a slab of iron, upon which a second slab is laid while the metal is solidifying. Thus large sheets, one sixty-fourth of an inch in thickness, are made, which are broken up, the pieces being soldered to a strip of brass. Then the drilling operation is begun. At first, the metal is countersunk with a diamond, it being found impossible to use any thing but pure white diamondsplint for this operation. For the drilling proper, a copper wire is used, placed in a drill making from 3500 to 5000 revolutions a minute, the wire being tapered down to a fine point with a file. Diamond-dust mixed with oil is put into the countersunk hole; and by jiggling the drill up and down, the hole is put through. One man can drill about fifty points a day. The iridium phosphide is as hard as the ruby, and resists the action of acids. It has been applied for a large number of purposes, Dr. Dudley showing samples of a great variety to the members present. One of the most promising applications, besides that for pen-points, is for draw-plates for fine wire, in which case the perforated iridium plate is held by brass plates. It is used also in place of watch and clock jewels, for the knife-edges of scales, blow-pipe tips, etc.

The phosphorus may be removed by fusing with lime, by imbedding the phosphide in lime, and heating it to whiteness. The last traces are taken out by putting it into a lime crucible in an electric furnace. The dephosphorized metal is used chiefly for electrical purposes, for the contact points in telegraphic instruments. Experiments have also been made to test the value of iridium for electric arc-light points. It was found that it would do for the negative but not for the positive pole. It is necessary, however, that the positive pole shall not strike the iridium point, because the intense current makes it soft, so that pounding deforms it. Trials with electro-plating have been fairly successful. It appears to be now a question of manipulation, so that iridium plating will probably come into use for certain purposes. The solution must be slightly acid. In order to prepare the salt for the iridium solution, a mixture of the metal and common salt is exposed to a low red heat in a muffle into which chlorine is conducted.

The iridium phosphide is capable of alloying with iron, silver, and gold. An alloy of copper and iridium has been employed as metal for boxes.

During the discussion, Dr. Dudley related an amusing story concerning the difficulties experienced in obtaining a supply of iridium from Russia. It appears that it was only too general a custom to mix the cheapest iridium with the gold-dust of the Siberian mines. This gave the mint officers so much trouble in working the gold that the sale of iridium was prohibited by a very heavy penalty. In this manner, the Russian mint accumulated a large quantity of it, but declined to sell it to others. The supply, in some unaccountable manner, is available through the intermediacy of a German firm, and it is presumed that occasional appropriations of the stock at the Russian mints must be made by unauthorized persons. The United States mints annually offer for sale from 300 to 400 ounces of iridium.

Mr. Pedro G. Salom, of Thurlow, Pa., was then called upon to read a paper on Analyses and Tests of Steel. We shall refer to it at greater length in the future, and may state now that it caused an animated discussion, in which Messrs. Kent, Jones, Weeks, Abbott, and others participated. On the motion of Professor Egleston, seconded by Mr. Edwin C. Pechin, it was decided to make the discussion of the paper a special order for the next meeting.

A number of papers were then read by title, and upward of sixty new members and associates were elected. After the passage of appropriate resolutions of thanks, the secretaries announced the following as the list of officers elected for the coming year:

James C. Bayles, of New York, editor of the *Iron Age*, President. Vice-Presidents—Eckley B. Coxe, of Drifton, Pennsylvania; Thomas Egleston, of New York; Edwin C. Pechin, of Cleveland. Managers—Edward S. Cook, of Pottstown, Pennsylvania; Frank Firmstone, of Easton, Pennsylvania; G. W. Maynard, of New York. Treasurer, T. D. Rand, of Philadelphia; Secretary, Rossiter W. Raymond, of New York.

On Thursday, the party took a train, kindly tendered by the Cincinnati Southern Railroad Company, to visit High Bridge, one hundred miles south of Cincinnati.

On Thursday evening, the members were invited to attend a performance of *Boito's Mefistofele*.

THE BESSEMER STEEL INDUSTRY IN 1883.

The following statistics have been issued by the Secretary to the British Iron Trade Association:

The total production of Bessemer steel ingots in the United Kingdom in 1883 was 1,553,380 tons, against a total of 1,673,649 tons in 1882. This amounts to a decrease of 120,269 tons, or 8 per cent.

It is probable that 1883 was the first year during which there was a decreased production of Bessemer steel in the United Kingdom since that industry became fairly established. It is, at any rate, the first year that has shown a decrease since 1878, when the returns of production were first collected by the British Iron Trade Association, as the following figures show:

TABLE I.—PRODUCTION OF BESSEMER STEEL INGOTS IN THE UNITED KINGDOM IN EACH YEAR FROM 1878 TO 1883, BOTH INCLUSIVE.

Year.	Make of ingots. Tons.	Year.	Make of ingots. Tons.
1878.....	807,527	1881.....	1,441,719
1879.....	834,511	1882.....	1,673,649
1880.....	1,044,382	1883.....	1,553,380

The principal decrease of make in 1883 has taken place in the Sheffield District, and is of course due mainly to the removal of one of the largest works to another part of the country. In the Cleveland District, the decline of 25,018 tons is mainly due to labor difficulties. Details are appended.

TABLE II.—QUANTITIES OF BESSEMER STEEL INGOTS PRODUCED IN EACH DISTRICT OF THE UNITED KINGDOM IN 1882 AND 1883, WITH AMOUNT OF INCREASE OR DECREASE.

District.	Production of Bessemer steel ingots.		Amount of increase or decrease in 1883. Tons.
	1882. Tons.	1883. Tons.	
South Wales.....	483,086	504,966	+ 21,880
Sheffield.....	420,000	285,763	- 134,237
Cleveland.....	326,924	304,606	- 25,018
Lancashire and Staffordshire*.....	252,313	247,440	- 4,873
West Cumberland.....	191,326	210,605	+ 19,279
Totals.....	1,673,649	1,553,380	

The production of Bessemer steel rails in the United Kingdom in 1883 was 1,097,174 tons, against 1,235,785 tons in 1882. There has therefore been a diminished make of 138,611 tons in 1883. Particulars of the make in each district are appended:

TABLE III.—PRODUCTION OF BESSEMER STEEL RAILS IN THE UNITED KINGDOM, AND IN EACH DISTRICT, IN 1882 AND 1883, WITH INCREASE OR DECREASE IN THE LATTER YEAR.

District.	Production of Bessemer steel rails.		Increase or Decrease in 1883.
	1882. Tons.	1883. Tons.	
South Wales.....	367,944	410,670	+ 42,726
Sheffield.....	310,000	142,665	- 167,335
Cleveland.....	295,842	245,386	- 50,456
Lancashire and Staffordshire.....	141,306	125,011	- 16,295
West Cumberland.....	150,693	173,436	+ 22,743
Totals.....	1,235,785	1,097,174	

NOTES ON THE LEACHING PROCESS.

Written for the Engineering and Mining Journal by W. George Waring.

As a practical method of beneficiating silver ores, the process of leaching with hyposulphites has obtained sufficient standing to be considered along with the other established processes of amalgamation and lead or matte smelting, when the question arises how to treat the ores of a particular mine or district. Yet comparatively little is known by metallurgical engineers in general about the principles which govern the successful application of the process under varying circumstances. For example, how is the quality and strength of the leaching agent affected by the character of the ores treated? We are told that at Joachimsthal, where the process was first successfully applied, not a pound of hyposulphite has ever been purchased since the beginning, when a few pounds were used to start with, the necessary wastage being more than replaced by regeneration, etc., during the progress of the operations. What is the experience elsewhere, under different circumstances?

While pausing for a reply—for the literature of metallurgy, so far as I am informed, furnishes none—I will transcribe the record of a sample test made under my direction recently.

A batch of 2480 pounds of roasted chloridized ore-pulp, containing about 40 ounces of silver per ton, about 5 per cent lead, considerable zinc, manganese, antimony, etc., was leached in a six-foot vat, first with hot water introduced from below until the ore was saturated, and then from above, followed by cold water, then by a solution of hyposulphite of lime, and finally by sufficient cold water to drive out the hyposulphite. The ore had been stamped through a 20-mesh steel wire screen, but was nevertheless so fine for the most part that 86 per cent of it would pass through a 60-mesh brass wire sieve. Six per cent of salt had been used for chloridizing.

During the hot water leaching, when the outflow or filtrate was most heavily charged with soluble salts, it carried out chloride of silver at the rate of 1.95 troy ounces of fine silver per 100 liters of filtrate. The hot and cold water leaching lasted 23½ hours. The volume of the ore which, when dry, measured 44.66 cubic feet, was decreased by wetting and leaching to 31.5 cubic feet.

The hyposulphite leaching was accomplished with a solution containing an amount of hyposulphite of lime equivalent to a solution of 1.8 grams of crystallized $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ in 100 cc. of water. It is therefore called a 1.8 per cent solution. The percentage of available hyposulphite was determined constantly by titrations with standard iodine solution and starch. This does not by any means determine the dissolving power of the solution upon silver chloride, which depends upon the extent to which the solution is saturated with certain other salts, and which is determined in another way.

When 255 liters of the hyposulphite had disappeared beneath the surface of the ore, the first traces of hyposulphite solution, saturated

* These two districts have been grouped together because, as there is only one work in Staffordshire, to give the make of the county would be to furnish details of that particular work.

with silver, appeared below. From this point, the progress and results of the leaching as regards practical loss of hyposulphite, are given below in tabular form. The total volume of hyposulphite solution let in upon the ore was 2390 liters, containing the equivalent of 96.8 pounds of crystallized hyposulphite of soda. The hyposulphite was on the ore 42½ hours. The filtrate as it came from the ore was saved in nine separate lots, measured, the silver precipitated (along with much lead) by means of polysulphide of calcium, and the supernatant fluid titrated for hyposulphite.

Lot No.	Vol. of filtrate. Liters.	Vol. of CaS ₂ added. Liters.	Total vol. Liters.	Percentage of h. p. sulphite.	Equivalent of cryst. Na ₂ S ₂ O ₃ ·5H ₂ O. Lbs.
1.....	380	2.5	383	0.4	3.4
2.....	198	6.0	204	1.0	4.6
3.....	330	22.5	353	1.8	14.3
4.....	370	12.0	382	1.8	15.5
5.....	370	4.5	374	1.9	16.0
6.....	350	2.5	352	1.8	14.3
7.....	350	2.0	352	1.8	14.3
8.....	330	2.0	332	1.1	8.2
9.....	70	0.5	70	0.8	1.3
	2,748	54.5	2,802		91.9

The first lot, 383 liters, was discarded, after precipitation, as being too weak to save, and the remainder, 2419 liters, containing 88.5 pounds hyposulphite, was saved. The amount of accidental dilution was 29 liters. To restore the 2419 liters to the original strength of 1.8 per cent would require the addition of 11.5 pounds of crystallized hyposulphite, although the actual loss of hyposulphite is only 8.3 pounds, or about 6½ pounds per ton of ore.

This record does not show the amount of hyposulphite introduced by the CaS₂ solution, nor, on the other hand, does it show the amount decomposed by chemical action, or the amount occluded by the precipitate, which is sometimes very considerable.

The amount of water required to drive out the hyposulphite from the ore at the end, until the filtrate was reduced to the strength of 0.6 per cent, was 650 liters. The operation lasted twelve hours.

HADFIELD'S MANGANESE STEEL.

In our last impression, says the *Engineer*, brief reference was made to some specimens of steel of remarkable properties exhibited at the recent meeting of the Institution of Mechanical Engineers. Some further particulars will be of interest. This manganese steel is really a new steel, and a few years ago could not have been made. It is only through the new manufacture and introduction of higher percentages of ferro-manganese that it can be now made a commercial success. It is sufficiently well known that manganese has been employed for many years in the manufacture of steel in various proportions; but any thing exceeding one per cent it has been generally believed would render the metal under treatment worthless, and any further addition thereof in excess of this proportion has been considered impracticable. In fact, Dr. Siemens had stated publicly, on many occasions, that the use of manganese was simply a cloak to cover the impurities in steel making, that it covered a multitude of sins, and this was the general opinion of the steel trade. Messrs. Hadfield, however, engaged in a long series of experiments and tests, with the object of discovering its truth, and after a considerable expenditure of time and capital, discovered that, by adding the ordinary ferro-manganese of commerce to iron or metal either wholly or to a great extent decarbonized and refined, and treated by any of the ordinary processes, or to steel produced by such processes, in increased proportions sufficient to obtain or produce in the steel or decarbonized iron under treatment a percentage of manganese varying from 7 to 20 per cent, the most beneficial results could be obtained. Such percentage is regulated according to the purpose for which the steel is required; for instance, to produce a steel suitable for armor-plates and other purposes, they add about 10 per cent of rich ferro-manganese, containing, say, 80 per cent of manganese, thus obtaining a steel containing about 10 per cent of manganese. For railroad purposes, they add about 11 per cent, for steel tools, about 12 per cent. They pour this ferro-manganese into the molten steel under treatment, thoroughly incorporating it therewith, and then run it into ingot or other suitable molds, and allow it to cool, after which it is ready for use, as it requires neither tempering, rolling, forging, or hardening. This treatment of steel in suitable proportions, according to requirements, appears to be novel, and renders the steel so manufactured harder, stronger, denser, and tougher than most steel now manufactured, even when forged and rolled. This steel may, however, be forged and rolled in the ordinary manner. For casting, it has the advantage that it possesses greater freedom from honeycombs and similar defects; but the most peculiar property is its great toughness, combined with extreme hardness. It is through this that the hitherto indispensable processes of rolling, forging, hammering, hardening, and tempering may be dispensed with, thus effecting for many articles an enormous economy in time, labor, and expense. In casting, its fluidity enables fine steel castings to be made without misrunning, and approaching in smoothness iron castings. As far as has been yet observed, it does not, when cast, settle so much, nor does it draw like ordinary steel castings at the junction of the thick and thin parts. It would thus appear that steel so manufactured is specially adapted for making steel rolls to replace those of chilled metal, iron, armor-plates, the larger edge tools, and articles known in the steel trade as steel toys. Its value for agricultural wearing parts will be at once seen, as these may be cast therefrom without requiring either forging or tempering; for, like large edge tools, they will be ready for use after grinding.

It appears that this use of manganese renders the use of silicon to obtain soundness unnecessary. Among the samples of the steel placed on the table at the meeting of the Mechanical Engineers were a sample test bar containing 12 per cent manganese, bent double when cold, though hard enough for turning iron; a sample from same ingot, tested by Mr.

Vyle, and showing tensile strength of 42 tons per square inch, with 20.85 per cent elongation; several hammered pieces; a manganese adze, containing 20 per cent manganese, just as it left the mold; an ax, containing 12 per cent manganese, just as cast in the rough, had chopped through half-inch square iron. This, like the others, had not been hardened or tempered, only the edge ground. There was also a large size, about 1½-inch wood chisel, which had been used in the pattern-shop fifteen months; this was of steel, containing 14 per cent manganese. Also, a corve-wheel which had been tested with sixty heavy blows, and showed a peculiar crystallization; it contained 12 per cent manganese. None of this steel has the slightest magnetic capacity; it is a very poor conductor of electricity, worse than iron wire, yet fine drillings or scrapings from it are attracted by the magnet. We are informed that it does not seem to oxidize easily, though tested by Messrs. Hadfield in sea-water. It is said not to corrode as much as ordinary steel, which is exactly what would not be expected from the many statements to the effect that manganese made steel easily corrodible. It is said not to tarnish easily, and it is found that heating it to a white heat and quenching in cold water, instead of hardening it, causes it to become softer and tougher. The tested sample mentioned above was heated to a white heat and allowed to cool down on the shop floor.

It is rather curious that the properties herein found should only be now found, and after finding a steel that is at the same time very hard, very tough, not attracted by the magnet, and with considerable elongation, we may next expect any thing to turn up to upset one's ideas as to the characteristics of steely materials.

THE COST OF PRODUCING PIG-IRON.

Mr. J. B. Moorhead, of Philadelphia, has addressed to the Committee of Ways and Means of the House of Representatives the following communication:

The undersigned has been engaged in the manufacture of pig-iron since 1857; he has given the business his close personal attention, and claims to be a practical man.

The location of his works (on the Schuylkill) and the character of his plant are fully equal to the average of furnaces in the Lehigh and Schuylkill valleys. He has now two idle furnaces, and none in blast. The reasons for their standing idle at this time will be shown by the following statement of the cost of production and the present ruling prices of the market for pig-iron.

Cost of production:

2 tons of ore.....	\$9.10
1½ tons of coal and coke.....	5.50
Lime-stone for flux.....	1.00
Labor, oil, and running repairs.....	2.70
Actual cost per ton of iron.....	\$18.30

No allowance is made for interest on capital invested, or for wear and tear of plant.

Ruling prices to-day of the different grades of pig-iron at furnace:

No. 1 foundry iron.....	\$20.00
No. 2 foundry iron.....	18.00
No. 3 gray forge iron.....	17.00
mottled iron.....	16.00
white iron.....	15.00

Average of the five grades, \$17.40.

Supposing a furnace to make equal quantities of each grade, the cost would be \$18.30 per ton; and the result of sales, taking the average of the five grades, would be \$17.40 per ton, showing a loss, per ton, of 90 cents; no allowance being made for interest on capital or to make good the wear and tear of the plant. Allowing for a blast of two years, which is fully up to the average, an expenditure of from fifteen to twenty thousand dollars is usually necessary to put the works in good repair to start on a new blast.

On a production of 17,500 tons of pig-iron in twelve months (the capacity of one furnace), the loss would be, in a blast of two years, say on 35,000 tons of iron, at 90 cents per ton, \$31,500.

These facts are sufficient reasons to account for idle furnaces at this time. There should be a margin of profit of at least \$1.50 per ton, to pay interest on capital invested, and to make good the wear and tear of the plant after two years' running. To warrant this result, the average ruling price of iron above the present ruling price should be not less than \$2.40 per ton. How can this be accomplished with a reduction of the present tariff?

The necessities of the case require an increase of at least two dollars per ton on the present tariff on pig-iron, to keep foreign iron out of our market and that the price here may be advanced to cover cost of production. At the present prices, it is only a question of financial ability and time to determine the closing of many of the furnaces now in blast.

THE ACTION OF HOT AND COLD SURFACES UPON THE DEPOSIT OF DUST.

—In illustration of the tendency of dust to move from hot and to deposit itself on cold surfaces, the following experiments were recently described before the Royal Society of Edinburgh by Mr. J. Aitken. Two mirrors one hot and the other cold, fixed face to face and close to each other, were placed in a vessel filled with a dense cloud of magnesia, made by burning magnesium wire. After a short time, the mirrors were taken out and examined. The hot one was quite clean, while the cold one was white with magnesia dust. In another experiment, a cold metal rod was dipped into some hot magnesia powder; when taken out, it had a club-shaped mass of magnesia adhering to its end, while a hot rod attracted none. This tendency of dust to leave hot surfaces and attach itself to cold ones explains a number of familiar things; among others, it tells us why the walls and furniture of a stove-heated room are always dirtier than those of a fire-warmed one. In the one case, the air is warmer than the surfaces, and in the other the surfaces are warmer than the air. This effect of temperature is even necessary to explain why so much soot collects in a chimney. It explains something of the peculiar liquid-like movements of hot powders, and perhaps something of the spheroidal condition. For practical application, it is suggested that this effect of temperature might be made available in many chemical works for the condensation of fumes, and that it might also be used for trapping soot in chimneys.

THE MATHIEU RETORT PLANT AT LUTHER, MICHIGAN.*

In the *Journal*, vol. iv., page 288, we promised a description of the plant which Mr. J. A. Mathieu had established at Wyandotte, Michigan; but as circumstances have prevented the continued operation of these works, the inventor has offered in lieu of it the illustrations which we present of the retort plant of the Luther Chemical Company, erected at Luther, Lake County, Michigan.

This plant was constructed in 1882-83, and was first operated in March, 1883. It consists of sixteen Mathieu retorts, and the necessary chemical works to produce wood-alcohol, acetate of lime, and brown sugar of lead.

There is no blast-furnace or iron-works at or near Luther, but the company owning the retorts operates them to produce charcoal, wood-alcohol, and acetates for sale, in connection with an extensive lumber trade. All the charcoal produced has, up to the present time, been sent to iron-works near Detroit, probably one hundred and seventy-five miles distant.†

The *Journal* has had frequent occasion to refer to the particular form of retort here illustrated, and we are gratified to be able to present to those of its readers who have been unable to inspect the retorts in actual use the plate which, with the description accompanying it, will give a correct idea of the shape and the method of installation.

The illustrations do not embrace any of the necessary apparatus for utilizing the products of distillation, except the condensers which transform the vapors into a liquor known as pyroligneous acid, and separate the uncondensable gases that are utilized as fuel. This pyroligneous acid is collected in tanks, and the tar contained in it allowed to settle; the liquor is then drawn into stills, where the alcohol is taken off and acetic acid formed. This last can be combined with various bases to form salable acetates, and the alcohol rectified for commercial purposes.

The inventor claims that the retorts are adapted to the manufacture of coke from bituminous coal and the collection of the by-products, as well as the production of charcoal from wood, peat, or bones. It is, however, with their use as means of manufacturing charcoal from wood that our readers are interested, and the description will be confined to this. Statements having already appeared as to the results obtained from these retorts, we will not repeat them here, but would refer our readers to what has already been published in the *Journal*.‡ The purpose of the present article is simply to describe how the retorts are constructed, arranged, and operated, and the Luther plant is selected as being of a more convenient size to illustrate and describe than the more pretentious establishments at some of the iron-works.

At present, these retorts are erected at the following places:

- 56 retorts at St. Ignace, Michigan, connected with the Martel furnace.
- 56 retorts at Newberry, Michigan, connected with the Vulcan furnace.
- 24 retorts at Port Leyden, New York, connected with the furnaces of the Gere Iron and Mining Company.
- 16 retorts at Luther, Michigan, described in this article and illustrated by plate accompanying it.
- 8 retorts at Sharbut Lake, near Kingston, Ontario.
- 4 retorts at Shelby Iron-Works, Alabama.
- 2 retorts near Muncy, Pennsylvania.
- 10 retorts of somewhat larger size than the above are now constructing for the McCullough Iron Company, near North East, Maryland.

Figure 1, in the accompanying plate, shows general plan, with horizontal sections at various heights, and top view of a portion of the plant. Figure 2 is a front elevation of battery, with vertical sections through heating-chamber, and the front wall of one retort removed. Figure 3 is a vertical transverse section through retorts, showing various parts in section. Figure 4 is an elevation showing the method of filling railroad cars from the cooling-tanks. Figure 5 is an enlarged view of the retort, showing half elevation and half longitudinal section. Figure 6 is an enlarged cross-section of the retort.

Figure 1 exhibits the following (the spaces for retorts being numbered from left to right): Nos. 1, 2, 3, and 4 show the stone and brick foundations with pipes for uncondensable gases. No. 5 is a section through fire-place under retorts. No. 6 is a section of the retorts through gas outlets, showing top of main flue *C*, and openings from fire-place to heating-chamber. No. 7 is a section through retorts and heating-chamber at the level of flue *E*. No. 8 is a top view showing wood-car overhead track, and charging-opening for retort. To the right of No. 8, a top view of the boilers, engines, steam connections, shafting, and the elevator for cut wood are shown. Two views of the condenser are also given, one with pipes and one with pipes removed. Similar condensers, acid receptacles, etc., are placed on the opposite side of the plant, one condenser being used for every four retorts. These condensers are constructed of a series of cast-iron *U* pipes of decreasing diameters, placed in a large box filled with water, so partitioned off as to secure proper circulation.

Figure 2 is numbered in the same manner as Figure 1. It presents in Nos. 1, 2, 3, 6, 7, and 8, a front view of the masonry surrounding the retorts as completed. No. 4 shows the front masonry and retort removed, exposing the interior of the heating-chamber *B*, and showing boiler-flue *C*, and the fire-place *D*, in section with the method of introducing the uncondensed gases from the condenser to the fire-place. No. 5 shows the front masonry removed, exposing a retort. Nos. 6, 7, and 8 show the gas outlets of retorts connected with the pipes leading to the condenser, and elevation of a condenser with the end removed, to show safety-box *I*. No. 8 exhibits a wood-car *G* and a cooling-tank *P* on their respective overhead tracks.

The braces extending beyond the height of the masonry and supporting the overhead roads are shown as formed of iron channel bars; timbers, however, have been generally used.

To the right of No. 8 are shown elevations of the boilers and engines, a cooling-tank being lifted from the lower to the upper overhead railroad, a wood-car receiving wood from the circular saws, and a cooling-tank on the upper or stock-house track.

Figure 3 is a section through the masonry and retorts, also showing in elevation two wood-cars *G* (one with door *g'* open as when filling a retort), two cooling-tanks *P*, one under retort ready to receive its charge, and one covered and carried on the overhead railroad.

Figure 5 is an enlarged view of a retort lying horizontally; the left-hand portion shows a half longitudinal section, and the right-hand portion a half elevation. These present an idea of the shape of the retorts and the method of connecting the various sheets of plate-iron.

Figure 6 is a cross-section through the body of the retort on line *X Y*. Figure 5 exhibits the approximate crescent shape of the retort.

The retorts are constructed entirely of wrought-iron (except the mouth-pieces *a* and *a'*, which are castings), the bottom being formed of one sheet of heavy plate bent to appropriate radius. The peculiar shape is adopted to present a practical uniform thickness of wood for carbonization, the ends being drawn in to facilitate charging and discharging. They are set in an inclined position, so that little labor is necessary to fill and empty them, and are located in pairs to economize space, labor in filling, and permit of one heating-chamber *B* serving for two retorts. The position in which these retorts are placed is exhibited by Figure 3, and by the exposed retort in Figure 2.

When the plant is working regularly, the following, furnished by Mr. Mathieu, will illustrate the details of operation:

The retorts *A* being hot, and the lower cover *a* closed, the top cover *a'* is opened and wood is dumped in from two wood-cars *G*. The retort is then closed, and, as the wood is heated, gas escapes by the pipe *H*, passing through the safety-box *I*, and into the condenser-pipes *J*, which are immersed in water. The condensed liquid runs into the barrel *j*, and is what is known as pyroligneous acid, while the gas not condensed passes by pipe *j* through a water-seal and safety-box *K*, into the distributing-pipe *k*, from which it can be admitted to the fire-places most needing it by valves *k'* and flues *d*. This gas in burning produces a very high heat, which passes through the flues *d* and *d'* to the heating-chamber *B*. From here, the heat goes into flue *E*, down to main flue *C*, to the boilers *L*, and then to the chimney *l*. A small quantity of the hot gas passes down by *E'* and up by *E''* (thus heating the lower side of the retort) directly to the chimney by flue *F*. The flue *E* is controlled by a damper which may be nearly closed if the retorts are warm and the wood dry.

If the wood is dry, after twelve or fourteen hours the smoke coming from a retort changes from yellow to blue; between these two points, the lower cover *a* is opened, and a piece of board which has been put across the retort, six inches from the cover, holds back the charcoal. The cooling tank *P* is pushed under mouth of retort, an attendant pulls out the board with a pike, and the charcoal runs into the cooling-tank from the retort, as if from a chute. A light cover is then put over the tank. If the attendant is accustomed to the work, very little blaze is produced at the time the retort is opened, as the coal is not red-hot. If any is produced, a little water thrown over it will quench it completely. The cooling-tank *P* is then rolled away on its truck; the lid *a* is cleaned, luted with clay, and put on the retort; and the operation goes on as before.

Clay or plaster is put around the cover of the cooling-tank to make it air-tight. The charcoal will be cooled in twelve hours at ordinary temperature; the cooling-tank is then hung by an overhead track *p*, and is raised by a rope and dumped on a platform *R*, where it should remain, to cool further, for about twenty-four hours, before putting on cars to ship to blast-furnaces or elsewhere.

If the works are located close to a blast-furnace, the tanks *P* can be raised to the tunnel-head and the coal dumped as from a charging-buggy.

The boilers *L* are heated by the waste heat from the retorts, and furnish steam for running water and acid pumps, engine *M*, elevator, and saw *N*.

The wood is brought by cars or carts near to saw *N*, and dumped on an inclined platform *n*. A workman rolls or slides the pieces of wood without lifting them, and pushes them on the lower part of the inclined plane of the saw-frame; the teeth on six endless chains catch the pieces, one at a time, and push the wood up against two circular saws; a spring *n'* (the pressure of which can be regulated by the foot of the workman) holding the wood in place. The three pieces of wood thus made are carried on the upper part of the incline and fall into the car *G*. Each of these cars holds half a cord, and one man can push them into position to empty into the retort. By use of switches, another empty car is carried to the saw to be filled. Two cars will fill one retort, and one cord of wood can be sawed every half-hour with a ten horse-power engine.

With good dry, hard wood, and the retorts emptied and filled as soon as charcoal is made, the foreman taking care that the retorts are regularly divided, there will be gas enough to keep the retorts running after the fire-place is heated. In case of stoppage, sawdust and charcoal dust mixed with the tar coming from the distillation can be used to keep the retorts warm.

If the wood is not dry, as it may contain from thirty-five per cent to forty per cent of water, it will be necessary to burn some other fuel to evaporate this water before the distillation begins; and as it will take from four to five or six hours or more before green wood begins to make gas, it is more economical to use dry wood. In addition, as the dry wood gives less pyroligneous acid, it is proportionally stronger, and needs a smaller quantity of steam to concentrate and purify the alcohol and acetic acid.

The plate shows the plant located against a bank. On level ground, the only difference in arrangement would be an elevator for the wood.

Where an ample supply of water is obtained by gravity, the condensers work most advantageously; but where such facility can not be had, a pump is employed to raise the necessary water for condensation.

THE BURNING OF PYRITES.—The Davis Company, whose mines are at Charlemont, Mass., and whose office is at 3 Merchants' Exchange, Boston, have issued a pamphlet, entitled *The Burning of Pyrites*, intended to supply information regarding that subject. Though intended chiefly to facilitate and increase the business of those who have published it, the little pamphlet contains, in a convenient form, many data which involve in their collection a good deal of labor and research. We therefore heartily recommend it to those who are making inquiries on the subject

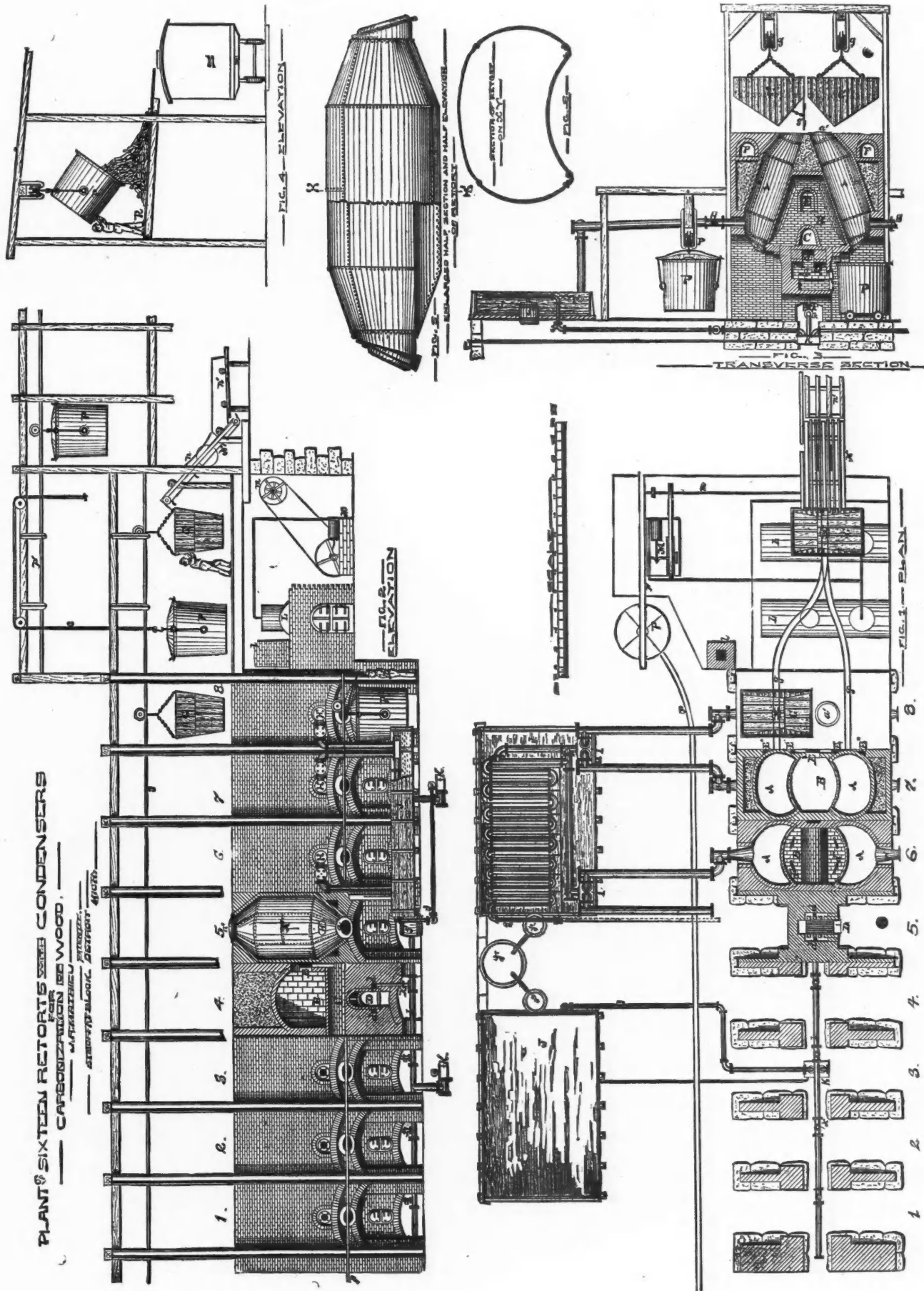
* From the *Journal of the United States Association of Charcoal Iron-Workers*. Edited by John Birkinbine, Secretary.

† See *Journal*, vol. iv., page 293.

‡ See *Journal*, vol. ii., page 361; vol. iii., page 290; vol. iv., page 291.

PLANT OF SIXTEEN RETORTS FOR CONDENSERS
CARBONIZATION OF WOOD.

DESIGNED BY
S. H. WALKER, ARCHT.



THE ADOPTION OF STANDARD FORMS OF TEST-PIECES FOR BARS AND PLATES.

At a meeting of the British Institution of Civil Engineers, the paper read was on the Adoption of Standard Forms of Test-Pieces for Bars and Plates, by Mr. William Hackney, B.Sc., Assoc. M. Inst. C.E. In breaking test-pieces of the same quality of tough metal by direct tension, very different results are obtained according to the form of the test-piece employed. The sample that one engineer would define as stretching nearly 44 per cent before fracture is classed by another, using a test-piece of different form, as stretching less than 28 per cent. In fact, to obtain from any bar of metal relatively high percentages of ultimate stretching, all that is needed is to use short or thick test-pieces. Mr. J. Barba has shown, in a paper published in the *Mémoires de la Société des Ingénieurs Civils* in 1880, that test-pieces of the same form, namely, in which the ratio of length to diameter is the same, give the same percentage of ultimate stretching, whatever their size may be; but that in those of equal length but differing in diameter, or of equal diameter but of different lengths, the percentages of ultimate stretching vary very much. Notwithstanding the extent to which the result obtained in testing a sample of ductile metal is thus affected by the proportions of the test-piece used, no standard dimensions or proportions for such pieces have been generally adopted, and those in common use vary very much. Sir Joseph Whitworth, for instance, advocated the use of a test-piece 0.798 inch in diameter by 2 inches long, or 2.51 diameters long, and the test-piece in use at Woolwich Arsenal is 3.75 diameters in length. From these proportions, the ratio of length to diameter is increased in the test-pieces adopted by different engineers, especially on the continent, to 10 or even more. The ultimate stretching of test-pieces cut from the same bar of mild-steel, similar in form at the ends and of these different proportions, would be:

Ratio of length to diameter.	Ultimate stretching. Per cent.
2.51.....	44.5
3.75.....	37.5
10.00.....	28.2

The proportions of the strips in which plates and flat bars are tested have almost as great an influence on the percentages of ultimate stretching as have the proportions of cylindrical test-pieces, and those in general use vary nearly as much. Mr. Barba showed that, in the case of pieces cut by lathe or planing-machine from the same bar of metal, the law of similarity—that is, the law that test-pieces similar in form give the same percentage of ultimate extension, whatever their size—is as strictly true in the case of flat as in that of cylindrical test-pieces. The effect on the percentage of stretching of the transverse dimensions of an ordinary strip of plate or flat bar is not so great as in the case of a cylindrical test-piece, as in the strip, whatever might be the width, the thickness remains always that of the piece of metal tested. Test-strips of mild steel plates, 0.5 inch thick and about 1.4 inches wide, that stretch 27.5 per cent in a length of 8 inches, stretch 37.3 per cent, if the measured portions are only 2 inches long; and in rather harder plates, which stretch 20 per cent in a length of 8 inches, the extension in 6 inches is 25 per cent, and in 4 inches about 32 per cent. The test-strips used at the Crewe Works of the London & Northwestern Railroad Company were only 2 inches long, and those employed in some tests of boiler plates, made at Sheerness Dockyard in 1875, and at Chatham Dockyard in 1879, were 4 inches long; but the length of test-strips adopted for plates, both in England and elsewhere, is almost universally 8 inches. The impossibility of comparing the results of tests made by different experimenters of the ultimate stretching of metals, in the absence of standard forms of test-pieces, has long been felt by engineers, and has led to the adoption of several alternative methods of comparing their relative toughnesses. When a bar of ductile metal is stretched to breaking, it at first extends equally from end to end, with each successive increment of load, until the maximum load that it can carry has been reached, and up to this point the percentage of stretching is absolutely independent of the proportions of the test-piece used. This percentage of extension would thus appear to be the most important in comparing the structural values of metals, and to be that which should be always the most particularly noted; but practically testing in this way would be more tedious than the ordinary mode of loading the piece until it breaks, and then measuring the elongation after fracture; so that in ordinary technical and commercial work, this latter plan will always be preferred. Another method that has been adopted to a considerable extent for obtaining comparable measurements of the toughness of metals, without using test-pieces of uniform proportion, has been to measure, not the linear stretching, but the percentage of contraction of area at the point of fracture. Practical objections, however, to this are, that the contraction of area can be much less accurately measured than the increase in length, and that, as a tough piece of metal often breaks irregularly, it might be difficult to determine what its exact diameter at the point of fracture should be taken to be. Whether, on account of the difficulty of accurate measurement or owing to the percentage of contraction of area not being exactly proportional to that of stretching, it is certain that the results obtained by the two modes of measurement seldom precisely agree. A third mode of obtaining comparable results in testing by tension would be to use very long test-pieces and to reject the percentages of stretching near to the point of fracture; but this would be expensive and often inconvenient or even impracticable, and would not always give accurate results; for a long bar, when stretched to breaking, often begins to draw down simultaneously in several parts of its length. The use of comparatively short test-pieces of some standard forms seems thus to be the best method of making tests of the quality of bars and plates of ductile metal that could be employed. The length of 8 inches, in the testing of plates, is the only dimension of test-piece that appears to be generally adopted; and as it is very desirable that the standard forms for cylindrical and for flat test-pieces should be such that the same metal might give the same percentage of stretching, whether tested in the one shape or in the other, this length, with a convenient width and an average thickness, might well be taken as the standard form, and that for cylindrical test-pieces be determined by experiment, so as to correspond with it. The effect of hammering or rolling in increasing the toughness of metals is so marked that, in determining the shape of the cylindrical test-piece that would give the same

percentage of ultimate stretching as the standard form adopted for plates, both shapes should be cut by lathe or planing-machine from the same bar, so that one might not be made from metal more drawn down than the other. This increase in the toughness of iron and steel explains the fact that, in testing plates and rivet bars, it is found that metal of the same quality stretches nearly as much in test-pieces of the same length, whether the bars and plates are thick or thin. The use of a test-piece 8 inches long is a more severe trial for a thinner than for a thicker plate; but the toughness of the former has been so much increased by the greater amount of rolling to which it has been subjected that the one stretches before fracture nearly as much as the other. As test-pieces similar in form have been found to give the same percentage of ultimate stretching, whatever their size, it might be better to define the standard cylindrical test-piece rather as being of a certain form than of a particular length. This would facilitate the adoption of the same form by engineers of different countries, using different units of measure. In testing plates and bars such as rivet-bars, which are reduced to the size of the test-piece by hammering or rolling, it would be best to retain, as at present, one length of test-piece, whatever the transverse dimensions. In fixing the standard forms, the effect on the percentage of stretching of the distance from the datum points of the test-pieces of the shoulders or enlargements at the ends by which they are to be fixed in the testing-machine should not be overlooked. The enlargement might begin, for instance, half a diameter beyond each datum point, and its radius of curvature might also be half a diameter. The whole subject of the testing of metals by tension seems to be well worthy of consideration. If a uniform system of testing could be generally introduced, so that tests made by engineers in all parts of the world might be directly comparable, the advantage would be very great.

THE GEOLOGY OF THE COMSTOCK LODGE.*

By George F. Becker.

The economical importance of the Comstock lode appears from the fact that in the twenty-one years ended June 30th, 1880, a little over \$306,000,000 worth of bullion has been extracted from it. Of this, about \$132,000,000 worth was gold. The mines are the deepest in America, reaching a distance of over 3000 feet from the surface, and they contain about 185 miles of galleries.

Besides the scientific importance attaching to the occurrence of the immense accumulation of ore, the lode and district present other features of great interest. The nature of the rocks associated with the ores, some points of structure, and even the character of the deposit, have received different explanations at the hands of different observers. A digest of the memoirs of Messrs. Von Richthofen, King, Zirkel, and Church forms one chapter of the volume.

The subject of rock decomposition has received special attention in the examination described in this report. This study has led to some lithological and mineralogical observations of interest and to the identification of all the Washoe rocks with well-established rock species. The greater part of the hanging-wall of the lode is diabase; the "black dike" is also a variety of diabase; and the supposed trachyte of the district is a hornblende-andesite. The so-called propylite of Washoe comprises a number of Tertiary and pre-Tertiary rocks, reduced to a nearly uniform appearance by decomposition. The erroneous determination of these altered rocks as an independent species arose mainly from a confusion between green and fibrous hornblende and chlorite. The supposed propylites from the other districts in the United States, microscopical determinations of which have been published, were also examined, and found to afford no sufficient evidence of an independent rock species.

A discussion of faulting leads to an explanation of the similarity of the shape of the west wall of the lode and the form of the adjoining face of the Virginia range. The ravines of the latter are a direct result of faulting, and are only slightly modified by erosion. A cross-section of the country on the Suto Tunnel line shows that the surface forms a logarithmic curve in accordance with the theory, which is further supported by experiments. The sheeted structure of the country seems to be referable to faulting and not to eruptive bedding. The theory leads to rules applicable in prospecting disturbed but not greatly eroded districts. The details of the topography of grassy hills are chiefly due to land-slips, which come under the law of faults in a modified form, and the characteristic curves of smooth hill slopes are logarithmic.

The order of succession of rocks in the Washoe District is: Granite, metamorphics, granular diorite, porphyritic diorite, metamorphic diorite, quartz-porphry, earlier diabase, later diabase, earlier hornblende-andesite, augite-andesite, later hornblende-andesite, and basalt. Hornblende-andesite thus followed as well as preceded augite-andesite.

Chemical evidence is offered to show that the pyrite of the region is a result of the action of soluble sulphides on the ferro-magnesian silicates of the rocks. Chlorite is held to be a product of the decomposition of hornblende, augite, or mica, while epidote forms at the expense of chlorite under certain conditions, but never from feldspar. There is extremely little kaolinization at Washoe, the feldspars having yielded to another kind of decomposition. The diabase of the hanging-wall, when fresh, was argentiferous and auriferous, and the precious metals of the lode are traced to this rock with much probability, the lateral-secretion theory being thus affirmed. It is further supported by the dependence of the other ore-bodies of the district on the character of the inclosing rock.

The hypothesis that the heat of the lode is due to the kaolinization of feldspar is not confirmed either by theory or experiment. On the other hand, there is much geological evidence pointing to a deep-seated source of heat, probably of volcanic origin. This conclusion is confirmed by extensive temperature observations, from which it appears that, from the

* A Brief Summary of the "Geology of the Comstock Lode and the Washoe District, with Atlas. 1882, 4°, 422+15 pp., 7 plates, and Atlas of 21 sheets, folio. Price, \$11." The atlas contains a fully indexed claim map of the district; a geological map of the surface; 10 geological sections of the lode; a vertical projection of the ore-bodies, and maps of the mine workings, complete to January 1st, 1881. The most noteworthy plates illustrate rock sections under the microscope. Applications for the Report should be made to the Director of the U. S. Geological Survey, Washington, D. C.

surface downward, the increase of heat is uniform, about 1 degree Fahr. for every 33 feet, while in a horizontal direction the heat decreases in a geometrical ratio to the distance from the lode.

Experiments on the kaolinization of feldspathic rock, conducted at the boiling-point of water, and extending over a number of weeks, show that no heating effect due to this cause could be detected with an apparatus delicate enough to register a change of temperature of 0.001 degree C.

The numerous geological sections are discussed in Chapter VIII., and the application of the explanations suggested in the preceding chapters is there shown in detail. All the important and profitable ore-bodies of the Comstock, it appears, have occurred at or close to the west face of the earlier diabase; and it is near that surface, and there only, that exploration is at all likely to be successful. The mode of occurrence of bonanzas is considered, and hopeful prognostications are made for at least two portions of the lode; but a series of bonanzas nearly on the same level, such as was found on the east vein near the surface, is not likely to recur.

Electrical surveys were made both on the Comstock and at Eureka. At Virginia, only negative results were obtained. At Eureka, a distinct though small difference of potential occurs near ore-bodies, and with sufficiently delicate apparatus the method might there be used for prospecting. It is believed that sulphuret ores would have given results of a more convenient magnitude than the carbonate ores of Eureka.

THE CARE OF ROLLING-MILL ENGINES.

Some very appropriate remarks on the design and maintenance of rolling-mill engines were made recently by E. Klein, of Dahlbruch, Germany, at a meeting of the German Society of Iron-Masters. They are worthy of the attention of a goodly proportion of our mill managers, because rolling-mill engines are only too often called upon to do work under the most unfavorable circumstances imaginable. Many precautions which are anxiously attended to with almost all other engines at work are too generally neglected in the case of the machinery which is used to drive trains of rolls. During the frequent stoppages of the machinery in a rolling-mill, large quantities of water accumulate in the long lines of pipe connecting the boilers scattered over all the parts of the work, and the engines must in starting work along with wet steam. The results are many leaky joints, a severe usage of the valves, a poor vacuum in the condensers, and other evils which rolling-mill engineers only too well know. It is rarely that proper attention is paid to good, continuous discharge of water condensed in the steam-pipe, or to careful covering with non-conducting materials. The latter point is not without its difficulties, because the covering is apt to fall off in consequence of the constant motion of the pipes, caused partly by expansion and contraction, and partly by the irregular flow of the steam. The steam-hammers often supplied from these pipes also tend to destroy the covering in the long run and cause the pipes to leak. It is urged as good practice to place the boilers as close to the rolling-mill engines as practicable, especially in modern steel-works where the principal battery of boilers may be located without reference to the location of the reheating and other furnaces, the waste gases of which are used for making steam. It is best, too, not to attempt to connect all the boilers of a large works with one another, and to run an engine with steam from a nest of boilers at a distance of from 75 to 100 feet from it, to provide for good insulation, and to place a reliable steam-trap as close to the engine as practicable. The water condensed may be advantageously returned to the boiler by a small injector. The best way of meeting the expansion of the steam-pipe is to place in the line bent copper tubing. The steam-pipes should be firmly attached to the walls, posts, etc., and their diameter should be larger than called for by the main steam-valve of the engine, in order to reduce the velocity of the flow of the steam through it.

The boilers should have as large a water space and as ample steam space as possible, so that, when the engine starts, a sufficiently large quantity of water is available, and the boilers need not be supplied with an excessive amount of feed-water. While the train is idle, the excess of water used during rolling may be supplied. Priming is then less liable to occur while the train is at work. The boilers should have a large heating surface, so that they need not be unduly pushed when at work.

Rolling-mill engines too frequently are placed so near furnaces and trains that it is impossible to keep them in a neat condition, and to provide properly for their care and maintenance. Dust and dirt inches thick accumulate in all parts not in motion, particularly on the fly-wheel bearings and the frame; the piston-rods, valve-rods, and slides are attacked by dirt; stuffing-boxes leak continually; and there is rarely a good vacuum in the condensers. In steel-works, the different apparatus are more independent of one another than in a puddling-mill. In newly built steel-works, the rolling-mill engines can be so placed that by means of extending the fly-wheel shaft, or by gearing or rope transmission, they are in a separate room, kept clean and well lighted. The additional expense of some such arrangement, which is possible and has been carried out, is more than compensated for by the fact that the engineer has a well-polished, clean engine, with all the advantages which that entails.

Even if a rolling-mill engine is supplied with dry steam, is placed in a separate room, and is kept clean and neat, it has hard service as compared with a cotton-mill or woolen-mill engine. While the greater number of engines have almost an approximately uniform duty to perform, a rolling-mill engine is alternately running free and is suddenly taxed to full capacity. Any one will recognize that under such unfavorable conditions no engine can work for any length of time without a shock. The great reversing-engines of the famous steel-works of Bolckow, Vaughn & Co., at Eston, pound in a manner likely to frighten a layman. Besides reversing-engines, these unavoidable defects are most frequently exhibited by those engines provided with an automatic cut-off and in which there are considerable variations in the pressure at the beginning and at the end of the stroke. Shocks produced by uneven steam pressure, unbalanced moving parts, may be counteracted partially by compression of the exhaust steam. It is possible to avoid the shock in a cut-off engine for one particular duty; for other work, shocks will be felt. This, it is true, is not a reason for condemning cut-off engines for rolling-mill work; but it is necessary to

emphasize that the compound receiver type deserves more attention, because the variations in the pressure between the beginning and the end of the stroke are less unfavorable. The compound engines have the advantage, besides, that the variations of the temperature in the steam-cylinders are less great, that there is less condensation in them, that the leakage is less, and that they are more economical. Unfortunately, there is a limit for the use of this excellent type of engines much earlier than ordinary engines, unless they are made too large for average duty.

As a rule, compound engines do not admit of cutting-off at less than from 15 to 40 per cent of the stroke in the large cylinders, as compared with 75 per cent with ordinary engines. It is not, therefore, advisable to make the proportion of the capacity of the cylinders of compound rolling-mill engines as large as one to four, as formerly, it being better to make it between one to two or one to three.

Unless the water for the condensers is too expensive, it is good practice to arrange for them. The designing of a condensing engine requires special care, particularly in the case of engines with high piston speed, so that the exhaust-valves, steam-ports, and pipe to the condensers are sufficiently large, and the steam has no tortuous passages to go through. A correct exhaust is possibly more important with rolling-mill engines than proper admission and cutting off. Whenever possible, the engine should be directly coupled to the train, avoiding gearing, which always consumes a good deal of power. A speed of from 200 to 250 revolutions per minute, with corresponding stroke, is admissible. Aside from the piston speed, the number of revolutions determines the limit of speed. In order to secure economical work, it is necessary that the engine retain its speed as uniformly as possible in spite of varying loads. This, the German engineer holds, can only be attained with the aid of fly-wheels of suitable proportions. Heavy fly-wheels exert a great pressure on the bearings, and this limits their weight. In rolling, the object is not so much to attain high speeds as to secure regularity of work. The engine must not run much slower even when heavily taxed. In order to meet this condition, the governor must aid, and therefore special attention must be devoted to this important part of the engine.

The Corliss and Allan gears are well adapted to rolling-mill work, when the engine is running at a speed of from 200 to 250 revolutions. D valves, except in the case of the Allan gear, have not proved successful, because they are too rapidly attacked by dirt and water, except when their travel is very short. Balanced valves are little used for rolling-mill engines.

ROTARY AND RECIPROCATING STEAM-ENGINES.

In a recent letter to the *Tribune*, Prof. R. H. Thurston, of the Stevens Institute of Technology, gives the following:

It is assumed that the reciprocating engine is essentially defective; that the conversion of the reciprocating motion of the piston into the rotary motion of the crank and fly-wheel involves, necessarily, some appreciable loss of power and efficiency; that the variation of speed of the reciprocating parts, from a state of rest at the "dead-points" to maximum velocity at half-stroke, must necessarily cause loss of power, increased wear and tear, and dangerous impact at high speed, and must thus restrict, to a very serious extent, the development of greater power by the adoption of higher velocities of piston. It is these notions which have been the usual stimulus to inventors, who have, during the past century, been endeavoring to produce rotary engines capable of competing successfully with the always standard reciprocating machine. The patent records teem with such devices, many of them ingenious, more of them crude and unmechanical.

Rotary engines have usually proved to be wasteful in their use of steam, subject to rapid depreciation in power and efficiency, and to great loss of power by friction of the working parts. Engineers are, therefore, likely to look with interest, and a little surprise, upon a motor of this class which is not subject to these defects, even though it may prove to be the superior of the best engines of the more common type.

But the assumed objections to the reciprocating form of steam-engine are, to a considerable extent, imaginary. The conversion of a reciprocating motion into rotation does not necessarily involve loss of power, and need not, and in good engines does not, cause objectionable jar or injury of the working parts. The limit to the increase of speed of the modern "high speed" engine is not set by the difficulties of the kind above described met with in its operation, but rather by the impossibility of carrying more than a certain amount of power through fast-running machinery with absolute certainty that lubrication may be secured, without interruption for an instant, day after day, indefinitely. The inertia of parts, which has been so generally assumed to be detrimental to the action of the machine, has an equilibrating effect with the irregularity of steam distribution due to the expansion of the steam; and this balance may be adjusted for speeds greatly exceeding even the highest attained by the most radical of the high-speed engine builders of the day. The rotary engine has not, therefore, the advantage in this respect claimed for it in the past by many engineers as well as by non-professionals. It has, however, evident advantages which have been hitherto more than compensated for by the apparent impossibility of securing that economical distribution of steam which is easily and satisfactorily obtained in the standard forms of engine, and by the failure of nearly every form of rotary, in competition with the reciprocating engine, when compared with respect to freedom from internal friction and leakage of steam past the piston. It is always safe for the layman, when asked to put his capital into rotary engines, to a sum that the machine possesses these defects to a fatal extent, unless the contrary has been proved to be the case by careful tests made by engineers of known skill and integrity.

The engineer is, therefore, pleasantly surprised when he finds one of this class of engines doing good work, and he will be still more pleasantly surprised when he finds the difficulties which have hitherto been met, in the endeavor to secure good steam distribution, high economy, and perfect regulation, such as is seen in the best reciprocating engines, combined with the undeniable special advantages of the rotary engine.

These latter impediments being overcome, the rotary will supersede the reciprocating engine, but I think not till then, except for very small powers. Our small reciprocating engines do not compare favorably with

larger sizes, in respect either to economy, exactness of regulation, or power per pound of weight of machine. They are usually capable of great improvement, but a small machine of this class will probably never do as good work as a large one. For the present, at least, the best rotary engines must compete solely with the smaller reciprocating engines.

OLIVER EDES.

Oliver Edes, originator of the vast industry of machine rivet-making in this country, and for many years past prominent in zinc manufacturing in Massachusetts and also connected with extensive zinc mining enterprises in Virginia and Tennessee, died at his home in Plymouth, Mass., of Bright's disease of the kidneys. He was born at Needham, Massachusetts, November 10th, 1815, and received the common school education of those days. At the age of sixteen, he learned the trade of nail-making on Boston Milldam. After working at this business in several places, he learned to run tack-machines at South Braintree, and worked there several years. Mr. Edes was a thoroughly practical mechanic, with a good share of inventive genius, and at the age of twenty-two, while at South Braintree, he invented and patented and put in operation the first rivet-machines which cut from drawn wire all the different sizes and forms of small rivets. These machines were so perfect in their construction that they soon revolutionized the business of rivet-making, which up to this time had been by hand-labor, importations being made from Europe at large cost. From this beginning has grown the vast industry throughout the United States, with the civilized world for a market. At first, Mr. Edes had considerable difficulty in introducing his rivets. With Mr. Andrew Holmes as a partner, Mr. Edes manufactured rivets at North Marshfield for four years. The firm of Farris, Edes & Co. was then formed at Plymouth, where the manufacture was entered upon extensively, and from that place the business really dates its growth, being still carried on there by several large and well known establishments.

In 1850, Mr. Edes retired from this business, and soon after engaged with Nathaniel Wood, of Plymouth in the manufacture of tacks and zinc nails. The firm of Edes & Wood increased its facilities by purchasing a large water-power in the southern part of Plymouth, put rolls in the mill, and began the rolling of zinc nail plate, carrying it on for nine years. Mr. Edes then bought out his partner's interest, and continued the business, his son, Edwin L. Edes, having been associated with him under the firm name of Oliver Edes & Son.

In conducting zinc manufacture extensively, Mr. Edes became interested in the production of the metal from the mines in this country. It was learned that the mountains of Virginia and Tennessee were rich in zinc ore of the very best quality. After investigations, Mr. Edes concluded to invest in this enterprise, and with his son, E. L. Edes, his son-in-law, Mr. J. W. Mixer, and Mr. T. H. Heald, of Knoxville, Tenn., formed the Edes, Mixer & Heald Zinc Company, for the purpose of making zinc metal from the ores, which was immediately put in successful operation, since which time the company has been turning out spelter of the finest quality.

DAVY SAFETY-LAMP.—Mr. John L. Williams, Mine Inspector of the Eastern Division of the Reading Coal and Iron Company's mining interests, has invented an improvement on the Davy safety-lamp for miners. As the Davy is now constructed, the only means of reducing the flame is the "pricker," which is worked from the outside, and as the hole in the wick tube is small and the pricker not easily distinguished through the gauze, it often happens that it is turned the wrong way, and fails to touch the wick at all. Where a body of gas suddenly makes its presence known, a failure to extinguish the light brings with it an explosion. Mr. Williams's invention is simply a covering for the wick tube worked from the interior, and is an exact imitation of the wick tube, except that it is movable. Attached to the bottom of the appliance is a steel needle that runs through the lamps. A greater or less pressure on the needle will extinguish or lower the flame.

FURNACE, MILL, AND FACTORY.

The report of Mr. W. E. C. Coxe, Superintendent of the Philadelphia & Reading rolling-mill, showing the operations, expenditures, etc., for the last fiscal year, states that the product consisted of 10,323 $\frac{1}{2}$ tons iron rails, 11,842 $\frac{1}{2}$ tons of steel rails, 1096 $\frac{1}{2}$ tons splice-plates and bolts, 884 $\frac{1}{2}$ tons steel crop ends, and 1170 $\frac{1}{2}$ tons muck bars sold, or a total merchantable production of 25,318 $\frac{1}{2}$ gross tons. With the exception of a very few tons, this entire product of rails and joints was used by the Philadelphia & Reading Railroad and its branches. With old rails at an average cost during the year of \$24.73 per ton and pig-iron and old car-wheels at \$18.48 per ton, the cost of the new iron rails was \$39.62 per ton, or, for the re-rolling, \$14.90 per ton. With steel blooms at \$34.73 per ton at the mill, the cost of new steel rails was \$43.18 per ton. Owing to the lack of demand for rails, the mill was stopped 103 days, or nearly one third of the working days of the year: this increased considerably the cost of both the new iron and steel rails, and reduced the profits. The profits were still further diminished by the stock of rails carried over from last year at \$42.22 per ton, being placed in the inventory at the close of this year at \$35 per ton. The furnaces and machinery have been well maintained during the year, and are in excellent condition. Wages paid, \$125,349.21; superintendent and office expenses, \$10,620; rent, \$26,327.78. Total business of the mill for the year, \$1,194,764.34. Profits of the Reading rolling mill for the year, \$4301.73.

The Reading iron-works and sheet-mills, which have been closed for six weeks by the bursting of a fly-wheel, resumed work February 25th.

The McCungie furnace, at Reading, after a month's idleness, has again started. An explosion in the zinc dust-chambers temporarily delayed the blowing in by Mr. Kenneth Robertson of the new spiegel furnace on the Hackensack. The property is controlled by Manning & Squire, who use the residuum which has for many years accumulated at their zinc-works. The furnace has a capacity of about 4000 tons of spiegel-eisen per annum.

The Philadelphia & Reading Railroad Company will remove all the cast-iron bridges crossing streets on the line of the Newark & New York Railroad, and will replace them with wrought-iron structures. Workmen are now engaged in removing the bridge spanning Pennsylvania Railroad avenue, Jersey City.

All departments of the Youngstown rolling-mill are working double turn. Grace furnace is the only one in blast of the Brier Hill Iron and Coal Company's plant.

Arrangements are making to place the Raney & Berger blast-furnace in New Castle, Ohio, in operation on March 1st.

The mills of Brown, Bonnell & Co. are working about half their capacity. The nail factory is running steadily with plenty of orders.

The iron business at Birmingham, Ala., is reported to be brisk. There are five large blast-furnaces, all in blast but one. The two Sloss furnaces are making an average of about 80 tons each daily, and the two stacks of the Alice Furnace Company are each averaging about 90 tons a day. The Mary Pratt furnace blew out about one month ago, on account of the ore giving out. The proprietors are now opening a large ore mine near the Oxmoor mines, and intend to build a railroad from this junction with the Louisville & Nashville road, about three miles to the mine. Repairs will also be made about the furnace. It will probably not be put in blast again before the last of April. The rolling-mill, which has been idle for over six months on account of a difference between the company and the Amalgamated Iron and Steel Association, has started up and is on single turn, refusing to employ any members of the Amalgamated Association.

The Lechner Manufacturing Company, Columbus, Ohio, manufacturer of roller detachable chain belting, elevating and conveying machinery, has recently received a large number of orders for its driving-belts, elevators, conveyers, etc., and reports the outlook as encouraging. This company has lately issued its new illustrated circular.

The Phosphor-Bronze Smelting Company, Limited, of Philadelphia, has issued a revised price list.

The Cincinnati Corrugating Company, manufacturer of iron roofing, is recovering from the effects of the fire at its works. It has started the machinery again, and is repairing the building as rapidly as possible.

The Western Nail Association met at Pittsburg, February 27th. Reports indicate an improved condition of the trade. Stocks have not accumulated, the new card has been maintained, and the demand is fair.

The Monacaey, Pa., Furnace Company's property is in the hands of the sheriff. The company was incorporated under the general laws of the State of Pennsylvania in July, 1873, with an authorized capital of \$120,000, all paid up. It has been carrying a bonded indebtedness against its property of \$105,000.

The Pittsburg *Telegraph*, reporting the condition of the iron and steel-works, states that since the recent flood nearly all the mills are again in operation. A few were seriously flooded, but even these have been set in motion, and so far as the damage to furnaces and machinery was concerned, it was not very great. But the average running of the mills is not quite as good now as the early part of last month, and much less than during the months of November and December last. It was not until about the middle of last month that the puddlers at Painter's mill dropped from double turn to six heats. As a general thing, business is somewhat slack at this time of year at this mill, but the work is much less now than in former years at this time. That the trade is not as good now as during last fall, is evident at the Elba iron and bolt-works at Frankstown. The puddlers are working double turn, but all the finishing rolls are idle. Previously to the stopping of these, nothing but skelp iron was turned out, but now all the muck iron made, about 65 tons, is shipped across the river to the American Iron-Works of Jones & Laughlin. This firm operates its mill in the puddling and a few of the finishing mills double turn. Specialties of iron, such as fine and polished sheets, are the leading demand. The trade with this firm is very encouraging. A better outlook for business has made its appearance at the Star Iron-Works of Lindsay & McCutcheon, in Alleghany. Since about the middle of December last, both puddling forges have been shut down, and the finishers were working scarcely half-time. Last week, the largest forge was lighted up on six heats, and since then the men employed in the others have received notice to go to work this week. The Keystone rolling-mill is closed in every department. The puddlers have been idle nearly four months; and since the 1st of January, the bar and train of small rolls have been operated about three days. At the Fort Pitt Iron-Works, the outlook is not now as good as before the holidays. Since the flood, the puddlers have not been working. The Vesuvius iron and nail-works, at Sharpsburg, have been idle for seven weeks. Last Monday, the puddlers went to work on six heats single turn, for nail iron. Both nail factories, consisting of 49 machines, were started up last Monday. The Etna Iron-Works were closed one week on account of high water, but are again in operation, the puddlers double turn. The volume of business at the blast-furnaces now in blast is very encouraging, mainly from increased improvements, and from two furnaces reaches 140 tons more in the twenty four hours. Isabella No. 2 turns out daily 200 tons, and at No. 1 the lining has all been removed. In a short time, a force of brick-layers will begin work on relining the furnace and the two Whitwell stoves. Lucy furnace No. 2 has just been lighted, and turns out daily 240 tons, an increase of ninety tons a day. Work at No. 1 is now going on. The furnace was torn down to the pillars and a new shell of greater dimensions built. The work of relining will also soon be commenced. One of the Juniata furnaces is in blast and one is out, but both of the Eliza, Sobo, and Clinton furnaces are in blast. The Elizabeth furnace, in Alleghany, is also out. The daily output reaches about 800 tons, which all finds a ready demand.

LABOR AND WAGES.

There are signs of trouble among the miners of the Connotton Valley, Ohio coal-fields. The operators have submitted to the miners a scale of wages to which objection is made, the men demanding an increase throughout on the scale announced. The following is the rate offered, to go into effect in March: New Hazelton, machine runners, 23 $\frac{1}{2}$ cents per ton; average tons cut by one machine per day, 18. Shooters and loaders, 33 cents per ton; average number of tons loaded by one man, 8. Dell Roy men are offered same wages as Salineville miners. Drivers are offered 17 $\frac{1}{2}$ cents per hour, and to outside hands 12 $\frac{1}{2}$ cents per hour. The men object to the new scale, insisting on 36 cents per ton for machine work and 42 cents for shooting and loading. The miners at New Hazelton insist that winter rates be maintained, while at Dell Roy miners are willing to continue work at 68 cents per ton, while the company offers 66 cents. Drivers at Dell Roy ask 19 $\frac{1}{2}$ cents per hour; the company offers 17 $\frac{1}{2}$ cents.

The employes of the Edgar Thomson Steel-Works, at Braddock, Pa., are making an effort to start a co-operative store. This subject was suggested at the time the wages question was settled. It was proposed by Mr. Carnegie, but now the workmen have taken the matter in hand themselves, and stock is subscribed for that purpose. Mr. Carnegie has offered to furnish the building, and those having the matter in charge are very much encouraged with the prospect. The plans on which the store will be run are not fully prepared yet.

The cause of the strike at Spring Hill, Nova Scotia, was the refusal of the company to increase wages from \$1.10 to \$1.25 for outside men and from 47 cents to 60 cents a box for miners. If the strike continues, a delegation of union men will go to Pictou to ask the miners there to join them. No coal trains are running, and a number of train hands are out of employment. It is reported that directors of the company have gone to the mines to endeavor to arrange matters amicably.

The Reading Hardware Company, whose 125 molders have been standing out six weeks against a 10 per cent reduction, has announced that it will resume in a few days by introducing molding-machines by which one man and an inexperienced boy can do the work of three full hands.

The coal miners of the fourth pool, Pittsburg, Pa., have resumed work, the operators agreeing to pay them the district price—three cents per bushel.

Engineers having charge of stationary boilers in this city recently met and formed the New York State Association of Engineers. It is the intention of the association to endeavor to effect a reformation in the present system of granting

licenses to engineers, and in the matter of inspecting boilers. It proposes to establish a branch of the association in each city in the State.

The coal miners of the third pool inaugurated a strike February 28th for the Pittsburg District price, 3 1/2 cents per bushel. Fifteen hundred men are out, and only twenty-two are working in the entire pool. An assessment of \$1 a week on each miner in the three other pools has been levied to support the strikers, and if this strike fails, a general suspension will be ordered.

The proprietors of the Weimer Machine-Works, at Lebanon, Pa., employing several hundred hands, have made a reduction in wages of from 8 to 12 1/2 per cent.

The striking puddlers at Fishback rolling-mill, Pottsville, who have been keeping 300 men in idleness during the past ten days, held a meeting there February 27th. The operators promised to restore the amount deducted from their wages in January, on condition that they would return to work to-morrow. When this promise of the operators was communicated to them, they held another meeting, and resolved not to go back to work until next Monday.

A large mass-meeting of miners was recently held at the Buena Vista Railroad mines. The object of the meeting was to prevail on the miners working at Scott's new mine to come out for the district price. About forty miners are working at that mine at 3 cents.

Some time ago, the coal miners of the Pittsburg District offered to load one "trip" with coal for the flood sufferers. At a moderate estimate, there is an average of ten mules to every pit in this district, and one trip is 5 cars of 25 bushels each, or 1250 bushels per pit. The 130 pits, river and rail, would therefore put out 162,500 bushels of coal, enough to load a dozen coal barges or 600 coal cars.

The striking miners of the fourth pool have established a camp near Neel's mines, Pittsburg District, where the men are working at the reduction. They propose camping there until the men come out for the district price. All the mines in the third pool, except one, are idle.

RAILROAD NEWS.

At a meeting of the directors of the Ohio & Mississippi Railroad, held at Cincinnati, February 25th, there were present Robert Garrett, James Sloan, Jr., W. T. Montague, J. L. Donaldson, C. R. Goodwin, Edward Higgins, Jr., A. B. Crane, W. E. Guy, Judge A. B. Patterson, from Baltimore; Edward L. Whitaker, St. Louis; J. J. Jackson, Parkersburg; W. T. McClintick, Chillicothe, Ohio; J. M. Douglas, receiver, and W. W. Peabody, general manager. After a somewhat extended conference, resolutions were adopted by a decided majority authorizing the executive and finance committees to dispose of the new five per cent mortgage bonds of the company, to the amount necessary to pay all arrears of indebtedness, so as to release the railroad and other property from the custody of the courts, and put the company again in control. Strong confidence is expressed by the committee in its ability to place the bonds with little delay. Provision was made for an early application to the court for a proper order to restore the railroad to the company, and for a statement of the receiver's accounts. It is believed that this valuable property will soon again be operated, free from the restrictions which necessarily trammel the receiver.

Commissioner Vining, of the Western Trunk Line Association, issued at Chicago, February 27th, an order reducing freight rates both ways from Chicago and St. Louis to all Colorado points common to the Burlington & Missouri River, the Union Pacific, and the Denver & Rio Grande roads. The following are the reductions to take effect immediately: On first-class freight, 87 cents; on second-class, 70 cents; on third-class, 53 cents; on fourth-class, 37 cents; on fifth-class, 30 cents; on class A, 32 cents; on class B, 28 cents; on class C, 23 cents; and on class D, 23 cents. The above sums are to be deducted from the rates quoted in the joint through freight tariff issued February 20th.

Gold spikes were driven at Gettysburg, Pa., February 26th, completing the Gettysburg & Harrisburg Railroad. The first through train reached Gettysburg at noon, bringing Jay Cook, Colonel J. C. Fuller, and others. The road will probably be opened for traffic in about six weeks.

COAL TRADE NOTES.

ALABAMA.

A fine vein of coal, averaging four feet eight inches in thickness, has been opened about twelve miles from Birmingham. Coke for the furnace that is in the immediate neighborhood is manufactured in the eighty double coke-ovens alongside of the furnace. The coal is reached by a slope 660 feet deep. Through the coal, two seams of slate two inches thick are found. The miners are paid 50 cents per ton for run of mine. The coal being hard, it is shot off the solid, and but little mining is done.

The Pratt mines are running full in all departments, putting out about 2000 tons of coal daily. They also manufacture large quantities of coke. The coal-works at Warrior, New Castle, and other points are also doing well.

CANADA.

PROVINCE OF NOVA SCOTIA.

Several gentlemen representing the Nova Scotia coal interests at Montreal waited on Sir Leonard Tilley at Ottawa, recently, and urged upon him not to abolish the tax on coal. They contend that Canadian coal is now consumed very largely, and the removal of the duty would have the effect of materially lessening the consumption, and as a consequence retard the development of an important interest.

COLORADO.

Advance-sheets of the annual report of the Colorado Coal and Iron Company have been issued, and the table printed below shows operations compared with 1882. It is stated that the company mined 599,000 tons of coal, against 350,894 tons in 1881 and 512,363 in 1882; 125,000 tons of coke were produced, against 47,640 tons in 1881 and 90,256 tons in 1882. At its works at South Pueblo and Denver, the company manufactured pig-iron, 25,000 tons; steel rails, 16,000; nails, 63,000 kegs; merchant iron, etc., 4500 tons. The statement of receipts and expenditures is:

	1883.	1882.	Increase.
Gross earnings.....	\$4,126,000	\$4,111,522	\$14,478
Operating expenses.....	3,813,000	3,665,736	147,264
Net earnings.....	\$313,000	\$445,785	*\$132,785
Other receipts.....	134,000	89,825	44,175
Total net earnings.....	\$447,000	\$536,610	*\$89,610
Fixed charges, etc.....	218,000	328,549	*\$110,549
Surplus.....	\$229,000	\$208,061	\$20,939

*Decrease.

MARYLAND.

Governor McLane has appointed Denis Sheridan, a civil engineer, of Cumberland, mine inspector for Alleghany and Garrett counties. Work in the New Central Company's Big Vein mine, suspended some time since, has been resumed.

MISSOURI.

The Keith & Perry Coal Company will soon begin sinking shaft No. 2. The Gulf switch will be extended to No. 1 and No. 2 shafts, and underground mining

will be the principal feature of this company's work in the Rich Hill belt henceforth.

MONTANA.

The men acting in the interest of the Union Pacific, who are said to have purchased the Maxey and other coal mines in Gallatin County, are negotiating for the purchase of various mines on Trail Creek, and have also bonded for \$20,000 Yankee Jim's Rocky Creek mine, binding themselves to expend \$5000 in its development.

OHIO.

Within a dozen miles of Akron, and on the very edge of Summit, Medina, and Wayne counties, says a correspondent of the Pittsburg Telegraph, there are two extensive coal-fields, embracing some ten or more different mines. The two fields are commonly known as Lake View and Silver Creek, and are operated mostly by Akron, Cleveland, and Youngstown companies. The Lake View field is about six miles from Akron, on a branch of the Valley Railroad, and although this field has been pretty well worked over, yet there are two mines there doing a fair business, and some talk of other openings being made. Silver Creek field is doing a much more extensive business, there being altogether about nine mines in operation in that region. The mines of Silver Creek are all located within a mile or so of the main line of the New York, Pittsburg & Chicago Railroad, about ten or twelve miles from Akron, and are for the most part doing a pretty good business, considering the season and its attending drawbacks.

Lake View shaft is operated by Todd, Stambaugh & Co., of Youngstown. The shaft is one hundred feet deep, with a seam of coal four feet and over, and is employing about 200 men. The work here has been good for some time past, with a good prospect. The price of mining is ninety-five cents, over an inch and an eighth screen.

Summit mine, heretofore known as the old Steere mine, operated by Payne, Newton & Co., is one of the oldest mines in Northern Ohio. It is a slope 270 feet long, with a coal-seam four feet and over, and employs about ninety men. The coal here is the same as at Lake View shaft, and is shipped by way of the Valley Railroad. The price of mining is the same.

At Sherman, a distance of ten miles, is the Silver Creek coal-field. Donison slope is about one mile from Sherman, in Summit County. It is operated by C. S. Barrett and O. S. Jacobs, of Akron. The slope is 200 feet in length, with a seam of coal from three to five feet in thickness. The mine is employing 125 men and has been doing well with good prospects. The price of mining is 95 cents per ton over an inch and an eighth screen, while some brush coal is taken out at 85 cents.

The Diamond coal mine, better known as Humphrey slope, has been doing pretty well, with good prospects. The slope is 220 feet in length, has a four-foot seam, and 95 cents per ton over an inch and an eighth screen is the price paid for mining. The coal is mostly shipped from here by way of the New York, Pennsylvania & Ohio Railroad to Cleveland. The mine employs at present 68 men.

Loomis Coal Company shaft is located near Doylestown, Wayne County. The shaft is sixty feet deep, with a four-foot seam of coal. The men have been doing well here for some time, with fair prospects. There are 50 men employed, and the price paid for mining is ninety-five cents per ton over an inch and a quarter screen. The coal is mostly shipped to Michigan, while not a little is taken by the New York, Pennsylvania & Ohio Railroad.

There are two Excelsior mines near Wadsworth, which employ in the neighborhood of 600 men. Both of these mines have been doing well, with good prospects. The Excelsior slope employs the largest number of men. It is a seam of four and a half feet in thickness, and 95 cents per ton over an inch and an eighth screen is paid for mining. Excelsior shaft, about a quarter of a mile from the slope, is fifty feet deep, with the same seam of coal as the slope. There are about 140 men employed here, and 85 cents per ton is paid for mining for run of mine.

The Card Coal Company shaft is about one and a half miles from Wadsworth, Medina County, and is 145 feet deep, with from 4 to 6-foot vein of coal. About 150 men are employed here, and 85 cents is paid for mining over an inch and a quarter screen. A large, new, and improved tippie has been erected about a mile from this shaft by the New York, Pennsylvania & Ohio Railroad, for supplying its engines, and the coal taken out is run to the tippie. The work has been doing very well.

Brewster mine No. 1 is located alongside of Excelsior shaft, and, when running, employs about 125 men, but recently has not been doing very well, nor is there any certainty of its working steadily for some time.

About two miles from Wadsworth and one and a half miles from Western Star, another pretty little town, one half of which is claimed by Summit and the other half by Medina County, with the main street as the dividing-line, is Steuver mine, which is owned by the Brewster Coal Company, of Akron. It employs fifteen men, has a seam of coal four and a half feet thick, and eighty-five cents per ton for run of mine is paid for mining. The coal is mostly consumed by the citizens of Wadsworth.

About a half-mile farther on, is Beese mine, one of the oldest mines in this vicinity, and, to add to its age, the men seem to have conformed somewhat to old ways, as they are still using the old appliance of getting out the water with a gin. The vein of coal is rather shallow here, some places not being more than two feet. About fifteen men are employed, and the same price for mining is paid as at Steuver mine, while the coal that is taken out is also consumed mostly by the people of Wadsworth.

PENNSYLVANIA.

ANTHRACITE.

The following reports have been made by the mine inspectors: Pottsville District—Samuel Gay, Inspector: Accidents, 12; killed, 2; injured, 10. Total number of employes, 7042; average number of days employed, 14 1/2; number of tons of coal mined, 90,856 1/4.

Shenandoah District—Robert Mauchline, Inspector: Accidents, 9; killed, 4; injured, 5. Total number of employes, 12,243; average number of days employed, 14 1/2; number of tons of coal mined, 261,049 0/4.

Shamokin District—James Ryan, Inspector: Accidents, 17; killed, 1; injured, 16. Total number of employes, 12,511; average number of days employed, 15 1/2; number of tons of coal mined, 251,275.

The pumps and hoisting machinery at Potts colliery can not control the water. At present, it stands four feet two inches over the road, and is slowly rising.

Proposals are asked for to drive a tunnel at Merriam colliery, from the old south gangway to a basin of coal lying between that and the counter gangway, which lies north.

It is stated that Samuel Snyder, of Plymouth, who has been prospecting for coal on the Nescopee Mountain for the past year or more, has discovered a vein of coal at the top of the mountain.

BITUMINOUS.

Several meetings of the bondholders and stockholders of the Keystone Coal Company, of Pittsburg, have lately been held, to devise means looking to a satisfactory settlement of the company's affairs without resort to the process of foreclosure. A plan has been prepared, but not yet submitted to vote of the creditors, which proposes the wiping out of all the old stock, the issue of new shares, and the retiring of the \$275,000 of bonds and the issue of \$200,000 of new bonds, the present bondholders to accept in lieu of their holding 50 per cent of the new bonds and 50 per cent in new stock, making \$137,500 of each; \$62,500 of the new bonds to be reserved as a working capital, and to meet any judgments now pending. If the present stockholders desire to retain an interest in the company, they must subscribe and pay for new stock.

COKE.

The coroner's jury in the West Leisenring mine disaster, brought in a verdict

that the explosion was due to the negligence of the Connellsville Coke and Iron Company, which owned the mine, which was not examined as required by law. The jury also found Augustus Steiner, Mine Inspector, had been negligent in his duty, in that he had never been in the mine prior to the explosion.

The coke trade remains just where it was at our last report, two weeks ago, says the Connellsville *Courier*. With the single exception of the Uniondale works, 76 ovens, which have been idle for some days past on account of water in the pit, the active and the idle ovens have not changed position in the list. The water that troubled several of the works during the flood season has all been removed, and those works temporarily embarrassed by it have been working steadily for the past ten days. The Mount Braddock works, which have been in litigation, precipitated by the embarrassment of A. O. Tintman, who purchased them from Robert Hogsett, and mortgaged them for part of the purchase-money, have been idle nearly a year in consequence. During this time, rust and decay have left their marks upon them, and as for water, those who know say the pit is full of it; that a mountain creek empties its contents into one of the air-holes; and that it will take many days of hard and powerful pumping to empty the mine. Of the 9695 ovens in the region, then, 780 are idle. Of the idle ovens, 319 are in litigation. This includes Mount Braddock, just mentioned; Mahoning, at Dunbar, mixed up with Brown, Bonnell & Co.'s failure; and Pennsville, also belonging at one time to Tintman. The latter works was sold some months ago by the sheriff, and purchased by Abram Sherrick, the original owner, but, on account of some informality in the sale, it was set aside. The works are advertised to be sold again on Monday, March 3d.

A charter has been granted to the Gallitzen Coal and Coke Company, of Cambria County. The capital is \$50,000, and the directors, Thomas Munroe, Altoona; James L. Mitchell, Osceola Mills, Clearfield County; and John W. Gilchrist, Wilkes-Barre.

No. 1, of the Mansfield Coal and Coke Company has not been doing any thing since the first of December. No. 2 is employing at present 234 men, but is crowded with some of No. 1's men, thereby making a shortage of cars. The price for mining is 91 cents a ton over an inch and a half screen, or equal to three and a half cents per bushel. There is a prospect of No. 1 starting up shortly again, whereby both mines will have all they want to do.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY.

BENSON SMELTING COMPANY.—A half-interest in the Blue Nose lead mine, in the Harshaw Mining District, has been purchased by this company. It lies between Harshaw and Mowry.

COPPER QUEEN.—It was the general impression, according to local papers, that when the settlement was made by the Copper Queen Mining Company with George Warren and others, a few months since, all litigation as to the title to that mine was at an end. Such, however, is not the case. Thomas J. Jeffords and Thomas Fitch have now begun suit against the Copper Queen Mining Company, to recover one-ninth interest in the mine and proceeds thereof. The interest sued for is what is known as the George Warren interest.

GOLDEN RULE.—This property has been attached, it is said, for \$80,095.

PIMA COUNTY.

CABABI CONSOLIDATED.—This company is composed of Philadelphia capitalists. They have been quietly developing a number of mines in the Cababi Mountains, about ten or twelve miles side of the Quijotoa District. The result of development so far is very satisfactory to the company. It owns First Prize, Grand Prize, P-tanke, Littlefield, and Little Monarch, and has done considerable development-work on several other claims in the group.

PINAL COUNTY.

SILVER KING.—A large amount of ore is on the dump. The artesian well, 15-inch bore, is about 85 feet deep. They struck water at 43 feet, in sandstone, and at 77½ feet in white quartz.

CALIFORNIA.

MONO COUNTY.

It is stated that a company has been organized in the East, to work on an extensive scale the old Silver Group mining claims.

SIERRA COUNTY.

BALD MOUNTAIN.—At this mine, about sixty men are employed. A larger force will be worked whenever an increase of water comes. About 21,000 carloads of gravel are stored in the two dumps. About 100 ounces of gold are cleaned up each week.

RUBY.—The scarcity of water has prevented any great amount of washing being done since gravel was found the last time; but the working force will be increased, and washing on an extensive scale will be commenced as soon as water begins to flow more freely.

COLORADO.

CLEAR CREEK COUNTY.

KOHINOOR & DONALDSON.—The Champion mine, which is owned and operated by this company, has a light working force, mostly leasers, who are taking out considerable smelting ore, which is hauled to Idaho Springs to the Mott sampler or shipped to Denver. The mill-dirt will remain on the dump until spring opens, when it will be either treated at the company's new mill near Fall River or sent to a custom mill. Not much development-work has been done lately. The Bellevue tunnel would strike this mine at an immense depth.

MINERS' SAMPLING-WORKS.—These works, at Georgetown, were to be opened February 25th by Edward C. Billings.

PAY ROCK.—The erection of a Huson tramway from the mine to the mill is the latest news from this property.

GILPIN COUNTY.

CALIFORNIA.—Owing to the trouble caused by the water, the sinking of the main shaft has been stopped. This shaft is the deepest one in the State, and until now has been comparatively dry. The question of the drainage of mines is one of great interest to the miners and mine-owners of the county. The time is not far distant when a Cornish pump of large capacity will have to be brought into requisition to drain the mines. A consolidation of mines in Gregory District under one management and the continuance or sinking of one main shaft to a depth of 2000 feet, with proper pumping facilities, and a level driven west up to and under Quartz Hill, is the most practical solution of the problem of drainage, according to the Central City *Register-Call*.

PALENS.—This company is arranging for the placing of a plant of machinery on its property on Central City Hill. When in position, it is the intention to sink the main shaft to a depth of 600 feet as soon as possible. The shaft has a depth of over 400 feet. This company will develop its mines on a more extended scale than heretofore.

LAKE COUNTY.

The following is taken from the Leadville *Herald*:
ARGENTINE.—This group of mines, comprising the Pine, Camp Bird, Charleston, Keystone, and Young America, is worked under eight different leases, five of which are producing ore, the aggregate shipments from which

amount to from ten to twenty tons daily of fair and high-grade ore. All is produced from new ground on and below the break.

A. Y.—During January, this mine shipped about 600 tons of ore. The output of the mine is about twenty tons a day of oxidized ore, carrying from twenty to eighty per cent of lead, and about an ounce of silver for every unit of lead. The ore for the past month has been shipped principally to the Royal Gorge smelter at Cañon City. Exploration is actively prosecuted at the mine, and encouraging indications have been met with, but so far no large ore-bodies have been encountered.

COLONEL SELLERS.—This mine is steadily producing the tonnage under the contract, the quality of the ore at the same time steadily improving. Machinery has been ordered for one of the shafts, and in a short time four shafts will be in operation. Propositions for ore have been declined, as the present contracts require the entire output with the facilities for extracting.

SIERRA NEVADA.—An important strike has been made in this mine, adjoining the Colonel Sellers mine, on Lion Hill. The ore is similar in appearance to the product of the Sellers and other mines in the vicinity.

SMUGGLER CONSOLIDATED.—At the annual meeting, recently held at Leadville, the action of the directors in extending the lease of Mr. H. Slockett to June 30th, 1884, by payment of 23½ per cent royalty, was approved.

VANDERBILT VS. MAID OF ERIN.—Secretary T-lier, of the Interior Department, has dismissed the protest of the Vanderbilt lot against the Maid of Erin lode. This closes the litigation of three years past over one of the most valuable properties in Leadville. The owners of the Maid of Erin will at once proceed to get the mine in working order.

SUMMIT COUNTY.

ROBINSON CONSOLIDATED.—The reports that have appeared in New York papers, that the property is steadily worked, have been contradicted by the Leadville *Herald*.

DAKOTA.

ATLAS.—This group consists of several properties adjoining the Atlas No. 1 on the east, the most prominent of which is the Atlas No. 2. It was located in 1877, and owned at present by James Shields and others. The developments are quite extensive. A company has been organized, and Mr. Shields is now abroad negotiating with an English syndicate for the sale of the property.

FATHER DE SMET.—The report for the week ended February 15th shows ore extracted from the first, second, and third levels, 2,980 tons. Ore milled, 2,100 tons.

MILWAUKEE & BLACK HILLS.—This company expects to resume operations in the spring, and provide the necessary works for reduction.

TORNADO CONSOLIDATED.—This company owns the Tornado, Silver Fraction, Big T-st Fraction, Daisy Fraction, Little Bird, and the Minnie lode. These properties are grouped together on the eastern base of Terry's Peak, covering an area of some fifty acres. Developments are quite extensive, consisting of tunnels, shafts, and open cuts. The question of erecting reduction-works is discussed.

MICHIGAN.

BELT.—The stamp-mill has been working since the 4th instant, but with one head of Ball stamps. The work of getting the second head ready will go on without interruption. The mill, when fully completed, will have three heads of stamps. There are six of Collum's washers and several finishing-machines, and the Evans lime-tables are nearly ready. Ten machine drills are working under ground, getting ready to put a large force of miners at stopping by spring. The new hoisting-engine will soon be ready to go to work in the new hoisting-shaft on the Butler vein.

CALUMET & HECLA.—When the expansion of buildings and additions and improvements of machinery now making in connection with the company's stamp-mills are completed, it will be in possession of the largest and one of the best mineral dressing plants extant. The dressing floors in each mill, in addition to a complete outfit of the improved iron frame jiggers will also contain 24 (48 in all) of Evans's circular or slime-tables for saving fine copper.

COLUMBIA.—The company is desirous of letting this mine on contract. Several propositions are under consideration.

ROPES.—Negotiations are pending between the managers of the Ropes gold and silver mines and parties who stand ready to put money into developing the property and working it on a large scale, without any delay other than will be required to equip it with the additional machinery required and to make other necessary dispositions looking to extensive mining and milling operations.

MONTANA.

LEWIS & CLARKE COUNTY.

ELKHORN.—A clean-up from a ten-days' run in the company's new mill on ore from the Elkhorn mine gave three bars of bullion aggregating 300 pounds in weight and having an assay value of \$4500.

SILVER BOW COUNTY.

BELL.—This smelter, after lying idle for several months, pending the sinking of the new shaft and the development of the ledge from the 400-foot station, has resumed operations, and is now making a smooth and successful run. About 600 tons of ore are at the works, which amount is increased daily. It is of fair grade, averaging from 15 to 22 per cent copper and 25 ounces in silver.

COLORADO.—To accommodate the increasing production of smelting ore in this district, this smelting company some time ago began the erection of two extra furnaces. They were recently completed and fired up. The smelter has six stacks and a reducing capacity of 60 tons daily.

COLUSA.—The mine has much improved of late on the 400-foot level. At the time the ledge was intersected at that depth by the north cross-cut, the prospect was not encouraging. Drifts east and west, however, showed that the cross-cut had simply run through the ledge between the main ore-chutes. The face of each drift at present is in high-grade ore, of which enough could be supplied if necessary to keep the smelter in operation. The old shaft on the west end of the claim is also enlarging and deepening, and the extraction of ore from that part of the ground will thus be greatly facilitated.

MOULTON.—The company is known to be out of debt and accumulating a surplus. The pulp samples during the past two months were higher than ever before recorded, in consequence of the strike made in December. The new ore-body on the 400-foot level and in the winze leading to the 500-foot level is intact and uniform in width and richness.

NORTH CAROLINA.

The developments at the recently discovered so-called tin mines in the northern part of the State have so far been confined to prospecting for the vein. The showing is said to be encouraging. Trenches have been run in four places, exposing the strata. These disclosed a more or less irregular and broken vein surface. One of them showed a vein about three feet wide, with another eighteen inch spur vein leading toward it. This main vein was sunk upon some fifteen feet, and was found to run nearly vertically through partly disintegrated slate. The recent continuous rains made it impracticable to do much sinking with the present facilities.

TENNESSEE.

Dispatches state that there is great excitement at Erin over the discovery of a gold mine. While out hunting recently, A. H. Bernathy found a cave and evidences of gold. He took a lease of the land, and is selling lots at large profits. Over \$50,000 worth of nuggets are on exhibition in a store. Miners and railroad men are flocking in, and there are already over 200 strangers in town. Erin is a small place on the Louisville & Nashville Railroad, near the Tennessee River.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Feb. 29.

Business was very dull at the mining market this week, the total number of sales not reaching the aggregate of last week with one day more included. There was but little of interest to note. Indeed, it may be said that the market ruled dull with a weakening tendency. The Bodie stocks were the exception, and were very strong. The Leadville stocks were weak, especially Chrysolite, while the Comstocks were very quiet and were unchanged in price. Horn-Silver exhibited a slight weakness, but Green Mountain was steady. The fancy stocks were very quiet, with the exception of Sonora. That stock was largely dealt in, and was irregular. Robinson was quite strong to-day, selling as high as 40c. We give a complete summary of the market below. The total number of shares sold aggregates 79,333, as against 81,490 last week.

The Comstock shares were very quiet and were steady. California sold from 23@25c. with a small business. Ophir was quiet and steady, selling from 22@22.25. Gould & Curry sold at \$2.25, and Sierra Nevada at \$3.50. Sutro Tunnel was very moderately dealt in at steady prices; it sold from 16@15c.

The Bodie stocks were moderately dealt in at strong prices. Bodie was very strong, selling from \$9.25@10 with a small business. Bulwer exhibited more strength than last week, and was quite strong; it sold from \$1.60@1.80. Standard was moderately dealt in at steady prices, selling from \$6.33@6.75. Consolidated Pacific sold at strong prices, with a small business, being quoted from 30@35c.

The Leadville stocks were quiet, and prices were inclined to weakness. Chrysolite was moderately dealt in at weak prices, selling from 97@99@95c. News from the mine is not of a very encouraging character. Among other points, we hear that work on the incline is to be abandoned. Dunkin was quiet and steady at 22@25c. Hareria sold at 3c. Iron Silver sold at steady prices under a small business; it was quoted at \$1.85@1.90. Leadville sold at 50c. Little Chief was quiet and steady, selling from 48@51c. Little Pittsburg sold to-day at 40@42c. Cimex sold from 6@5c., with a small business.

Navajo was the only stock of the Tuscaroras dealt in this week; it sold at weak prices, with a moderate business, being quoted from \$27.00@25.

In the miscellaneous list, Alice continues strong, with a moderate business, selling from \$240@250. Bassick sold at \$9.13, with one small transaction. The company has just declared a dividend of \$1 per share. Eureka Consolidated was evidently sold under strong manipulation. During last week, its highest price was \$2.70; but on Saturday it was rushed up to \$4.05. Yesterday, it sold at \$3.05, and to-day from \$3.50@3.65. Father de Smet was quiet and steady at \$2.75. Green Mountain seemed to be in good demand, and was quiet and steady in price; it sold from \$2.05@2. Hill-Anderson was steady under a small business, selling from \$1.35@1.30. Horn-Silver suffered a slight decline this week and was fairly dealt in; it sold from \$7.63@7.13@7.25. Northern Belle sold at 4c. assessment unpaid. Robinson was quiet and strong, selling from 23@40c. Bonanza King was liberally dealt in and was quite strong; it sold from \$10@10.25@10.13.

Barcelona sold from 16@17c. with a small business. Central Arizona was moderately dealt in at steady prices, selling from 32@30c. Decatur sold from 3@2c., and was very quiet. Durango sold at 3c. Eastern Oregon was quiet and steady, selling from 8@7c. Harlem sold at 7c. with a small business. Oriental & Miller was steady, under a small business, selling from 15@13c. Rappahannock sold at good prices with a very fair business; it was quoted at 13@15c. Sonora Consolidated was very actively dealt in at irregular prices; it sold from 8@5@7c. The State Line stocks were quiet and steady. Nos. 1 & 4 sold at 4c. and Nos. 2 & 3 from 7@9c.

We learn from an official source that the prospects of the Tip Top Silver Mining Company are not very bright at the present time. The mines have been shut down since the first of November last, owing to want of funds, and no bullion has been produced since then. Most of the stockholders allowed their stock to be sold for the last assessment (No. 7) rather than pay it, and

the company has now on hand a large block of this stock.

As the outgrowth of a reorganization scheme, the stockholders of the Eagle River Consolidated Mining Company have been notified that they can exchange their stock for that of the New York & Red Cliff Silver Mining Company on a basis of ten shares of the old for one of the new, and a further payment of ten cents per share within sixty days from date.

At a meeting of the Trustees of the Old Dominion Copper Company in this city on Thursday, the following officers were elected: President, George A. Pope; Vice-President, S. Freudenthal; and Secretary, A. Harnickell.

MEETINGS.

The following companies will hold their annual meetings for the election of trustees and the transaction of business at the times mentioned:

The Atlantic Mining Company, No. 76 Wall street, New York City, March 11th, at twelve o'clock M.

The Intercolonial Coal Mining Company, No. 199 Commissioners street, Montreal, Canada, March 5th, at twelve o'clock M.

The Osceola Consolidated Mining Company, No. 69 Devonshire street, Room 20, Boston, Mass., March 13th, at twelve o'clock M.

The Pewabic Mining Company, No. 19 Congress street, Boston, Mass., March 29th, at twelve o'clock M. Besides the election of trustees, the following business will be transacted: 1st. To authorize a sale and conveyance of all the real and personal property of the company. 2d. To authorize a sale and conveyance of all the real and personal property of the company to a new corporation, to be organized under the mining laws of Michigan, and to receive in payment therefor the capital stock of said new corporation. 3d. To authorize the board of directors to settle and close the business of the company. The charter of the company having expired by limitation, it is necessary, in order to reorganize, to pass the above votes.

The Preston Coal and Improvement Company, No. 227 South Fourth street, Philadelphia, Pa., March 26th, at twelve o'clock M.

The Sherbrooke Gold Mining Company, No. 101 Duane street, New York City, March 5th, at twelve o'clock M. The question of winding up the company will be discussed.

DIVIDENDS.

The Bassick Mining Company, of Colorado, has declared a dividend of \$100,000, payable March 5th.

The Charleston Mining and Manufacturing Company, of South Carolina, announces a quarterly dividend of \$3.50 a share, payable March 1st.

The Syndicate Mining Company, of California, has declared a dividend of 10 cents a share.

DIVIDENDS PAID BY MINING COMPANIES DURING THE MONTH OF FEBRUARY AND FROM JANUARY 1ST, 1884.

NAME OF COMPANY.	Location of mines.	Paid during month of February.	Since January 1st, 1884.
Atlantic, c.	Mich.	40,000	40,000
Bonanza King Cons. s.	Cal.	50,000	100,000
Bulwer Consolidated, g.	"	10,000	10,000
Calumet & Hecla, c.	Mich.	500,000	500,000
Central, c.	"	40,000	40,000
Copper Queen, c.	Ariz.	100,000	100,000
Hecla Cons., s.	Mont.	15,000	30,000
Homestake, g.	Dak.	25,000	25,000
Horn-Silver, s. L.	Utah	300,000	300,000
Idaho, g.	Cal.	15,500	31,000
Iron Silver, s.	Colo.	100,000	100,000
Jocuisita, s.	Mex.	50,000	50,000
Kentuck, s.	Nev.	3,000	6,000
Lexington, s.	Mont.	80,000	80,000
Little Chief, s. L.	Colo.	20,000	20,000
Ontario, s.	Utah	75,000	150,000
Original, c.	Mont.	3,000	6,000
Oro Grande, c.	Cal.	6,000	6,000
Oxford, g.	N. S.	5,000	5,000
Plymouth Cons., g.	Cal.	50,000	100,000
Quicksilver, Pref. g.	"	129,000	129,000
Quincy, c.	Mich.	180,000	180,000
Small Hopes Con.	Colo.	50,000	50,000
Standard, Con., g.	Cal.	25,000	50,000
		\$925,500	2,083,000

G., gold; S., silver; L., lead; C., copper; Q., Quick-silver.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows for the week:

On Saturday, February 23d, the market opened at 99½c., sold up to \$1.01½, and closed \$1½. Monday, Tuesday, and Wednesday it hung around the dollar point, but on Thursday it began to manifest more strength, not rising above \$1.01½, however. On Friday, the buying was of a better character than for some time, and prices rose to \$1.02½. There has been a good short interest in the market and carrying rates are 50c.

The monthly report figures show an increase in new production of 1060 barrels, and the wells drilling about the same.

During the past two weeks, interest has centered in the Henry Mills wells, McCalmont's, McKinney's, and Porter's, and they have made quite a respectable showing, but are declining in production. It is not likely that this district will add much to the permanent oil production.

Refined oil is in firmer demand than a week ago, but at unchanged quotations, 8½c.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
Feb. 23	\$0.99½	\$1.01½	\$0.98½	\$1.00½	3,074,000
25	1.00½	1.01	.99½	1.00½	6,020,000
26	.99½	1.00½	.99	.99½	5,332,000
27	.99½	1.01½	.99½	1.00½	8,205,000
28	1.00½	1.01½	1.00½	1.00½	5,929,000
29	1.01	1.02½	1.00½	1.02½	6,809,000
Total sales					35,369,000

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS.					
	Feb. 22.	Feb. 23.	Feb. 25.	Feb. 26.	Feb. 27.	Feb. 28.
Albion						
Alpha						
Alta		1½	1½	1½	1½	1½
Argenta						
Bechtel						
Belcher			.90	1	1	1¼
Belle Isle		.40	.40	.40	.35	.35
Best & Belcher		2½	2½	2½	2½	2½
Bodie		8½	8¼	9½	9½	10½
Bullion						
Bulwer						
California			.25	.25		
Chollar		2½	2½	2½	2½	2½
Con. Pacific		.45	.40	.45	.40	.45
Con. Virginia		.25	.30	.25	.25	.30
Crown Point		1	1½	1½	1½	1
Day		2¼	2½	2½	2¼	2¼
Elko Cons			4¼	3¾	3¾	3¾
Eureka Cons			4¼	3¾	3¾	3¾
Eschschuer						
Gould & Curry		1½	2	1½	1½	1½
Grand Prize			.15	.15	.15	.15
Hale & Norcross		2½	2½	2½	2½	2½
Independence						
Martin White		.75	.80	.75	.80	.80
Mexican		2½	2½	2½	2½	2½
Mono						
Mount Diablo		2½		2½	2½	2½
Navajo		2½	2¼	2¼	2½	2¼
Northern Belle						
North Belle Isle						
Ophir		1½	1½	1½	1½	1½
Overman						
Potosi		1¼	1½	1¼	1¼	1½
Savage		.70	.80	.85	.80	.70
Scorpion						
Sierra Nevada		3½	3½	3½	3½	3½
Silver King						
Tip Top						
Union Cons.		3	3½	3½	3½	3
Utah		1½	1½	2	2½	2
Wales Cons.						
Yellow Jacket		1½	2¼	2½	2½	2½

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, February 28.

The market the past week has ruled extremely dull and inactive, and prices are a shade lower. Calumet and Hecla declined from \$240@239½, on sales of about thirty shares. Franklin was steady at \$11½, although a small lot sold at \$11½. The Quincy declined from \$45¼@45 without any apparent reason. Atlantic and Osceola were neglected. Pewabic advanced from \$1¼@1½, and Huron was stronger at \$1¼@1½. The market for ingot copper is firm, and Lake cannot be bought much if any thing under 15c. An advance of ¼@½c. a pound would give an impetus to the stock market which would be refreshing in these dull times. The low-priced mines are almost entirely neglected, and are selling, when there is any market for them, at low

prices, which may some day show a handsome profit. In silver stocks, Catalpa is in little more active demand, with sales at 32½@35c. Harshaw, 50c. Napa Quicksilver, 35@40c.

At the Boston Mining Exchange, business continues light, and there is no evidence at present of improvement. Bowman Silver Company dull at 16@17c. Empire, 22@23. Dunkin, 24@25c. Sullivan, 25c. bid. American Electric Light Company has been quiet since the books closed for the dividend payable March 1st. Sales at \$4½@4¼, ex dividend. In regard to the Empire mine, the Tombstone Epitaph of February 12th says the mine is running smoothly and hoisting a considerable quantity of ore, some of which is very high grade. Considerable ore is taken from the 200 level. The drift on the 300 level is driven alongside of an ore-vein, stripping it and leaving the ore standing. They are working to develop at present more than to produce. The ore below water-level is increasing in value as depth is gained. The bottom of winze No. 1, which is 30 feet north from the shaft, is nearly all in a fine hard carbonate ore, which, after being exposed to the atmosphere for some time, disintegrates and appears more like a gray sand carbonate. Winze No. 2 is 170 feet north of winze No. 1, and is going down from the 450 level. Nearly half the bottom of this winze is now in ore of the same character as that found in winze No. 1.

3 P.M.—At the afternoon Board, there was nothing doing, and prices practically unchanged.

BULLION MARKET.

NEW YORK, Friday Evening, Feb. 29.

DATE	London.	N. Y.	DATE	London.	N. Y.
	Pence.	Cents.		Pence.	Cents.
Feb. 23	51¾	*	Feb. 27	51¼	112½
25	51 5-16	112½	28	51 3-16	112½
26	51¼	112½	29	51½	†

* 112½@112½. † 112½@112½.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 3½ per cent. During the week, the bank gained £246,000 bullion, and the proportion of its reserve to its liabilities was raised from 40 13-16 to 40½ per cent, against 43 per cent at this date last year. The weekly statement of the Bank of France shows an increase of 2,650,000 francs gold, and a decrease of 50,000 francs silver.

Gain in Gold and Silver.—The Director of the Mint has prepared the following statement, showing the gain in gold coin and bullion in the United States from July 1st, 1883, to January 1st, 1884: Gold coin, \$15,542,830; gold bullion, \$10,152,275; silver coin, \$14,192,965; silver bullion, \$52,157; total, \$39,940,217. Total gain in gold coin and gold bullion, \$25,695,095.

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of January.	Year from Jan. 1st, 1884.
		\$	\$
*Alice, G. S.	Mont.	98,736	
*Belmont	Mont.	8,081	
*Bonanza King, S.	Cal.	56,278	
*Boston & Montana, G.	Mont.	60,305	
*Consolidated, S. L.	Colo.	4,721	
*Consolidated Bobtail, G.	Colo.	8,163	
*Contention, S. G.	Ariz.	80,439	
*Deadwood-Terra, G.	Dak.	49,196	
*Derbec Blue Gravel, G. S.	Colo.	13,623	
*Father de Smet, G.	Dak.	25,095	
Grand Prize, S.	Nev.	25,000	
*Homestake, G.	Dak.	104,231	
Horn-Silver, S. L.	Utah.	174,000	
*Iron Silver, S. L.	Colo.	58,995	
*Kentuck, G. S.	Nev.	3,810	
*Lexington, G. S.	Mont.	110,446	
*Little Pittsburg, S.	Colo.	8,588	
*Mount Diablo, S.	Nev.	24,820	
*Navajo, G. S.	Nev.	28,840	
*Ontario, S. L.	Utah.	163,576	
*Oxford, G.	N. S.	3,660	
*Plymouth Consolidated, G.	Cal.	102,438	
*South Yuba, G.	Cal.	2,040	
*Syndicate, G. S.	Cal.	15,235	
*Tombstone, S. L.	Ariz.	73,046	

Total amount of shipments to date...\$1,301,388

* Official. † Assay value. G. Gold; S. Silver; L. Lead.

METALS.

NEW YORK, Friday Evening, Feb. 29.

Copper.—The situation remains practically unchanged. Both supply and demand are on a moderate scale, and business moves along in confined channels at a slow rate, with Lake selling at 14½@15c., and other brands from 14@14½c. Our future is dependent largely upon the course of events abroad. The news from there is not very encouraging, Chili Bars cabling £55 10s., and Best Selected £62 10s. It is difficult to tell at a distance what influences are at work in London. So much, however, seems apparent, that the depression there is to some extent artificial. Those who are forcing low values there have actually used the fact that large amounts of copper are now sent to England from here to scare the trade, and it may take some time before it is thoroughly understood in England that our export this year is destined rather to be a little lighter than heavier than in 1883. Best Selected at £62 in London means only 13½c. delivered there, and £60 for Tough Cake 12½c. Any important selling movement of American bar abroad would probably be preceded by a period of forcing copper on the market here, and of that there are not as yet any indications. Our friends in England need not therefore be frightened at the bugbear of American production for the present. The all-important point is now to watch what effect low prices are having on the Chilians. It is a question whether they can in the long run stand the strain of Bars at £55@£56 without curtailing their make.

The English Board of Trade returns for the month are as follows:

	Jan. 1 to 31.		
	1884.	1883.	1882.
Imports:	Tons.	Tons.	Tons.
Pure in pyrites.....	1,197	1,670	1,402
precipitate.....	1,334	2,163	1,978
ore.....	1,241	676	946
regulus.....	561	530	449
Bars, cakes, etc.....	2,800	1,933	1,873
	7,133	7,242	6,378
Exports:			
Raw (English).....	1,682	1,448	828
Sheets.....	1,873	1,474	1,206
Yellow metal at 60 per cent.....	901	714	796
Brass at 70 per cent.....	315	345	285
	4,771	3,931	3,115
Foreign.....	780	793	833
	5,551	4,724	4,048

Tin.—The market has been quiet and weaker, a flurry having been created by a failure in Philadelphia. London cables £82 5s., while here, Straits spot is worth 17½c.

Lead.—In the early part of the week, a few hundred tons of lead were bought by the largest Western holder at 4-05c., who is now bidding 4c. The market has been dull during the past few days, the available supply being firmly held, while consumers are not yet urgent. We quote 4c. for Common and Refined.

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

The trade of the past week has been very much like that of its predecessors, being remarkable only for its dullness. Buyers are as scarce as hens' teeth. Sales for the week sum up to 70 tons of Refined lead at 3-70c. The only buyers in the market are speculators. Receipts during the week foot up to 350 tons.

From Chicago, Messrs. Everett & Post wire us to-day:

Business has been quiet and of a limited character, with quotations at 3-75c. and 3-80c. There is a somewhat better feeling, due to growing inquiry from corrodors. Offerings are only moderate, the stocks being concentrated in the hands of one party principally.

Spelter.—This week brings the first symptoms of improvement in this metal, which has for so many months languished in spite of its sound position. There is a firmer feeling, and it would be difficult to get ordinary Domestic spelter at less than 4½@4-40c., sales having taken place at the former figure. England cables £14 10s.

Antimony.—There has been no change.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Feb. 29.

According to the English Board of Trade returns, the following quantities of iron and steel were exported from Great Britain to this country in January:

	1882.	1883.	1884.
Pig-iron.....	31,460	21,226	10,670
Old iron for remanufacture	9,215	5,345	2,102
Steel unwrought.....	15,430	2,357	1,267
Tin plates.....	19,959	16,371	15,796
Hoops and sheets.....	3,733	1,315	614
Bar, angle, bolt, and rod...	2,639	1,316	457
Railroad iron.....	27,523	6,606	1,845

American Pig.—The market is very quiet, though, so far as standard brands are concerned, it is firm. Buyers call only for small lots, to which business is restricted. Outside brands show a slight tendency to weakness, and mill irons are not particularly strong. On the whole, however, the feeling still remains one of confidence. We quote No. 1 Foundry at \$20.55@21; No. 2, \$19@19.50; and Gray Forge at \$17.50@18.50. There has been some business in domestic Bessemer pig at \$18.50 at furnace. Foreign remains quiet at \$19.50@20, and 20 per cent Spiegel is selling at \$28.50@29 ex ship. Ferro-manganese, 45 per cent, is worth \$45.

At the Metal Stock Exchange, the following transactions were recorded: Monday, February 24th, 100 tons American No. 1 pig-iron, spot, at \$19; 100 tons American No. 1 pig-iron, March, at \$19; 100 tons American No. 1 pig-iron, September, at \$19.75; and 200 tons American No. 1 pig-iron, April, at \$19.25.

Scotch Pig.—The market is very quiet, there being no transactions on a large scale. No iron has arrived during the week.

We quote ex ship and to arrive: Coltness, \$22.50 @23; Langloan, \$22.25@22.50; Summerlee, \$21.50; Dalmellington, \$20.75; Gartsherrie, \$22@22.50; Eglinton, \$20.25; and Glengarnock, \$22@22.25.

At the Metal Exchange, the following cable quotations have been received: Coltness, 57s.; Langloan, 54s.; Summerlee, 52s.; Gartsherrie, 51s. 9d.; Glengarnock, at Ardrossan, 51s. 9d.; Dalmellington, 49s.; and Eglinton, 45s. 9d. Warrants are quoted 42s. 3d.

Steel Rails.—There has been no business worthy of special mention. We quote \$34@35 at mill, according to quantity, section, etc.

Old Material.—We quote, nominally, \$21.50@22.

Pittsburg.

February 27.

[From our Special Correspondent.]

The demand for crude iron has been more active during the past week than for several weeks before, and although no quotable change be noted in prices, there has been a slight improvement in some makes. Mill irons have been in most active demand, in from 100 to 500-ton lots, and have ranged from \$17@18 for most makes. Foundry has sold mostly in 50 and 100-ton lots, at prices ranging from \$18.50 @19. Charcoal foundry has sold at \$25.50. Inquiry is more active, and the outlook for a better business in the near future is quite bright. Muck Bar sells very slowly at about \$32. Prices for manufactured iron are about as they were, but are more firmly held, and demand is of larger proportions. All the mills have resumed, and will probably be well employed for some time to come. Nails are still quoted at \$2.50@2.60, but demand is improving, and the spring trade will probably begin to come along in a few weeks. Old rails are quoted at \$23 @24; no sales reported. Merchant steel is improving a little, and the prospects for spring trade are fair. Steel rails are quoted at \$35 for near-by delivery, but sales have been made at slightly less. Oliver Brothers & Phillips have purchased the interest of Graeff, Bennett & Co. in the Isabella furnaces, at Etna, for \$290,000. These furnaces have a capacity of 150,000 tons of foundry and mill iron. Graeff, Bennett & Co. owned one fourth interest on these furnaces, and by this purchase, Oliver Brothers & Phillips have secured a half-interest. The latter firm is making extensive improvements in its South Fifteenth street mill. The puddling department is shut down and will remain so for about ten days. Three-high muck rolls are to be put in, and a pair of new rolls for steel. They are preparing to manufacture their own steel, which they have heretofore purchased in Europe.

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 23-29), SALES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 23-29), SALES.

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 36,633. Non-dividend shares sold, 42,740.

BOSTON MINING STOCKS.

PHILADELPHIA MINING STOCKS.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 22-28), SALES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Feb. 22-28), SALES.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Feb. 29.

Anthracite.

The market has been very quiet during the week, and in some cases the companies have been forced to stock some of their stove and chestnut coal. Of course, should the present cold snap continue for any length of time, there would be a temporary rush for coal. The cold weather has made it impossible for the Pennsylvania Coal Company to go to Newburg as expected. There has been some discussion as to opening prices, and there is a prospect that the season will be started with low figures. We quote Stove coal \$4.15@4.20 f. o. b.

Mr. Charles F. Diggs has been appointed sales agent of the Philadelphia Coal & Reading Coal and Iron Company at Baltimore, to succeed Messrs. Albright & Co. His office is in the Marine Bank Building, 25 South Gay street, Room 2.

Bituminous.

Rumors of the closing of large contracts are numerous, and low figures are generally named, in spite of the alleged agreement between the Pennsylvania and Baltimore & Ohio railroads. The latter has at last, it seems, awakened to the situation, and Cumberland companies have secured a goodly share of the business. As they do not stop now to solicit orders at very low prices, it is reasonable to assume that they feel secure in a good backing. There seems no doubt that contracts have been made with consumers in a very quiet way on the basis of \$2.25 at Baltimore, and it is stated that \$3.25 here has been named by a Cumberland company to a steamship line. The struggle for the steamer business is now beginning. We quote here \$3.60@3.90 for Clearfield coal.

Pittsburg. February 28.

[From our Special Correspondent.]

Trade here shows, outside of the river branch, little change for the better, and most operators seem distrustful of the future. The situation may be outlined as follows:

In railroad trade, I find an apathy that has not prevailed for years. This is the time of the year when operators supplying gas and steam coal to the West and Northwest via the lakes should be figuring on lake contracts. But nothing of that kind appears to be going on, and for the simple reason that operators are in a quandary. They insist that they can not and will not pay present prices for mining (3½ cents) after April 1st, the date when the arbitration rates expire. The miners in their last convention as squarely insisted on adherence to the existing rate for the spring and summer. With this wide difference of opinion, it is impossible for operators on the Pan-Handle, Baltimore & Ohio, and Alleghany Valley to find a basis for bidding on lake contracts. There is, besides, an apparent apathy on the part of consumers in the West and Northwest. They want less coal than usual and they don't seem to want that very badly. As to gas-coal, the tendency seems toward restricted demand. Whether this arises from the gradual encroachments of electric lighting, or a greater display of economy on the part of the consumers of gas, is not clear; but if men who sell gas-coal are to be believed, there will be a lighter demand for their product next season than has been the case for a number of years. Another feature of this trade is found in a falling off of the demand from railroads. This applies more particularly to roads leading west from this point. The falling off is placed at 25 per cent, as compared with this time last year. If this is a faithful barometer of the condition of traffic on these roads, it does not speak well for their business. Prices remain purely nominal, with coal on the wall here purchasable at from 5½ to 6 cents, with more transactions below than at the last-named price. Mill demand is improving and is up to the average for this season of the year. The rivers being in better shape, a great deal of river coal is finding its way to the mills, tending to keep railroad prices at a low ebb.

River matters show considerable life as to mining. All the pools are at work except the third, where a strike against the reduction of ¼c. is still in progress. The total number of miners at work will approxi-

mate 5000, and coal craft are rapidly filling, to leave for lower ports on the first good stage of water. At New Orleans, there are reported sales of Pittsburg coal at 28c. per barrel. This coal can hardly cost less than 32c. to the shipper. At Louisville, the price of Pittsburg coal is 7½c. per bushel afloat, by the barge. Kanawha coal has crowded that of Pittsburg, at Cincinnati, making a surplus for the New Orleans trade. Alabama coal is also gaining a good foothold in the Crescent City market, so that the river operator of this city is about as prone to growl as his fellow operator of the rail.

Coke shows the same changeless front. Demand about 700 cars daily; prices stick at \$1.10@1.25 per ton, and prospects for a bettering of these values is apparently as remote as ever.

Buffalo. February 29.

[From our Special Correspondent.]

Since our last letter, trade in coal has run its usual course, unmarked with incidents worth recording. The weather has been very unsettled, alternating from cold to fair and warm.

Forwarders are making inquiries relative to the opening rates for coal freights to Western points by lake. A contract has been made to bring 400,000 bushels wheat from Duluth at first opening at four cents per bushel, and the vessels chartered will doubtless take up coal; but I can not ascertain the figures, but hope to do so next week.

Coke is unchanged; business good.

Have you seen the report of which the following is a synopsis? The anthracite coal trade of the Philadelphia & Reading Company is expected to reach a very large tonnage in the spring, and to prepare for it 1500 cars are in process of construction at the shops. Each car will have 15 tons capacity. Thirty new locomotives are also talked of for the same service. The aggregate of ten million tons production is prophesied for 1887.

The receipts of coal here by the Lake Shore & Michigan Southern Railroad for the week ended last Saturday were 660 tons; 432 tons for Buffalo, and 228 tons for through shipment.

Col. Peter C. Doyle, well known to many of your readers, has been promoted. On the 1st of March, he becomes the general Northern freight and passenger agent of the Lehigh Valley Railroad—an admirable appointment and a well-deserved recognition of valuable services heretofore rendered to the company. Mr. J. H. Horton will succeed Colonel Doyle as general Northern sales agent of the coal of the company.

Last week, I wrote that the "investigation relative to the stranding of the steam barge Frederick Mercur was to the effect that no blame could be laid upon the captain or officers in charge." I should have said "the captain," and stopped there. Then have added that the first mate had had his license revoked, and the second mate's license was suspended for six months for gross neglect of duty as pilot for not reporting soundings to the captain while attempting to enter the harbor of Erie, Pa.

The Lehigh Valley Railroad will place on its line very soon fifty (50) of the Van Wormer side-dumping coal cars. These cars are similar in appearance to the ordinary gondola; but the sides, instead of being stationary, are made to swing on hinges in such a manner that they are automatically emptied by the pressure of a lever on the truck-beam. The operation is simply and rapidly performed.

The Rochester Democrat publishes the following as an explanation of a paragraph that I sent you relative to the consolidation of the Buffalo & Pittsburg and Brandy Camp railroad companies: "Brandy Camp is a small town situated in the Pennsylvania coal and lumber district, about 40 miles from the Rochester & Pittsburg, on Clarion Creek. The idea of building a narrow-gauge line from that town to connect with the Rochester & Pittsburg has been broached several times, and it is probable that this road is the one referred to." The road will doubtless be devoted to the coal and lumber trade if built.

With reference to the secret meeting I spoke of last week as having been held here, the bituminous coal men profess to know nothing of its objects. Perhaps a Cleveland soft-coal pool was to be formed to buck against the Buffalo project! The mystery remains to be solved.

Chicago. February 27.

[From our Special Correspondent.]

There has been no change in the general situation of the market for anthracite since my last week's letter. Trade continues light and prices unsatisfactory, though no lower than for weeks past. Indeed, it is acknowledged on all hands that values have reached bottom, and that nothing could bring about lower prices except a break in freight rates, which is practically not to be considered as an element in the situation. There is no money for our shippers in coal at present selling prices, and while they may have beaten themselves out of a fair profit for the season's business, they are not likely to go farther and sell their coal at an absolute loss. It is most aggravating for the coal shippers and wholesale dealers to look back over the past season, which, in all the elements that naturally go to make a prosperous and satisfactory coal trade, has been most amply endowed, and reflect on what might have been. The movement of anthracite has been larger than ever before, the Northwest has experienced an unusually long and severe winter season, and yet the coal men have made little or no money.

The trouble began early in the season, when the market was allowed to go to pieces, not because there was any real valid reason why it should, but because those who were in a position practically to control the situation apparently lost their heads and allowed every claim as to the prospects of a mild winter, enormous receipts, etc., etc., to have an influence in determining the course of prices. The country trade has steadily and persistently maintained the policy of buying only for immediate requirements; and if the price should go down to \$5 a ton, it would doubtless pursue the same course.

At the present time, the country retail yards throughout the West and Northwest are nearly bare of coal, and for this reason trade for March and April will be better this year than last, or better than it usually is for those months, when dealers of all classes are working off their stocks. I have looked carefully into the question of the stocks of anthracite on hand, with the view of getting approximately at the amount of coal likely to be carried over in Chicago May 1st. I have done this mainly to correct the impression erroneously conveyed by a letter written to the ENGINEERING AND MINING JOURNAL last month. I find that the stocks of anthracite at the present time are lower than usual at this time of the year, and, with the prospect of a better trade in March and April than usually falls to the lot of those months, the conclusion is reached that our docks and wholesale yards will be more nearly exhausted May 1st than for several years past at the corresponding period. Rail receipts of late have been light, and they will not, in all probability, increase during the rest of the season.

Prices remain unchanged, as stated above.

The market for bituminous descriptions continues dull and flat, with prices tending toward weakness, though nominally unchanged. The miners in the Indiana Block and Hocking Valley districts are expected to go out on a strike March 1st, owing to a reduction of 25 cents a ton in the price of mining, announced to take place on that date by the operators. Operations in the Indiana Block region have been very light for several days past, the men spending a large portion of their time in holding meetings and agitating the subject of a general strike. As a consequence, receipts from that district have been light and shippers are already getting behind in their orders. There is nothing new to note in other grades. Prices remain nominally at last week's quotations. Coke is in light demand, ample supply, and prices are unchanged.

Boston. February 28.

[From our Special Correspondent.]

The great dullness in the anthracite branch of the coal market, amounting almost to stagnation, continues as heretofore noted. Receipts of anthracite are coming along at the picayune rate of from 6000 to 10,000 tons a week. This is the piecing-out business usual at this period, but on a somewhat smaller scale than usual. The main trouble lies in the fact that the weather has called for less than the average winter consumption, and retailers are in no need of purchasing. Prices, while unchanged, are not much

more than nominal. The opinion is general that, whatever the March circulars may be, anthracite coal will be easier.

It is hard to predict the future of steam sizes. The fact that the Reading Company lost the Pacific Mills' 20,000-ton contract is used by the bituminous dealers for all it is worth, and is likely to give decided impetus to the growing tendency of several years in the East—not merely of the past few months, as some suppose—to use bituminous coal. We understand that the Reading Company made no bid whatever on the Pacific contract. The company which did take it claims to have done rather better than the reported prices of earlier contracts would indicate.

However this may be, there is a firmer feeling in bituminous coal. Dealers report withdrawing low offers, which were out in many directions previous to the reported combination. A short time will show whether this branch of the business is to be carried on this year on war or business principles. It is believed generally that the lowest prices of the season, say about \$4 delivered, have been made. There is chance for a fair advance on this figure and still keep out of reach of anthracite competition.

Freights are actively discussed. At the present price of bituminous contracts, the skippers will find that every cent advance of freight will come hard. Still if there should be a general business improvement, or if the Southern lumber and other freights should pay unusually well this year, the coal shippers would find themselves in an uncomfortable fix. Luck was on their side last year. Will the vessel owners have it this year? Rates have not changed materially since last week. We quote:

New York, \$1.10@1.25 per ton; Philadelphia, \$1.30@1.35; Baltimore, \$1.40; Georgetown, nominal, \$1.75; Newport News, \$1.25; Richmond, \$1.35; Bay of Fundy, \$1.60@1.65; Cape Breton, \$2.25.

Retail trade is quiet for this season, and unless the month of March braces up, the winter's trade will prove a light one. The market is a trifle easier. We quote:

Table listing retail prices for various types of coal and stove fuel, such as White ash, Red ash, Lorberry, Franklin, and Lehigh.

STATISTICS OF COAL PRODUCTION.

Comparative statement of the production of anthracite coal for the week ended February 23rd, and year from January 1st:

Table showing coal production statistics for 1884 and 1883, broken down by region (Wyoming, Lehigh, Schuylkill, Sullivan) and total production.

* Included in tonnage of the Philadelphia & Reading Railroad.

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.

Table comparing total coal production for the same time in 1879, 1880, 1881, and 1882.

The decrease in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 19,945 tons, as compared with the corresponding period in 1883.

Belvidere-Delaware Railroad Report for the week ended February 23d:

Table showing coal shipment and distribution statistics for the Belvidere-Delaware Railroad, comparing weekly, 1884, and 1883 figures.

The Production of Bituminous Coal for the week ended February 23d was as follows:

Table detailing the production of bituminous coal in tons of 2000 pounds for various regions in Pennsylvania, including Cumberland, Barclay, Broad Top, Clearfield, Alleghany, Pittsburg, West Penn, Southwest Penn, Pennsylvania RR, Westmoreland, and Monongahela.

The Transportation of Coke over the Pennsylvania Railroad for the week ended February 23d, and year from January 1st:

Table showing the transportation of coke in tons of 2000 pounds over the Pennsylvania Railroad, broken down by region and total.

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ANDRE, GEORGE G. A Practical Treatise on Coal Mining. 2 vols. royal 8vo, cloth. Lond. 1878. \$28.

ATKINSON, J. J. A Practical Treatise on the Gases met with in Coal Mines. 16mo, boards. N. Y. 1875. 50 cents.

ATKINSON, J. J. Friction of Air in Mines. 12mo, boards. N. Y. 1879. 50 cents.

ATKINSON, J. J. A Practical Treatise on Mining Machinery. 2 vols. 4to, cloth. Lond. 1878. \$28.

BAGOT, A. Accidents in Mines, the Cause and Prevention. 12mo, cloth. Lond. 1878. \$3.

BAILES, W. The Student's Guide to the Principles of Coal and Metal Mining. Vol. I. (only). 8vo, half morocco. Lond. 1870. \$8.

BELL, I. LOWTHIAN, F.R.S. Notes of a Visit to Coal and Iron Mines and Iron-Works in the United States. 8vo, paper. Lond. 1875. \$1.

BOYD, R. N. Coal Mines Inspection, its History and Results. 8vo, cloth. Lond. 1879. \$6.40.

COAL. Its History and Uses. Edited by Professor Thorp. 8vo, cloth. Lond. 1878. \$3.50.

COLLINS, J. H., F.G.S. Principles of Coal Mining. With 139 illustrations. 12mo. Lond. 1876. 50 cents.

DADDOW, S. H., and BANNAN, BENJAMIN. Coal, Iron and Oil; or, the Practical Miner. A Plain and Popular Work on our Mines and Mineral Resources, and a Text-Book or Guide to their Economical Development. With Maps and Engravings. 8vo, cloth. Pottsville, 1867. \$7.50.

FAIRLEY, W. The Theory and Practice of Ventilating Coal Mines. 12mo, cloth. Lond. \$1.20.

GALLOWAY, ROBERT L. History of Coal Mining in Great Britain. 12mo, cloth. Lond. 1882. \$2.

MAPS.

ARIZONA AND NEW MEXICO.—This map shows all the Township Surveys, Private Land Claims, Post-Offices, and Settlements. It also exhibits the Explorations of other Government and Private Expeditions, including the facts developed by the Surveys for the Routes of Projected Railroads, etc., 1881. Scale, one inch to thirty-three miles. Colored, 24x17 inches. Pocket form, \$1.

COLORADO.—Topographical and Township Map of Part of the State, exhibiting the San Juan, Gunnison, and California Mining Regions. By Louis Nell. Substantially same as above. Post-offices, March 1st 1880. Scale, 1 inch : 9 miles, 1-570,240. Plain sheets for wall, 90 cents.

COLORADO.—Cannon's Map of the Mineral Belt of Colorado. Taken from the Records of the Surveyor-General's Office, and other reliable Official Sources. Showing, in colors, the Mineral Belt, Gold Districts, Silver Districts, Coal Districts, County Lines, and Boundaries of Land Districts. There are also given the Capital, County Seats, Township Lines, Railroads, and Projected Railroads. Scale, 1 inch : 10 miles. Size, 26x30 inches. Pocket form, \$1.50; as a wall-map, \$2.

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DEALERS IN

All Kinds of Metals.

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**THE OLD RELIABLE
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IT IS MADE OF HEAVY TIN AND IS HIGHLY POLISHED.

It is air-tight around the lid, and this feature saves its cost to the Miner in the
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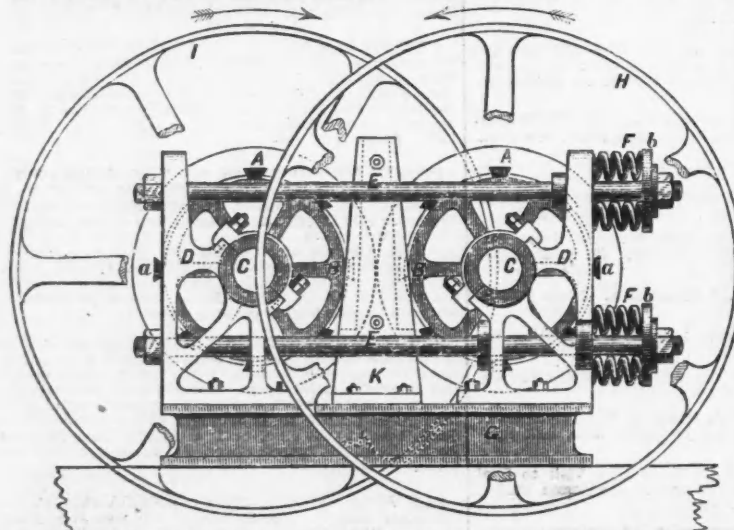
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BUCHANAN'S HIGH-SPEED CRUSHING ROLLS.



by reducing the friction, and require no oil or attention. They make no noise or vibration, and can be run at high speed, if necessary, without fear of breakage; they are more reliable and positive; for in case of any very hard material getting between the rolls, the pulleys acting as fly-wheels carry it through, while gears would be very likely to be broken. The machine is also more compact, and is self-contained.

We build four different sizes, from 18 inches in diameter up to 36 inches. Send for Circular.

**BUCHANAN & JENNINGS, MINING AND MILLING MACHINERY,
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This machine was designed with the view of reducing the weight and number of wearing parts, and at the same time increase the strength, durability, and efficiency of the machine. The cut represents the machine as built for all ordinary purposes. The crushing shells or tiers are made either of chilled iron or steel as desired, and can be replaced when worn at a very trifling expense. These shafts *C* are of *hammered steel*, running in hard anti-friction boxes of unusual length. The standards *D* are held in position by grooves planed in frame, and are connected by four strong tension-rods running through them and receiving the entire tensile strain due to crushing. One end of the tension-rods is provided with a nest of steel springs *F* resting against the back of the standard, and held in position by the washers *b*; the standards having the springs attached are not firmly bolted to the frame *G*, and are at liberty to slide back under abnormal strains. The steel springs are stiff enough to do the regular and legitimate work of crushing; but in case of the accidental intrusion of drill-heads, or any foreign substance too hard to crush, the springs will yield and allow them to pass through without breakage or injury to the rolls.

The resistance of the springs can be increased or reduced by means of the adjusting nuts on the tension-rods. The rolls are adjusted by means of nuts on opposite standards—which are stationary—being held by bolts to frame. It will be noticed that the gearing usually employed is in this design omitted, and heavy wheels acting as fly-wheels and pulleys are substituted. There are many advantages in this arrangement of driving. It is more simple and the pulleys can never wear out, and are not liable to break as in the case with gears. They save power