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MESSRS. J. G. MURPHY and A. J. RIGBY have established themselves in the City of Mexico as consulting engineers and as the representatives of the Union Foundry, New York.

THE preliminary work in connection with the International Electrical Exhibition, to be held at Philadelphia under the auspices of the Franklin Institute, is progressing very favorably. The contract has been awarded for the erection of a building on a site granted by the Pennsylvania Company, embracing two acres of ground between Thirty-second and Thirty-third streets and Lancaster avenue and Foster street. The buildings, which were designed by the well-known firm of WILSON BROTHERS & CO., of Philadelphia, will include a main building 283 feet long and 160 feet wide, with a sixty-foot tower at each corner and a large

triangular building joined to the main hall. The buildings are to be completed by the 15th of June, exhibits being received from the 11th to the 30th of August, so that the opening ceremonies can be held on the 2d of September, the exhibition to remain open until the 11th of October. The past successes of the Institute and the earnest, well-directed efforts now making by its officers, are guarantees that the plan will be well carried out, and Americans may therefore look forward to a display which will rival, if not outdo, similar exhibitions held during the past few years in Europe.

THE English newspapers print the reports of two copper enterprises in widely different parts of the world, the one being the Quebrada Railroad, Land, and Copper Company, of Venezuela, and the other the English & Australian Copper Company of South Australia, owners of the Burra Burra mines. Although the former exported 31,500 tons of ore, and smelted 24,600 tons, sending out 4500 tons of matte, equivalent in all to a production of metallic copper of fully 7,800,000 pounds of copper, the directors are not happy. The figures given coming from an interim report, and about one third of the product being still unsold, no statement of the accounts is submitted, and it is evident that, in spite of a heavily increased production, the profit is much smaller. The Quebrada management, it may be of interest to mention, has engaged the services of a chemist who has had experience at Rio Tinto, in order to test on a working scale the extent to which copper can be profitably extracted on the spot by one or the other wet method.

The Australian company has also suffered severely from a decline of values, making a profit of only £1435 on sales of copper aggregating £115,000. The company has two smelting-works, the Port Adelaide and the New Castle; but the supply of ore, regulus, and precipitate, during the year ended June 30th, 1883, was only 7683 tons, against 10,715 tons during the previous year, which was due partly to drought, that bugbear of all Australian mining operations. The combined output of the two smelting-works was 3,452,000 pounds of copper, against 3,830,000 during the preceding year.

The reports of a number of Cornish mining companies must be very discouraging to their shareholders, and it seems likely that before many years have elapsed they will have to succumb to more vigorous rivals in other countries.

THE questions raised in Mr. HARRIS's paper on the relief fund for the workmen of the Lehigh Coal and Navigation Company, brought forward and discussed at the Cincinnati meeting of the American Institute of Mining Engineers, gain additional interest by a presentation of the insurance schemes which Prince BISMARCK is trying to push through the German parliament. Two plans had been previously proposed; but were so obviously defective as to be withdrawn. They have been supplanted by a third which is just now coming up for discussion. The accident insurance of the German empire is to benefit the workmen, all factories, mines, salines, and metallurgical works of the country, and those officers whose annual income does not exceed 2000 marks. The relief paid to the injured or to those dependent upon workmen killed is the following: The cost of medical attendance beginning after 14 weeks' sickness due to the accident, the payment of 66 $\frac{2}{3}$ per cent of the average yearly earnings if entirely incapacitated for work, and as a maximum 50 per cent when partially disabled, any excess over 4 marks daily wages earned when at work being counted in to the extent of only one third of such excess. In case of fatal accidents, the payments provided are: The cost of burial, estimated at twenty times the average daily earnings; an annuity of 20 per cent to the widow, of 10 per cent to every child until it has reached its fifteenth year, and of 15 per cent to orphans, the total not to exceed 50 per cent of the average daily earnings of the deceased. Injured workmen have no claims for compensation if the accident was due to their own negligence. The payments to widows and children are not affected by any complicity in the accident on the part of the deceased.

The funds are to be raised by associations embracing all the employers belonging to the given branch of industry in the empire. Thus, all the rolling-mills in Germany or all the collieries form an association, which may be divided into sections, if necessary, and they are to bear alone all the cost of fatal and a part of the cost of non-fatal accidents in the country. The workmen do not in any way contribute to the fund. German manufacturers naturally make objection to such a law, which is particularly onerous in those cases where the cost of labor is a heavy item in the expenditures and the occupation of the workmen is hazardous. Their main point is, however, that non-participation in the burden of providing for relief to those injured by accident, or those dependent upon workmen killed, relieves the workmen of a share in risks which it is their duty to assume. It creates and fosters an idea, only too prevalent among men, that they have no responsibilities, no duties to themselves, to their fellow-workmen, or to their employers. There are in every gang of men reckless or ignorant individuals who do not hesitate not only to expose themselves,

but their mates, and the property of their employers, to danger, out of pure laziness, willfulness, or ignorance; men who resent a warning, from whatever source it may come, by promptly acting in opposition to it; men whom the very enforcement of discipline provokes into disobedience. Nothing therefore could, in our opinion, be more ill-advised than to give encouragement to the idea that after all it is the employer's business to prevent accidents, and to put his hands into his pocket when they do occur. These provisions become more obnoxious and dangerously misleading when coupled with another relating to workmen's committees, chosen from the local relief associations, and excluding the representatives of the employers. Members of the workingmen's committee are entitled to seats in an arbitration board pre-aided over by a government official, this board being the last resort of appeal in case of differences of opinion. They are given as much power as the employers in the settlement of their disputes, in the examination of the causes of accidents, in the drawing up of regulations for the prevention of casualties. The employers have no right to attempt to exclude themselves from the operations of the act by making agreements with their employes. The entire liability rests with them, while they must submit to equality so far as the settlement of many important points is concerned.

It seems strange that such an unjust act should be forced upon the industries of a country in which, more than any other, relief funds have flourished in some instances for centuries. In them, the plan has been invariably followed, which is now in course of adoption here, of equal participation in raising the funds, both by employer and employes. The action of Prince BISMARCK can only be explained by the fact that he is trying to conciliate the working classes, is working hard to counteract the pernicious influence of socialistic agitators, and, last but not least, is making effort to capture votes for the support of whatever policy expediency may dictate in the near future.

Thus far, the attempts of European governments to cope with the questions involved in providing relief for accidents to workmen have not been encouragingly successful. The English Employers' Liability Act, much better and much more justly framed, has not come up to expectations. The German Mutual Accident Insurance scheme, if passed, will be a miserable failure, because it is unjust on the face of it.

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.]

On the Use of Pyrites for the Manufacture of Sulphuric Acid.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The question of substituting pyrites for brimstone in the manufacture of sulphuric acid is one that has occupied a good deal of attention during the last two or three years. But so much exaggeration and misrepresentation have been indulged in by interested parties that manufacturers investigating the matter have great difficulty in distinguishing solid facts from exaggerated statements. I purpose in this article to take up and discuss a few disputed points; and having had several years' experience in the use of pyrites at the best English and American works, and being thoroughly familiar with all details of construction, manufacturing, and cost, I trust that what I say may be of some assistance to those who are endeavoring to decide for themselves the important question, Shall we or shall we not adopt pyrites?

Cost of Plant for Burning Pyrites.—A grate-burner capable of burning 800 pounds lump pyrites per twenty-four hours in summer, and 900 pounds in winter, can be put up in very good style for \$225. A block of twenty, with niter furnace attached, will cost about \$5000. They can be put up for less than this; but it is preferable to build them in a substantial manner at the first, and they will then run for many years without costing a dollar for repairs.

The shelf-burners with niter furnace attached, capable of doing the same amount of work as the above 20 grate-burners, will cost \$7000.

Relative Merits of Grate and Shelf-Burners.—A good deal has been said as to the relative merits of grate and shelf-burners, some contending that the latter are the more economical to run, and prophesying that the day is not far distant when grate-burners will be abolished and all lump ore be pulverized and burnt in shelf-burners. Were "small" to cost as much as lump ore, I should not hesitate always to recommend the erection of grate in preference to shelf-burners; but where "small" ore can be bought at a considerably less price than lump ore, as is usually the case, and where slight contamination of the Glover tower acid by particles of iron carried over by the draught from the shelf-burners is of no importance, the latter can be worked to advantage, as will be seen from the following comparative statement:

	Daily cost.	Cost per ton.
6.83 tons lump ore broken to size and screened at say \$7.50*	\$51.22	\$7.50
Charging and working burners and potting niter—1 man on each shift at \$1.75	3.50	.51
Wheeling pyrites to burners and removing cinders—1 man on day shift only	1.75	.23
	\$56.47	\$8.24

* This is an outside figure.

COST OF WORKING 10 SHELF-BURNERS, EACH BURNING 1700 POUNDS "SMALLS" ORE PER DAY.

	Daily cost.	Cost per ton.
7.59 tons smalls ore at say \$6.50*	\$49.33	\$6.50
Charging and working burners and potting niter—2 men on each shift at \$1.75	7.00	.93
Wheeling pyrites to burners—2 men 4 hours each = 8 hours at \$1.75	1.40	.19
Taking away cinders—one man 3 hours at \$1.75	.52	.07
	\$58.25	\$7.69
Cost per ton in grate-burners		\$8.24
Cost per ton in shelf-burners		7.69
Difference in favor of shelf-burners		.55

The grate-burner men would have time to pump acid to towers and take chamber drips, but the shelf-burner men would not.

One objection hitherto urged against shelf-burners has been, that a great deal of air rushes in during the raking of the charges, which dilutes the gas and diminishes the amount of work per unit of chamber space. By a recent device of the writer, this is entirely overcome, and the "small" burner gas is practically as rich in sulphurous anhydride as that from grate-burners.

Where ore is bought unbroken and is broken at the works, some method of dealing with the "small" is absolutely indispensable, even supposing no "small" ore is bought from the mines.

Glover Towers.—Many acid-makers who have had no experience with pyrites regard a Glover tower as a *sine qua non* in the burning of it; and as at some works using brimstone in this country, Glover towers have not been an entire success, they hold back from adopting pyrites. I would remind such manufacturers that pyrites were in successful use in Europe for many years before Glover towers were thought of, and that the largest user of pyrites in this country at the present time works without any. I recommend that a Glover tower be always built in connection with pyrites burners; but where it is preferred to work without one, perfectly satisfactory results can be obtained. In such case, I combine not more than 16 grate-burners in a set, put concentrating pans on top of the burners, use a steam column or platinum injector for denitrating, and allow 10 per cent more chamber space than where a Glover tower is provided.

A great saving in lead is supposed by some to be effected by building round towers, in preference to square ones. Let us figure out an example, and compare the amount of lead required in each case.

A tower 10 feet square and 30 feet high has a capacity of 3000 cubic feet, and requires for its construction sheet-lead as follows:

Sides	10 feet by 30 feet by 4 =	1200 square feet.
Top and bottom	10 feet by 10 feet by 2 =	200 " "
		1400 " "

3000 cubic feet ÷ 1400 square feet = 2.14 cubic feet per square foot of lead.

A tower of circular section 10 feet in diameter and 30 feet high has a cubical capacity of 2356 cubic feet, and requires for its construction sheet-lead as follows:

	Square feet.
Sides	10 feet by 3.1416 × 30 feet = 942
Top and bottom	10 feet by 10 feet by 2 = 157
	1099

2356 cubic feet ÷ 1099 square feet = 2.14 cubic feet per square foot of lead.

It will be seen that the amount of lead required per unit of capacity is the same in both cases.

A Glover tower large enough for 18 or 20 grate-burners standing on brick base 15 feet high, with cisterns, etc., complete, will cost, put up in first-rate style, \$3500.

Chamber Space.—The smallest chamber space I have known worked with pyrites was 16 cubic feet per pound of sulphur charged per twenty-four hours = say 17 cubic feet per pound of sulphur burnt per twenty-four hours. The niter consumption was rather high—about 4½ per cent on sulphur charged, or say 4½ per cent on sulphur burnt.

In another instance, excellent results were obtained with 18 cubic feet per pound of sulphur charged, or say 19.1 cubic feet per pound of sulphur burnt per twenty-four hours: consumption of niter, 3.25 per cent on sulphur charged, or 3.45 per cent on sulphur burnt. In the same works (when charging less pyrites), with 19 cubic feet on sulphur charged = say 20.2 cubic feet on sulphur burnt, the consumption of niter was 3.0 per cent on sulphur charged = 3.2 per cent on sulphur burnt. Glover towers were used in each case.

I am inclined to recommend that 20 cubic feet per pound of sulphur charged per twenty-four hours (= 21.3 cubic feet per pound of sulphur burnt) be allowed in winter and 25 cubic feet (= 26.6 cubic feet on sulphur burnt) in summer. With this allowance, and with properly proportioned niter recovery apparatus, the niter consumption can be kept steadily at 3 per cent on sulphur charged.

Niter Consumption.—This has been spoken of above. It depends to a very great extent on the amount of chamber space per pound of sulphur. It varies from 2 to 5 per cent on sulphur charged; with properly proportioned plant, it should not exceed 3 per cent; but with specially pure pyrites, there is no difficulty in working with 2 per cent on sulphur charged.

Coal Consumption.—When Glover towers are erected, there is a saving in coal amounting to 15 per cent and over. This arises from the generation of steam during the concentration of acid in the Glover tower. With brimstone, the amount of steam generated in the tower is very small, owing to the coolness of the burner-gas.

Yield of Acid.—In the best English practice, 295 parts 66 degrees acid (O. V.) are obtained per 100 sulphur contained in pyrites; and in average good working, 280 parts and upward are obtained. Many people say these are impossible yields, being too near the theoretical to be correct. I would remind them that the theoretical yield of 66 degrees acid from 100 sulphur is

$$306.25 \times \frac{100}{93.5} = 327.54 \text{ (not } 306.25\text{)}$$

* This is an outside price.

Dr. Lunge gives the following figures of the yield of H₂SO₄ at different works which had come under his observation.

- (1.) 272 to 275 per cent H₂SO₄ on sulphur charge.
- (2.) 276.4 " " " "
- (3.) 270 to 272 " " " "

Put into terms of O. V. (66° acid = 93.5 per cent H₂SO₄), these figures are equal to

- (1.) 292.5 per cent O. V. per 100 sulphur charge.
- (2.) 295.6 " " " "
- (3.) 289.9 " " " "

I have worked out the following table, which may be of service in comparing yields:

TABLE OF YIELDS OF H₂SO₄, O.V. (66 DEGREES ACID = 93.5 PER CENT H₂SO₄) AND CHAMBER ACID (50 DEGREES B.).

Per cent on sulphur charged.			Per cent on sulphur burnt.*			Per cent on pyrites.			Gross tons pyrites per net ton of		
O.V.	H ₂ SO ₄	50°B.	O.V.	H ₂ SO ₄	50°B.	O.V.	H ₂ SO ₄	50°B.	O.V.	H ₂ SO ₄	50°B.
260	243.09	390.98	276.10	258.15	415.20	124.80	116.73	187.67	7154	7651	4757
265	247.77	398.50	281.41	263.12	423.18	127.20	118.98	191.28	7019	7507	4688
270	252.45	406.02	286.72	268.09	431.17	129.60	121.22	194.89	6889	7368	4581
275	257.12	413.54	292.03	273.06	439.15	132.00	123.47	198.49	6764	7234	4486
280	261.80	421.06	297.34	278.03	447.14	134.40	125.71	202.10	6643	7105	4418
285	266.47	428.58	302.65	283.00	455.12	136.80	127.95	205.71	6527	6981	4340
290	271.15	436.09	307.96	287.97	463.11	139.20	130.18	209.32	6414	6860	4265
295	275.82	443.61	313.27	292.94	471.09	141.60	132.42	212.93	6305	6743	4193
300	280.50	451.13	318.58	297.91	479.08	144.00	134.64	216.54	62.1	6632	4124

Assuming a yield of 295 per cent O.V., 48 per cent sulphur in pyrites, and 4 per cent in cinders, the following will show what becomes of the sulphur in pyrites:

Sulphur left in cinder.	Per 100 pyrites.	Per 100 sulphur.
Burnt off.	2.80	5.83
In acid.	43.23	90.06
In outlet gas.	.96	2.00
Other losses and unaccounted for.	1.01-45.20	2.11-94.17
	48.00	100.00

Quality of Pyrites Acid.—The quality of the acid made from pure domestic pyrites—if we leave out of account the acid from Glover towers—is quite equal to any brimstone acid. The acid from the Glover towers (of which a small quantity has to be run out of the process about once a week) is generally somewhat discolored from the presence of iron derived from particles of pyrites carried over from the burners. If it be attempted to concentrate such acid to 66 degrees Baumé, it is found that scales of sulphate of iron deposit in the stills and endanger the platinum. Usually, however, instead of running their surplus Glover tower acid to the stills, manufacturers use or sell it for making superphosphates, or (if the ore used is not arsenical) mix it off for making muriatic or nitric acid. If there be no such outlet for the excess of Glover tower acid, it is best to work without a tower and convey the gases to the first chamber in a tolerably long and large pipe.

A great objection to pyrites has been the presence of arsenic in it and in acid made from it. Such acid can not be used for many purposes; this is, therefore, a vital point. There are now in our market, however, domestic pyrites entirely free from arsenic, and the acid from which can be (and is now) used for every purpose to which brimstone acid is used.

For the manufacture of superphosphates, any pyrites acid is just as good as brimstone acid; the presence of arsenic in it is not at all detrimental, although, as we shall see below, the use of arsenical ore is undesirable for another reason.

Labor.—In works having say 18 grate-burners and 10 shelf-burners, together burning 14.42 tons of pyrites a day, the number of men required will be 11, stationed as follows:

- Breaking pyrites—One man, on day shift only.
- Wheeling pyrites to burners and taking out cinders from shelf-burners—Two men, on day shift only.
- Grate-burner men—One man on each shift charges and works burners, wheels away cinders, and pots niter.
- Shelf-burner men—Two men each shift charge and work burners, wheel away the cinders, and pot niter.
- Chamber men—One man on each shift attends chambers, fires steam-boilers, and pumps acid to towers.

Wear and Tear.—At the outset, we may say that the wear and tear on pyrites burners is quite inappreciable. If properly built in the first instance, they will work many years without requiring any repairs whatever. In regard to the wear and tear on chambers, I wish to point out that no comparison of the life of a set of chambers worked with pyrites and another set worked with brimstone (or, in fact, between any two sets whatever) can be made, unless it be taken into account how much chamber space per pound of sulphur per twenty-four hours there is in each case. A set of chambers worked with 30 cubic feet space per pound of sulphur per twenty-four hours ought to last almost twice as long as a set worked with only 20 cubic feet. It is, therefore, obviously unfair to compare the life of chambers worked with brimstone in this country, having from 30 to 40 cubic feet per pound of brimstone per twenty-four hours (as is sometimes the case), with the life of chambers worked with pyrites in England having only 20 cubic feet and less per pound of sulphur per twenty-four hours (which is a very common allowance there). Doubtless, under equal conditions, chambers worked with arsenical pyrites will wear out quicker than with brimstone; but there is now no need to use imported or other arsenical pyrites, when there are plentiful supplies of pure domestic ores at hand.

The repairs to Glover towers cost considerable, if a penny-wise policy is practiced in their construction; but if strongly built of suitable material at the first, no part of an acid plant gives less trouble.

Management of Pyrites Acid Plant.—If the plant is properly designed and built, and set running under experienced supervision, the most

* Based on assumption that pyrites contains 48 per cent sulphur, and cinders contain 4 per cent sulphur.

unskillful staff of men can in a very short time be thoroughly trained to their respective duties. But if the plant is badly proportioned and slimly constructed, no satisfaction can be expected. In no business is it more important to begin right than in the manufacture of sulphuric acid, whether the raw material used be brimstone or pyrites.

The economy of using pyrites instead of brimstone is evidenced by the fact that in England, France, Germany, and universally in Europe, it has entirely supplanted the latter for sulphuric acid making; and this, notwithstanding that pyrites have to be imported from Spain, and that the relative prices of brimstone and pyrites are not nearly so favorable to the latter there as they are here. That pyrites is not on its trial, is shown by the fact that for years past upward of 1,000,000 tons of it have been used annually in Europe. Considering how much more highly favored this country is, with its immense deposits of rich and pure pyrites close to the seaboard, it can not be long before the use of brimstone for acid making here is a thing of the past.

W. M.

OFFICIAL STATEMENTS AND REPORTS.

THE NORTH BLOOMFIELD HYDRAULIC MINING COMPANY, NEVADA COUNTY, CAL.

The following figures, giving the result of the work of this famous hydraulic mining company, will be of special interest:

RECEIPTS.			
Mining Profits.			
Bullion product in 1883, including January, 1884, \$39.60 coin	\$483,187.57		
Less mining costs, as per statement herewith	169,138.51	\$314,049.06	
Water Sales.			
Net proceeds of water sales		4,629.46	
Personalty.			
Reduction in value of supplies, pipe, etc.		6,103.25	
Milton Stock.			
Dividend \$3 per share, Nos. 23 and 24		18,379.50	
Cash Assets.			
Decrease in cash assets—			
Cash assets, 1882	\$134,740.44		
" " 1883	73,226.32		
	\$61,514.12		
Debt, 1882	\$6,352.66		
" " 1883	5,455.84	897.02	60,617.10
Receipts			\$403,778.37
DISBURSEMENTS.			
Bonds.			
200 bonds paid in 1883		\$200,000.00	
Interest.			
Interest on bonds, etc.	\$35,446.05		
Less interest on loans and rebate on bonds, etc.	11,667.68	23,778.37	
Stockholders.			
Dividends, \$4 per share	180,000.00		
Disbursements			\$463,778.37
BALANCE-SHEET, JANUARY 31ST, 1884.			
ASSETS.			
Propertics.			
Bloomfield mine and tunnel, at cost	\$687,584.89		
Ditches and reservoirs, at cost	713,474.62		
Milton stock, at cost	361,536.64		
Union Gravel Mining Company stock, at cost	93,953.83		
Yuba Gravel Range, at cost	7,438.00	\$1,863,987.98	
Personalty.			
Supplies in mine	\$7,062.31		
Iron pipe in mine	13,710.38		
Quicksilver	857.00		
Manufacturing tools and machinery	5,289.00		
Powder stock, at cost	3,700.00	30,718.68	
Cash Assets.			
Bullion on hand and in tunnel	\$1,662.00		
Due from Bank of California	18,615.07		
Due from Union Gravel Mining Company	915.20		
Due from call loan	44,000.00		
Due from call loan	5,000.00		
Due from Milton Mining, Gravel, and Water Company	3,034.05	73,236.32	
			\$1,967,932.98
LIABILITIES.			
Stockholders.			
Assessments collected	\$1,590,000.00		
Less dividends paid	821,250.00	\$768,750.00	
Debt.			
Mortgage bonds outstanding	\$100,000.00		
Due depositors	5,281.00		
Due W. N. Radford, Superintendent	174.75	105,455.84	
Profits.			
Mining at Bloomfield to February, 1884	\$1,388,100.37		
Sale of water to Nevada Reservoir Company	20,000.00		
Sale of Vulcan stock	4,680.00		
Dividends from Milton stock	333,894.26		
	\$1,746,674.63		
Less interest paid	\$617,622.04		
Less San Francisco Express	35,325.45	632,947.49	1,093,727.14
			\$1,967,932.98
WATER RECEIVED.			
24 hours—Inches.			
From main ditch	795,557		
From Humburg	52,920		
From Milton Company	14,183		
Total	862,660		
WATER USED AND SOLD.			
—Inches.—			
Mining at No. 8 shaft	57,837		
Mining at No. 10 shaft	749,062	866,399	
Sales	29,852	29,852	
			836,251
Yield of bullion and water sales.			
\$483,147.97	No. 8, 18.6 cts.	\$169,138.51	\$314,009.46
5,597.46	No. 10, 63.1 cts.	968.00	4,629.46
\$488,745.43	Average, 59.5 cts.	\$170,106.51	\$318,638.92
The cost of mining was \$169,138.51, the principal items being \$87,			

308.72 for labor, \$8079 for powder, \$1015.79 for fuse, \$5332.78 for blocks, \$1940.11 for lumber, \$1242.86 for coal, \$1652.55 for expressage on bullion, \$3217.97 for taxes, \$2136.82 for grizzly bars, \$1713.23 for quick-silver, and \$2500 for wear and tear on pipe. Three quarters of the general expense account, or \$21,715.24, were charged to mining and \$26,194.24 for 806,399 inches of water at cost, or 3.24 cents per inch. The principal items of the cost of the water were \$12934.41 for labor, \$1815.33 for lumber, \$3486.13 for taxes, and \$7238.41 for one quarter of general expense, the total cost being \$27,162.24 for 836,251 inches of water. The following gives the sources from which the gold was collected.

From No. 10 sluice.....	\$311,865.68	
From No. 10 cut.....	104,146.19	\$416,001.87
From No. 8 sluice in tunnel.....	2,574.06	
From No. 8 sluice in mine.....	5,898.01	
From No. 8 cut.....	2,129.39	10,571.46
From under-currents.....		13,194.08
From tail sluice.....		3,708.75
From cuts below tunnel mouth.....		1,792.25
From 700 feet of tunnel between sluice and under-currents.....		21,749.14
From quicksilver, cleaning tanks, etc.....		16,150.42

Total..... \$843,147.97
Total bullion product to February 1st, 1884, \$2,829,869.59.

THE HECLA CONSOLIDATED MINING COMPANY, GLENDALE, MONTANA.

Mr. H. Knippenberg, the general manager of this company, which he has brought to its present prosperous condition by his exertions, has just made his usual full annual report. It is opened by a statement from which we learn that, from December 1st, 1880, to December 31st, 1883, the gross profit of the Hecla Company was \$685,396.83, of which \$77,785.13 went toward the extinguishment of a debt, \$360,000 were paid out in dividends, \$84,257.89 are on hand in the form of cash and furnace products, \$20,307.39 were expended in permanent improvements in 1881, \$75,621.21 for the same purpose in 1882, and \$27,825.38 in 1883. Fuel, flux, ore, and timber are on hand to the aggregate cost value of \$39,600. This is a handsome showing, especially when it is considered that the result was achieved in working ore which Mr. Knippenberg's predecessors rejected. The low market price of lead hurt the company to some extent, but the general manager feels confident of being able to show for some time a monthly profit of \$15,000, with which he couples the recommendation that an excess be used to accumulate a surplus, which in another part of the report he urges should not be less than \$100,000. There are probably few mine managers who would doubt the wisdom of such a recommendation; but unfortunately the directors of mining companies too frequently are deaf to argument on this point, being unable to appreciate its necessity. We trust that Mr. Knippenberg will be more fortunate than many of his fellow managers.

Mr. James Parfet, the superintendent of the mining department, has an elaborate report on the condition of the mines of the company, many of which are apparently in a very promising condition. Without numerous drawings, these details are of course unintelligible to outsiders, though it appears that the deposits worked show features which must be of great interest to geologists and mining men. We have looked forward with special interest to this year's report, because we expected some details in regard to the results of the concentrator put up for the Hecla Company by the Fort Scott Foundry and Machine Company. These have not been submitted, and apparently because the entire year has been consumed in finding the most profitable manner of working the ores. This is not surprising when the fact is taken into account that the company has 17 mines, more or less developed, of which Mr. Parfet says: "No two mines are alike, and the ores differ in each." It appears, too, that the managers felt it their duty to use up the second-class ores stored on the outside, in order to turn into money what was dead property. The result was, that it cost more to clean it up than if it had been taken out of the ore-bodies in the mine, and then it was mixed with rubbish. To keep the concentrator busy, an unduly heavy proportion of the force was employed during the summer months, when it would have been more profitable to extract first-class ore from the mines. Mr. Parfet, to illustrate his point, brings forward the following figures: The total production of first-class ore and concentrates for 1883 was 12,466 tons, on which the pay-rolls were \$184,537.42, or \$14.80 per ton. During the same time, there were shipped and mined and concentrated 26,760 tons second-class ore, at an estimated cost of \$4 for transportation and concentration, or \$107,040 in all. Therefore the 3885 tons of concentrations cost \$27.55 per ton. This leaves \$77,497.42 as the pay-roll for 8590 tons of first-class ore, so that the cost of the latter is only \$9.03. We presume, however, though Mr. Parfet does not say so distinctly, that the concentrates are relatively more valuable to the smelter than the first-class ore. It does not seem that any but that part of the silver in the ore is saved which is associated with the lead, and Mr. Parfet looks forward to the time when it has accumulated in sufficient quantity to warrant putting up stamps. The plan he advocates in reference to the use of the concentrator is to run it whenever the second-class ore accumulates in quantities that would be expensive to handle, and whenever one handling would send it to the concentrator. Then he would clean out the mine of its second-class, and get the first-class needed from some other mine. This plan, which we are informed is to be adopted for the future, will, we fear, involve some drawbacks, unless the distribution of the ore is peculiarly adapted to carrying it out successfully. It is just to state that the managers of the company take occasion to reiterate that the machinery itself does its work very well.

The report is accompanied by tables showing the annual production of the different mines of the company since 1876, the aggregate product being 63,717 tons, costing \$1,266,957.04. Mr. J. V. Seybold, superintendent of the reduction-works, gives a table exhibiting the consumption of ore, fuel, and fluxes and the production of lead, copper, and silver monthly. The totals show that, during the year 1883, 11,638 net tons of ore, 540 tons of "roast," 1293 tons of matte, 5663 tons of ore, 3694 tons of limestone, and 5375 tons of slag, a total of 29,090 tons of mixture, were smelted with 931,962 bushels of charcoal and 599 net tons of coke, or 31.2 bushels of charcoal and 41.2 pounds of coke per ton of mixture. The cost of fuel per ton of mixture was \$5.04. The ore averaged 57.8 ounces of silver, 34 per cent of lead, and 31.9 per cent of silica. The product was

2602 net tons of lead, 599,472.71 ounces of silver, and 402.53 ounces of gold in the lead, and 674,695 pounds of copper matte, containing 63,362.21 ounces of silver and 808,519 pounds of copper.

No details as to the expenditures in the different departments are submitted. The headquarters of the company are at Indianapolis.

THEORIES ON THE FORMATION OF MINERAL VEINS.—I.*

By Fridolin Sandberger.

Few geological phenomena offer apparently so many problems the solution of which is not only of the greatest interest to science, but to commerce and industry, as ore-deposits in general and mineral veins in particular. It is not surprising, therefore, that, since the beginning of the development of geology as a science, efforts have been constantly made to explain the formation of the latter. They naturally always assumed a direction coinciding with the views prevailing among scientists. Thus, Werner's explanation—the so-called descension theory—is purely that of a Neptunist, and assumes that veins were exclusively filled from above by the deposition of ores from solutions, without, however, having reference to the question whence these solutions derived their metallic contents. The descension theory is even to-day accepted in those cases where it is possible to prove with certainty the existence, in rocks above the deposit, of substances which have accumulated as ore-deposits in cavities or in fissures of deeper rocks that originally did not contain these substances. When the ores fill fissures, they possess all the properties of mineral veins. So far as my knowledge of ore-deposits goes, cases of the filling of fissures with ores which can be proved to be due to infiltration from above are not frequent, while the filling of irregular cavities often occurs. An excellent example of the latter is furnished by the lead and zinc deposits of Raibl, † as I showed in 1880. In the cavities of the triassic limestone there, are found the blende containing lithia and galena as the products of the leaching of the black marl shale above it, containing *trachyceras aonoides*. Occasionally stalactites of these ores are suspended from the roof of the cavities. It is not my purpose to enter specially into a discussion of these otherwise highly interesting deposits, which appear to possess a much more general distribution and importance in the new world. I propose to deal chiefly with true veins, that is, fissures filled with ore. Such irresistible proofs that veins are fissures filled with ore and gangue have been furnished from all parts of the world that I do not believe it necessary to discuss the so-called "congenation" theory, supported, for instance, by Stahl, § Zimmermann, || Von Charpentier, ¶ and Von Trebra. ** They held the view that veins were formed simultaneously with the country-rock, a theory which has not for years found a single representative.

It appears necessary, however, to examine the so-called ascension theory and its different modifications, because just now it still has many supporters, among them eminent scientists belonging to the school of plutonists that ruled science many years after the first appearance of L. Von Buch.

The ascension theory assumes in all cases that the ore found in the fissure was not all or only partially derived from the immediately adjoining country-rock, but that it came from greater depth, and that it was carried into the fissures either by ascending mineral springs or by sublimation. The substances deposited in the veins should therefore not be the same as those of the country-rock and be found in the latter only in the form of lateral impregnation from the fissure.

Considering one modification of the ascension theory, that referring to the filling by the deposit of ore and gangue from mineral springs, difficulties are encountered in most cases. They should be discussed first. Waters that issue with so great a velocity as those of carbonated springs do not, as experience teaches, deposit precipitates in their channels. These begin only in the immediate neighborhood of their mouth. I have repeatedly had occasion to directly observe this fact, for instance, at the mineral springs at Petersthal, Rippoldsau, Baden, and Badenweiler, in the Black Forest, the Max Springs at Kissingen, etc. The deposits are the result of the admixture of atmospheric air, which, on the one hand, displaces the carbonic acid of the bicarbonate salts, and on the other hand, by means of its oxygen, changes the substances capable of being oxidized, like carbonate of protoxide of iron and of manganese, into oxyhydrates soluble with greater difficulty. At the same time that iron is precipitated, arsenic, antimony, copper, tin, and lead, if dissolved in the spring, are deposited as the corresponding oxides, but never as sulphides. There are some localities where a fortunate combination of circumstances makes it possible directly to ascertain the origin of these metals, but thus far they have been so rare that I do not believe it superfluous to discuss one of them in detail.

It is well known that important mineral springs flow from faults between the "Bunte" sandstone and "Wellen" limestone at Kissingen. They contain a good deal of carbonic acid but little protoxide of iron, and judging from the result of the drilling at the Schönbrunn springs, they meet on their course upward and leach salt clays and zechstein dolomite. They never form deposits in the drill-holes or the fissures carefully examined by me in 1867. It is after coming into contact with the air in the open collecting basin, in the distributing-pipes, never entirely filled, that deposits are found. They consist of a muddy iron ochre that is so rich in arsenic that, for instance, one grain of it taken from the edge of the Round Spring shows a strong mirror in the Marsh apparatus, and that it is possible to prove in 10 grains of the substance lead, tin, and copper in notable quantities, and antimony, nickel, cobalt, and chrome in small quantity. †† These substances are derived from the

* Translation of the first chapter of *Untersuchungen über Erzgänge*, v. Wiesbaden: C. W. Kreidel, Publisher. 1882.

† A. G. Werner, *Neue Theorie von der Entstehung der Gänge*. 1791.

‡ Berg- und Hüttenmännische Zeitung, 1880, p. 390.

§ De Ortu Venarum Metalliferarum. 1700.

|| Obersächsische Bergacademie. 1746.

¶ Mineralogische Geographie der Kurfürstlichen Lande. 1778.

** Erfahrungen vom Inneren der Gebirge. 1785.

†† Buchner discovered arsenic, tin, and copper in the ochre of the Kissingen Ragocsy spring many years ago. *Journal für Practische Chemie*, xl., p. 445.

zechstein dolomite. A sample of it, deep black in color, taken from a drill-hole 294 meters deep contained:

Carbonate of lime.....	60.20
Carbonate of magnesia.....	17.22
Alumina and bitumen.....	22.58

When treated with hydrochloric acid, the dolomite yields only iron and copper; but when the residue of 5 grams not soluble in acid was melted with carbonate of soda and potassa, arsenic, lead, tin,* nickel, and cobalt could be detected in the same proportion as found in the ocher itself. This ocher could never cause the filling up of fissures reaching into greater depth. It might accumulate in cavities in higher levels through which course surface waters carrying air. In fact, there is, not far from Kissingen, at Oberebersbach, an ocher deposit worked for many years for color. It contains the elements mentioned above, and is justly considered a deposit of a spring which has ceased to flow. It is a circumstance worthy of notice that, in the ordinary ocher deposits from flowing wells, and in the Oberebersbach ocher, there is no separation of gangue and ore, and that, in spite of the high percentage of sulphate salts in the water, the ocher never contains metallic sulphides. Sulphides of the metals can only be formed from such waters after they have remained quietly for a long time in contact with decaying organic matter. It is a well-known fact that sulphide of iron forms in bottles of mineral water containing sulphates and salts of iron, through the action of the decaying cork. Similarly, iron pyrites often form in the vicinity of choked or imperfectly opened mineral springs, which impregnate the marshy meadow soil near their mouth and decompose with the organic substances. I have not recently seen a more striking example than the coating, resembling galvanic gilding, on the gravel of an alluvial deposit in the vicinity of the choked Memlose carbonated spring in the Lütter Valley, near Fulda.

There are many carbonated springs which contain iron and organic substances besides sulphates. But some of them deposit sulphides of the metals in the channel because the formation can only result from the gradual reduction of the sulphates contained in stagnant waters by means of larger quantities of organic matter than have been ever observed in such springs. Carbonated springs of this character have certainly never formed ore-veins, and can not form them. If, nevertheless, examples are quoted which are intended to furnish proof of the deposit from them of gangue alone or of ores and gangue, I must confess, that to me all of them appear to rest upon error, easily possible, but not capable of bearing the light of criticism. Thus it is proved that many mineral springs, some of them carbonated, issue from veins, and, like many others, I formerly was of the opinion that there was a connection between these two facts, implying that the ascending mineral springs used the same fissure for the deposit of ore and gangue in former times from which they still flow. In this case, it might be expected that some recently found deposits of ore ought to be found in such fissures. I did not find this experience realized in the fissures of the Rippoldsau veins made accessible by pumping. Not the faintest trace of recently formed copper pyrites, the prevailing ore, nor of crystals or powdery deposits of recently formed heavy-spar could be discovered on pieces of heavy-spar detached from the walls of the fissure. I did not have more success in examining other fissures similar in character. Among the ores of the Rippoldsau veins copper pyrites containing a little tin predominates, together with its ordinary products of decomposition, copper glance, covellite, cuprite, malachite, and metallic copper; iron pyrites containing arsenic; and a little galena.† According to Will,‡ 10,000 parts of water contain:

Carbonate of protoxide of iron.....	0.04037
Protoxide of tin.....	0.00025
Oxide of antimony.....	0.00016
Oxide of copper.....	0.00104
Arsenious acid§.....	0.00000
Oxide of lead.....	0.00025

In 100 parts of the ocher deposited by the well there are:

Oxide of iron.....	44.60
Heavy metals and arsenic.....	55.24

It will be observed how much the latter have been concentrated through the oxidation of the water, and that they have been precipitated simultaneously with the oxide of iron. There are other striking points.

In the water, there is a large excess of arsenic over copper, while the latter predominates considerably in the vein. It may be safely assumed that this proportion is due to the fact that the arsenic of the decomposed iron pyrites enters into solution as arsenate of lime, being much more easily soluble than the arsenates of the heavy metals. If this spring was capable at all of forming sulphides of the metals, then the metals, having reached the third deposit (the first being the mica of the Rippoldsau gneiss), would not group again as copper and iron pyrites, but as arsenical fahlore and arsenical pyrites. As the proportion of arsenic to copper in the ochers is 5 to 1, but in tennantite only 1 to 2.71, only one third of the arsenic would be consumed in the formation of fahlore; the remainder might be used to form pyrites with the iron present in abundance.

It is very desirable that a similar examination be made of the deposits of ocher of other carbonated mineral springs having their origin in veins, and that they be compared with the ores occurring in the veins.

Ascending carbonated mineral springs, whatever their temperature may be, must not be considered as the source of the ores in fissures. They simply use the veins as they would any other fissure as the shortest route to the surface, as I explained in 1880,|| and deposit the substances leached out by them at their mouths in the form of ocher.

There are other kinds of mineral springs, and notably thermal springs, which deposit, besides large quantities of silica and sulphur, cinnabar, argentiferous (?) iron pyrites, and even very small quantities of metallic gold. Until now, they have been discovered exclusively in California and Nevada, and only within the coast range for a distance of 500 kilometers.

They have created a good deal of interest, both practically and from a scientific point of view. In some of them, observations can be made on the formation of ore-deposits by ascending springs belonging to the present era.* I say expressly in some of them, because the quicksilver deposits of California, judging from the reports of Whitney,† Sieveking,‡ Rolland,§ Phillips,|| and Christy¶ differ widely in their character, and must not be discussed in a body but in groups. Thus, quicksilver and liquid hydrocarbons are found impregnating clay, as at the Rattlesnake mine, Sonoma County, quite similar to an occurrence at Idria, except that liquid hydrocarbons in this case take the place of solid hydrocarbons. In other localities, cinnabar occurs as an impregnation of sandstone, as in the Palatinate. But the ore more frequently forms, accompanied with silicium, quicksilver deposits similar to stockwerks or veins. As a rule, they are neither wide nor extensive, though in some cases, as in Lake County (north of San Francisco), they fill a fissure several miles long and from 14 to 60 feet thick. All important deposits of cinnabar are generally accompanied with quartz; occasionally, however, they are mixed with dolomite (New Almaden), or with opal and hornstone (Redington mine), attaching it to a rock called "serpentine." Of course, it will be possible only after thorough lithological and chemical investigation to judge what is meant by this name. As it has been long since proved not only that a great variety of rocks have been compounded with serpentine, but that true serpentine is never a primitive rock, but always the product of a decomposition of olivine, picrite, gabbro, or horn-blende rocks, it is necessary to make certain studies. These must afford light not only upon the present lithological and chemical composition of the rock called serpentine, but lead, if possible, to some conclusion as to the rock from which it has been derived. Until this has been done, there is little hope of obtaining an insight into the relations between the serpentine and the cinnabar veins associated with it. The same, is true of course, of the stratified rocks in contact with it, which are said to belong to the Cretaceous formation.

All the California quicksilver deposits thus far mentioned do not contain free sulphur; they carry partly dolomite, and are not distributed in siliceous sinter, but form coarse masses. Externally, they furnish no evidence to justify the claim that they are the product of ascending springs, though in some of them carbonic acid and warm water issue from cracks even to-day. Where I have had the opportunity of examining the ores of veins dependent upon a certain country-rock—for instance, the manganese ores in the porphyrite of Hefeld and the copper veins in the diabase of the Hartz and Nassau, to choose some of the simplest examples—their constituents could be detected in the adjacent country-rock without any trouble. Therefore I hardly doubt that a close examination of the California "serpentines" would lead to a similar result.

On the other hand, circumstances appear to be entirely different in other localities, as these ores are still deposited to-day from hot springs. The nature of these curious deposits must be discussed in detail. One hundred and fifty kilometers southwest of San Francisco, is Borax Lake, with the extinct volcano Uncle Sam rising to an elevation of about 4500 feet above it. Its flanks are covered with streams of trachyte and obsidian. It is surrounded on all sides by thermal springs (72 degrees C.), which emit great quantities of carbonic acid and sulphureted hydrogen and deposit borax, silica, and sulphur. On the southeast shore of the lake, there are hills consisting of tufa, interstratified with trachyte and resting on limestone.** These hills have received the name of Sulphur Bank, on account of the great deposits of sulphur. Phillips found there a strongly decomposed rock, from the numerous fissures of which issued the gases named above, steam, and hot alkaline water. Sulphur is everywhere distributed in the mass, often to such an extent that it predominates. It always contains some sulphide of mercury. The walls of the crevices from which the gases and the water issue are sometimes coated with amorphous silica, under which is found a layer of chalcedony and finally a layer of crystalline quartz. The siliceous layers frequently contain iron pyrites and notable quantities of cinnabar, or appear to be covered with a drop of a tar-like hydrocarbon. It is stated that the richest parts of the deposit are those in which the rock has been most corroded by the gases and has been altered to masses of clay having an acid reaction with a good deal of free sulphur. Accordingly, the percentage of quicksilver, which was not present in workable quantities in the beginning, accumulated in the deeper parts of the decomposed tufa until it reached 40 per cent. There, according to Sieveking, it gradually changes to a sandy conglomerate of iron pyrites, gravel (!), clay, and cinnabar. In the colder parts of Sulphur Bank, the ore can be profitably extracted. The Sulphur Springs northeast of Borax Lake, in Colusa County, deposit siliceous sinter containing cinnabar in which gold is occasionally found, and the same may be said of the Steamboat Springs, in Western Nevada. According to Phillips, the silica deposits on the walls of the fissures from which they issue show a regular structure in layers. It can not be doubted that these deposits are in the act of formation; but they are very peculiar in character, and can only be compared with the metallic deposits—insignificant as a rule, it is true—from the solfataras, fumaroles, and exhalations from the surface of streams of lava from which sulphureted hydrogen issues. There are no deposits either in the old or the new world carrying such masses of free sulphur in a purely siliceous gangue, and there are none the country-rock of which is clay showing acid reactions except within the reach of the zone of oxidation. Judd, therefore, justly in the discussion of Mr. Phillips's paper before the Geological Society of London, pronounced it analogous to the solfataras of volcano, show-

* Newberry, The Origin and Classification of the Ore-Deposits. New York. P. 15: "In the Steamboat Springs of Western Nevada, we in fact catch mineral veins in the process of formation."

† Geological Survey of California.

‡ Berg- und Hüttenmännische Zeitung, 1876, pp. 456, 576.

§ Les Gisements de Mercure de Californie. Annales des Mines, viii. serie, xiv., pp. 384-432.

|| A Contribution to the History of Mineral Veins, Quarterly Journal of the Geological Society, xxxv., pp. 390-396.

¶ Genesis of Cinnabar Deposits, American Journal of Science and Arts, iii. series, xvii., p. 453-463.

** Several persons report Cretaceous limestone as the foot-wall, but it does not appear to have been directly proved to be such.

* It will be noted that in this case it is not correct to assume that the tin and lead in the ocher were not derived from the mineral waters from which it was deposited, but that their source was the distributing-pipes attacked by the water.

† Geologische Beschreibung der Renchbaeder, p. 39.

‡ Annalen der Chemie, ix., p. 202.

§ It would probably be preferable to compute for oxide of tin. Berg- und Hüttenmännische Zeitung, 1880, p. 404.

ing the same association of free sulphur and sulphur containing selenium with boric acid. It may be said, in addition to this, that, both in this case and in that of the solfatara of Pozzuoli, the impregnation of the decomposed rock with free sulphuric acid has reached a high degree. This ends the analogy with true solfataras, because in them acid gases alone escape, and not, at the same time, alkaline water carrying considerable silica. Except at the California volcano, there is none at which cinnabar or hydrocarbons have been observed in notable quantities, as the product of solfataras or fumaroles, nor have gold or silver been noted in such a connection. As a rule, the products of a fumarole are quite different substances, the origin of which may partly be very well explained. Thus, I was able to show some time since that the origin of the copper, cobalt, and lead in the products of the fumarole of Vesuvius, need not be sought anywhere else but in the olivines and augites of its own lavas decomposed by the acid vapors. They carry these elements as constituents of silicates. Is it possible that the trachyte of the Uncle Sam contains silicates carrying quicksilver? * This is a question of great interest, which certainly should be looked into, because the presence of quicksilver is mentioned in the decomposed trachyte rocks of Hungary, Toscana, and Peru, † and small quantities occur in veins in the propylite of Schemnitz and Kremnitz. This, however, would leave unexplained the occurrence of hydrocarbons, which make their appearance in these deposits of siliceous sinter carrying cinnabar, and which, to my knowledge, are found nowhere outside of California. Besides, it would be impossible to explain the similar siliceous deposits carrying cinnabar of the Steamboat Springs, because there there is no trachyte, but true basalt. ‡ We are met therefore by questions of a different kind, which can not be satisfactorily solved without an exact chemical investigation of the rocks. § This, however, will not prevent my attempting an explanation corresponding as much as possible with the facts as now known concerning the formation of the springs of California and Nevada, which deposit siliceous sinter carrying cinnabar. I start with the opinion that the quicksilver ores and the gold and silver in them have been derived from veins of greater age, or from stratified rocks impregnated with ores; that they were dissolved by the springs, and were, therefore, redeposited with the siliceous sinter. Though in a different form and on a much larger scale, this would present an analogy to the deposits of metals in the others of carbonated springs issuing from ore-veins or rocks carrying ore. In itself, it is striking that these siliceous sinter springs deposit exclusively those metals which occur in the older ore-deposits of California and Nevada, and it is certainly worthy of notice that they are accompanied by hydrocarbons which are elsewhere not observed in connection with siliceous sinter, but which occur very frequently in the older deposits of California, and can only exist originally in the sedimentary rocks (Cretaceous limestones) leached by the geysers. Now, it is well known that sulphide of mercury is soluble in alkaline sulphides, and sulphide of barium, forming with them compounds (RS, HgS + 5aq) at a much lower temperature (45 degrees C.) than that of the Sulphur Bank Springs (72 degrees C). There is, therefore, no difficulty in the leaching of older quicksilver deposits by such springs. The solubility, too, of sulphide of gold in the sulphides of the alkalis is a well-known fact. I can not judge in what form the solution has taken place of the silver in the argentiferous iron pyrites only incidentally mentioned in the reports. Solutions which carry alkaline sulphides besides a large quantity of the alkaline carbonates, in cooling first deposit the silica dissolved, and then, as soon as they come into contact with the air, undergo an oxidation to hyposulphites, which are decomposed, forming free sulphur and sulphites. The latter finally became sulphates. The great quantity of free sulphur in the Sulphur Bank deposit is due to the decomposition of the hyposulphites and the oxidation of the escaping free sulphureted hydrogen. The double salt of sulphide of an alkali and of quicksilver contributes to it also, because finally it decomposes to alkaline sulphates, sulphur, and sulphide of mercury. The sulphide of gold dissolved in the sulphide of sodium and deposited from the spring is soon decomposed, forming free gold and sulphuric acid. Such is the manner in which I believe the sinter and the ores of Sulphur Bank and similar deposits in California and Nevada have been formed, and I hold the opinion that no well-founded objection can be raised against it until the absence of quicksilver in the form of original silicates has been proved in the trachytic rocks of the Uncle Sam volcano and in the basalt of Steamboat Springs.

It is well known that, as in the geyser regions of Iceland, New Zealand, and Wyoming, there are extinct geysers in California, which may be easily recognized by their shape and the character of their deposits. It would be worth while to inquire whether they have deposited in their channels such quantities of ores that they have been obstructed, and that therefore in reality a species of mineral vein has thus been formed, or whether their extinction is due to the same cause prevailing in other geyser regions, the building up of their channels to such a height that the higher pressure gradually renders the ascent of the water at this point more and more difficult, and finally makes it impossible. If this is the case, as I am led to believe by analogy, then the ores will only be found in the deposits of sinter about the mouth of the springs, and not in their underground channels. American enterprise will certainly take hold of this question, because it seizes every means to hunt up and raise underground treasures, as is shown by the latest experiments to discover ore-bodies by ascertaining the existence of underground electrical currents, which was tried at an earlier date unsuccessfully in the vicinity of Freiberg.

As a summary of the observations thus far made, it results that no proof has been furnished of the formation of ore-veins by ascending springs in California. The ore-deposit created by the united action of

solfataras and sinter springs at Sulphur Bank may be compared with a stockwerk, so far as its outer form is concerned, and this Stelzner * does. But only so in reference to its form. It is not admissible to make any further comparison, for instance, with the stockwerk of Altenberg, a lithmite granite, altered by the decomposition of lithion mica to chlorite and tinstone, of feldspar to kaolin and quartz, the granite being traversed in different directions by quartz veins, which contain the products of the alteration and of the leaching of the rock. It is not admissible, because, in this case there is neither clay showing an acid reaction, nor free sulphur with sulphides of the metals in an exclusively siliceous gangue, and because in this case, as in the case of similar tin stockwerks, there should not be a trace of fluor-spar if they had come in contact with the gases of a solfatara, or with thermal springs carrying a large quantity of sulphur.

That modifications of the ascension theory that assumes the deposition of ores, not by ascending mineral springs, but by metallic fumes, may be still held by one or the other geologist, but it is rejected by an overwhelming majority. I may, therefore, abstain from discussing it, because I do not know of any deposit to which it is applicable.

STRUCTURAL STEEL.

At a meeting of the American Society of Civil Engineers, a paper on structural steel was read by Edward B. Dorsey, M. Amer. Soc. C.E. It gave the results of an examination by the writer into the subject during two recent trips to Europe. The steel used for structural purposes is called generally in England mild steel, and in Germany homogeneous iron. Experts in Great Britain generally rely more upon physical tests and the reputation of the manufacturer than upon chemical composition. The physical requirements are stated, and the manufacturer uses his discretion as to the composition which will answer these requirements. The rules for testing steel adopted by the British Admiralty, by Lloyd's Register, and by the British Board of Trade were given. The tendency among English engineers is to use steel still softer than has heretofore been thought best. Some large builders use nothing in their boilers over 26 long tons tensile strength per square inch and 25 per cent elongation in 8 inches. Others advise the use of steel of from 23 to 25 long tons tensile strength, with the same elongation. American engineers require from 15 to 20 per cent higher tensile strength than the English. The Siemens-Martin or open-hearth steel is preferred by nearly all experts for structural purposes, the Bessemer steel being principally used for rails. Ship-builders are decided in their preference for the open-hearth steel. A much larger number of plates would be condemned of the best wrought-iron than of steel. Data were given as to loss of strength in steel plates by punching. Steel can be manufactured into much heavier, longer, and wider pieces than wrought-iron. Steel rivets are used on the Clyde exclusively in riveting steel. The new Forth bridge is to be built of mild steel. The use of mild steel is extending very rapidly in Europe, and has fast superseded iron for structural purposes.

During the discussion, Mr. Theodore Cooper referred to the conservative stand taken by him in a paper presented to the society some four years since, and expressed the opinion that at the present time he would feel still more conservative in regard to the use of iron instead of steel for structural purposes, particularly for bridges or similar constructions. For boilers, for ships, etc., steel has answered very well, but for structures he would be inclined as yet to advise the use of wrought-iron. In compression, in his opinion, steel has not been proved to be as strong as wrought-iron, and the necessity for more careful inspection is greater for steel than for wrought-iron.

Mr. M. N. Forney referred to the increasing use of steel for rails, for wheel-tires, and for various parts of locomotive machinery. He referred to the record of accidents, which showed that some 66 per cent of accidents in this country are due to derailment, and only 8 per cent due to the same cause in England. In this country, the number of broken wheels is very great, and the tendency toward the use of steel for tires is decided.

Vice-President Paine gave details of the methods of tests of steel in use during the construction of the Brooklyn Bridge, and expressed an opinion favorable to the use of steel.

The paper was also discussed by Messrs. Collingwood, Frith, and North.

RUSSIAN MINES.—Some idea may be formed of the extent of the possessions attached to the Russian crown when it is stated that the Altai estates alone, in which are situated the gold and silver mines of Barnaul, Paulov, Smijov, and Loktjepp, the copper foundry at Sasoum, and the great iron-works of Gavrilov, in the Salagirov District, cover an area of over 170,000 square miles, being about three times the size of England and Wales. The receipts from these enormous estates are in a ridiculously pitiful ratio to their extent. In the year 1882, they amounted to 950,000 rubles, or a little more than \$450,000; while for 1883, the revenue was estimated at less than half this sum, or about 400,000 rubles. The rents, etc., gave a surplus over expense of administration of about a million and a half of rubles. On the other hand, the working of the mines showed a deficit of over a million; hence the result just indicated. A partial explanation of this very unsatisfactory state of things is to be found in the situation of the mines, which are generally in places quite destitute of wood, while the smelting-works are naturally located in districts where wood abounds, sometimes as much as from 400 to 500 miles distant from the mines. The cost of transport of raw materials became considerable in this way. By degrees, all the wood available in the neighborhood of the smelting-works became used up, and it was necessary to bring wood from distances of even over sixty miles. Formerly the mines were really penal settlements, worked by convicts, who were partly helped by immigrants whose sons were exempted from military service on the condition of working in the mines. But since the abolition of serfdom, this system has been quite altered, and there is now a great deal of free labor on the ordinary conditions.

* Berg- und Hüttenmännische Zeitung, 1878, p. 390. Jahrbuch für Mineralogie, 1878, p. 232.

† For instance, by Rainaudi, Minéraux du Pérou, p. 179.

‡ Zirkel, in Clarence Kinz, United States Geological Exploration of the 40th Parallel. Microscopic Petrography, p. 231.

§ I hope to be able to solve some of these questions next year. American State geologists having kindly furnished me with the necessary material. It is certainly worthy of notice that inquiries showed that there was not a single specimen of these curious occurrences in the scientific collections of Germany, so that until now they have been judged by reports, a method which has certainly its great dangers.

THE LIDGERWOOD HOISTING-ENGINE.

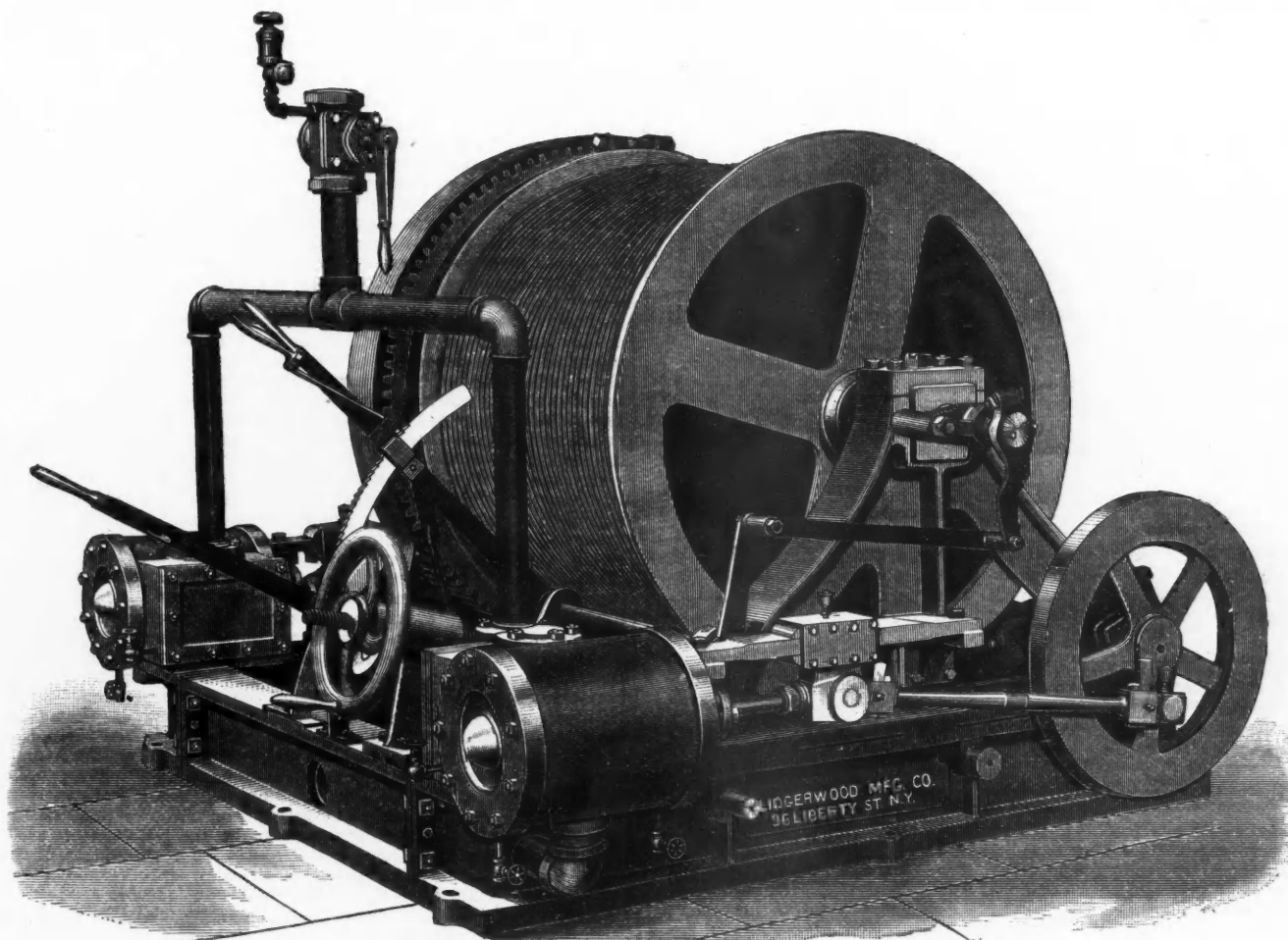
Among the recent designs of hoisting-engines for shafts and inclines which are largely used, is that brought out by the Lidgerwood Manufacturing Company, of this city, the principal feature being that the hoisting-drums may be loose or may be thrown in and out of gear with the engines, whether in or out of motion. A glance at our engraving will show the general design.

The cylinders have large steam and exhaust-ports for rapid action; the pistons have metallic packing-rings of simple form which are automatic in action and are steam-tight, with little friction upon either the cylinders or rings. They can be replaced by any ordinary repair-shop at small cost, or can be ordered and sent for at any time. Paper joints are used upon the cylinder-heads. The valves are the ordinary D slide-valve, made of great width to secure the proper area, and as short as possible, in order to decrease the pressure upon the back of them, so as to decrease the friction and consume as little power as is possible to operate them. The valves are secured to the stems by clamps each side of the valve, which enables lost motion to be taken up easily and avoids corrosion of threads or nuts inside the steam-chest. The valve-stems and piston-rods are made of steel. The pistons are driven or forced upon their rods with a nut at the back end to hold them; and a pin through this nut, to keep it from working off. The piston-rods are attached to the cross-heads with a long, well-fitted thread and jam-nut. The cross-heads and slides have large and broad wearing surfaces, with composition gibbs top and bottom.

turned up true all over, and spirally grooved for wire ropes, and, when out of gear, run freely on the shaft. The brake is attached upon the outside of the friction-flange next to the spur-wheel, and has a broad surface, and will hold securely any load that the engines can hoist. The frictions composed of wood, and is bolted to the spur-wheel in sections or pieces, with the end of the grain toward the wear. This wood is turned off true, to suit the flange of the drum in a sort of wedge shape. A very small movement of the drum endwise either engages or releases it from the friction surface. This is accomplished by means of a screw into a nut at the end of the drum-shaft and bearing. This bearing acts as a thrust against the power of the screw to force the drum against or in contact with the friction surface; the power being conveyed through the center of the drum-shaft to the end of the drum by a steel pin which pushes a cross-key or gibb that is against the collar at the end of the drum. Then, by means of a suitable lever connections, etc., the drum is thrown in or out of gear from the position where the engineer or operator stands to handle the engine.

THE DURANGO IRON MOUNTAIN.

For many centuries, one of the wonders of Mexico was the great Iron Mountain, near Durango. A few years ago, American enterprise took hold of the question of utilizing this vast iron deposit, and as the Iron Mountain Company is now coming before the public for support, it may



THE LIDGERWOOD HOISTING-ENGINE.

They can be adjusted and kept close fitting to the slides by means of paper, tin, or thin metal packing put in between the gibbs and cross-heads over their whole surface, from time to time, until the gibbs are entirely worn through. This is done by simply removing the plate or cover of the cross-head upon the outside of the slide. The cross-head, crank, link, and valve-stem pins are made of steel. The connecting-rods are of the regular design, with square ends, straps, gibbs, keys, set-screws, and composition-boxes. Their length from center to center is three and a half times the stroke, thus making an easy running motion with little friction upon the cross-head and slide, main journal, crank-pin, etc. The pins the connecting-rods work upon are of large diameter and length. The crank or disk-wheels are forced upon the shafts, and fitted with a good key, and never come loose. They are made with a heavy side to counterbalance the connections as much as possible. The crank-pins are forced and riveted in same as solid. The links, link-connections, rock-shaft, eccentrics, etc., are got up in good shape for the best possible amount of durability that can be put into such gear, and they are easily adjusted, taken care of, and operated. The links and connections counterbalance weights upon the opposite side. The reversing-lever can be set to cut off steam by the links at any point of stroke. The crank and drum-shafts are of wrought-iron and of large diameter, with long journals filled with anti-friction metals, arranged for easy adjustment in case of wear.

The friction-drums are generally made in one complete casting, and, as they are loose upon the shaft when not engaged in their friction, they have a long bearing upon the shaft with oil-holes for oiling. They are

not be without interest to give some of the details referring to it. Among the reports concerning the property, that of Mr. John Birkinbine, of Philadelphia, made in 1882, is the clearest, most authoritative, and touches most directly upon a number of important practical points. We quote from Mr. Birkinbine's report as follows:

"Having heard of this deposit, its enormous size, the solidity and purity of the ore (some even going so far as to pronounce it a mass of pure metallic iron, or an immense aërolite), I had prepared myself for disappointment, basing my expectations upon former experiences, where distance lent enchantment to what were reported as most wonderful ore supplies. I am, however, free to say that, after visiting most of the larger iron-ore mines of the United States, I have as yet found nothing to compare, as to quantity 'in sight,' with the Cerro de Mercado, at Durango. I am fully aware what such a statement means, appreciating from personal inspection the immense quantity and great purity of the magnetic ores of the Adirondack and Lake Champlain regions of New York State, the incalculable wealth of magnetic ore stored in the Cornwall deposit in Pennsylvania, the extent of the hematites of Virginia, Alabama, Tennessee, and Kentucky, the large output and superior quality of the specular ores from Missouri, and the enormous shipments of rich iron ores annually made from the upper peninsula of Michigan. Unless the physical and geological indications fail, I have no hesitation in pronouncing the Cerro de Mercado the most extensive known single deposit of iron ore on the American continent, or, possibly, in the world.

"As the visible ore exists above ground-level, the facilities for mining

will admit of obtaining it at remarkably low cost, and large quantities of it will require nothing more than shoveling it into receptacles for conveyance to an iron-works. The advantage of mining above ground is demonstrated by the development of the Cornwall ore-hills, Pennsylvania, and the Pilot Knob deposit, Missouri, which more nearly approach in mode of occurrence to the ore of the Iron Mountain at Durango.

"Just beyond the limits of the city, and less than two miles from its center, the Cerro de Mercado rises from the great plateau—a hill one mile long, a third of a mile wide, and from four hundred to six hundred feet in height. The surface of the mountain exposing ore so as to be classified as good mining lands aggregates over 10,000,000 square feet; but there are indications that the deposit is not all above ground, but extends far beneath the plain from which its top projects.

"Considerable time was spent in examining the mountain, clambering over its steep escarpments, and collecting samples from its surface. I am not prepared to verify some authorities by pronouncing the deposit a solid mass of iron ore, although almost the entire surface exposes ore to view. I incline to the belief that the Cerro de Mercado is formed of one or more immense veins of specular iron ore, standing nearly vertical, the fragments of which have, by the action of the elements for ages, been thrown down to form the slopes of the mountain as a talus; but the extent of this detrital ore is too great to permit of locating any foot or hanging-walls. While the study of the formation is of great interest, it is unimportant for your present consideration; for the amount of ore 'in sight' is practically inexhaustible, and the question whether the mountain is a mass of solid ore, or whether the projecting turrets and precipitous battlements which arise from its slopes are parts of great veins or dikes, will not affect its value as a source of supply for generations to come. I have, therefore, not attempted to form an estimate as to whether the calculations made by others as to the number of hundreds of millions of tons of ore in the deposit could be verified or not.

"Not only was the surface examined, but old shafts and drifts, and hills in the talus, and every possible method of determining the contents of the mountain, were investigated, all showing the deposit to be one of great immensity.

"A large number of samples were taken from various parts of the mountain to indicate the peculiarities of the formation; and from these, should you so direct, a thorough chemical examination of the ore from all portions of this deposit can be made. Twenty-seven typical specimens were forwarded to Mr. A. S. McCreath, Chemist of the Second Geological Survey of Pennsylvania, with a request to make an analysis to represent the average."

Mr. McCreath reported:

Magnetic oxide of iron.....	2.071	Phosphoric acid.....	3.041
Ferric oxide.....	77.571	Loss on ignition—water, etc.....	1.584
Manganic oxide.....	.113	Silica.....	7.760
Titanic acid.....	.710	Alumina, etc., undetermined.....	1.124
Lime.....	5.050		
Magnesia.....	.364		100.000
Sulphuric acid.....	.212		
Metallic iron.....	55.800	Phosphorus.....	1.328
Manganese.....	.079	Phosphorus in 100 parts iron.....	2.379
Sulphur.....	.085		

Some of the samples, confined to a limited area on the northern face of the mountain, showed crystals of phosphate of lime. Acting under instructions, Mr. McCreath made an average of 17 samples, excluding those referred to, with the following result:

	Per cent.
Metallic iron.....	62.775
Phosphorus.....	.288
Siliceous matter, including a little titanac acid.....	5.240
Phosphorus in 100 parts of iron.....	.458

The samples of pig and bar-iron yield respectively the following results:

	Pig-iron.	Bar-iron.
Silicium.....	.771	.105
Phosphorus.....	.428	.193

On the question of fuel, Mr. Birkinbine says:

"The great plateau adjacent to Durango sustains a considerable growth of mesquit and huysahic woods, either of which makes a hard, dense charcoal and possesses unusual calorific power. Most of the hills convenient to the city, the Sierra Madre Mountains and their foot-hills are covered with oaks, pines, and other woods suitable for producing charcoal; and extensive works can safely depend upon a supply of this fuel at a cost but little, if any, above the average price now paid by the American Charcoal Iron-Works.

"With the present crude methods of manufacture and expensive means of transportation, charcoal costs less in Durango than at some of our own iron-works. The prices now ruling (from eight to ten cents a bushel) could be much reduced if more modern practice was employed and large quantities produced."

THE MATRIX OF THE DIAMOND.—Until the South African mines were discovered, the diamond was generally found in sands and gravels different from the mineral in which it was believed to be formed. At Griqualand West, however, the consolidated eruptive mud of the mines was believed by some to be the true matrix of the diamond; but opinions differed on the question, and arguments were found on both sides. M. Chaper, a French geologist, has, however, during a scientific mission to Hindostan, succeeded in finding the diamond in its mother rock. At Naizam, near Bellary, in the Madras Presidency, M. Chaper has found the diamond in a matrix of rose pegmatite, where it is associated with corundum. The tract of country is almost denuded of trees, bare and rocky, and the rains wasting the rocks, every year expose fresh diamonds in the soil. The rock is traversed by veins of feldspar and epidiotiferous quartz. Here the diamond is always found, associated with epidiotiferous rose pegmatite. The diamond crystals observed are octahedral, but less distinct in line than the stones of South Africa, which seem to have been formed in a freer matrix. It follows from M. Chaper's discovery that diamonds may exist in all rocks arising from the destruction or erosion of pegmatite, for example, in quartzites with or without mica, clays, pudding-stones, etc.

MODERN PROGRESS IN MINE ENGINEERING.—I.*

By H. Bramall, M. Inst. C.E.

In accord with the custom which has obtained in this society, it becomes my duty as retiring president, on this the last evening of the session, to address you on some engineering topic. In selecting a subject, I have been guided by the practice of previous occupants of this chair, who, I find, have adopted one of two courses: either to pass in review the principal important works in progress or completed at home or abroad during their year of office; or, confining themselves to that particular branch of the profession with which they have more especially identified themselves, to relate what is of most interest as exemplifying the progress made in that branch. But Mr. Brunless, the President of the Institution of Civil Engineers, in his recent address, took the first course, and so ably and so exhaustively has he dealt with the subject that, should I follow the same line, I could only repeat what he has already said with far greater ability; and so I will adopt the alternative course, and I purpose to treat of that important branch of civil engineering with which I am most familiar, and to speak to you of the progress which in modern times has been made in mine engineering.

Before commencing to win a mineral deposit, some preliminary research is usually required, and this, more particularly in the case of a bed, is effected by deep boring. From very early times, this has been done by a chisel fixed to rigid iron rods, motion being imparted by manual labor, aided by a spring pole; and for moderate depths, this system, improved by substituting a lever worked by an engine for the pole, is still much in use, and is the most economical. When greater depths were attempted, the repeated breakages of the rigid rods became a serious hindrance; but this difficulty was overcome by the invention of the free-falling tool, by the means of which Mr. Kind explored the Creusot coal-field to a depth of 8017 feet, while at Spenberg a depth of 4170 feet has been attained. The Chinese, from remote ages, have bored holes by using a rope in place of rigid rods, and the Americans have adopted and improved this method in the Pennsylvania oil district, where holes have been bored by the thousand. The chisel is attached to a short length of rods, with jars, and these are connected by a round hemp rope to a reciprocating beam actuated by a steam-engine, two men sufficing for all the labor and attention required. Holes 1500 feet deep have thus been put down in 36 days, a speed of 39 feet per twenty-four hours having been attained, while the cost of a 5 or 6-inch hole of that depth is stated at about 8s. 5d. per foot. Mather & Platt, in their boring-machine, use a flat wire rope to connect the boring-head with the motor, and the motion is giving by passing the rope over a pulley mounted on the piston-rod of a vertical steam-cylinder. The turning of the chisel is effected by an arrangement in the boring-bar, and cores of the strata are readily obtained from holes of from 9 to 18 inches diameter. The 1300-foot bore at the Bootle Well was done by one of these machines, and they have also been largely used in the Middlesborough and other districts, the speed attained being from 4 to 9 feet in twenty-four hours.

Herman, in 1854, proposed the use of diamonds for arming the cutter of a rotary drill; and in 1862, a patent was granted to Leschot for a drilling-machine in which the diamonds were mounted on the end of a steel tube, and a current of water employed to clear away the abraded rocks. Further improvements have been effected by Colonel Beaumont, whose machines are now in extensive use. The diamonds used are of the black or carbonado variety, and are mounted (by pressure) on the end of a steel tube, and on being rotated cut an annular groove in the rock, leaving a central core. The rods are tubular, and a stream of water passing down the inside of them, and flowing up between the rods and the sides of the hole, keeps the cutting surfaces clean, and brings up the debris. Many important borings have been carried out on this system. At Neuville, 2430 feet, chiefly coal measures, were bored through in thirteen months, the hole being 6 inches in diameter at top, and finished 4 inches, and the average speed obtained 3½ feet in twenty-four hours. At Aschersleben, 2959 feet were bored, the hole being 12 inches diameter at top and 3 inches at bottom; but at Lüththeen, in Mecklenburg, a depth of nearly 4000 feet is stated to have been reached in six months. The system has the advantage over all others in the large percentage and perfect state of the cores obtained, and the knowledge thereby afforded of the nature of the strata passed through; but it would appear to entail an increased cost of from 50 to 75 per cent over rigid rods, and considerable trouble has been experienced, in Australia especially, from the liability of the holes to become crooked. The benefits derived from the continuous flushing of deep bore-holes (patented in 1844) are very marked, and advantage has been taken of this in the plan for boring through alluvium, invented by Mortensen, and known as the Aalborg system, in which no cutting tool is used, but a current of water is forced down an inner tube, and, ascending through the annular space between that and an outer lining tube, brings up with it the debris; holes have been thus put down at a rate of from 60 to 100 feet a day.

The hand tools used by the miner in breaking ground have undergone but slight change in form; but a decided advantage has been gained by the substitution of steel for iron, more especially in the case of drills, which are now commonly made from solid octagonal steel bars in place of iron bars with steel bits. Accidents having arisen from the use of iron for prickers and stemmers, this material was forbidden by the mines acts, 1872, and gun-metal or copper has been very generally substituted. But these metals are both capable of giving off sparks, and the new alloy proposed by Mr. Lawrence, though apparently safe, is not strong enough. For the first tamping, a hard wood "stemmer" is efficient and quite safe, and safety-fuse ought to displace the "pricker," while the use of suitable cartridges would materially lessen the danger of premature explosions from loose grains of powder being scattered in the holes.

The great expenditure of time and labor involved in the drilling of holes for blasting, particularly in hard ground, has led to the invention of numerous rock-drills to be driven by steam or compressed air. Among the earliest successful ones of these were the Ferroux and Dubois and François, which, with the McKean, are in especial favor on the continent, where they have contributed greatly to the success of Mont Cenis, St. Gothard, Aarlberg, and other important tunnels. In America and Eng-

* President's Annual Address to Liverpool Engineering Society.

land, we have a considerable number of machines, any of which are capable of and are daily giving most satisfactory results wherever due attention is paid to systematic and orderly arrangements in their use. All these are upon the percussive principle, the drill being attached to the rod of a piston, by the direct reciprocating action of which it is impelled against the face of the rock, the feed being either by hand or automatic. In Brandt's machine, which is held in high esteem in Prussia, the drill is a hollow cylindrical steel bar, on the end of which are formed five teeth: this is forced against the face of the rock by an hydraulic press, and is rotated by a pair of small hydraulic engines, and cuts a cylindrical hole, the core of which is cleared away by the continuous stream of water escaping from the driving-cylinders. The results of a series of trials, extending over ten or eleven months at Zankerode, to determine the relative advantages of hand, percussive pneumatic power, and rotary hydraulic power drilling, show that, calling hand-drilling unity, the efficiency as to speed of Schram's percussive drill driven by compressed air was 4.73, and of Brandt's rotary drill driven by hydraulic power, 5.26; and in cost per meter, again taking hand-drilling as the unit, the cost by Schram's drill was from .62 to .70 and by Brandt's .60. A rotary drill, invented by Mr. Walker, is used in Cleveland, the drill being a bar of twisted steel, rotated by a pair of cylinders driven by compressed air.

When neither air nor water-power is available, hand-drilling machines are sometimes useful. The best known are those of Macdermot and Baird, both comprising a twisted steel bit, to which a rotary motion is imparted. The advantages of these machines are not so strikingly apparent as to have induced their very extended adoption.

Mention may here be made of the tunneling machines of Mr. Brunton and Colonel Beaumont, in which the whole face of a heading some 7 feet diameter is ground away at one operation by a series of cutters carried upon a rotating boring-head. During this session, our members have had the opportunity of seeing the Brunton machine tried practically at a quarry at Bootle; and the Beaumont machine is doing excellent work in the heading of the Mersey Tunnel.

The use of explosives of great power is a quite modern innovation. Sombbrero, of Turin, in 1847, discovered nitroglycerine or glonion, a heavy, yellowish oil, with from five to ten times the explosive force of ordinary gunpowder; but its extremely dangerous character prevented its extensive adoption. In 1864, Nobel introduced dynamite, which consists of diatomaceous earth (kieselguhr), saturated with about three times its weight of trinitroglycerine. Thus prepared, we have a powerful blasting agent, which, with ordinary care, is safe to handle, and great advantages have been gained by its adoption, especially in hard ground, in the lessening of the number and size of the drill-holes requisite. Mr. Nobel has since invented blasting gelatine, which is prepared by dissolving collodion cotton in nitroglycerine, and is a jelly-like, almost transparent substance, containing 90 per cent trinitroglycerine. Weight for weight, this is about 25 per cent, and bulk for bulk, about 40 per cent more powerful than dynamite, and it has already come into considerable use in America; its greater insensibility to shocks and absence of dust after explosion, with its greatly increased strength, compensating for the extra cost, which is about double that of dynamite. Other strong explosives in common use are tonite, or compressed gun-cotton, and the E. S. M. powder.

The fullest benefit of these modern explosives can only be obtained by the use of strong detonators fired by electricity, by which we are enabled to plant a number of shots in such a manner that, when fired simultaneously, they shall mutually assist each other, the whole area of level or shaft, to the depth of the drill-holes, being usually broken out at two discharges. At Prizbram, some experiments carried out with great exactness showed a saving over black powder of 23 per cent in cost and 33 per cent in time, when dynamite exploded by electricity was used; while with safety-fuse and caps, the saving was 9 per cent in cost and 15 per cent in time. The frictional electric machine of Bornhardt and the magneto-electric exploder of Siemens are both effective and in considerable use, the latter being, perhaps, less liable to derangement by damp or neglect. For coal-getting, these explosives are too quick, and blasting-powder continues to be used, the compressed cartridges, manufactured by Hall, being very handy and convenient.

COAL-GAS AS A LABOR-SAVING AGENT.

Gas is now used as fuel in a great many trades where small objects are to be heated, and where the heat is required to be used intermittently, or under such conditions that it is under perfect control, and can be increased or diminished at will. Yet although the applications of gas are exceedingly numerous, they are often made upon entirely mistaken principles, and the result is, that very poor results are attained and great expense incurred. For gas is undoubtedly a dearer fuel than coal, unless it be so employed that its useful effect is confined solely to heating the objects under treatment, and be not wasted in raising the temperature of large volumes of air or masses of brick-work. It is impossible to obtain an intense heat with solid fuel except a large quantity of it be used, while with gas an extremely high temperature may be concentrated on a small spot, and thus the high-priced material is very often the more economical of the two. The principles governing the use of gas as fuel in mechanical trades lately formed the subject of a paper read by Mr. Thomas Fletcher, F.C.S., of Warrington, before the Society of Arts. In this, he pointed out that a burner may be perfect for one purpose, yet exceedingly wasteful for another, and thus an error in judgment in its application may lead to its total condemnation. An excess of chimney draught, in cases where a flue is necessary, may pull in sufficient cold air to almost neutralize the whole power of the burner. With solid fuel, an excess of draught causes more fuel to be burnt, but with gas the fuel is adjusted and limited; there is no margin or store of fuel ready to combine with the extra air, which therefore lowers the amount of work done by its cooling powers. The power of a burner for any specified purpose depends principally upon the difference in the temperature of the flame and the object to be heated. For instance, it is not possible to obtain a bright red heat economically with any burner working without an artificial blast of air. If high temperatures are required, an artificial blast of air is necessary; the heavier the pressure of air, the greater the economy. For the very highest temperatures, as large a quantity of gas as possible must be burned in as small a place as possible,

with the maximum speed, and, given a suitable air supply, this is easily attained, as an explosive mixture may be blown through gauze into a fire-clay chamber, closed except so far as is necessary to allow the escape of burnt gases. The speed of combustion is limited only by the speed of the supply of air and gas, and by increasing these, there is no practical limit to the heat which can be obtained. With a modification of the well-known injector furnace, Mr. Fletcher has, in actual work, obtained the fusing heat of cast-iron in two minutes from starting, and has fused every furnace casing he has been able to produce.

On the other hand, low temperatures and diffused heat are obtained best by flames without any artificial air supply. For such purposes as cooking, japanning, and core-drying, the best results are obtained by a number of separate flames at the lowest part of the inclosed space, and the use of either illuminating or blue flames is a matter of little importance, the former having the advantage, however, of radiating better, and thus making the average temperature of the inclosed space more equal. For the heating of liquids, the greatest economy is to be obtained from one single flame of as high a temperature as can be conveniently obtained, and the flame must be in actual contact with the vessel to be heated. In burners of the type of Fletcher's solid flame burner, which is largely used for boiling purposes, gas and air are supplied separately to a mixing-tube, whose diameter is from four and a half to six times its length. The diameter rules the quantity of gas which can be satisfactorily burnt. With large flames, the diameter of the mixing-tube should not be less than ten times as great as the nozzle: as the flame is solid, and will burn without any external air supply, it is necessary that the proportion of gas and air should be very correctly adjusted, and the gas outlet regulated to the pressure under which it has to work.

Another very useful form of burner which has the advantage of not requiring the use of wire gauze, is the slit burner. It is composed of a number of pipes laid side by side and cut across with transverse slits on their upper surfaces. These slits are about an inch apart, and the flames rise from them like tongues of fire. The whole arrangement resembles a number of fire-bars, and with a pressure of one inch of water will, at its maximum power, consume about 100 cubic feet of gas per hour per square foot of surface. By applying a blast of air at the ordinary gas-jet, and supplying the gas by a separate pipe or a series of pipes, below the open end of a burner, this can be converted into a furnace of extraordinary power. It is quite possible to burn as much as 2000 cubic feet of gas per hour per square foot, producing a heat sufficient to fuse any ordinary crucible. It will then burn equally well any side up, and the flames can be directed on to the work. In one form or another, it is almost a universal burner, as it can be readily adapted to almost any purpose, from tempering a row of needles to making steam for a 200 horse-power steam-engine.

For heating large plates of metal equally, for drying paper impressions for stereotypers, hot-pressing hosiery, crumple-baking, working up plastic masses, which can only be manipulated hot, a number of separate flames equally diffused under the whole surface are necessary to equalize the heat unless the plate be very thick. In hosiery presses, printers' arming-presses, and many others, the top plate also requires to be heated, and the best way to do this is by a number of blow-pipe flames directed downward. For heating book-finishers' tools, a ring flame is the simplest, the tools being supported a little distance above the flame. For type-founding machines, bullet-molding, stereotype metal melting, solder making, lead melting, etc., one flame should be used of a suitable power for the work, and this should be as perfect and of as high a temperature as possible to secure economy. It is now a simple matter, owing to Mr. Fletcher's recent researches in the theory of heating burners, to obtain flames of any power without practical limit, which, without any artificial air supply, will do all that is necessary in this class of work.

To heat blanks for stamping, to harden the toes of spinning spindles, and generally to heat articles where a small mass is to be heated to a very high temperature, a long, narrow flame is required driven by a blast of air. The same arrangement can be used for tempering wire and crinoline steel, and for brazing long lengths of tools, its form being suitably modified for the purpose in view. When a red heat is needed for slow, continuous processes on a small scale, such as case-hardening small steel goods, annealing, and heating light steel articles for hardening, a high-power burner of simple construction may be used, as it is capable of heating a crucible equal to its own diameter to bright redness without the assistance of a chimney.

There is one application of gas as a fuel, which was discovered by Mr. Fletcher two years ago, but is not yet generally known. This is the addition of a very small quantity of coal-gas or light petroleum vapors to the air supplied by a blower or chimney draught to furnaces burning coke or charcoal. The instant and great rise in temperature in the furnace, and the great stability of the solid fuel used, are extraordinary. This is, in fact, a practical application of the well-known flameless combustion, the only sign that the gas is burning being the great rise in temperature, and a decreased consumption of solid fuel; indeed, solid fuel is not necessary, and may be replaced by red-hot lumps of fire-brick.

SPECIFICATIONS FOR STEEL RIVETS.—The following are the latest instructions issued by the British Admiralty for testing steel rivets. The rivets are to be made from steel bars, having an ultimate tensile strength of not less than 58,000 pounds per square inch of section nor more than 67,000 pounds, with a minimum elongation of not less than 20 per cent in a length of 8 inches. A portion of one bar in every fifty is to be taken for testing before being made into rivets. Pieces cut from every bar, heated uniformly to a low cherry-red, and cooled in water at 82 degrees Fahr., must stand bending in a press to a curve of which the inner radius is equal to the radius of the bar tested. Rivets are to be properly heated in making, and the finished rivets allowed to cool gradually. The rivets are to stand the following forge tests: (1.) The shank to be bent double cold, without fracture, to a radius equal to the radius of the shank. (2.) Bent double hot, without breaking, to as small a radius as possible. (3.) Flattening of the rivet-head while hot, without cracking at the edges—the head to be flattened until its diameter is $2\frac{1}{2}$ times the diameter of the rivet shank. (4.) The shank of the rivet to be nicked on one side, and bent over, to show the quality of the material. One rivet in every hundred to be forge-tested as a sample.

FACTORY CHIMNEYS.

At the meeting of the American Society of Civil Engineers, March 5th, the secretary read a paper by Hiram F. Mills, C.E., describing the construction of the Pacific Mills chimney at Lawrence, Mass. This chimney was built by Mr. Mills in 1873, and consists of an outside octagonal shell 222 feet high above the ground, with a distinct interior core 8 feet 6 inches in diameter inside extending one foot above the top of the outer shell and eleven feet below the ground. The chimney is founded 19 feet below the ground, upon coarse sand, the foundation being 35 feet square, inclosed by pine sheet piling. The base is concrete, one foot thick, then rubble masonry of large pieces of granite in cement, this stone-work being 7 feet high. Upon the stone-work, is placed the brick chimney, the outer shaft being at the base 20 feet wide, and at the top under the projecting cornice 11 feet 6 inches wide. This brick-work is 28 inches in thickness at the base; at 12 feet in height, it becomes 24 inches, which continues 18 feet; then 20 inches for 20 feet; then 16 inches for 40 feet; then 12 inches for 60 feet; then 8 inches to the top. The inside core is 2 feet thick to a height of 27 feet, and one foot thick for the remaining height of 154 feet. The top of the chimney is of cast-iron plates three quarters of an inch thick. The horizontal flue entering the chimney is 7 feet 6 inches square. The vertical flue of the chimney is a cylinder 8 feet 6 inches in inside diameter, and 234 feet high, with walls 20 inches thick for 20 feet, 16 inches thick for 17 feet, 12 inches thick for 52 feet, and 8 inches thick for 145 feet. The foundations were laid in mortar of Rosendale cement and sand; the outer shell in mortar of Rosendale cement, lime, and sand; and the flue walls in mortar of lime and sand.

During the winter of 1873, the flue being 90 feet above the ground, boilers having 452 square feet of grate surface were connected with the chimney with satisfactory results. Between June and September, 1874, the chimney was finished. The approximate weight of the chimney is 2250 long tons, the number of bricks being about 550,000. The chimney is opposite the middle of a line of 28 boilers and 210 feet distant from them. It was designed to serve for boilers having 700 square feet of grate surface, burning about 13 tons of anthracite coal per square foot of grate surface an hour.

The chimney was struck by lightning in June, 1880, after which date a lightning-rod was put up, which consists of a seamless copper tube $\frac{1}{8}$ th of an inch thick, one inch inside diameter, at the top of which are 7 points radiating from a ball 4 inches in diameter, the top of the central point being $8\frac{1}{2}$ feet above the iron cap. The rod is attached to the chimney by brass castings, and is connected at the bottom with a 4-inch iron pipe extending 60 feet to a canal.

A description was then read of the chimney of the Merrimack Manufacturing Company at Lowell, Mass., built under the direction of J. T. Baker, C.E., in 1882. This chimney is founded on a ledge of sandstone. The foundation, 30 feet in diameter, is built of granite blocks laid as they come from the quarry. At the surface of the ground, there is a dressed granite base 2 feet 6 inches in height, laid in clear Portland cement, the remainder of the foundation being in Rosendale cement and sand. Upon this base is placed the brick-work, consisting of three cylinders, the outside one 28 feet in diameter, 24 inches thick; the middle one, 18 feet in diameter, 8 inches thick; the core, 12 feet inside diameter, and 16 inches thick. The middle cylinder is carried up vertically 75 feet 6 inches; the outside ring has a batter of $\frac{1}{100}$ th of an inch per foot to a height of 100 feet. At the height of 75 $\frac{1}{2}$ feet, the middle ring connects with the exterior ring, making the masonry at that point 36 $\frac{1}{2}$ inches thick; it is then 20 inches thick for an additional height of 60 feet; 16 inches thick for 70 feet; and 12 inches thick thence to the enlargement for the chimney-head. The core is uniformly 12 feet inside diameter to the top; the first 100 feet being 16 inches thick; then 12 inches thick for 60 feet; then 8 inches thick for 90 feet; and then 4 inches thick for 29 $\frac{1}{2}$ feet to the top. It is entirely separate from the outside masonry, except about the door-ways and openings for the flues. The core was laid in mortar of lime and sand; the outside shell in lime, cement, and sand. On one side of the chimney, is a ladder of iron extending from the ground to the top, and on the opposite side is a $\frac{1}{2}$ -inch galvanized iron wire rope, both ladder and rope being connected with a copper ring having four spurs the central point of which extends 8 feet above the top of the chimney. The bottom of both ladder and rope is connected with a 16-inch water-pipe. Two wrought-iron flues enter the chimney, one 5 feet by 6 feet; the other, 5 feet by 11 feet. The chimney is constructed to provide for 15 sets of boilers, only 12 now being in use. Each set has 103 $\frac{1}{2}$ square feet of grate surface, and is rated at 300 horse-power. The weight of the chimney is 3392 tons; 1,101,000 bricks were used, 6875 cubic feet of stone masonry. The cap weighs 18,600 pounds. The cost of the chimney was \$18,500.

A description was then given by Dr. Charles E. Emery, M. Amer. Soc. C.E., of the construction of the chimney built under his direction, of the Greenwich street boiler-house of the New York Steam Heating Company. This chimney was a creature of circumstances, it being necessary to place within a very limited area very large boiler capacity, namely, 16,000 horse-power. This was done by making four stories of boilers. The chimney was therefore necessarily located with reference to these boilers, and the plan of the chimney was determined by the shape of the lot. The beach of the Hudson River was at some time at this locality, and the foundation of the chimney was placed in fine clear beach sand with some pockets of coarser sand and a little stone. The foundation is one foot below high water. The chimney is 27 feet 10 inches in the clear inside, and 8 feet 4 inches wide. The height is 220 feet above high water, 221 feet above the foundation, 217 feet above the basement floor, 201 feet above the grates of the lower tier of boilers, and 141 feet above the grates of the upper tier of boilers. The thickness of the walls on the interior of the building runs from 5 feet to 20 inches, and on the other sides from 3 feet to 20 inches. The gases for each chimney are taken from 32 boilers of 250 horse-power each. About 1000 tons of coal will be burned daily. It is expected that elevator arrangements will be perfected to receive this amount of coal each night. More trouble is experienced with the ashes than with the coal. Ordinary grate-bars have been used. Cleaning is done once every six hours. We have used a new bar that turns on hinges, and gives good results. We have not made many experiments with coal-dust. We have

to use a fuel which has some reserve power, to provide for possible contingencies. We find coal is worth about what is charged for it.

Mr. P. L. Griswold, M. Amer. Soc. C.E., described a chimney erected in Mexico for a cotton factory about 160 feet high, which had been in use for over twelve years, which was built of apparently sun-dried bricks, and which seemed to be now in excellent condition. This chimney was built by Indians, and seemed to be very symmetrical and well made. The bricks were about 10 by 3 by 7.

Mr. H. W. Brinckerhoff, M. Amer. Soc. C.E., described a chimney constructed of old rails, which was in successful use in Pennsylvania. It was generally known as a crinoline chimney.

Mr. William E. Worthen, M. Amer. Soc. C.E., referred to several chimneys built by him, and expressed a doubt as to the necessity of very great height in chimneys.

Mr. J. M. Knap, M. Amer. Soc. C.E., described chimneys constructed in Pittsburg, and which, though of very moderate height, had given excellent results.

The subject was further discussed by Messrs. Cooper, Croes, J. P. Davis, Hamilton Fteley, and Prindle.

THE CRUSHING STRENGTH OF ICE.—At a recent meeting of the Philadelphia Engineers' Club, President Ludlow described tests of the crushing strength of ice, which were made by him in order to learn approximately the strength required for an ice harbor of iron screw-piles, in mid-channel, at the head of Delaware Bay. Eighteen pieces were tried with government testing-machines at Frankford, Philadelphia, and at Fort Tompkins, Staten Island. The specimens were carefully prepared 6-inch and 12-inch cubes, and roughly cut slabs about 3 inches thick, of different qualities and from different localities. For pure Kennebec ice, the lowest strength obtained was 327 pounds, and the highest 1000 pounds, per square inch. For inferior qualities, the strengths varied from 235 to 917 pounds. The higher results were obtained, generally, when the air temperature in the testing-room was from 29 to 36 degrees Fahr., as against from 55 to 68 degrees Fahr. for the lower results. The pieces generally compressed from half an inch to 1 inch before crushing.

PHOSPHORESCENCE IN LIMESTONES.—At a meeting of the Academy of Natural Sciences, Philadelphia, Prof. H. C. Lewis exhibited a specimen of limestone from Utah that emitted a lurid red light when struck, scratched, or heated. The glow lasted from half a second, when lightly struck, to a much longer time, as the result of a blow. On examination, the specimen proved to be an almost perfectly pure carbonate of lime, with but a slight percentage of impurities. It is loose-grained, white, and crystalline, the grains being but slightly coherent, thus giving the rock the appearance of a soft sandstone. It crumbles easily between the fingers, forming a coarse sand. When heated in a glass tube over a flame, it glows with a deep red light, which lasts for a minute or more after withdrawing the flame. After two or three heatings, the phosphorescent property disappears. A search through the collection of the academy for limestones having similar properties resulted in finding specimens from Kaghberry, India, which glowed with a strong yellow phosphorescence when heated, although no such effect was produced by scratching or striking. It was of great interest to find that the Indian limestone alone, of all in the collection, had the precise external characters of that from Utah. This similarity is more than a coincidence. It confirms Becquerel's view that phosphorescence depends upon physical rather than chemical conditions. In the rocks referred to, it is probably dependent upon a disturbance of their loosely aggregated crystalline particles, whether such be produced by percussion, friction, heat, or decrepitation.

AMERICAN MINING MACHINERY FOR SOUTH AFRICA.—A short time ago, says the *Ironmonger*, we made allusion to the proposed development of the auriferous deposits of South Africa, and called attention to the statement that the machinery for one such enterprise was said to have been ordered from the United States. We are now in possession of more definite information on the latter point, and again refer to the subject in order to bring the matter more directly under the consideration of the manufacturers of similar machinery and appliances in this country. The whole of the hydraulic and quartz-mining machinery, etc., has been constructed at San Francisco, and is stated to be the most complete outfit ever sent out thence to any country, the value being over \$75,000, or about £15,000. The fittings include two miles of piping, monitors, deflectors, elevators, and a complete hydraulic outfit. The piping, it may be remarked, is of sheet-iron, and ranges from 15 inches to 6 feet in diameter. The sheets are sent out flat, and will be put together on arrival at the mines. The shovels, mattocks, axes, picks, and other tools are also sent from California. The quartz-mill is a 60-stamp one, each stamp weighing 900 pounds. The mortars are all made in sections, for convenience of transport, no single piece exceeding 500 pounds in weight. The mill includes automatic self-feeders for the batteries, improved sectional crushers, retorts with smelting-backs, traveling-crabs, and pulley-blocks, a water-wheel, etc. Besides the machinery, a number of experienced gold miners have been engaged in California for service in the Transvaal, so that, if gold really exists in paying quantities in the latter locality, it may soon be realized.

A TRIAL OF HARRIS-CORLISS ENGINES.—Mr. John W. Hill, a well-known mechanical engineer, has made a series of investigations for the National Rubber Company, at Bristol, R. I., to suggest improvements in its steam plant. The works have one Harris, 36 by 72, condensing, and two Harris non-condensing engines. Concerning the first, he reports that the average steam pressure in the pipe was 70.137 pounds, the average initial pressure being 68.795 pounds, the number of revolutions per minute 50.155, the piston speed 601.86. The actual cut-off in parts of stroke was 0.104, and the average indicated horse-power 392.862. The consumption of steam per indicated horse-power was 19.095, and the coal per indicated horse-power, per hour, based upon the main tubular boilers, 1.892. The percentage of the steam accounted for by the indicator was 74.048 per cent, and the quantity of steam per indicated horse-power, per hour, by the diagrams, 14.139. Mr. Hill says: "The economy of the engine is excellent, but scarcely up to the standard of Harris-Corliss engines. With an increase of load to about 600 horse-power, the writer is of the opinion that the consumption of steam per horse-power will be reduced about fourteen per cent."

"The writer's belief is that, with a load of 600 horse-power, pressure of 80 pounds in pipe at engine, and a vacuum of 26 inches in condenser, the economy will excel the best he has ever obtained from condensing single-cylinder engines, and he has placed the gain at fourteen per cent as a maximum to be expected."

Full details of the tests will be found in *Van Nostrand's Engineering Magazine* for February, 1884.

SUMMARY OF BOILER INSPECTORS' REPORTS FOR THE YEAR 1883.—The Hartford Steam-Boiler Inspection and Insurance Company gives a summary of the result of the work of the inspectors for the entire year, together with that of the year previous, for the purpose of ready comparison. For a year of such general depression of manufacturing interests as the past one has been, the result is extremely satisfactory :

	1883.	1882.
Visits of inspection made.....	29,324	25,742
Total number of boilers inspected.....	60,142	55,679
" " " internally.....	24,403	21,428
" " " tested by hydrostatic pressure.....	4,275	4,564
" " " defects reported.....	40,953	33,690
" " " dangerous defects reported.....	7,472	6,867
" " " boilers condemned.....	545	478

The following is the detailed analysis of defects reported during the year 1883 :

Nature of defects.	Whole number.	Dangerous.
Cases of deposit of sediment.....	4,424	506
" incrustation and scale.....	6,121	541
" internal grooving.....	204	78
" " corrosion.....	1,168	214
" external corrosion.....	2,267	476
Broken and loose braces and stays.....	518	227
Settings defective.....	1,595	197
Furnaces out of shape.....	1,232	184
Fractured plates.....	1,610	768
Burned plates.....	1,318	445
Blistered plates.....	3,240	394
Cases of defective riveting.....	4,638	824
Defective heads.....	424	148
Serious leakage around tube ends.....	4,889	818
Serious leakage at seams.....	2,642	410
Defective water-gauges.....	1,031	220
Defective blow-offs.....	371	87
Cases of deficiency of water.....	175	89
Safety-valves overloaded.....	407	176
Safety-valves defective in construction.....	367	163
Pressure-gauges defective.....	2,281	486
Boilers without pressure-gauges.....	31	21
Total.....	40,953	7,472

FURNACE, MILL, AND FACTORY.

By the fire at the foundry in South Brooklyn, Thursday evening, February 28th, the Lidgerwood Manufacturing Company lost only a small portion of the large amount of patterns belonging to it. The various newspapers in New York and vicinity reported the loss from \$50,000 to \$70,000, whereas the total loss did not exceed \$6000, the fire occurring in a room where, fortunately, very few patterns had been stored. The company lost no time in making new patterns, beginning the following day with a large force of pattern-makers ; and it has, at this writing, made such progress that it will very shortly have new patterns equal to those that were destroyed. By the wise system adopted by this company of always keeping on hand a number of castings of the various hoisting-engines manufactured by it, no delay has been occasioned in filling orders or in building engines for stock.

Mr. J. M. S. Egan, Manager of the Pay Rock mine, Clear Creek County, Colo., after examining the various systems of wire rope transportation, has decided upon the Huson wire rope tramway, manufactured by the Colorado Machinery Company, of Pueblo, to convey the ore from the mine to the mill. The tramway is to be 2100 feet long, and the contract stipulates that it shall be in operation by May 1st.

The Penn Iron-Works, the most extensive iron-works in Lancaster, Pa., resumed operations March 13th, the difficulties in regard to wages, which caused their suspension, having been amicably arranged.

The leading inventors of the country have issued a call for a mass convention, to take action to prevent pernicious legislation by Congress. It will be held at Cincinnati on March 25th and 27th. Responses from all parts of the United States and territories already received show that an attendance of 3000 may be expected. All inventors are eligible as delegates.

Shortly after seven o'clock on the morning of March 13th, gas in the furnace of the Edgar Thomson's steel-works, at Braddock, Pa., exploded, instantly killing William McCall and seriously injuring James Murray and Chris Toole. The concussion was terrific, rending the furnace asunder and scattering debris in all directions. The cause of the explosion is not known.

Falling Spring furnace, at Chambersburg, Pennsylvania, has lately resumed operations under the management of Col. George B. Westling, of Mont Alto, and is producing 17 tons of pig-iron daily. To make a ton of iron, 5614 pounds of ore are smelted, and the charcoal (which is of an inferior quality) consumed amounts to 135 bushels per ton of product. Colonel Westling thinks that with good coal the fuel consumption per ton could be reduced to 100 bushels, and the daily production increased to 20 tons.

The furnace of the Crozer Iron & Steel Company, at Roanoke, Va., is out of blast after a short run of a little over eight months. The lining gave way about 40 feet above the hearth, immediately above the iron notch, and the shell of the furnace became red-hot at that point. The manager, finding it impossible to prevent the overheating, blew out the furnace. New lining is already on the way, and it is expected to have every thing ready at the furnace again by April 10th.

After seven years of idleness, the larger furnace of the South Boston Iron-Works was lighted up March 1st, for casting a 12-inch rifled mortar for the United States Ordnance Department. This will be the first of a lot of five heavy experimental guns authorized by the last Congress.

Carrie Furnace, the new furnace at Rankin Station, on the Baltimore & Ohio Railroad, in Alleghany County, Pennsylvania, formerly known as Pittsburg Furnace, has been completed and blown in.

About thirty representatives of barbed-wire manufacturers in New York, Pennsylvania, Illinois, Iowa, and Missouri have held a meeting at St. Louis, Mo., and had a long consultation regarding their interests. The meeting was secret, but it is learned that it was decided to advance the price of barbed wire half a cent per pound.

The locomotive-works at Schenectady, New York, were started up March 11th. They have been closed since January 1st.

The rolling-mills of the Joliet Iron and Steel Company at Joliet, Ill., will start up one turn March 17th.

The Tremont Nail Company at Wareham, Massachusetts, has started its works, employing some new hands. It is said that the Wareham Nail Company

will start up within a few days. The Parkham nail hands are still out, and there is little prospect of their going in under the reduction.

The accounts of Henry Stanton, assignee of the Manchester Iron and Steel Company, were confirmed at Pittsburg, March 12th, by Judge Collier, and E. W. Smith was appointed auditor to distribute the money in the hands of the assignee. Over \$100,000 are involved.

A company has been formed among a number of practical men of New Castle, Beaver Falls, and Pittsburg for the purpose of erecting a steel mill at Wampum, that town having raised about \$3000 to secure the works. The company intends to manufacture a fine quality of steel for tool purposes, and will employ about 150 hands.

The Hazard Wire-Rope Works, at Wilkes-Barre, are making a wire cable 43,000 feet long, for a street railroad in Kansas City.

The Thomas Iron Company, Hokendauqua, Lehigh County, Pa., is making preparations to blow in one of its stacks, which has been idle for about six months. A stack of the Lucy Furnace, at Glendon, Northampton County, which has not been in operation for two years, is also in process of repair preparatory to blowing in.

LABOR AND WAGES.

The Coal Miners' District Convention, held at Pittsburg, March 11th, has decided to order an assessment of 15 cents for every 100 bushels of coal mined. A resolution was adopted ordering out the men now working at the reduction, and promising to pay them \$3 per day while the strike lasts, and also to furnish them with provisions.

The employes of Singer, Nimick & Co.'s steel mills, at Pittsburg, have decided to strike if the firm insists on reducing their wages.

The railroad coal miners at Shaner's station and the Youghiogheny Slope mines have resumed work at a reduction of half a cent per bushel, and have signed a contract to continue at the same rate for a year.

Information from Shawnee, Straitsville, Corning, Nelsonville, and other points shows that the strike in the coal-mining region of the Hocking Valley has been made general, and will continue. The last man went out March 11th.

The Amalgamated Association of Iron and Steel-Workers, at the Pittsburg District Scale Convention, held March 8th, resolved to ask that the scale now in force be continued next year. Delegates to the National Convention were also elected. At the Youngstown Convention, after delegates had been elected, a resolution was adopted condemning the Morrison tariff bill.

Reports from Troy state that the stove foundries have not yet started after the winter stoppage. The manufacturers demand 20 per cent reduction in wages; the molders concede only 10. At one foundry, the men agreed to go to work at the terms offered by the proprietor, which the men say, amount to a 14 per cent reduction; but the union refused to sanction it, and the agreement was broken March 7th. Many molders are restive under the union yoke, being out of work and money. The union has spent about \$12,000 fighting the proprietors of the Malleable Iron-Works, and now has only about \$1200 in the treasury. Donations from other unions are the only encouragement left.

RAILROAD NEWS.

The Cumberland Coal and Iron Company has secured the contract for supplying the Grand Trunk Railroad Company of Canada with 50,000 tons of Lower Ports coal, and Messrs. H. Dobell & Co., of Montreal, Canada, have received from the above railroad company a contract for the supply of 20,000 tons—terms private.

The House Committee on Pacific Railroads at Washington, March 10th, agreed to report favorably a bill incorporating the Spokane Falls & Coeur d'Alene Railroad Company. It authorizes the building of a railroad and telegraph line from Spokane Falls, Washington Territory, by way of Fort Coeur d'Alene, to an intersection with the Northern Pacific or Utah Northern Railroad in Western Montana, and also the operation of a steamboat line on certain rivers and lakes near there.

The final spike in the Mexican Central Railroad was driven, March 8th, on a broad plain six miles from Fresno, in the presence of a distinguished assemblage. There is now an unbroken railroad from Mexico City to the Rio Grande. The two locomotives, one from Mexico City and the other from the United States, decorated with the Mexican and American colors, approached until the cow-catchers met.

Presidents Lovejoy, of the Denver, and Dillon, of the Union Pacific, are understood to have reached a satisfactory conclusion on Colorado traffic. The Union Pacific's use of the Denver road into Leadville has been extended to July 1st. Mr. Lovejoy has also made an exhaustive reply to the circular of President Palmer, of the Colorado Coal and Iron Company. The gist of it is, that the Denver Company has in no way violated its contract with the Colorado Coal and Iron Company.

A dispatch says: The Baltimore & Ohio Railroad Company within the past three weeks has placed 500,000 tons of Cumberland coal in Philadelphia, New York, and the New England States. This coal was sold at an average of 50 cents per ton lower than was asked for the Clearfield coals. The negotiations were conducted with secrecy and did not reach the ears of the Pennsylvania Railroad Company until the amount of coal above named had been disposed of, and then an agreement was reached between the two companies that the freights should be reduced 30 cents per ton lower than the ruling price last year. The reduction has been made too late, however, to benefit the Clearfield shippers, as the Cumberland coals have already taken up the spring orders, the consumers eagerly grasping at the reduced rate offered by the shippers of the latter coal. The anthracite shippers also state that they will be injuriously affected by the action of the Baltimore & Ohio Railroad Company and the Cumberland operators in putting soft coal into the market so cheaply. They instance the fact that the Pacific Mills at Salem, Mass., which use 60,000 tons of anthracite coal per year, have contracted for 75,000 tons of Cumberland coal this year.

COAL TRADE NOTES.

ALABAMA.

From Birmingham, comes the report that arrangements have been perfected to consolidate the Pratt Coal and Iron Company, the Alice Furnace Company, and the Linn Iron Company, all in or near Birmingham, into one organization, with three million dollars capital. The property of the new company will be the most extensive coal and iron property in the United States, and will have about a hundred thousand acres of coal and iron lands, five hundred coke-ovens, two blast-furnaces with a daily capacity of a hundred and fifty tons. The Pratt Company is already mining from 2500 to 3000 tons of coal daily. The new company intends to build several new furnaces as soon as possible.

CANADA.

PROVINCE OF NOVA SCOTIA.

The annual meeting of shareholders of the Intercolonial Coal Mining Company took place at the company's office at Montreal, March 6th. Statements of last year's business were submitted and approved. The quantity of coal marketed during 1883 was 159,557 tons. The following gentlemen were re-elected directors of the company for the ensuing year: Messrs. Gilbert Scott, H. A. Budden, D. L. MacDougall, Peter Redpath, Angus C. Hooper, James P. Cleghorn, Robert

Anderson, Alexander Gunn, and Henry J. Tiffin. At a subsequent meeting of the Board, Messrs. Gilbert Scott and Henry A. Buddon were re-elected president and vice-president respectively, and Mr. W. J. Nelson reappointed secretary of the company.

PROVINCE OF QUEBEC.

The trade reports of the *Montreal Gazette* state that the demand for hard coal during the past few days has been unusually brisk, the colder weather having stimulated it into renewed activity. Stocks have been greatly reduced, and although some dealers state that they are amply sufficient to last until the opening of navigation, others appear dubious on that point. Prices are very firm, but it is hoped they will not go higher. There have been some heavy transactions in steam coal for spring delivery, the Grand Trunk Railroad Company being the chief purchaser.

The Grand Trunk Railroad having advertised for tenders for its yearly supply of locomotive coal, to the extent of 416,000 tons, a large number of coal men and representatives of American coal firms and railroads have been at Montreal for the purpose of filing their tenders, the time for which closed March 5th. No decision has so far been made. The coal offered was all of the soft variety, and mined in Ohio and Pennsylvania.

MARYLAND.

The New Hope mine of the Consolidation Company, near Frostburg, which has been idle for nearly two years, has resumed operations with a force of thirty-five men. This force will be increased shortly. The Alleghany mine of the same company has also resumed work on a larger scale than heretofore.

There is considerable stir in the neighborhood of Hancock over coal developments in Sideling Hill Mountain, six miles west of that place. Parties are engaged in the effort to develop a workable vein. Capitalists are leasing lands along the mountain for mining purposes.

MISSOURI.

The output of coal at the Rich Hill Coal Company's mines during the month of February was over 2000 cars. All the shafts are running, but there will probably soon be a shutting down of the full capacity, and preparations will be made during the summer for an increased output during the fall and winter.

PENNSYLVANIA.

ANTHRACITE.

A company of Philadelphia capitalists secured a charter about a year ago to mine coal on the lands above the Locust Mountain. The company was chartered under the name of the Jonathan Beasley Coal Company, and had a nominal capital of \$200,000. This company started work lately on the site of the old Robinson colliery, and is engaged in sinking a double-tracked slope. All former ventures in this direction were unsuccessful.

The annual meeting of the Mill Creek Coal Company, whose colliery is located on Broad Mountain, near Delano, was recently held at Oak Hall. T. F. Walter was re-elected president, whose report showed that, during the year 1883, the company had shipped over 135,439 tons of coal and made several improvements at the mines, among which were the building of a new breaker and the sinking of a new slope on the Buck Mountain vein. The following gentlemen were elected as the board of directors: Warren Delano, of New York; James S. Cox, of Orange, N. J.; Joseph F. Hitch, of Brooklyn, N. Y.; and Frederick Bertolette and T. F. Walter, of Mauch Chunk.

The Susquehanna Coal Company has begun to open a new colliery, the Newport. The sinking of a shaft has begun, and the driving of a tunnel to get out coal above water-level.

A stock company has been formed for the purpose of digging for coal on the farms of David Kunkle and John Leopold, near Kempton, on the Berks & Lehigh Railroad, which the members have leased. Coal was found there about two years ago. The quality of the coal taken from the shaft, although not equal to that mined in Carbon or Schuylkill counties, was good, and the quantity large. Tradition has it that long ago the few people in that region of Lehigh County felt convinced of the existence of coal on the farms named. The story was in substance that a party of Indians called upon a blacksmith who resided in Lynn, not far from Kempton, to have a gun repaired, and that on being informed that it could not be done for want of coal, they departed, and after an absence of less than an hour returned with a supply more than sufficient for the emergency, but where they secured it always remained a profound mystery.

A case of unusual interest was decided in the court at Wilkes-Barre, March 10th. Arnold Bertois *et al.* brought suit against the Franklin Coal Company to recover valuable coal lands in Hanover township. The lands in question were seized by the county commissioners in 1866 for unpaid taxes, and after being held for five years, as the law requires, were sold at a tax sale to the plaintiffs. The defendant claimed that the taxes were paid and that the plaintiffs were not entitled to the lands. After a trial of four days, the jury returned a verdict for Bertois *et al.*

BITUMINOUS.

The works at Du Bois are rather dull. Hildrup mine, operated by Sandy Lick Gas, Coal, and Coke Company, has not worked more than six days the past month. During the strike last fall, it lost a large contract that should have kept it running steadily all winter; but as this month is the time for taking new contracts, it is in hopes of bettering its condition soon. It employs forty-five men at present, and forty cents per ton for run of mine is paid for mining. Rochester mine, employing nearly 400 men, has been doing better.

The works at Farmout have been doing pretty well the past month, but will probably be idle most of this week, owing to the fact that they are at work day and night tearing up the old and laying new track into their mine for the purpose of running an engine into it. There are about 350 men employed here, and the price of mining is sixty cents a ton over an inch and a quarter screen. It is said that this company will make a new opening just over the Redbank this summer.

Long Run mine, at New Bethlehem, employing about 200 men, has been doing very well the past month. The prospect for this month is good. The price of mining here is sixty cents a ton, over an inch and a quarter screen. This same company is building a narrow-gauge road two and a half miles to another opening, where it expects to begin operations about the 1st of May, with about 150 men. The Bostonia mine just over the Redbank has not been doing anything lately, but is in hopes that orders may soon come in.

The Oak Ridge Coal Company's mines, at Dexter, have been working during the past month; but here, as in almost all other mines in the district, the works are crowded, and in consequence the men can not make so much; but as there is a prospect of several new mines opening up this spring, it is quite likely that in the summer run they will all have about as much as they want to do. The mine employs about 100 men. The price of mining is sixty cents a ton over an inch and a quarter screen.

COKE.

Though the coke business is at last in a position for substantial improvement, says the *Connellsville Courier*, there has as yet been no change, from the fact that the preliminaries introductory to the working of the pool have not yet been arranged, nor will they be for a month hence. The output has gone down somewhat, the idle ovens this week numbering 977, against 780 two weeks ago, besides which many of the smaller operators are only running part full. Some of them are only keeping their ovens warm and not shipping any coke at all, waiting for the completion of the pooling arrangement to begin shipments to the syndicate. These arrangements are expected to be completed by the first of April. Meantime, trade is decidedly dull. Eastern shipments have fallen off

largely within the past week; Western shipments also receding, the furnaces overstocked with coke. This falling off in demand has not yet seriously affected the volume of shipments, the output still holding up to 700 cars daily; but from this week on, it will dwindle considerably until trade brightens. McClure & Co., of the syndicate, are only running half full at all their works, pending the consummation of the pooling scheme. Labor and cars are plenty. Prices remain stationary at \$1 per ton.

The Pennsville works have again been sold by the sheriff, and again they have been bid in by Abraham O. Sherrick, the original owner. The nominal bid was \$15,050; but as the works are subject to a \$54,000 mortgage held by Sherrick himself, and to other liens to the amount of \$13,000, they will cost the purchaser \$67,000, which is perhaps a fair price. A O. Tinstman, the late owner, says he will have the sale set aside, but on what ground is not known or even conjectured.

The Youngstown Coke Company has appealed from the decision of Mine Inspector Stinner, that it must use safety-lamps in its mine located at Stambaugh, Fayette Co., and the court has appointed Elijah Parker, Patrick Locke, and Crawford Stillwagon a committee to examine the mine and make report to the court. To this report, either party may except; then the decision of the court will be final.

Application was made at the State Department at Harrisburg, March 10th, for a charter for the New York & Pennsylvania Coal, Iron, and Coke Company. The capital stock is \$5,000,000. The company proposes to conduct business in Somerset and Cambria counties. Among the directors are Samuel Bonnell, of Elizabeth, N. J., and John C. Short and Francis A. White, of New York.

A charter was granted to the Hempfield Coal Company, of Westmoreland County, with a capital of \$250,000. The stockholders are Richard Coulter, George F. Huff, William A. Huff, J. A. Coulter, and Alfred W. Jones, all of Greensburg.

VIRGINIA.

A terrific explosion, which caused the loss of a hundred and fifty lives, occurred at the coal mines of the Southwest Virginia Improvement Company at Pocahontas, Tazewell County, shortly after midnight, March 13th. Press dispatches state that it is impossible to get a detailed account of the explosion in the Pocahontas mines, as every thing there is in the utmost confusion. The latest telegram received says that the whole of the east mine was shattered by the explosion, and every thing in front of the main entrance was demolished. Both of the mine engines are safe, but most of the mine cars were completely wrecked. Fire can now be seen at the mouth of the mine, and no one can enter. The fan-house and fan are a total wreck. As soon as they can be repaired, attempts will be made to go into the mines.

GENERAL MINING NEWS.

ARIZONA.

PINA COUNTY.

It is reported that nine claims just south of the Bonanza firm's property have been sold for a large sum, and that the purchasers will incorporate this property and place it on the San Francisco market.

Dr. J. C. Handy and D. A. Sanford have announced that they will erect a copper smelter at their own expense at Tucson.

YAVAPAI COUNTY.

The owners of the copper mines in the Eureka District state that within a very short time large and regular shipments of high-grade ore, going from 50 to 60 per cent in copper and carrying silver, will be made to Pope, Cole & Co., of Baltimore, for reduction.

CALIFORNIA.

MONO COUNTY.

MONO LAKE HYDRAULIC.—Suit has been commenced in the Superior Court of San Francisco by this company against D. E. Jones, A. Packard, J. D. Wilson, and John Elbert, to set aside a certain note and mortgage. Complainants allege that on November 13th, 1882, Wilson and Elbert were president and secretary, respectively, of the company. Jones and Packard were stockholders. On the same day, defendants executed a note for \$45,241.60 in their own favor, secured by a mortgage on the entire property of the mine. Suit is therefore begun to set aside the note and the mortgage.

BODIE DISTRICT.

BODIE CONSOLIDATED.—The company has leased the mill of the Bodie Tunnel Company. Work has already begun at the mill in getting an ore chute from the road to the mill. The mine continues to look well. The winze on the Vulcan vein continues in rich ore.

BODIE TUNNEL.—The company will employ a force of men in the mine prospecting until the lease of the mill expires.

GOODSHAW.—The mine has started up with a number of men on the 600-level, where prospecting-work will be continued.

STANDARD CONSOLIDATED.—It is said that a telegram was received March 13th, by Vice President Cook, of this city, which reads: *Our mine is not looking well, and the ore has very materially diminished in quality. The last thirty days we have been doing the best we can, but the results are not entirely satisfactory. No more bullion has yet been received; probably the final shipment will come to-morrow; will notify you immediately.*—There were extracted and shipped to the mills during the week ended March 4th, 1457 tons of ore; 857 ounces of crude bullion were received, and \$10,929.57 shipped to the company.

HOMER MINING DISTRICT.

C. A. Gregory has brought suit in equity against G. W. Butterfield, in the United States Circuit Court at San Francisco, to obtain a decree that twelve mines in this district, in which are included some of the most valuable mines of the district, are held in trust for the plaintiff, he having entered into an agreement in Chicago, in May, 1883, by which agreement he was to have an interest in said mines.

SAN BERNARDINO COUNTY.

BONANZA KING CONSOLIDATED.—The affairs of this company are attracting considerable attention. The stock has recently been listed at the Mining Exchange in this city, and dividends have been paid regularly for some months past. The official reports from the mine state that the main shaft and development-work throughout are pushed forward with full force. The ore stops are all in good condition. Five bars of bullion, valued at \$8777.28, have just been shipped, and by the next opportunity a further lot will follow to close the month's product.

CANADA.

PROVINCE OF MANITOBA.

The Rabbit Mountain silver mine, 25 miles from Prince Arthur, has been sold to a party of capitalists for \$200,000, and it is stated that the mine will be equipped with first-class machinery and mining appliances and worked on a large scale.

COLORADO.

BOULDER COUNTY.

CARIBOU.—It is stated that this mine has been sold for \$150,000.

CLEAR CREEK COUNTY.

GREAT WESTERN.—This lode is developing by a shaft that is down sixty feet. The crevice is five feet wide, and carries a ten-inch streak of decomposed mineral, principally copper, lead, and iron. The lode is in the vicinity of the Mattie, and must have more depth before shipping mineral is struck.

REPUBLICAN.—A three-foot streak of very rich mineral, at a depth of 140 feet from the surface, has been exposed. The discovery of the body of ore was made in the east slope, and as the greater portion of the claim lies easterly of the workings, the value of the ore-body is supposed to be great.

SCHWARTZ.—Work has begun on the Schwartz tunnel, the entrance to which is at Schwartzville, on Chicago Creek. This tunnel is in the mountain a distance of 300 feet, and it is the aim of the owners to push the workings through to the ledge on which the Great Republican, Mattie, and other locations have been made.

TERRIBLE.—The main shaft, which is now 900 feet deep, will be sunk 70 feet deeper.

FREMONT COUNTY.

ROCKY MOUNTAIN MINE DEVELOPING COMPANY.—The small copper smelter owned by this company will, in a few weeks, be completed and blown in. The company claims to own some valuable copper mining property, on the ores from which it expects to keep its smelter going.

GILPIN COUNTY.

CONSOLIDATED BOBTAIL.—The company is continuing the cross-cut north from the German mine, to intersect the Kip mine on German Mountain. Owing to the hardness of the country-rock passed through, this vein will not be reached as soon as was anticipated. Power drills are used in driving the work. The miners have ample ventilation since the German vein was struck.

LAKE COUNTY.

The Leadville Herald reports the following: The lead production of the Leadville smelters during January and February averaged about 3000 tons per month. The average monthly product last year was 3600 tons.

The rate on iron ore from Leadville to Salt Lake City has been fixed at six dollars a ton.

BREECE.—This mine has made a contract for its output with the Colorado Coal and Iron Company, and will begin shipments to Bessemer in a few days.

CARBONATE HILL.—During February, this company shipped about one hundred tons of ore. The ore sells better about twice as much as the working expenses of the mine.

DUNKIN.—The mine during February did quite well. The bulk of the higher-grade ore shipped was obtained in the northeast workings of the mine, where some fine streaks of galena ore were found in a body of black iron. This streak, as far as known, has been nearly exhausted, and the mine is not looking remarkably well at present. Exploration-work will be carried on vigorously.

MAID OF ERIN vs. VANDERBILT.—Secretary Teller has denied the application for a rehearing in the case of the Maid of Erin and Vanderbilt. This is the end of the case, as far as the government is concerned.

MANVILLE.—The third furnace at these (Elgin) smelting-works has been blown in, and the establishment is running at its full capacity. The receipts of ore are reported quite fair.

MORNING AND EVENING STAR.—Reports state that large portions of the old workings will shortly be let out to tributaries.

ROBERT E. LEE.—The strike of a body of high-grade ore is reported. The lessee has sub-let a large portion of the mine, embracing nearly all the old workings and stopes. The virgin ground in the Lee is, in the main, retained by Mr. Fritz, who is employing about twenty men in exploration-work, some of which is turning out well.

SMUGGLER.—The lessees of this mine on Iron Hill are doing a great deal of exploration-work. Quite extensive resources have been opened up, and considerable ore was shipped during the month.

TWIN LAKES.—Operations on the Cash Creek tunnel of this placer mining company are advancing very rapidly. Four headings are now driving, two starting from a shaft sunk in the center of the ridge to be tunneled through, and extended both ways, to meet the sections from each gulch.

PARK COUNTY.

The concentrating mill at London Junction has at last been started up.

EAST LEADVILLE.—This company, operating in Horseshoe Gulch, has suspended operations. No explanation of this action is given, and as the properties are looking well, no explanation can be suggested.

PITKIN COUNTY.

It is said that the Spar and Washington mines have been incorporated, with a capital of \$2,000,000. The properties are to be actively worked.

SAN JUAN COUNTY.

SILVER PLUME.—According to reports, English bondholders have foreclosed mortgages amounting to £40,000 on the property of the Silver Plume Mining Company, of Animas Forks. The mortgages are Randolph Stuart, Jared T. Harris, and Thomas E. Foakes. The Silver Plume Mining Company was organized three years ago as the Bonanza Tunnel Company. The company owned valuable property, and expended considerable money on developing it and providing machinery for running it. Some time ago, the company was succeeded by the Silver Plume Mining Company, which gave heavy mortgages in order to secure funds to carry on the work of developing the mines. These are two in number, and have a valuable lot of machinery with which to work them. The foreclosure of the mortgage will, perhaps, wind up the affairs of the Silver Plume Company, but the mines will be worked by the mortgagees.

IDAHO.

MINNIE MOORE.—According to the Ketchum Keystone, this mine, located one mile west of Bellevue, has been sold for \$500,000.

PHILADELPHIA SMELTING COMPANY.—The works will be ready for operation April 1st, but they will not be started until the roads are in a good condition.

MICHIGAN.

The February output of the mines mentioned is as follows:

	Tons.
Calumet & Hecla.....	1906
Quincy.....	200
Franklin.....	175
Atlantic.....	172
Allouez.....	98
Huron.....	78
Peninsula.....	65
Wolverine.....	48
Hancock.....	37
Copper Falls.....	36
Grand Portage.....	35

CONCENTRATING COMPANY.—It is announced that the mills of this company, at Negaunee, will not start up this spring, the management having decided to postpone a resumption of operations until a better demand for ore springs up.

GREAT WESTERN.—The mine has been closed down by an attachment placed upon it by J. M. Longyear, agent of the Canal Company, this being the result

of a judgment for about \$20,000 for royalties, trespass, etc., obtained some time since.

MONTANA.

LEWIS & CLARKE COUNTY.

BELMONT.—A cross-cut has been run a distance of 105 feet on a level with the lower or No. 1 tunnel, and 575 feet from the mouth of the same. This cross-cut is expected to cut the bonanza of rich quartz encountered in the north vein in tunnel No. 4. Three veins have already been cut, each from ten to eighteen inches in width, and prospecting quite well in gold. In the face of this cut, there is considerable quartz, which is a fair indication that the ledge is not far off. It is very probable that the mill will start shortly.

GRANITE MOUNTAIN.—The company is pushing developments in three tunnels. Bonanza, in No. 2, 243 feet long, and still in it. Tunnel No. 3 has struck the 406-foot large ore-body, struck in No. 2, and is of much better grade, 12 inches, assaying 160 ounces. The vein is very wide, and the ore is reported to be five feet in width.

HELENA MINING AND REDUCTION COMPANY.—The smelters are running successfully, turning out from five to seven tons of bullion per day. The mill and concentrators are also working well. The company is shipping from twenty to thirty tons of concentrates per day, besides the bullion from the smelter and mill. The total yield is between four and five thousand dollars a day, or between \$120,000 and \$150,000 a month.

MONTANA COMPANY (LIMITED).—Mr. Thomas Cruse, of Helena, has made a loan of \$150,000 to this company for one year at eight per cent per annum, taking a mortgage for that amount upon the company property. This money is intended to be used for the exclusive purpose of adding thirty more stamps to the twenty now going up in the new mill at Marysville, thus giving the company sixty stamps in all.

NEBRASKA.

The annual report of the Omaha Smelting-Works Company puts the production in 1883 at \$12,700,000. This is an increase of 33 per cent over the output in the preceding year. The force employed last year averaged 350 men. Over 17,000 tons of coal and 8000 tons of coke were consumed, and \$750,000 paid to the Union Pacific Railroad for freight charges.

NEVADA.

ESMERALDA COUNTY.

CANDELARIA.—This water and mill company has filed articles of incorporation in New York, with a capital of \$2,500,000. The purpose is to supply water to the towns of Candelaria and Metallic City, in the Columbus Mining District, and also to erect mills and reduction-works and purchase ores in that district. The company will supply a long needed want in the district.

NORTHERN BELLE.—It is stated that all the personal property of this company has been sold, in order to satisfy the judgment recently obtained by the Holmes Company. On March 20th, the realty and improvements will be sold at marshal's sale. This will close up the Northern Belle. It is presumed the property will be bid in by the Holmes Company.

EUREKA COUNTY.

EUREKA CONSOLIDATED.—Workmen are employed at the works removing the old No. 1 furnace and digging out the bed for a new furnace. The dirt taken out for a depth of four or five feet is rich in lead that has stolen through the furnace bottom in the course of years, and will more than pay for putting in a new foundation. When the new furnace is constructed, it will be for the purpose of reducing the speiss on the slag-dump. The style and plan of it have not yet been determined on.

EUREKA TUNNEL.—Laurence Hartnett has sued this company for damages to recover \$23,000, the alleged value of 10,000 shares of the capital stock, due him, as he claims, as a consideration for certain mining property transferred to said company. The case is on trial. Reports from the mine state that there are considerable good ore and screenings awaiting shipment, but the snow in the cañon is too deep to think of taking the teams up to remove it. In the mine, the prospect is exceedingly good, but the capital necessary to do the required dead-work is wanting.

LINCOLN COUNTY.

DAY.—This smelting company has reduced the wages of its employes to the standard of the Utah smelters, which is \$4 for furnace-men, \$3.50 for helpers and feeders, and \$3 for outsiders.

STOREY COUNTY—COMSTOCK LODGE.

Reports by local papers state that, although prospecting-work has been commenced at two or three points, it is not sufficiently advanced to develop any thing new. The leading mines are in a shape to which it has been the object of most of the work done in the last three or four years to bring them, and if any benefit is to be derived in the way of ore developments from what has been done, it must shortly be seen.

Active explorations will be next in order at the north and south ends of the lode, and also in the central part at two or three points. Not much else remains to be done but to prospect. All that is in any way necessary in the shape of "approaches" and dead-work has been done.

At the middle mines, there of course remains to be run a drift from the 2800 station of the Combination shaft to the 2800-level of the Hale & Norcross; but this drift will be directly across the vein from first to last, and may show up something of value, being really a cross-cut. The Hale & Norcross folks are already at work on this drift or cross-cut from their 2800 station, and are encountering material of the most favorable character. Real prospecting-work is also doing on the 2800-level of the Savage. Active prospecting will also be commenced at several points in the Chollar and Potosi mines as soon as the drift from the Chollar-Norcross-Savage or Combination shaft on the 2800-level is completed.

At the Alta, they are going directly out toward the point where ore was found to the east by the diamond drill.

The Gould & Curry and Best & Belcher and the California and Consolidated Virginia, whose deep operations are to a considerable extent joint, will in a short time resume active prospecting, they having for some years been engaged on work which was wholly preparatory—the shaping of all underground openings toward a certain system, outlined long ago. Some of the results of all this engineering and "shaping" will begin to be seen in two or three months, if not sooner.

At the Union Consolidated, the work is progressing favorably, both on the 3100 and 2900 levels.

The northeast drift on the 3100 level of the Sierra Nevada continues in quartz of a good appearance, giving very fair assays.

The mills on the Carson River are all thawed out and running right along. There is now an excellent milling stage of water in the Carson River, and the mills will be able to run steadily for some months—until the water falls next fall.

SUTRO TUNNEL.—The report presented at the annual meeting, held in San Francisco recently, shows that the total receipts for the year have been \$107,776.07; balance on hand, \$1502.14. Of the receipts, \$71,515.75 was the return from royalties, Crown Point having paid \$25,940.25 and Andes \$123.75. Fourteen other mines contributed to the receipts by royalties. The following officers were elected for the ensuing year: President, Charles W. Brush; Vice-President,

William Johns; Treasurer, London, Paris, and American Bank (Limited); Secretary, Pelham W. Ames; General Superintendent, C. C. Thomas; Trustees—F. F. Low, William Johns, Thomas P. Stoney, David Cohn, Hugh Marshall, Charles W. Brush, and Pelham W. Ames.

TENNESSEE.

EAST TENNESSEE VALLEY.—This zinc company has made its first shipment of zinc to New York. The company was organized at Knoxville a few months ago, with a capital of \$300,000.

UTAH.

A bill regulating the building and operating of smelters in the territory was introduced in the House of Representatives, March 31, by the Committee on Public Health. The bill reads as follows: Section 1. Be it enacted by the Governor and Legislative Assembly of the Territory of Utah: That hereafter, no person, firm, or corporation shall erect and operate any smelting-furnaces in or within the quarantine limits of any incorporated city, without the permission of the authorities thereof, nor near any agricultural or grazing districts in this territory, without building or operating in connection with said smelters, good and sufficient condensing-chambers, with the required amount of superficial surface to prevent the escape of lead and other poisonous substances in such quantities as would prove injurious to the health and property of the inhabitants of the vicinity.

Sec. 2. All persons aggrieved and injured by the non-compliance with the first section of this act may, upon proper showing before any competent court, recover damages to the extent of their losses or injuries, from the agents, operators, or owners of such works, and also a writ of injunction restraining such persons operating until they have complied with the provisions of the first section of this act.

Sec. 3. All persons violating the provisions of the first section of this act shall be deemed guilty of a misdemeanor.

SALT LAKE COUNTY.

NEW EMMA.—The worst snow-slide that ever occurred in the Little Cottonwood District took place March 7th, at Alta. It swept away the works of the New Emma mine, killing twelve people. The snow was piled forty feet high. The damage to the mine is \$15,000.

SUMMIT COUNTY.

CRESCENT.—The shipments at present amount to about sixty tons a day. The mine is in better shape for working than ever.

SAMPSON.—During the month of February, sixty-four tons, which netted the company over \$100 per ton, were shipped. The mine is constantly improving as depth is attained. The shipments already reach about \$6000 per month, and are constantly increasing as development progresses.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

GRANTED JANUARY 1st, 1884.

- 291,021. Steam-Pump. Moses F. Bagley and Joseph C. Dawson, Mount Vernon, Ill.
 291,041. Steam Boiler and Furnace. William U. Fairbanks, Hyde Park, Mass.
 291,044. Apparatus for Equalizing the Temperature of Steel Ingots. John Gjers, Middlesborough, in the North Riding, County of York, England.
 291,045. Apparatus for Equalizing the Temperature of Steel Ingots. John Gjers, Middlesborough, in the North Riding, County of York, England.
 291,046. Apparatus for Equalizing the Temperature of Steel Ingots. John Gjers, Middlesborough, in the North Riding, County of York, England.
 291,047. Apparatus for Equalizing the Temperature of Steel Ingots. John Gjers, Middlesborough, in the North Riding, County of York, England.
 291,048. Apparatus for Equalizing the Temperature of Steel Ingots. John Gjers, Middlesborough, in the North Riding, County of York, England.
 291,067. Ore-Separator. Gordon McKay, Newport, R. I., and Hadley P. Fairfield, Medford, Mass.
 291,084. Method of Preventing the Accumulation of Inflammable Gases in Oil-Tanks. John P. Reinecke, Pittsburg, Pa.
 291,085. Safety Apparatus for Oil-Tanks. John P. Reinecke, Pittsburg, Pa.
 291,098. Art of Upsetting and Shaping Metal Bars. William Sellers, Philadelphia and George H. Sellers, Ridley Park, Pa., said George H. Sellers Assignor to John Sellers, Jr., Philadelphia, Pa.
 291,113. Dumping-Car. Matthew Van Wagoner, Melrose, Mass.
 291,121. Force-Pump. Henry M. Wyeth, Salt Lake City, Utah.
 291,123. Machine for Separating Slate from Coal. Charles W. Ziegler, Scranton, Pa.
 291,124. Machine for Molding in Sand. William Aikin and William W. Drummond, Louisville, Ky.
 291,126. Safety-Valve. Henry G. Ashton, Somerville, Mass.
 291,160. Metallic Packing for Stuffing-Boxes. Jeremiah J. Crowley, Savannah, Ga., Assignor of two thirds to John D. Richardson, Brooklyn, and Francis L. Manchester, New York City.
 291,163. Manufacture of Ferro-Cyanides. Georges De Vigne, Lille, France.
 291,186. Hot-Blast Stove. Frederick W. Gordon, Pittsburg, Pa.
 291,189. Hydraulic Motor. James Henry Hitch, Laconia, Assignor of three fourths to Walter Henry Philbrick, Belmont, N. H.
 291,191. Clay-Pulverizer. Anthony Itner, St. Louis, Mo.
 291,217. Hoisting-Machine. Stephen A. Morse and Charles Tyson, Philadelphia, Pa.
 291,223. Process of and Apparatus for the Production of Dense Metal Castings. Carl Maria Pielsticker, London, England, and Friedrich C. G. Müller, Brandenburg, Prussia, Germany.
 291,250. Pump. Archibald Watson White, San José, Cal.
 291,251. Hoisting-Machine. Joseph J. White, New Lisbon, N. J.
 291,253. Machine for Spinning Metals. Frederick C. Williams, Arlington, N. J.
 291,260. Process of Manufacturing Planished Sheet-Iron. W. Dewees Wood, Pittsburg, Pa.
 291,261. Process of Obtaining Ammonia from Furnace-Gases. John Addie and James Addie, Glasgow, Scotland.
 291,270. Ore-Concentrating Machine. John W. Ealey, Denver, and Burgess B. Warfield, Holy Cross, Colo.
 291,271. Pump-Regulating Device. James H. Eaker, New York City.
 291,294. Ore-Reducing Apparatus. Nelson Clement, Chicago, Ill.
 291,298. Retort Deoxidizing Furnace. Israel D. Condit, Jr., Milburn, N. J.
 291,321. Device for Transmitting Rotary Motion and Power. Gustav Focke, Brooklyn, N. Y.
 291,331. Apparatus for Equalizing the Temperature of Steel Ingots. John Gjers, Middlesborough, in the North Riding, County of York, England.
 291,343. Miner's Squib. George Hayes, Girardville, Pa.
 291,353. Dump-Car. Samuel M. Kebbler, Saltsburg, Pa.
 291,367. Apparatus for Pulverizing Ores, etc. Frederick A. Luckenbach, New York City.
 291,386. Gas-Furnace for Metallurgic and other Purposes, and Method of Operating the same. John T. Morgan, Selma, Ala., and Henry F. Hayden, Washington, D. C.
 291,387. Machine for Forming Eye-Bolts. Laurids J. M. Mortenson, Racine, Wis., Assignor of one half to Stephen Anderson, same place.
 291,410. Blast-Furnace for Zinc Ores. Amedée M. G. Sébillot, Paris, France.
 291,413. Brick-Machine. Frank W. Shelley and Samuel Kiser, Anderson, Ind.
 291,417. Process of and Apparatus for Making Coal-Gas. Anton Stamm, Leadville, Colo.
 291,419. Ratchet-Drill. Richard Stephens, Negaunee, Mich.
 291,422. Coke-Oven. Heinrich Stier, Saxony, Germany.
 291,454. Mechanism for Introducing Tubes into Furnaces. Edward W. Wolfe, Reading, Pa., Assignor to the Reading Iron-Works, same place.
 291,462. Fume-Condensing Attachment for Ore-Furnaces. Eli M. Alderman, Tucson, Ariz., Assignor of two thirds to E. J. Benedict and Paul Maroney, Sr., same place.
 291,469. Device for Grinding Roll-Bars. Charles James Bradbury, Assignor of one half to John H. Horne, Lawrence, Mass.
 291,470. Process of Making Wrought-Iron. Lucius D. Chapin, Chicago, Ill., Assignor to the Chapin Pneumatic Iron Company, same place.

REISSUES.

- 10,432. Cupola-Furnace. William J. Clapp, Nantyglo, and Thomas Griffiths, Blaenavon, County of Monmouth, England. Assignors to James Porter Witherow and Henry William Oliver, Jr., both of Pittsburg, Pa.
 10,433. Mechanical Movement. George Crompton and Horace Wyman, Worcester, Mass., Assignors to George Crompton, same place.
 GRANTED JANUARY 8TH.
 291,493. Blast or Exhaust-Fan. George Marie Capell, Passenheim, County of Northampton, and George Scougal Maclean, The Grove Bishopstoke, County of Hants, England.
 291,507. Pig-Carrier for Blast-Furnaces. Frederick W. Gordon, Pittsburg, Pa.
 291,517. Roller-Mill. James W. Jackson, Denver, Colo.
 291,518. Hot-Blast Stove. Daniel N. Jones, Johnstonva, Pa.
 291,520. Evaporator. Adolf Kayser, Buffalo, N. Y., Assignor of one half to Albert B. Young, same place.
 291,550. Filter. John Toland, Boston, Mass.
 291,558. Rock-Drill. Hugo Borchardt, New York City, Assignor to the Parsons Hand Rock Drill Company, same place.
 291,578. Co I-Drilling Machine. Jonathan M. Davies and John W. Davies, Bryan, Ohio.
 291,582. Manufacture of Bricks, Tiles, etc. Anton Dimpf, Munich, Bavaria, Germany. Assignor to Michel Poletti, Hoboken, N. J.
 291,587. Apparatus for Transporting and Dumping Earth, Gravel, etc. Quincy A. Fisk, Springfield, Ill.
 291,589. Traction-Rope Railroad. Eleazer S. Gardner, Philadelphia, Pa., Assignor of two thirds to John H. Gould, same place, and Oliver L. Gardner, New York City.
 291,606. Method of and Tool for Blasting Rock. John L. L. Knox, Alleghany, Pa.
 291,620. Flanging-Machine. Richard C. Nugent, Pittsburg, Pa., Assignor of five eighths to W. J. Armstrong, Thomas T. Wightman, John Farrell, and Joseph G. Wainwright, same place.
 291,627. Miner's Combination-Tool. John Ryan, Salt Lake City, Utah.
 291,631. Process of Obtaining Aluminium. Frederick J. Seymour, Wolcottville, Conn., Assignor of one half to William Henry Brown, New York City.
 291,656. Machine for Threading Sheet-Metal Screws. William Werts, Camden, N. J.
 291,670. Process of and Apparatus for Obtaining Gold and Silver from their Ores by Combined Electrolytic and Amalgamating Processes. Michel Body, Liège, Belgium.
 291,763. Furnace-Mouth. Timothy O'Brien, Boston, Mass.
 291,775. Compound Metal-Working Machine. Nicholas J. Rice, Vernon, Crawford County, Pa.
 291,788. Coal-Cleaner. William Henry Shepherd, Pittston, Pa.
 291,821. Process of Concentrating Sulphuric Acid. Moses A. Walsh, Camden, N. J.
 291,830. Hydrocarbon-Furnace. Richard B. Avery, Washington, D. C., Assignor of one fourth to Dewitt Stearns, Alberquerque, New Mexico.
 291,834. Machine for Wiring Sheet-Metal Pans. Charles F. Beaman, Chicago, Ill., Assignor to the Wellsville Plate and Sheet-Iron Company, Wellsville, Ohio.
 291,859. Double-Acting Force-Pump. Alexander Crawford, Evansville, Ind.
 GRANTED JANUARY 15TH.
 291,872. Ore-Separator. Francis R. Brown, Boulder, Colo.
 291,876. Drilling-Machine. Robert K. Carpenter, Medford, Mass.
 291,892. Steam and Hydraulic Pumping-Engine. Harvey F. Gaskill, Lockport, N. Y.
 291,916. Coal-Mining Machine. John Lucas, Hawk's Nest, West Va.
 291,953. Puddling-Machine. Henry B. Van Benthuyen, Phenixville, Pa.
 291,971. Metal-Turning Lathe. John E. Atwood, Sincington, Conn.
 291,982. Ore-Concentrator. Alexander D. Clarke, New York City.
 291,997. Concentrator and Amalgamator. George R. Evans, San Francisco, Cal., Assignor to John P. Couch and William F. Oneale, both of same place.
 292,054. Apparatus for Making Sulphuric Acid. John Samuel Rigby, Beaufort, Assignor of one half to Frederick Brotherhood, Charleston, S. C.
 292,075. Rumble for Scouring Castings, Washing Ores, etc. Ezra W. Vandusen, Newport, Ky.
 292,095. Coupling for Shafts or Rolls. Charles P. Carlson, McKeessport, Pa., Assignor to himself and the National Tube-Works Company, Easton, Mass.
 292,096. Magnetic Ore Separating Machine. George W. L. Carter, New York City.
 292,122. Rotary Pump. Joseph Lee, Cleveland, Ohio.
 GRANTED JANUARY 22D.
 292,188. Regenerative Hot-Blast Stove. Peter L. Weimer, Lebanon, Pa.
 292,215. Grate. Daniel McBride Graham, Chicago, Ill.
 292,229. Machine for Sharpening Drills. Moses C. Johnson, Hartford, Conn., Assignor to William N. Woodruff, same place.
 292,230. Self-Clearing Furnace-Grate. James C. Jones, Chicago, Ill.
 292,245. Ore-Concentrator. Walter McDermott, Orange, N. J.
 292,260. Utilizing Waste Calcium Chloride and Sulphate. Conrad Semper, Philadelphia, Pa.
 292,280. Ratchet-Drill. William Brice, Honolulu, Hawaiian Islands.
 292,305. Method of Preventing Chilling of Blast-Furnaces. John M. Hartman, Philadelphia, Pa.
 292,336. Coal-Car. John D. Madeira, Chillicothe, Ohio.
 292,341. Purification of Coal-Gas. James T. McDougall, No. 52 Granville Park, Blackheath, County of Kent, England.
 292,344. Hoisting Apparatus. Pentecost J. Mitchell, Dragoon Summit, Ariz., Assignor of one half to Samuel H. Eckles, same place.
 292,345. Ratchet-Drill. William Moritz, Philadelphia, Pa.
 292,348. Foot-Power Hammer. John L. Painter, Bellevue, Ohio.
 292,366. Car for Inclines in Mines. John Rosquist, Park City, Utah.
 292,384. Ore-Pulverizer. Jerome B. Sweetland, Pontiac, Mich.
 292,396. Pump-Valve. Christopher Ahrens, Cincinnati, Ohio, Assignor to the Ahrens Manufacturing Company, same place.
 292,413. Kiln. Jacob Pearson Cramp, Finedon, County of Northampton, England.
 292,418. Pipe-Bending Machine. Edward Devine, Detroit, Mich.
 292,427. Brick-Kiln. Willis N. Graves, St. Louis, Mo., Assignor of one half to the Hydraulic Press Brick Company, same place.
 GRANTED JANUARY 29TH.
 292,492. Furnace Grate. Milton C. Jones, Green Island, N. Y.
 292,497. Device for Indicating the Temperature in Annealing Furnaces. Michel A. Lhuissier, Buffalo, N. Y.
 292,508. Manufacture of Non-Calcareous Linings for Metallurgical Furnaces. Jacob Reese, Pittsburg, Pa.
 292,522. Ratchet-Drill. Pardon A. Whitney, Cleveland, Ohio.
 292,525. Duplex Pumping Engine. Charles C. Worthington, Irvington, N. Y.
 292,537. Furnace-Joint. Ezekiel C. Condit, Kansas City, Mo.
 292,539. Electric Conductor. Alfred A. Cowles, New York City, Assignor to the Ansonia Brass and Copper Company, Ansonia, Conn.
 292,540. Process of Tinning Sheet-Copper. Alfred A. Cowles, New York City, Assignor to the Ansonia Brass and Copper Company, Ansonia, Conn.
 292,543. Quartz-Crushing Machine. Cyprien Dandurand and Louis M. Lafrance, Virginia City, Nev.; said Lafrance Assignor of one third to said Dan dandurand.
 292,544. Portable Oven. Léon Dathis, Paris, France.
 292,560. Coal-Screen. John Jones, Portsmouth, Ohio.
 292,576. Clay-Crushing Roller. James W. Fenfield, Willoughby, Ohio.
 292,577. Clay-Crushing Roller. James W. Fenfield, Willoughby, Ohio.
 292,585. Metallic Roofing-Shingle. Ephraim B. Repp, New Windsor, Md., Assignor to the Anglo-American Roofing Company, New York City.
 292,605. Art of Extracting Gold by Means of Alkaline Sulphites. Charles P. Williams, Philadelphia, Pa.
 292,635. Charcoal-Oven. John A. Edwards, Columbiana, Ala.
 292,637. Ore-Separator. Hadley P. Fairfield, West Medford, Mass.
 292,638. Ore-Separator. Hadley P. Fairfield, West Medford, Mass.
 292,642. Safety-Shell for Blasting. George Freund, Durango, Colo.
 292,655. Railroad T-Rail. Tom L. Johnson, Indianapolis, Ind.
 292,665. Hand Rock-Drilling Machine. Robert Magill, Pittsburg, Pa.
 292,668. Tuyere. Enoch P. H. Martin, Wilmington, Del.
 292,683. Metal-Screw Machine. Charles F. Roper, Boston, Mass.
 292,690. Furnace for Treating Ores Continuously. Amedée M. G. Sébillot, Paris, France, Assignor to the United States Ore-Separating Company, New York City.
 292,697. Steam Pumping-Engine. Edward G. Shortt, Carthage, N. Y.
 292,745. Heat and Fire-Resisting Valve. Watson A. Goodyear, New Haven, Conn.
 292,751. Boiler-Furnace. Thomas E. Jones, Cincinnati, Ohio.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, March 14.

The mining market this week was more active than for some time past, but prices were weak and seemed to be on the decline. The chief item of interest was the heavy decline in the stock of Standard. Bad reports have been received from the mine, and this has caused the weakness. The remainder of the Bodie stocks were strong. The Leadville stocks, with the exception of Brece, were quite weak, Chrysolite and Iron Silver suffering a strong decline. Brece, on the contrary, was very strong. The stock of Hall-Anderson was very actively dealt in at irregular prices. It rallied, however, and closed firm. Sonora was very active at steady prices. The remainder of the market was of but little interest, small transactions being the rule, with no material change in prices. The total number of shares sold aggregates 132,760, as against 84,663 last week.

The Comstock shares were very quiet, and sold at weak prices. California was quiet, selling from 20@15c. Consolidated Virginia was quite weak, declining from 22@16@17c. with a fair business. Ophir was quiet and steady at \$1.80@1.75. Sutro Tunnel was moderately dealt in at weak prices; it sold from 15@13c.

The Bodie stocks, with the exception of Standard, were strong, and were moderately dealt in. Standard suffered a strong decline, owing to unfavorable news from the mine. Mr. M. R. Cook, the vice-president of the company, in answer to inquiries by our representative, stated that he had telegraphed to the secretary of the company, and also the superintendent of the mines for information, and had received the following replies, which he very courteously furnished:

"SAN FRANCISCO, March 8.

"M. R. COOK, Vice-President, etc.:

"Standard bullion shipments for February not yet received, and amount forwarded to date is \$24,000. It is impossible to give balance to March 1st until final receipts of bullion, which will be less than usual, owing to diminished value and quantity of ore. However, I see no immediate reason to anticipate a suspension of dividends. No improvement in our mine is reported by Superintendent Irwin.

"WILLIAM WILLIS,

"Sec'y Standard Cons. Mining Company."

The following dispatch was received from the superintendent: "The reason for last month's small shipment is the falling off in the value of ore on the 500-foot level. Shipment as before impossible for reasons. Mine does not look encouraging. Letter will give all particulars."

The stock declined from \$6.63@3.50, closing at \$3.70, and was liberally dealt in. Bodie was strong under a small business, selling from \$10.13@10.50. Bulwer also sold at strong prices; it was quoted at \$2.45@2. and was moderately dealt in. Goodshaw sold to-day at 40c., and Consolidated Pacific was strong at 40@50c.

The Leadville stocks were liberally dealt in, the more prominent ones selling at weak prices. Amie, with a fair business, was steady, selling from 9@10c. Chrysolite continues to decline, selling this week at its lowest figure; it sold from 93@70@75c., and was liberally dealt in. Brece, for some unknown reason, was largely dealt in; it rose from 13@36c. Hibernia sold at 5c. Iron Silver was quite weak, and was very actively dealt in; it declined from \$1.70@1.20, closing at \$1.25. Leadville sold at 50c. Little Chief was quiet and steady, selling from 51@50c.

The Tuscarora stocks were almost neglected. Grand Prize sold at 10c., Independence at 10c., and Belle Isle from 30@12c.

In the miscellaneous list, Alice was very quiet at \$2.40. Bassick was quite irregular under a moderate business; it sold from \$8.13@8.50. Eureka Consolidated was strong, with a small business, selling from \$3@3.80. Green Mountain was quiet and steady, selling from \$2@2.05. Hall-Anderson was very actively dealt in, and at one time was quite weak; it rallied toward the close, however, and was strong; it sold from \$1.35@1.10@1.30. Horn-Silver sold at strong prices under a small business; it was quoted at \$7.38@7.25. Robinson Consolidated was quiet and irregular, selling from 37@32@35c. Sierra Grande

sold at 70c. with a small business. Silver King declined from \$6.25@6, under a small business. Stormont sold from 15@12c. Bonanza King continues strong, and was fairly dealt in; it sold from \$10@10.38.

Barcelona was quiet and steady at 15@14c. Central Arizona suffered a slight decline; it sold from 30@22c. with a small business. Decatur sold at 3c., and was but moderately dealt in. Eastern Oregon was quiet and a little weak at 8@6c. Harlem sold from 6@5c. under a small business. Rappahannock was liberally dealt in at steady prices, selling from 18@17c. Sonora Consolidated was very active at steady prices; it sold from 6@8c. We hear that the stockholders of this company have sent a competent mining engineer to make an examination of the mine, secure the titles, and make a report. State Line Nos. 2 & 3 was quiet and steady at 5c.

DIVIDENDS.

The Plymouth Consolidated Mining Company, of California, has declared a dividend (No. 10) of \$50,000, or fifty cents per share.

PIPE LINE CERTIFICATES.

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

Saturday, March 8th, the market opened \$1.00%, and sold up to \$1.02%, closing at \$1.02%. On Monday, the market sold up to \$1.03, breaking late in the day to \$1.00%, and closing at \$1.01. After the Board closed Monday, the market was sold down to 99% on the curb, and though only a few brokers were present when this was done, the opening of Tuesday was made by it. Tuesday, it opened 99% and sold up to \$1.01% at the close. Wednesday, the market was firm during the forenoon, selling up to \$1.02%; but later in the day, it weakened to \$1.00%, closing at \$1.01. Thursday, the market opened at \$1.01%, and soon reached \$1.02, selling during the afternoon at \$1.03%, but closing at \$1.02. During the evening of Thursday, the Clapp well, located on a south spur of Cooper tract, came in as a good well, and the result was, that the New York market opened at \$1.01 and Oil City at \$1. The close of business Friday night was at about the lowest figure of the day, and the short interest is large. It has been large for several weeks, and as the bears have made the money, they are very bold. The principal bull point is the general short interest. The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
March 8...	\$1.00%	\$1.02%	\$1.00%	\$1.02%	4,306,000
10...	1.02%	1.03	1.00%	1.01	5,306,000
11...	.9%	1.01%	.99%	1.01%	5,582,000
12...	1.01%	1.02%	1.00%	1.01	5,515,000
13...	1.01%	1.02	1.00%	1.02	4,364,000
14...	1.01	1.01%	1.00	1.00%	5,504,000
Total sales					30,577,000

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, March 13.

The market for mining stocks the past week has ruled extremely dull and devoid of interest. The predicted boom is evidently as far off as ever, and there is nothing in the situation worthy of comment. Calumet & Hecla declined from \$239 1/4 @ \$236 1/2, simply in accordance with the law of supply and demand. Less than twenty shares changed hands. The February output (25 days) was 1906 tons, and certainly shows no falling off in the product to warrant a decline in the stock. Franklin is dull but firm at \$11 1/2, sales. Quincy is also quiet but steady at about \$45. Osceola sold at \$16 1/2, same as last week. The company will pay a dividend of 50 cents a share April 1st. Pewabic advanced from \$1 1/4 @ \$2, but subsequently declined to \$1 1/2, and is offered at that price. There is a vigorous effort making to change the management of this company, and it is reported that as high as 1/16 was bid for the use of the stock at the annual meeting which takes place on the 26th inst., and a lively time is anticipated. The point at issue is the refusal of the officers to allow a stockholder who owns about one twentieth of the stock to have access to the transfer-books and accounts as required by the laws under which the company is organized, and who objects to repeated

assessments for dead-work and official salaries. Huron declined from \$1 1/2 @ \$1 1/4 and rallied to \$1 1/4. About 1000 shares of delinquent stock were sold this week for non-payment of assessments at \$1 1/2 @ \$2, or rather better than the price in open market. Allouez sold at \$1 1/2 assessment paid. Ridge sold at 50 @ 45c., and a small sale of Minnesota at 25c.

In silver stocks, Catalpa sold at 35@37 1/2c. Crescent, 15c. Bonanza, \$1.25.

At the Mining Exchange, there was no special feature, dullness being the prevailing characteristic. Bowman Silver was steady at 16@17c. Empire, 19@20c. Dunkin, 22@24c. American Electric Light and Illuminating Company was steady at \$3.75@4. Standard Water Meter Company continues to advance on the small amount of stock offered, and reached 75c. to-day. This stock has sold within a few months as low as 15c. a share.

3 P.M.—At the afternoon Board, Calumet & Hecla declined on sale of 7 shares to \$236. Huron sold at \$1 1/2. Closing prices: Allouez, \$1 1/4 bid. Atlantic, \$3 bid. Calumet & Hecla, \$235 bid, \$237 asked. Franklin, \$11 1/2 asked. Huron, \$1 1/2 bid, \$1 1/4 asked. Osceola, \$16 bid. Pewabic, \$1 1/2 bid. Quincy, \$44 bid, \$45 asked.

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS.					
	Mar. 7.	Mar. 8.	Mar. 10.	Mar. 11.	Mar. 12.	Mar. 13.
Albion.....						
Alpha.....						
Alta.....	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Argenta.....						
Bechtel.....						
Belcher.....	.95	1	.95	.95		.95
Belle Isle.....	.30	.25	.25	.30	.30	.20
Best & Belcher.....	.25	.25	.25	.25	.25	.25
Bodie.....	.9 1/2	.9 1/2	10	.9 1/2	10 1/2	10 1/2
Bullion.....						
Bulwer.....						
California.....		.20	.20	.20	.20	.15
Chollar.....	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Con. Pacific.....	.40	.40	.40	.45	.45	.50
Con. Virginia.....	.25	.25	.20	.20	.20	.15
Crown Point.....	1		1	1 1/2	1	1
Day.....	.2 1/2			2	2	2
Elko Cons.....						
Eureka Cons.....	3 1/4	3 1/4	3 1/4	3 1/4	3 1/4	4
Exchequer.....						
Gould & Curry.....	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Grand Prize.....			10			.05
Hale & Norcross.....	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Independence.....						
Martin White.....	.35	.40	.75	.75	.75	.65
Mexican.....	1 1/2	1 1/2	1 1/2	1 1/2	2	1 1/2
Mono.....						
Mount Diablo.....				2 1/2	2 1/2	
Navajo.....	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4
Northern Belle.....						
North Belle Isle.....						
Ophir.....	1 1/2	1 1/2	1 1/2	1 1/2	2	1 1/2
Overman.....						
Potosi.....	.95	1	.90	.95	1	.90
Savage.....	1	1	1	1	1	.95
Scorpion.....						
Sierra Nevada.....	3	3	2 1/2	2 1/2	3 1/2	2 1/2
Silver King.....						
Tip Top.....						
Union Cons.....	2 1/2	2	2	1 1/2	2 1/2	1 1/2
Utah.....	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	
Wales Cons.....						
Yellow Jacket.....	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

The following are the financial balances of the various mining companies on March 1st:

CASH ON HAND.	
Andes.....	\$5,735.67
Alpha Con.....	10,212.33
Alta.....	11,265.13
Benton Con.....	2,880.50
Bulwer.....	561.21
Bodie Con.....	116,313.23
Chollar.....	571.88
Con. Virginia.....	9,261.13
*California.....	671.95
Exchequer.....	7,029.92
Gould & Curry.....	\$7,133.35
Hale & Norcross.....	895.51
Mono.....	14,073.11
Martin White.....	7,234.50
Mexican.....	282.37
Occidental.....	4,291.75
Potosi.....	4,825.45
Sierra Nevada.....	40,608.86
Standard.....	39,18.77
Utah.....	57.02
INDEBTEDNESS.	
Best & Belcher.....	\$13,602.63
Lady Washington Con.....	4,101.88
Ophir.....	40,673.97
Savage.....	13,080.06
Utah.....	1,771.83

* Overdraft at Nevada Bank \$5834.30.
 † Amount due on assessment No. 80, \$11,380.50.
 Albion indebtedness exact amount not known; approximate, \$65,000.

BULLION MARKET.

NEW YORK, Friday Evening, March 14.

The market for silver in London and here, as foreshadowed in our postings of last week, has become

weaker, as shown by the figures of the annexed table, and closes without any indications of a rally.

DATE.	LONDON.		N. Y.	
	Pence.	Cents.	Pence.	Cents.
March 8	51 1-16	112 3/4	12 1/2	112
10	51 1-16	112 3/4	13 1/2	112
11	51	112	14 1/2	111 3/4

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of February.	Year from Jan. 1st, 1884.	
			\$	\$
*Alice, G. S.	Mont.		+ 98,776	
*Belmont	Mont.		8,081	
Bodie, G.	Cal.	32,683	62,683	
*Bonanza King, S.	Cal.		56,278	
*Boston & Montana, G.	Mont.	25,498	76,699	
*Chrysolite, S. L.	Colo.		4,721	
*Consolidated Bobtail, G.	Colo.		8,169	
*Contention, G.	Ariz.		80,439	
*Deadwood-Terra, G.	Dak.		49,196	
*Derbec Blue Gravel, G. S.	Colo.		16,623	
*Father de Smet, G.	Dak.	31,082	56,177	
Grand Prize, S.	Nev.		25,000	
*Homestake, G.	Dak.		104,231	
*Hope, S.	Mont.	15,433	15,433	
Horn-Silver, S. L.	Utah.	150,000	324,000	
*Iron Silver, S. L.	Colo.	66,887	125,882	
*Kentuck, G. S.	Nev.		3,810	
*Lexington, G. S.	Mont.	90,956	201,402	
*Little Pittsburg, S.	Colo.		8,588	
Moulton, S.	Mont.	60,000	122,000	
*Mount Diablo, S.	Nev.		24,820	
*Navajo, G. S.	Nev.		28,840	
*Ontario, S. L.	Utah.	174,902	338,478	
*Oxford, G.	N. S.	3,500	7,160	
*Plymouth Consolidated, G.	Cal.	84,063	186,501	
*South Yuba, G.	Cal.		2,040	
Standard Cons., G.	Cal.		3,818	
*Syndicate, G. S.	Cal.	6,995	27,290	
*Tombstone, S. L.	Ariz.		9,710	
Total amount of shipments to date			\$2,179,811	

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

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, reduced the bank's minimum rate of discount 1/2 per cent, to 3 per cent. During the week, the bank gained £883,000 bullion, and the proportion of its reserve to its liabilities was raised from 38 3/4 to 43 7/16 per cent, against 42 3/16 per cent at this date last year. To-day, the bank gained £89,000 bullion on balance. The weekly statement of the Bank of France shows an increase of 7,130,000 francs gold, and a decrease of 1,100,000 francs silver.

METALS.

NEW YORK, Friday Evening, March 14.

Copper.—Nothing except possibly the fact that some outside hands are selling at less than 14c. has disturbed the serenity of this market. The Lake companies profess to be unwilling to hear of any thing less than 15c. as the basis of the coming contracts, and manufacturers speak of 14 1/2 cents. We quote, as before, 14 3/4@15c. for Lake, and 13 3/4@14 1/4c. for other brands.

The latest English cables are again lower, showing £54 10s. for Chili Bars and £62 10s. for Best Selected.

Lead.—During the week, from 1000 to 1200 tons of lead have been placed at 4 1/2c., which has apparently satisfied the demand, the market closing flat.

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

No abatement is to be noted in the demand, which is quite good. Subsequent to our last week's report, a few hundred tons were sold at the last-named price, when suddenly a stronger feeling manifested itself, and a few small lots have been placed at 3 90c. Buyers are now freely bidding the latter for Refined, but holders refuse to take it. The asking price is now 4c. Stocks in the hands of holders are but limited. Receipts during the week foot up to 360 tons.

Messrs. Everett & Post, of Chicago, send us the following dispatch:

The market is very steady at some advances on last week's quotations, with a good demand from consumers noticeable. Prices are 3 92 1/2 and 3 95 bid.

Spelter.—This metal remains firm at 4 1/4c., London being unchanged.

Antimony.—This metal is weaker, with Hallett's at 11 1/2c. for spot and 10 3/4c. for shipment, and Cookson's 11 1/4c.

Tin.—The market has been active, rising during

the week to 18 3/4c., from which it has gone back to 18 1/4@18 3/4c., London cabling now 83s. 5d. There have been sales for March and April shipment at 18 3/4c.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, March 14.

Importations of iron and steel at this port were as follows in the month of February, as compared with the month of January:

	January.	February.
	Gross tons.	Gross tons.
Pig-iron	4,055	3,061
Spiegeleisen	6,264	3,370
Old rails	237	83
Scrap iron	229	1,489
Scrap steel	1,363	160
Steel blooms	173	79
Steel rails	28	921
Steel rods	8,141	4,306
Iron rods	2,302	788
Bar-iron	16	32
Beams	21	26
Sheet-iron	161	194
Steel bars	394	378
Steel tires, etc.	382	296
Swedish iron	1,375	427

American Pig.—There have been no features of special interest, business being confined to small lots, which in the aggregate foot up well. The leading furnace companies have contracts ahead, and are not now anxious to sell. In spite of this, there is anxiety shown by some sellers, and this especially the case with mill irons, in which considerable business has been done. We quote No. 1 Foundry at \$20 55@ \$21; No. 2, \$19@19.50; and Gray Forge, \$17.50@ \$18.50. There have been some sales of Bessemer pig, which remains quiet at \$19.50@20, and 20 per cent Spiegel is selling at \$29 ex ship. Ferro-manganese, 45 per cent, is worth \$45.

At the Metal Stock Exchange, the following transactions were recorded: Wednesday, March 12th, 100 tons No. 1, April, \$19.25, and 100 tons No. 1, \$19 1/2.

Scotch Pig.—The market is very quiet, and very little business is doing. Importers are firm, however, for reasons independent of the situation here. This week, the arrivals aggregated 1600 tons. Very little of the iron went into store-houses.

We quote ex ship and to arrive: Coltness, \$22.50 @ \$23; Langloan, \$22.25@23.50; 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, 58s.; Langloan, 54s.; Summerlee, 52s.; Gartsherrie, 52s. 9d.; Glengarnock, at Ardrossan, 51s. 9d.; Dalmellington, 49s.; and Eglinton, 46s. Warrants are quoted 42s. 10d.

Steel Rails.—Sales aggregating 30,000 tons have been made during the week at, it would appear, concessions from \$34, in one case 25c. only.

Old Material.—A little business is doing at \$21@21.50 for Ts.

Philadelphia, March 13.

[From our Special Correspondent.]

Pig-iron.—The downward tendency in some grades of crude iron reported last week seems to have entirely disappeared, and prices are, though low, firm and strong. The preference is for the better makes, and more of these are selling than last week. Orders for iron are in no cases large, but they are frequent; and though no upward tendency in prices is to be looked for, for reasons often stated, yet the trade seems to be slowly approaching the activity which is always looked for at this season. Mill men are buying in small lots yet, but as the demand for refined iron improves, they will come forward more freely, and, according to present indications, this will occur very shortly. No change in prices is to be reported. Good No. 1 Foundry commands \$21 @21.50, and a fair make can be had at \$20.50, with inferior 50 cents less. No. 2 is, as usual, rather dull, and averages \$19. Mill irons sell at \$18, delivered, for the makes most in demand, but buyers readily pay \$18.50 for very good iron. Some inferior lots have gone at \$17.50.

Foreign Iron.—Most of the interest in foreign irons this week has been centered in ferro-manganese, of which some 7000 tons have sold, in three or four lots, to Pennsylvania and Illinois companies. For 45 per cent, \$44.50@45 was paid; \$44.50@45 was bid. Some low-grade Spiegeleisen has been offered, and 20

per cent is quoted at \$29, but neither have sold except in trifling lots. Bessemer pig is in dull demand, owing to the competition of the domestic product, which is rapidly crowding the foreign article out of the market. Quotations nominally, \$30@30.50.

Muck Bars.—Quotations, \$31@32 at mill, according to quality. Some of the best makes are held 50c. and \$1 higher.

Blooms.—Quotations are continued at \$55@57 for Charcoal, and \$45@47 for Anthracite, with the usual amount of business.

Manufactured Iron.—Demand is more active, and prices rather firmer this week. Mills are still working only on orders, but these are so much more numerous that the production may be said to be considerably increased. The price paid at mill for large lots of refined is 1 90c., and 2c. for smaller lots. The favorable weather has brought out a large number of small buyers, and manufacturers are taking heart of grace, being assured that, though prices must remain low, they will be well employed in a short time. A few of the mills making superior iron have succeeded in selling their production at 2 05@2 10c., and have their capacity engaged some weeks ahead at these figures; but these are the exception.

Nails.—Orders are still small, and inquiry not as abundant as usual at this season; but the requirements are large, and as soon as the weather permits the inauguration of building operations, the makers of nails will probably have nothing to complain of in the way of slack demand. The decision of the Western nail-makers at their recent meeting has been favorably received here. Prices will probably remain steady at about present limits, which are \$2.60 for small and \$2.50 for large lots.

Plate and Tank-Iron.—Only small orders are booked at the usual quotations, namely, 2 20@2 30c. for both Plate and Tank; 2 75c. for Shell; 3 75c. for Flange; and 4 75c. for Fire-Box.

Structural Iron.—Mills are very busy, though the orders booked for the past week have been small. The bridge-works are particularly active, and contracts for two bridges, one near Harrisburg and the other at Havre de Grace, will be given out within a day or two. Carnegie, of Pittsburg, claims to have one secured, but it is not yet definitely known. Some 5000 tons of iron will be wanted, and several parties have their bids in. Prices are steady at 2 20@2 25c. for Angles, 2 25@2 30c. for Bridge Plates, 2 75c. for Tees, and 3 50 for Beams and Channels, of which latter some large lots have been bought during the last week or two.

Wrought Pipes and Tubes.—Demand is for current requirements only, and the prospects for spring trade are good, as requirements are unusually heavy. Quotations are unchanged.

Steel Rails.—The quotations remain \$34@35, and nothing less will be taken at present for large and small lots. There is a steady run of trifling orders, but buyers of large lots are not in the market, finding it useless to make offers of \$33 and \$33.50, the figures that they are prepared to pay for large blocks.

Old Rails.—The large offerings of old rails that have been made during the past few days have had a weakening effect. Buyers are now unwilling to pay more than \$21@21.50 for stocks which they would have taken eagerly a week or two ago, at a much higher figure. Small lots can be placed at about \$22 50, and a few have commanded as high as \$23.

Pittsburg, March 12.

[From our Special Correspondent.]

The average daily output of the six furnaces now in blast in and around Pittsburg is 800 tons, as against an average of 1020 tons at the same time last year, with nine furnaces in blast. One of the Lucy and one of the Isabella furnaces are now out, re-lining. The prospects seem to be discouraging at some of the iron mills. Quite a number are working single-turn, with reduced forces. Among the exceptions to this rule are: Oliver Brothers & Phillips (both mills, Nineteenth and Tenth streets), Chess, Cook & Co., the Wayne Iron-Works, and one or two others, which are running double turn.

The scale question is absorbing a great deal of attention at present. The manufacturers are determined to reduce wages, and the workmen, on their part, are just as firm. It is estimated that the proposed reduction of 50 cents a ton for puddling will

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

Table with columns for Name and Location of Company, Highest and Lowest Prices per Share at which Sales were Made (March 8-14), and Sales. Lists various mining companies like Alice, Amie, Argenta, etc.

NON-DIVIDEND-PAYING MINES.

Table with columns for Name and Location of Company, Highest and Lowest Prices per Share at which Sales were Made (March 8-14), and Sales. Lists various mining companies like Alta-Montana, American Flag, Barcelona, etc.

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 89,860. Non-dividend shares sold, 42,900.

BOSTON MINING STOCKS.

Table with columns for Name and Location of Company, Highest and Lowest Prices per Share at which Sales were Made (March 7-13), and Sales. Lists various mining companies like Allouez, Amie, Atlantic, etc.

PHILADELPHIA MINING STOCKS.

Table with columns for Name and Location of Company, Highest and Lowest Prices per Share at which Sales were Made (March 7-13), and Sales. Lists various mining companies like Amer. Cons., Argent., Arizona So., etc.

save Pittsburg manufacturers \$330,000 per annum. The increasing use of steel is making this department of less and less importance every year, and wages will probably have to go down.

Three of the green bottle houses have started up at old wages, and others will probably follow in a short time. The window-glass factories are busy, and are only able to fill the most pressing requirements. It is reported that the tack factory of S. P. Hollis & Co. has been purchased by a syndicate of Eastern capitalists, and that the machinery will be shipped East. The factory has been in operation for over a year, and contained fifty machines, employing thirty hands.

The business of the past week in iron and steel has been lighter than for the previous week; but in the present condition of the trade, heavy buying could not be expected for a long time together. The home furnaces are pretty well sold up, and but little iron is offered on the market. Furnace-men are still confident that they will obtain rather better prices before long. Prices are quoted as usual, at \$18 for all ore Forge iron; \$24@24.50 for Charcoal Foundry. Muck-Bars, \$31@31.50 for cash. Nails are in better demand, and prices are steady for steel rails at mill. Both the mills here in operation. Wrought Pipes and Tubes are not active, but will be in a short time, as the requirements are known to be large.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, March 14.

Anthracite.

The market is quiet and dull, and the questions agitating the trade are rather those concerning the near future than those affecting the present. The scare concerning the sudden inroads of soft coal is now pretty well over, and it is generally conceded that a large tonnage has been displaced by it. In the next few weeks, the policy will be outlined which is to govern the trade during the current year, and it may not be out of place here to call attention to some points that affect the situation. During the past few years, a curtailment of the production has been found necessary during from three to six months in the year, and it would be idle to expect that this year it will not be found expedient to keep production in check for at least five months. It is evident, therefore, that the capacity is far beyond the demand, and the natural increase can not be expected to catch up to capacity for years to come. The managers of the anthracite coal trade are not therefore in a position to be arbitrary, this year less than ever before. It is preposterous to claim, at a time when the business stagnation has become as general as it is now, that an industry like the anthracite coal trade is unaffected by it, especially at a time when it has met so dangerous a competitor as soft coal is at present prices. We are told, over and over again, that anthracite has the great Western outlet; but even if the demand, which is undoubtedly growing, were such as to absorb what the East will not take, there are not now the transportation facilities for it. Let us hope with the sanguine ones that the West will do all it is expected to accomplish in the way of consuming anthracite coal. That does not help the companies during the period remaining until lake navigation opens. Until that time comes, the West will afford no relief, and the companies have to take care of this market as though that market did not exist. They must do something to stimulate buying in our markets first, and to do so must start off with attractive figures in April, so that purchasers will be inclined to anticipate their wants. They must stop the bad practice of making paltry 10c. and 15c. advances that hurt those upon whom they must chiefly depend for aid in moving their coal into the hands of consumers. Let them make one or two advances during the year of 25c. or 50c. at a time, so that the retail dealer can avail himself of it. The companies owe it to themselves and to the trade to make the opening figures low and to continue half-time work. The condition of the market will force them into it later on, if they begin with the *faux pas* of high prices and full work.

Bituminous.

It appears now that the Baltimore & Ohio has secured a sufficiently large share of the business of the

year to relieve it of anxiety, and that it is chiefly the Clearfield producers who will compete for the remaining business. There is less pressure, but it is not likely that there will be any material advance in prices for the present.

It is stated that Cumberland shippers have secured considerable business at Delaware River points. To them, the rumor will be disquieting that the Pennsylvania Railroad has secured control of the Chesapeake & Delaware Canal, which would thus give it control of the canal system between this city and Baltimore, and practically secure to Clearfield operators the bulk of the steamer trade.

Philadelphia. March 13.

[From our Special Correspondent.]

Stocks at Port Richmond this afternoon are 100,000 tons. Freights are low, inquiries coming in freely. Stocks in consumers' hands here and elsewhere are not so large as reported—at least, a good many are practically out, and, according to good authority in the trade, a heavy distribution will take place at an early day, although it may not be inaugurated until after the 20th of the month, when prices for bituminous coal will also be known. Consumers can then figure down close, and place business accordingly. The machinery in the mines that have been flooded is all at work again. Representatives of the anthracite coal interests are of the opinion that the pending competition between hard and soft coals in Eastern markets is of less importance than is made to appear. The displacement of a few hundred thousand tons of coal is a small matter to the anthracite producers, in view of their rapidly expanding home, Western, and Southern markets. The larger sizes, which are likely to be displaced by bituminous coal, can readily be broken up and shipped to the markets consuming the smaller sizes, thus avoiding any loss. Western markets will take largely increased shipments of anthracite this year, as will also the South. The Cumberland people are not taking any more heavy contracts, the reason given being that they are now living up to freight rates, and that the threatened war will not take place. Both sides have decided to keep faith. Freights have not been officially announced; but it is believed there has been an understanding, and all are anxious to know what it is. The fact that 200,000 tons of Cumberland coal have been sold in this market is a significant one. It will be brought through the Delaware & Chesapeake Canal. The Pennsylvania has secured a controlling amount of the stock of this road. It is believed that rates this year will be from 25 to 35c. lower than last year. The Clearfield operators are, of course, dissatisfied at the treatment they have received in letting the Cumberland operators get ahead of them. But the damage is done. The amount of Cumberland placed in the East is estimated at 500,000 tons. A great deal of coal is stocking up at shipping ports, as stocks are very low.

The local and line trades are rather quiet. The fine weather has caused a falling off in domestic demand. Manufacturing demand is not yet improving in Eastern Pennsylvania. The smaller operators of the Clearfield region are looking forward eagerly to the completion of Wallace's road, but they will probably be disappointed at the result. The activity will be determined by the actual demand for coal, and not upon the facilities for shipping coal, or by the supply of cars. The car-works are pushing orders through as rapidly as possible, and deliveries are made every day. Other large contracts are to be given out in a short time. The Pennsylvania Company is taking its coat off, for an active year.

Pittsburg. March 13.

[From our Special Correspondent.]

The coal trade here is in a generally shaken-up condition, mainly due to the attitude of labor and the varying rates of wages in pits that usually show a uniformity in this respect. The convention of miners which assembled in this city during the week did not help matters, but left the question of wages comparatively open, and passed resolutions requesting all strangers to stay away from pits where the full rate, 3½ cents, was not in force. The Board of Arbitration, still in session, can hardly bridge the chasm that exists between operator and miner at present. The difficulties that are met with by the former can readily be outlined. Contracts for the lake trade should be placed this month, and as yet

I hear of but one that has been placed. This is a heavy contract for a Canadian road and was taken by W. L. Scott, the Erie magnate, whose bid was based on 3 cents for mining. His pits, near this city, on the Baltimore & Ohio Railroad, will therefore have plenty of work for the summer if the men are not intimidated and brought out for digging at a half-cent below the "district" price. Another big contract was bid upon by a Pan-Handle firm, at a rate lower than the same firm is supplying its local customers at. But it was of necessity based on 3½ cents mining, and so the job went to rival parties in the Ohio mining region. Pittsburg operators are therefore completely at sea as to lake trade, and there must be a "lock-out," if miners persist in adhering to present rates for summer mining. Prices are low and unchanged, with a fairly good local mill demand, and 6 cents on the wall as the nominal rate.

River matters are as much mixed as are affairs in the railroad trade. In the third pool, work was resumed at the reduction, 3½ cents. In the second and first pools, 3½ cents still rules, and naturally the operators there send their barges to the third pool to be loaded. The result is, that the miners loyal to the Miners' Association find their occupation gone, while the cheap diggers are as busy as nailers. It was not surprising, therefore, to learn to-day, that the second and first pool diggers declare that, if the cheap fellows don't come out, they will all dig for the same rate, and 3½ cents will then be a dead issue on the Monongahela River. Meanwhile, four million bushels have just gone down the Ohio, and Pittsburg coal is flat at 7 cents in Cincinnati, and 7½ cents in Louisville. Shippers must avail themselves of every rise; for they do not know how long a dry period may be in store for their trade. But the river operators seem as fully determined on lower rates for mining as are their fellow operators of the rail. The encroachments of Kanawha (West Virginia) coal are felt keenly on the Monongahela, as I have heretofore stated, and the prices that have ruled down the river for months show this.

Coke presents no new features, being in fair and steady demand, with prices wholly unchanged at \$1@ \$1.25; Crushed, \$1.75 per ton f. o. b. Demand equal to 700 cars daily, and prospects rather brighter for the spring business.

Buffalo. March 13.

[From our Special Correspondent.]

Winter lingers with us. Yesterday and to-day, we experienced a pleasant change, if we except a strong wind which at one time on Wednesday blew at the rate of 56 miles an hour. Your correspondent, like most of his neighbors, finds it necessary to order more coal, the supply laid in last year for use until May having nearly given out. Hence local trade is good, and the grumbling is all on the side of the consumer. This winter has been of the old-fashioned kind, and the inroads on the bins indicate its severity.

Prices of hard and soft coal are unchanged. Coke is steady and in good demand.

At the time of writing, no news is at hand relative to the bituminous coal contract for the Grand Trunk Railroad of Canada. Many of our dealers are over the border awaiting developments. If I learn any thing of interest, I will wire you.

The Erie is reported to have made contracts with the Pennsylvania and the Delaware & Hudson, relative to the use of the new Wyoming line for coal traffic.

Mr. Edward Wemple, member of Congress from this State, has framed a bill and procured a favorable report upon it, providing for the appropriation of \$1,000,000 for ten years, to be used exclusively in improving and enlarging the prism of the Erie Canal and the locks. The canal is without doubt the great regulator of freights, and it has done more to develop the West than any other agency. State pride may oppose the bill; but really the West should share the burden if the question is narrowed down to where the greatest benefit is shown. Mr. Wemple claims that 20,000,000 people are directly benefited in the receiving and transporting of property. Mr. Albert Fink says the "Erie Canal influences the rates of transportation from Chicago, St. Louis, Cincinnati, etc., to the interior of the Gulf States." The amount the bill provides for would pay the cost of lengthening the locks so as to admit the passage of two boats at

once, and of adding two feet more of water by digging down the bottom and building up the banks as suggested by ex-State Engineer Seymour. The Albany Argus would not have the State sell the Erie Canal to the Federal government at any price; but if said Federal government recognizes State ownership, jurisdiction, and management of the canal, and then gives the State \$1,000,000 for the canal (yearly) because it is now a free water-way for the commerce of all the States, then "well and good, and the sooner the better."

At Albany, last week, Senator Titus, of this city, introduced a bill reducing the charges for towing canal-boats on the Hudson River from Albany to New York to \$15, and from New York to Albany to \$10, about half the amounts now charged. This has been one of the great taxes on canal commerce, and the fact is one of the strongest arguments in favor of enlarging the locks on the Erie Canal so that a steamer and consort may be locked through together. Such boats can do their own towing on the Hudson or anywhere else. This bill, if it becomes law, will have a tendency to cheapen coal freights.

Coal pilferers are punished here by fine or imprisonment. Several came to grief this week.

The receipts of coal at Buffalo by the Lake Shore & Michigan Southern Railroad for the week ended Saturday last were 432 tons; 228 tons for Buffalo, and 204 tons through for other points.

The freight business of the Buffalo division of the Rochester & Pittsburg Railroad is steadily growing. The company's and other mines continue to deliver here about 100 car loads daily.

Canal-boat owners and boatmen are making strenuous efforts to establish a co-operative transportation company at this port in connection with their fellows at other points. Time will show whether they will succeed or not. All previous efforts have proved fruitless, from the fact that there are so many engaged in canal transportation who only own one boat, and they dislike very much the idea of pooling or waiting their turn for freight.

Chicago. March 12.

[From our Special Correspondent.]

The situation of the anthracite market was given in a nut-shell by a prominent shipper in a conversation with your correspondent this afternoon, when he said: "The market is in a more satisfactory condition to-day than it has been at any other time this season. Orders for small amounts are fair, stocks are daily growing smaller, a comparatively small amount of coal is coming in from the mines, and, while prices are low—very low—one has a surplus and no one is over-anxious to sell." This is as near to the situation as one can well get. The recent severe weather has driven consumers into restocking their cellars and coalbins when they supposed they had laid in sufficient coal in the fall to last until May. Orders from the country are still for small amounts, but are urgent, generally coming in by telegraph and demanding immediate shipment. Stocks are growing lighter, but no fears are felt that they will not prove sufficient. A smaller amount of anthracite will be carried over in the West this spring than in any previous spring for years. Milwaukee, which has received from 50,000 to 60,000 tons more coal than she had last season, is nearly bare of stocks, and some of her shippers are daily wiring Chicago dealers for shipments to Western customers. Receipts, as stated above, are light, the supply of cars for shipment West being very small, owing to the unusually light movement of freight Eastward. While dealers feel more independent, and the conditions of the market would naturally be supposed to be favorable to somewhat better prices, we can learn of no improvement in this respect, and, in fact, none can now be looked for, the season being so near the end.

The market for bituminous descriptions is about as last reported—quiet and unsatisfactory. The strike in the Indiana Block region has put a stop to receipts of that description, and Illinois coals are drawing a little benefit from the stoppage. Cannel coal is in moderate request and fair supply at unchanged prices. Illinois coals of standard grades are just about holding their own as to prices, though the tendency is, if any thing, toward lower figures.

Coke is in only moderate supply at present, and the receipts are quickly taken on arrival at old rates.

Boston. March 13.

[From our Special Correspondent.]

There has been a decided improvement in the anthracite branch of the Eastern coal market within the last ten days. The soft weather of the last few days has slackened the demand somewhat, but retailers are very generally making inquiries in the wholesale market, and are buying where they can do so at advantage. Thus far in March they have moved an unusually large amount of coal, and they will end the season with smaller stocks than was generally anticipated by the trade. The inquiry is chiefly for egg or broken sizes. Stove sizes are ordered in small lots, and this trade has kept pocket dealers busy.

The prevalent idea is, that stove coal will be somewhat lower when the new circular appears, but that egg and broken coal are now quoted at bottom figures. Doubtless the circulars will be delayed until the 20th, and perhaps later, if the demand continues fairly active. The companies are not pressing so hard for business as they were in February. Prices are nominally unchanged, quoting New York f. o. b prices: Stove, \$4.25; broken and egg, \$3.85. Philadelphia, stove, \$4.15; egg, \$3.70; broken, \$3.50@3.60; chestnut, \$4.

It is rather hard to follow broken coal at this time. Undoubtedly special concessions are made to induce manufacturers to retain anthracite, although full competition is out of the question. Such figures, however, where given, are regarded like the price of bituminous contracts as strictly sub rosa.

There has been less activity in bituminous coal for a week past. Dealers claim that the tone of the market is improving, and there does seem to be a rather better feeling, as though the railroads would keep up to agreement. This may be attributable, however, to the absence of large and close contracts in the market. Buyers are skeptical, and will sound the market thoroughly before paying any better figures than were asked a fortnight ago. Quoted prices are of little value. For any sizable lot, say five thousand tons, a special price would be given.

Gas-coal prices have not yet put in an appearance, and there is no special activity in this line. They are looked for daily.

Freights continue low with vessels in better demand. We quote:

New York, \$1@1.10 per ton; Philadelphia, \$1.25@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 has been quite active this week at well-maintained figures. We quote: White ash, furnace, egg, and nut, \$5.75; "stove, 6.00@6.25; Red ash, egg, 6.25; "stove, 6.50; Lorberrry, egg and stove, 6.50@6.75; Franklin, egg and stove, 7.00; Lehigh, furnace, egg, and stove, 6.00@6.25; Hudson, 6.00.

The receipts of domestic coal at this port for the month of February were 66,447 tons, a decrease of 7516 tons as compared with last February. From January 1st to March 1st, the receipts have been 165,419 tons, which is an increase of 11,497 tons over the receipts in the corresponding period of last year.

STATISTICS OF COAL PRODUCTION.

Belvidere-Delaware Railroad Report for the week ended March 8th:

Table with 4 columns: Description, Week, Year 1884, Year 1883. Rows include Coal for shipment at Coal Port (Trenton), Coal for shipment at South Amboy, Coal for distribution, Coal for company's use, Total, Increase, Decrease.

The Transportation of Coke over the Pennsylvania Railroad for the week ended March 8th, and year from January 1st:

Table with 4 columns: Description, Week, Year, Year. Rows include Gallitzen & Mountain (Alleghany Region), West Penn. RR., Southwest Penn. RR., Penn. & Westmoreland Region, Pa. RR., Monongahela, Penn. RR., Pittsburg Region, Pa. RR., Snow Shoe (Clearfield Region), Total.

The Production of Bituminous Coal for the week ended March 8th was as follows:

Table with 3 columns: Region, Week Tons, Year Tons. Rows include Cumberland Region, Md., Barclay Region, Pa., Broad Top Region, Pa., Clearfield Region, Pa., Alleghany Region, Pa., Pittsburg Region, Pa., Westmoreland Region, Pa., Monongahela Region, Pa., Total.

FREIGHTS.

Coastwise Freights.

Per ton of 2240 lbs.

Representing the latest actual charters to March 12th.

Table with 4 columns: PORTS, From Philadelphia, From Baltimore, From Elizabethport, Port Johnston, South Amboy, Hoboken, and Weehawken. Rows include Alexandria, Annapolis, Albany, Baltimore, Bangor, Bath, Me., Beverly, Boston, Mass., Bristol, Bridgeport, Conn., Brooklyn, Cambridge, Mass., Cambridgeport, Charleston, S. C., Charlestown, Chelsea, City Point, Mass., E. Boston, East Cambridge, E. Greenwich, R. I., Fall River, Galveston, Gardiner, Me., Georgetown, D. C., Gloucester, Hartford, Hackensack, Hudson, Lynn, Marblehead, Medford, Millville, N. J., Milton, Newark, N. J., New Bedford, Newburyport, New Haven, New London, New-Berne, Newport, New York, Norfolk, Va., Norwich, Norwalk, Conn., Pawtucket, Philadelphia, Portland, Me., Portsmouth, Va., Portsmouth, N.H., Providence, Quincy Point, Richmond, Va., Rockland, Me., Rockport, Roxbury, Mass., Saco, Sag Harbor, Salem, Mass., Saugus, Savannah, Somerset, Staten Island, Trenton, Troy, Wareham, Washington, Weymouth, Williamsburg, N. Y., Wilmington, Del., Wilmington, N. C., St. Thomas, W. I.

* And discharging. † And discharging and towing. ‡ 3c. per bridge extra. § Alongside. ¶ And towing up and down. ** Below bridge.

Comparative statement of the production of anthracite coal for the week ended March 8th, and year from January 1st:

Tons of 2240 LBS.	1884.		1883.	
	Week.	Year.	Week.	Year.
Wyoming Region.				
D. & H. Canal Co.	44,008	507,781	36,276	555,709
D. L. & W. RR. Co.	79,751	750,309	67,298	726,260
Penna. Coal Co.	13,948	155,581	14,435	188,511
L. V. RR. Co.	18,733	213,510	13,319	166,531
P. & N. Y. RR. Co.	2,820	30,236	4,107	32,731
C. RR. of N. J.	*	*	35,514	366,333
North & West Br. RR.	12,509	143,400	10,786	93,860
	171,859	1,800,817	181,733	2,130,025
Lehigh Region.				
L. V. RR. Co.	71,453	687,936	70,371	734,977
C. RR. of N. J.	5,322	36,520	502	2,864
S. H. & W. B. RR.				
	76,775	724,456	99,420	1,066,562
Schuylkill Region.				
P. & R. RR. Co.	148,154	1,529,004	91,589	1,027,004
Shamokin & Lykens Val.	*	*	24,517	218,518
	148,154	1,529,004	116,106	1,245,522
Sullivan Region.				
St Line & Sul. RR. Co.	1,280	13,907	1,113	10,827
Total	398,068	4,063,184	398,372	4,452,936
Increase				
Decrease		384,752		

* 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.

Total same time in 1879	3,862,734 tons.
" " " 1880	3,617,342 "
" " " 1881	4,687,291 "
" " " 1882	4,111,780 "

The decrease in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 23,111 tons, as compared with the corresponding period in 1883.

Horsford's Acid Phosphate, In Night Sweats and Prostration.

Dr. R. STUDHALTER, St. Louis, Mo., says: "I have used it in dyspepsia, nervous prostration, and in night sweats, with very good results."

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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.

COLORADO.—Topographical and Township Map of the State. Compiled from U. S. Government Surveys and other authentic sources, by Louis Nell, Civil Engineer. By means of symbols, the following mass of facts is graphically shown: Railroads in operation; Railroads chartered or in progress; Wagon-roads; Wagon-roads proposed; Trails; Drainage dry during the greater part of the season; County-seats; Post-offices; Villages; Townships subdivided; Townships surveyed in outlines; Contour-lines, with vertical intervals of 1000 feet; Altitudes in feet above sea-level, by barometer observations and by spirit-levels; Private grants; Military reservations; Indian reservations ceded to the U. S. Government; Arable land, with irrigation. Tables of Areas of Counties; Astronomical Positions; Arable Land. Scale, 1 inch : 10 1/2 miles. Size, 31x40 inches. Pocket form. \$1.50 on thick paper.

IDAHO.—The Wood River Region of Central Idaho, giving the first correct Geography of that recently explored and remarkable Belt of Discoveries of Gold and Silver Mines on the tributary streams of the WOOD and LITTLE WOOD Rivers, on the Upper Waters of the SALMON RIVER, among the SAWTOOTH MOUNTAINS, and on the Forks of the BOISE RIVER; embracing the Mount Estes and Custer Mines on the north and the Oregon Short Line Railroad on the south. Prepared by Frank J. Scott. Scale, 5 miles to the inch. Size, 15 x 26 inches. In paper pocket. Price, \$1.

MAP OF MINING CLAIMS ADJOINING LEADVILLE, California Mining District, Lake County, Colo. By Edward Rollandet. 1879. Mounted on muslin, \$2.50. In cloth-bound covers, \$2.

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- 1 Blake "Challenge" Rock-Breaker, 10 by 7.
- 1 Deane Steam-Pump, No. 6 1/2, complete.
- 1800 feet tramway (in sections), steel rails and 13 iron dumping cars, and track scales for weighing ore.
- 4 Hendy's "Challenge" Self-Feeders.
- 1 Frue Vanner, for concentrating ores.
- 1 Twenty-stamp Mill (new).
- 1 Ten " "
- 1 Eight " "
- 2 Mill Pumps, 5 by 3 stroke.
- A lot of Hoisting Gear, Sheave Pulleys for Wire Rope, 1200 feet 3 in. Wrought-Iron Pipe.
- 2600 " 1 1/2 in.
- 6 Heavy Copper Amalgamating Plates, in splendid condition.
- 1 Theodolite (for mine surveying), Chain, and other instruments.

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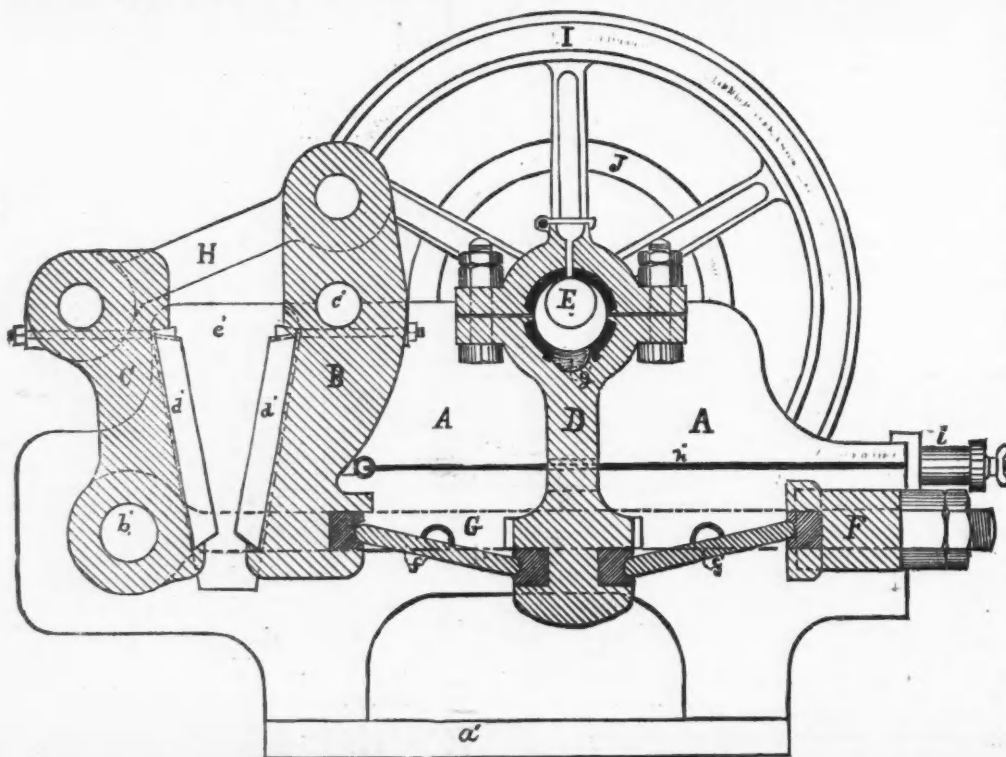
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In this crusher, the crank-shaft, tension-rods, links and pins are made of the best quality of hammered steel. The crusher is designed so that all tensile strains due to crushing are imposed upon steel, instead of cast iron. Each machine contains in weight 20 per cent of hammered steel, and as it is as heavy as any machine built of same receiving capacity, it is easy to understand why it is at least twice as strong as any other in the market. In addition to its immense strength, it possesses the advantage of being sectional, so that, in an ordinary-sized machine, no one piece will weigh over 2000 pounds. The motion of the jaws in this crusher is different from any other built: both jaws move—one from the top, and the other from the bottom—producing a motion which is uniform from the opening or mouth to the bottom or point of delivery. The advantage of this motion is, that the crusher never clogs, and the ore or rock is broken by the first advance of the jaws, thereby largely increasing the capacity of the machine. It will also crush wet and slimy rock, and as there is absolutely no rubbing or grinding motion, it makes but little dust, and crushes with great uniformity, and with less wear on jaw plates than in any other crusher made. The journals are very large and long, and do not wear rapidly or heat. Nine sizes made.

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