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MR. E. E. OLCOTT will start on a trip to examine mines near Sombretete, Zacatecas, Mexico. He leaves on the 28th inst.

MR. WILLIAM M. COURTIS, mining engineer, of Detroit, Mich., sails on the Oregon, December 26th, on a professional trip to England. He will be absent several months.

EMPLOYERS in any part of the world who require the services of superintendents, mining or civil engineers, metallurgists, chemists, mine or furnace foremen, or other assistance of this character, can have their wants advertised in the ENGINEERING AND MINING JOURNAL without charge.

Applications for the positions so advertised will be forwarded for sub-

scribers to the ENGINEERING AND MINING JOURNAL. Postage to cover forwarding should be inclosed.

THE dreadful accident at the Nanticoke colliery of the Susquehanna Coal Company, which is referred to in our mining news, was one of those disasters that create the most intense interest in and sympathy for the "soldiers of the deep." In this case, it appears that the roof of the mine gave way at a point where a vast accumulation of coal-dust or "culm" on the surface, acting as a dam, had created a large pond of water. When the "cave" took place, this great volume of water rushed into the mine, carrying with it culm, soil, and rocks.

The flood, rushing along the gangway, quickly alarmed the men at work in the mine, and some of these succeeded in making their escape, reaching the slope or an air-shaft before the water could cut them off; but a number of men working at a distance from these outlets were locked in by the rapid filling of the gangway with water and debris.

The water rose to a considerable depth, but the chambers to the rise were still far above the water-level, and it was supposed that the twenty-six men who were imprisoned, if they had succeeded in reaching these chambers, would be able to live there for a number of days until rescuing parties could reach them. Every effort was made by the company and the workmen of the district to rescue their comrades; but it was found that the gangway had been filled full of culm and clay, rocks and timbers, so that the progress was comparatively slow; but when almost within reach of the chambers in which it was supposed the men were confined, fresh falls of roof made it impossible to continue the work, and rendered it all but certain that the imprisoned men, if they escaped the first rush of water, must have been buried under the falls of roof. After three days of agonizing effort, the attempt at rescue had to be abandoned, and it is probable that more than a month will elapse before the bodies can be recovered.

The uncertainty as to the fate of the imprisoned men, and the hope of saving at least some of them, created the wildest excitement in the district, and indeed led to the death, through excitement, of one or two of the female relatives of some of the unfortunate victims.

The condition of the mine previous to the accident is not stated; but it is believed that this disaster, in which, as stated above, twenty-six lives were lost, was not due to culpable carelessness, but was one of those that, though not strictly unavoidable, could at least not be foreseen.

Such accidents have been comparatively rare in this country, and even now the extent of this is completely overshadowed by the following report that comes by cable of an explosion in the Ferndale Pit, in Wales:

"The explosion occurred in the upper of the two seams. There were 750 men in the mine at the time of the explosion. The majority were in the lower seam, otherwise the death list would have been much larger. At least fifty men were killed in the upper seam and scores were terribly burned. The injured were carried to places of safety by their more fortunate companions who had not been hurt."

These are the terrible occurrences that give coal mining the reputation among laymen of being an "extra-hazardous" calling, and yet it is well established that the death-rate in it is less than in many other industries that rank as "ordinary risks."

THE RENSSELAER POLYTECHNIC INSTITUTE.

The Rensselaer Polytechnic Institute, at Troy, New York, has so long held the rank of the first civil engineering school in America, and its alumni occupy so many important positions throughout the country, that every thing connected with its management has a wide-felt interest.

It is well known that the Institute, though the oldest and the most distinguished of its class, is also perhaps the poorest financially, and it has for some time been evident that it can not long maintain its eminent position on its wholly insufficient means, while so many rival institutions are provided with the most magnificent endowments. The many rich Trojans have never fully appreciated the needs of this school or the benefits it has brought on the city, and, with a few generous exceptions, have treated the Institute in a decidedly illiberal manner. The alumni of the Institute have for some years past taken a more active share in its management, a number of them being now on the board of trustees, and it is evident that they are better qualified than mere laymen to judge of the shortcomings of the Institute, and of what is necessary to bring it up to the requirements of the profession and the standards of other more liberally endowed engineering schools; for there is a very general impression that this famous school is falling behind in the race, and something must be done to add to its revenues and to increase its efficiency. A difference of opinion upon some of these points appears to exist between the professional (alumni) and the non-professional (citizen) trustees, and this difference took form in their meeting on the 16th inst., when Mr. J. C. PLATT, Jr., of Waterford, New York, an alumnus trustee, as chairman, presented the report of a committee, recommending the consolidation of the offices of president and director of the Institute in the hands of one person, on the ground that it would be beneficial to the school. It is generally conceded that President FORSYTH

is a devoted friend of the Institute, and he has frequently stated his willingness to resign his post. Director D. M. GREENE is also an efficient officer and a well-known engineer. So that this resolution was evidently free from any personal reflection, and was made solely in the interests of the Institute, which most of its graduates believe would be promoted by consolidating these offices and putting greater responsibility upon one head. Who that head might be, though a most important matter for the Institute, is not now the question, and it is to be regretted that it assumed apparently a personal bearing.

The report says: "The resolution called forth a heated discussion. President FORSYTH said he had been ready and willing to resign the office of president for a long time; but he did not propose to be voted out, neither was he in favor of having Director GREENE used in that manner. Action on the resolution was indefinitely postponed by a bare majority of one in a vote of 13."

It is to be noted that all of the trustees present who were graduates of the Institute favored the consolidation, and, as several of the graduate trustees were absent, it appears probable that, should the question come up again in this form, it will be adopted. It is to be hoped that the interests of the Institute will overshadow any personal question, and that the trustees, under the lead of their estimable and devoted president, Mr. FORSYTH, will promptly adopt what appears to be the general desire of the alumni, and that the new head, whether it be Director GREENE or some other distinguished engineer—and we have heard no other name mentioned in this connection—will find the ways and means to recover or maintain for the Institute the first position in this country which it has so long held.

THE COPPER PRODUCTION AND TRADE OF THE UNITED STATES IN 1885.

The close attention that has been given to the copper trade in the ENGINEERING AND MINING JOURNAL during the year, and the assistance of several gentlemen connected with the copper industry, enable us to give at this early day a review of the trade for the year, which, though possibly not absolutely accurate, is very nearly so, and, given at this time, is really of greater value than a somewhat more detailed statement would be a month hence, when the full returns will come in.

The production of copper in the United States during the current year is given in the following tables, which have been compiled by Mr. S. RAUNHEIM:

YEARS.	Production.	Home consumption.	Export to Europe.	Stock on hand Dec. 31st.	New York price of copper.	
					Average.	Average.
	Pounds.	Pounds.	Pounds.	Pounds.	Cents.	Cents.
1882.....	92,000,000	77,000,000	5,000,000	23,000,000	18½	15¼
1883.....	117,000,000	77,000,000	40,000,000	23,000,000	16¾	14¾
1884.....	143,000,000	79,000,000	68,000,000	19,000,000	13¼	12¾
1885.....	†146,000,000	85,000,000	70,000,000	10,000,000	10¾	10¾

The production in the current year, 1885, is thus distributed by Mr. RAUNHEIM:

Michigan.....	66,000,000	pounds fine copper.
Montana.....	55,000,000	" "
Arizona.....	19,000,000	" "
Miscellaneous.....	3,000,000	" "
From foreign ores.....	3,000,000	" "
Total.....	146,000,000	" "

Against 145,000,000 pounds in 1884.

The exports from the United States to Europe, according to the official returns from the Bureau of Statistics at Washington, were:

1884.		Pounds.
Copper ingots, bars, old copper, fine copper.....		30,405,159
33,672 tons ore and matte, equal to fine copper.....		37,500,000
Total.....		67,905,159
1885 (DURING THE FIRST ELEVEN MONTHS).		
Copper ingots, bars, etc.....		34,408,747
32,380 tons matte and ore, equal to.....		35,820,508
Estimate for December (shipments will be very small, on account of the reduction of the Montana output).....		3,000,000
Total.....		73,229,255

These shipments include about 3,000,000 pounds of copper, made of imported foreign ores and re-exported.

These figures show:

1st. The production of fine copper in the United States, and the quantity made from imported ores, were only about 1,000,000 pounds—no greater

* In addition to this amount of 79,000,000 pounds, about 3,000,000 pounds of copper made from imported material went into consumption, making the total home consumption 82,000,000 pounds.

† The figures for 1885 include 3,000,000 pounds of fine copper produced from foreign ores.

in 1885 than in 1884; the increased output of Calumet & Hecla being balanced by the closing of other Lake mines, and the increase in Montana being balanced by the decrease in Arizona and other districts.

2d. The home consumption, which in the early part of the year was very light, has increased so rapidly during the past four or five months that the whole year will exceed that of 1884 by 3,000,000 pounds.

3d. Our exports, including the re-export of copper from foreign ores, were only about 5,000,000 pounds greater in 1885 than in 1884.

4th. Our stocks, which decreased 4,000,000 pounds in 1884, declined in 1885 fully 9,000,000, leaving us with the smallest stock for very many years.

Prices ranged from an average of 13¼ cents in 1884 to 10¾ cents in 1885, in the face of this strong statistical position; but this anomalous feature of the market was not confined to, in fact did not originate in, this country.

The visible supply of copper at Liverpool, Swansea, London, and Havre, including the quantities reported by cable and afloat from foreign countries to England and France, averaged in—

1880.....	64,561	gross tons, while the average price for Chili Bars was £62½
1881.....	58,870	" " " " " 61½
1882.....	54,087	" " " " " 66¾
1883.....	50,227	" " " " " 63¼
1884.....	46,362	" " " " " 54¾
11 months, 1885.....	54,100	" " " " " 43¾
December 1st, 1885.....	53,984	" " " " " 42¾ while price of Chili Bars is.....

And they are now about £41 a ton.

Figures like these show clearly that the depressed condition of the copper market, either in Europe or here, is not due to any abnormal supply as compared with consumption; on the contrary, the rate of consumption here has been growing much more rapidly than production; and if our present revival of business should continue during the year 1886, as appears probable, we shall have to restrict exports very considerably, unless, indeed, some quite unexpected new source of supply should be opened. The increase from Calumet & Hecla and Tamarack will probably be offset by a reduction in Montana and Arizona, and nothing of moment need be looked for from Texas or any of the old producers, unless the price should advance very largely, and induce the reopening of mines and works now shut down.

The prospects for the year 1886 are decidedly encouraging, and we believe there is every prospect of better prices than have obtained during the past twelve months.

CORRESPONDENCE.

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

Cost of Producing Copper at the Calumet & Hecla Mine.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The directors of the Calumet & Hecla Company remain the exception to all other Lake Superior copper companies, and give its stockholders no information as to how their business has been done, or how their money is disposed of, beyond the small part given to them as dividends.

It has been the custom, from the earliest days, of the directors of lake copper companies to make annual reports to their stockholders, giving an account of receipts and expenditures, with sufficient detail to enable the stockholders to judge of the manner in which the business has been conducted. These reports are generally in such detail as to be very instructive and highly satisfactory. The Calumet & Hecla stockholders are required to take it for granted that every thing has been done for the best. Many stockholders have hoped this company would conform to the practice of other companies, and give them annually a statement of their business. This has been particularly desired since the dividends have become irregular and have been reduced in amount; but so far, their hopes have not been met.

A desire to know something about the business set me to figuring again—after the manner of last year—the results of which you published in your issue of December 6th, 1884.

Not doubting that many of the 2045 stockholders are deeply interested, I send you the main results of my figuring for publication.

I have taken the Quincy, Allouez, and Atlantic reports for 1884 to learn the value of copper and the cost of smelting, and for purposes of comparison.

These mines obtained for copper for that year:

Quincy.....	10-23	cents, partly estimated at 10 cents.
Allouez.....	13-02	" realized.
Atlantic.....	11-81	" partly estimated at 10-6 cents.
Average.....	11-69	" per pound—nearly.

Which is adopted as the price realized by the Calumet & Hecla, in the absence of any statement of the price received.

The costs of smelting, transportation, selling, Eastern office, insurance, and other costs not incurred at the mines, all classed under the item "smelting" in the following tables, were for—

Quincy.....	1-803	cents per pound of ingots.
Allouez.....	2-091	" " " "
Atlantic.....	1-834	" " " "
Average.....	1-909	cents per pound of ingots.

Which is taken as the cost of similar items for the Calumet & Hecla. It

is quite possible this is too high a figure for this company, in consideration of the large amount of copper it has produced. If too high, the difference should go into the "mine" cost item. The "mine" item includes mining, stamping, and all lake costs not otherwise classified, and is got by subtraction.

The item "real estate" covers investments, improvements, and buildings.

The item "personal estate" is found only in the Calumet & Hecla classification. In the other companies, this is included in "real estate" and "mine" costs. As the items are not known to me, it can not be distributed to those other accounts, so as to make the exact comparison. However, what would be taken from this item would be added to the other two headings.

From statements on file with the Secretary of State, required by the Michigan statute, verified by affidavits, it is shown that the Calumet & Hecla Company had as follows:

In 1883, the sum invested in real estate was	\$4,388,126.16
" " " personal estate was	2,942,989.62
" " " bills receivable	2,004,159.40
" " " the debts payable unsecured were	785,600.07
In 1884, the sum invested in real estate was	4,573,000.95
" " " personal estate was	3,127,224.29
" " " bills receivable	2,470,862.42
" " " the debts payable unsecured were	530,556.06

Showing an increase during the year—

In real estate investment	\$184,874.79
personal estate	184,234.67

And a decrease—

In bills receivable	\$133,267.04
debts payable unsecured	255,044.01

The copper produced was 20,263,585 tons.

These figures show that there were received—

For copper at 11.69 cents a pound	\$4,730,012.96
Received from bills receivable	133,267.04
Total receipts for the year	\$4,863,280.00
Deduct debts paid unsecured	255,044.01
Balance of receipts	\$4,608,235.99
Deduct dividends paid in 1884	800,000.00
Balance expended in carrying on the work	\$3,808,235.99

It is assumed that the Calumet & Hecla stamp rock yielded 4.8 per cent of copper, equal to 96 pounds per ton of rock stamped. Though this may not be strictly correct, it is believed to be very near the mark.

This yield of copper would require the stamping of 421,600 tons of rock. It is also estimated that 99 per cent of the rock mined went to the mill.

COMPARATIVE STATEMENT.

Name of mine.	Pounds of ingot copper produced in 1884.	Tons of rock stamped in 1884.	Per cent stamped of total rock mined.
Calumet & Hecla	40,473,585	421,600	96.00
Quincy	5,680,087	99,196	74.99
Allouez	1,932,170	119,639	84.50
Atlantic	3,163,585	219,510	99.50

This table shows that the other three mines combined stamped 16,736 tons more than the Calumet & Hecla stamped. They therefore make a good basis for comparison.

For reasons spoken of last year, the Calumet & Hecla can not be considered at a disadvantage in natural conditions, ruling necessary costs, when compared with the average of the other three mines.

TABLE OF COSTS, 1884.

NAME OF MINE.	Subdivisions of expense.	Amounts expended in subdivisions.	Amounts expended in subdivisions per ton of rock stamped.	Pounds of copper per ton of rock stamped.	Per cent of copper in rock stamped.	Costs in cents per pound of copper, in subdivisions of expense.
Calumet & Hecla.	Mining	\$2,666,485.80	\$6.3246	96	4.800	6.585
	Smelting	772,640.73	1.8326			
	Real estate	184,874.79	0.4385			
	Personal estate	184,234.67	0.4369			
	Totals	\$3,808,235.99	\$9.0328			
Quincy	Mining	\$263,473.07	\$3.6641	57.26	2.860	1.803
	Smelting	101,417.93	1.0224			
	Real estate	23,790.32	0.2398			
Totals	\$488,681.92	\$4.9263				
Allouez	Mining	\$239,804.23	\$2.0045	16.15	0.800	2.091
	Smelting	40,403.20	0.3377			
	Real estate	41,276.39	0.3451			
Totals	\$321,483.82	\$2.6873				
Atlantic	Mining	\$285,989.53	\$1.3650	15.10	0.755	1.834
	Smelting	58,036.12	0.2770			
	Real estate	14,215.21	0.0678			
Totals	\$358,240.86	\$1.7009				
				Average of three		1.909

I would have introduced the Osceola in the foregoing table had I possessed all the necessary data. However, its costs are very near the average of the Quincy, Allouez, and Atlantic costs.

The Quincy, Allouez, and Atlantic each shows a considerable decrease in the "mining" item of costs, as compared with previous years. The

economy and success with which they are managed challenge the admiration of miners.

COMPARATIVE TABLE.

MINE.	Subdivisions of expense.	Average cost in cents per pound of copper produced in subdivision of expense for the 5 years previous to 1884.	Cost in cents per pound of copper produced in subdivision of expense for the year 1884.	Reduction in cents of cost of copper per pound in subdivision of expense for the year 1884 from the cost of previous 5 years, average.
Calumet & Hecla.	Mining	6.023	6.588	0.335
	Smelting	2.197	1.909	0.288
	Real estate	1.700	0.456	1.244
	Personal estate	0.770	0.455	0.315
	Totals	11.590	9.409	2.178

The above table shows a saving in the cost of production for the year 1884 of 2.178 cents per pound from the previous average rate for five years, amounting to \$881,514.68 on the year's product of copper. This is more than the amount of the dividends for the same year.

It is noticeable that a very small part of this saving—about 1 1/2 per cent—is found in the item of "mining," which includes the lake costs. The great bulk of the saving arises from the reduced investments in real estate. Many stockholders expected a very considerable reduction in "mining" costs, in consideration of the very extensive plant of new and costly machinery brought into use, the increased production and the decline in prices generally, below the average of the previous five years, to say nothing of the special efforts toward economy supposed to have been made.

It will be seen by the above table, that the item "mining" is \$6.3246 per ton of rock stamped, against an average for the other three mines of \$2.3445 per ton stamped, the difference being \$3.98 per ton stamped, against the Calumet & Hecla. Had this company done its work as cheaply as the average of the other three companies in the item of "mining," it would have added the snug sum of \$1,677,968 to its net earnings, a sum more than twice the amount of dividends for the year.

The Calumet & Hecla Company possesses a wonderfully rich mine, more extensively opened than any other mine, with greater capacity of production, magnificently equipped with machinery, and able to stand to the last if the contest should ever come for the survival of the strongest. And it certainly has a very great capacity in the way of net earnings that the stockholders may yet hope to receive.

It can not be doubted that a compliance by this company with the custom of other lake companies, of submitting a detailed statement of receipts and expenditures to its stockholders for inspection and criticism, would lead to a greater share of the earnings going to the side of profits.

I wish to say, for the relief of other persons from blame, that the writer of this is not a resident of the Lake Superior mining district, and that no mining superintendent or other person has furnished him any information other than that found in the published and filed reports referred to in these articles.

MINER.

UINTAHITE—A NEW VARIETY OF ASPHALTUM FROM THE UINTAH MOUNTAINS UTAH.

Written for the Engineering and Mining Journal, by Prof. W. P. Blake.

In the month of September last, a sample of a peculiar asphalt was received for examination, and recently when in Provo, Utah, I had the opportunity of seeing a considerable quantity brought in from the Uintah Mountains.

It is obtained in masses several inches in diameter, and apparently free from mechanically disseminated impurities. It breaks with a conchoidal fracture, is very brittle, and is readily reduced to powder in a mortar, Hardness, 2 to 25. Gravity, 1.065 to 1.070. Color, black, brilliant, and lustrous; streak and powder, a rich brown. It is a non-conductor of electricity, and is electrically excited by friction.

It fuses easily in the flame of a candle and burns with a brilliant flame, much like sealing-wax; and like sealing-wax, it will give a clean sharp impression from a seal. Unless the melted mineral is very hot, it does not adhere to cold paper. It has considerable plasticity while warm, and is not sticky, but retains after melting its lustrous black and smooth surface. By distillation, a very small quantity of a clear white and dense oil is given off, and a little gas or vapor.

It is much more readily dissolved by the heavy oils and fats than by the lighter and more volatile menstrua. Thus it dissolves and incorporates quickly in heavy lubricating petroleum, while the white distillates from petroleum have little or no effect upon it at ordinary temperatures. So also it freely dissolves in oil of turpentine, when warmed, but it does not readily dissolve in cold spirits of turpentine. Ether apparently does not attack fragments, but the powder is slowly dissolved. It is not soluble in ordinary alcohol.

The mineral dissolves quickly in melted wax and incorporates with it, producing on cooling a hard, black mixture, which closely resembles "burnt wax," and may be used for similar purposes. The mixture also closely resembles the Utah mineral wax or ozokerite. The mineral will also freely melt and combine with ozokerite. It dissolves in hot stearine and melted tallow, giving black mixtures varying in hardness with the amount of uintahite used.

It differs from grahamite and albertite by its easy fusibility and other characters; from piazite by its gravity, structure, and deportment with alcohol; and from wolongonzite by its fusibility and small amount of oil and gas.

It is said to occur in considerable quantities, and it will no doubt find many useful applications in the arts as a pigment, insulator, and ingredient in lubricating cereous and fatty mixtures.

ON THE REACTIONS OF THE POLYSULPHIDES.

Written for the Engineering and Mining Journal by C. H. Aaron.

(Concluded from page 418.)

Following up this subject, it occurred to me that, if the view set forth in my former communication is correct, it will depend upon the relative affinity of sodium for S_4O_6 and for S_2O_3 , as to whether, in precipitating, we should have to deal with silver hyposulphite or with silver tetrathionate in the main. I made some experiments.

A sodium hyposulphite solution, containing also silver, was divided into two parts. From each part, four separate precipitations were made with equal quantities of solution of KS_2 . The silver was in excess to the last. The two series did not agree as closely as was desirable. The mean results were:

1st precipitation gave	242 silver.
2d	237 "
3d	217 "
4th	188

This negatives the supposition that silver tetrathionate was the substance acted on after the first precipitation; at the same time, it indicates a progressive diminution of the coefficient of precipitation, which, for certain reasons, I expected to find. The figures given are only relative, having no absolute value.

The inference is, that sodium has more affinity for S_4O_6 than for S_2O_3 .

Another solution of silver was divided into four parts. From each of two parts, a small proportion only of the silver was precipitated by a known quantity of precipitant. From each of the other two parts, the whole of the silver was precipitated by a slight excess of the precipitant, a record being kept of the quantity of that used. Immediately after the last addition of precipitant, in order to utilize the entire quantity added, some more silver solution was poured in.

In this case, owing to the precaution of diluting the precipitant so as to lessen the effect of any error in the measurement, and to great care in all respects, the duplicates agreed very nearly. The mean results were:

Partial precipitation, 1 vol. precipitant gave	368 silver
Total	193 silver.

I still did not think that silver tetrathionate was the substance acted on, and I have since found that sodium tetrathionate does not dissolve silver chloride to any appreciable extent. What I did think will appear hereafter.

Something seems to depend on the manner of applying the precipitant. To test this, two equal quantities of silver solution were taken for experiment, and the following results were got:

1st. Excess of polysulphide poured into 1 part of silver solution gave 560 silver.

2d. One part of silver solution poured into excess of polysulphide gave 525 silver.

The difference was less than was expected, and may have been accidental, but it presents a general agreement with my theory, as will appear hereafter. However, the conditions were not completely reversed; the silver solution, in the first case, should have been strong, and the precipitant weak; in the second case, the silver solution should have been weak and the precipitant strong. The figures, as before, are only relative.

But if sodium tetrathionate is formed, and does not afford silver tetrathionate (either by direct action on silver chloride or by metathesis with silver hyposulphite) for the precipitant to act on, we might infer that it would accumulate in the solution, in continuous working, until that should be saturated, and then crystallize out. In working on the large scale, with the calcium salts, no such thing has been observed that I know of. The question then arises, How does the tetrathionate behave, and what becomes of it?

On consideration, I think there may be a certain error in my comparative coefficients of partial and total precipitation; the difference seems too great, perhaps, from one point of view, though not from another. I shall give this a place in the list of matters requiring explanation, as follows:

1. The possibly too great difference between my experimental coefficients of partial and total precipitation.
2. Gradual progressive diminution of the coefficient of precipitation.
3. Margin between complete precipitation and a positive excess of precipitant.
4. Turbidity caused in the clear filtrate from complete precipitation on addition of more of the precipitant (provided no more has been added than was strictly necessary in the first place).
5. Non-accumulation of $Na_2S_4O_6$.
6. Discrepancies of experimental results as to coefficient of precipitation.
7. Difference in results by reversal of conditions during precipitation.
8. Failure to reach the full coefficient of precipitation indicated by my theory, so far as yet set forth.
9. Maintenance or increase in strength and volume of the leaching solution in practice.
10. Free sulphur in the precipitate, whether the disulphide or a higher one be used as precipitant.
11. The coefficient of precipitation is greater with a dilute precipitant than with a highly concentrated one, and with a strong solution of silver than with a weak one.

This looks like a rather formidable array; but we shall see that the key to any one of these problems is the key to all. If $Na_2S_x + Na_2S_4O_6 = 2Na_2S_2O_3 + xS$ (in which x is not less than 2), then all difficulties vanish.

Let us concede that the primary and, for a time, predominant reaction is that expressed by the equation $2Ag_2S_2O_3 + Na_2S_2 = 2Ag_2S + Na_2S_4O_6$, as given in my former letter, all atoms of sulphur above two in the molecule of polysulphide being liberated. For the sake of clearness, we will call this reaction A. The reaction expressed by $Na_2S_2 + Na_2S_4O_6 = 2Na_2S_2O_3 + 2S$, we will call B.

As soon as A begins to operate, sodium tetrathionate is formed, and

then B also begins its work. But A predominates by virtue of stronger affinities, and in proportion as the silver in the solution predominates, as yet, over the sodium tetrathionate; also, as the precipitant is relatively weak, and is rapidly distributed by stirring, while B reacts on such portions of the inflowing precipitant as may be, locally and for the moment, in excess of the silver. To this extent, B plays the rôle of a secondary reaction or of an opposing force, the resultant, to that extent, being $Ag_2S_2O_3 + Na_2S_2 = Ag_2S + Na_2S_2O_3$, a higher polysulphide, only differing in its action by liberating the extra sulphur. (This explains 8.)

But in proportion as the silver solution becomes weaker, B has more opportunity to act, unless the precipitant be correspondingly diluted. The increasing proportion of tetrathionate also increases the activity of B. (This explains 2 and 11.)

If the precipitant is poured in rapidly, and without active stirring of the silver solution, it will be in greater local excess than if added slowly while the solution is well stirred; then the effect of B increases. (This may account for 6; it explains 7.)

A point must be reached at which A and B are in equilibrium, owing to increase of tetrathionate and decrease of silver in the solution; then tetrathionate will no longer be formed, or, if formed, will be first equally and later increasingly decomposed. Owing to the stronger affinities acting in favor of A, and to the now decreasing quantity of tetrathionate in the solution, as well as because the precipitant was comparatively weak at the commencement, the neutral point will be beyond the middle, and some tetrathionate will exist after all the silver is precipitated; this will depend partly on the manner in which the precipitant is used, and on the initial strength of the two solutions relatively. Consequently, if more of the precipitant is added after complete precipitation of the silver, B still acts, and the precipitant is decomposed, with liberation of all its sulphur, as long as any tetrathionate remains. (Applies to 3 and 4.)

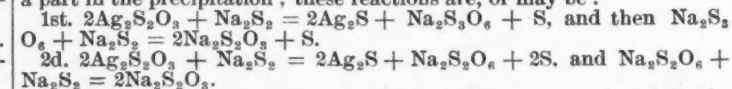
In my experiment on total precipitation, I perhaps added a little more of the precipitant than was necessary to precipitate all the silver, and a part, or the whole, of that excess was decomposed according to B, rendering futile, in part or wholly, the precaution of adding some silver solution afterward. Hence, too low a comparative coefficient may have been found for total precipitation. But this is by no means certain. If we reduce 193 to 180 (the minimum for 100 of pure soda), we have 343 for partial precipitation, a very reasonable result in view of my theory, but leaving no margin for residual sodium tetrathionate in the solution. If, however, we take say 355 for partial precipitation, the proportion gives 186 for total, which would allow of the "margin" observed in practice. This would be on the supposition that I used a little more of the precipitant than was strictly necessary, but not passing the margin; and perhaps this is the more reasonable view; for, although 355 of silver to 100 of soda is a nearer approximation to the possible maximum, according to A, than has been got in any other instance by either Mr. Russell or myself, yet it must be remembered that I precipitated only a very small proportion of the silver from a strong solution, with a weak precipitant, all favorable conditions for a high result.

In practice, the workmen frequently add more of the precipitant than is absolutely necessary to precipitate all the metals; but, owing to B, this may not appear as excess by the test given them for their guidance, called "back test" in the works, and which only indicates such excess as will cause a precipitate in a metal solution. (Applies to 5 and 9.)

But even if the workmen are careful to leave a little metal in the solution, as they are permitted, or even instructed to do, as a safeguard against injurious excess, so that tetrathionate may accumulate to a certain extent, yet the final result is the same; for in that case, B will be more active all through the next or succeeding operations, and, in the long run, all of the sodium hyposulphite (or calcium, as the case may be) that is decomposed by its action on silver chloride will be regenerated, except a more or less constant quantity that may remain in the solution. The mechanical loss of the solvent will be compensated, or more than compensated, by the hyposulphite in the precipitant. (Explains 9 and 10; also applies to 5.)

Since writing the foregoing, I think I have found, by direct experiment, that sodium tetrathionate does decompose the alkaline polysulphides with formation of hyposulphite and liberation of sulphur.

On consideration, I find two other reactions, either of which, but especially the first, accords better with observed facts than the one suggested by Mr. Stetefeldt. It seems possible that these may also play a part in the precipitation; these reactions are, or may be:



2d. $2Ag_2S_2O_3 + Na_2S_2 = 2Ag_2S + Na_2S_2O_6 + 2S$, and $Na_2S_2O_6 + Na_2S_2 = 2Na_2S_2O_3$.

But No. 2, with its sequence, would not alone account for 4 in the list unless a higher polysulphide were used, which, however, is usually the case in fact. In all these reactions, the only effect of substituting the higher polysulphides for Na_2S_2 is to increase the quantity of sulphur liberated.

I am convinced that the key to our problem will be found in the formation of one or several of the salts of the less known sulphur oxacids, and the decomposition of these by the polysulphides with reproduction of hyposulphite.

I will further venture to say that the coefficient of precipitation, in continuous working, will not exceed 180 of silver per 100 of caustic soda used (disregarding base metal); in fact, it will fall below that figure, on account of oxidation of the precipitant, and the difficulty of making the polysulphides quite free from caustic, which I have had occasion to notice in my experiments, as well as the surprising effect of a very little caustic soda in reducing the solvent energy of the hyposulphite solutions (unless I was deceived as to the latter).

It would seem that the monosulphide would be the more economical precipitant, if it could be prevented from oxidizing much; otherwise, I suggest a mixture of that and disulphide for the Patera process, or Russell's modification of that, where lead is to be saved.

While I do not claim to have positively proved my theory, I may be permitted to say that all the facts, so far as known to me, support it, and on the other hand the theory explains, without straining, all the facts.

I am sure that Mr. Stetefeldt's theory is erroneous; I venture to hope that mine may be found correct; but beyond and above all personal vanity or emulation, let us have the truth!

THE CONDITION OF THE EUROPEAN IRON TRADE.

Written for the Engineering and Mining Journal by George G. Andre.

The year 1885 closes in gloom for the iron industry of Europe. In England, the most hopeful of the iron-masters are trying to pick out some crumbs of comfort from the reports of an improvement in the trade of the United States, which, for speculative purposes probably, are actively circulated here. But even these men of sanguine temperament find but little to sustain their hopes; while the rest, the greater part of the iron manufacturing community, obstinately refuses to be comforted. It persists, in spite of much newspaper writing to the contrary, in believing that the much talked of revival on your side of the ocean is rather artificial than real; that it is a speculators' "boom," founded indeed upon some real improvement, but having nothing to justify its astonishingly rapid development. Outside this, there are no indications of an immediate revival. In France, the situation is worse, and the bottom is apparently not yet reached. Each weekly report of the markets reveals a state of things less satisfactory than the preceding, and the manufacturers are losing hope and heart. Among the workmen, the suffering from privations is very great, and to these the prospect of a long and hard winter must be terrible. In Belgium, matters are scarcely better. Prices have reached a level that leaves no room for profit, though the cost of production has been brought down to the lowest possible point. In Germany, the same situation has been reached through a year of rapidly failing trade. Whatever there was of prosperity when the year opened has wholly vanished at its close. The trade is in a sorely depressed state, and the tendency is still downward. Taking into account the circumstances of the iron industry in these great producing countries of Europe, we are forced to admit that no improvement worthy of being described as a revival of business can reasonably be expected for some time to come. Probably another year will have rolled away before that change takes place.

EXPORTS OF IRON AND STEEL FROM GREAT BRITAIN TO THE UNITED STATES.

	Eleven months ended Nov. 30.		
	1883.	1884.	1885.
	Gross tons.	Gross tons.	Gross tons.
Pig iron.....	269,395	151,154	99,632
Old iron for remanufacture.....	42,005	24,812	10,359
Steel unwrought.....	27,336	12,726	12,570
Tin plates.....	201,760	195,973	207,318
Hoops and sheets.....	28,115	19,867	20,861
Bar, angle, bolt, and rod.....	8,328	4,171	2,010
Railroad iron.....	69,269	17,820	5,469

The Clapp-Griffiths Process in France.—The French Société Clapp et Griffiths, with head-quarters at Paris, report favorable progress, having introduced the process into several works, and being engaged in building at Creil a two-converter plant to produce mild steel in small ingots.

The Manufacture of Magnesium.—The problem of producing the semi-precious metals at a low price is now very actively considered in France, and in this direction small works for making magnesium have been established at Corbeil. The most suitable lamp for burning wire of this metal is now the subject of investigation.

The Basic Process Patent.—According to reports, a decision has been rendered by the Commissioner of Patents in the case of Jacob Reese vs. Thomas, of the basic process, for priority in invention of furnace linings, in favor of Mr. Reese.

French Colliery Statistics.—Recent statistics show that 111,317 persons are employed in the French collieries. Under ground, there are 76,982, or about two thirds of the total, and 34,335 are above ground. In each 100 persons employed, 89.1 per cent are men, 4.6 per cent women, and 6.3 per cent children. In 1882, there were 108,300 persons employed, 77,800 under ground, who received 94,996,000 francs, and 30,500 on the surface, whose wages amounted to 24,020,000 francs, the total wages being 119,016,000 francs.

The Progress of the Basic or Thomas-Gilchrist Process.—The total make of steel and ingot iron made from phosphoric pig during the twelve months ended September amounts to 945,317 tons, being an increase over the make for the previous twelve months of about 10 per cent. It is noticeable that of this make no less than 600,183 tons were ingot iron, containing under .18 per cent of carbon, used for wire, sleepers, tin plates, tubes, boiler and ship plates, etc. The makes of the various countries are as follows: England, 145,707 tons; of this, 70,813 tons contained under .18 per cent carbon; Germany and Austria, 617,514 tons; of this, 424,862 tons contained under .18 per cent carbon; France, 130,582 tons, of which 62,390 tons contained under .18 per cent carbon; Belgium and other countries, 51,514 tons; of this, 42,118 tons contained under .18 per cent carbon; total, 945,317 tons; of this, 600,183 tons contained under .18 per cent carbon.

Extending Trade—An Example for Imitation.—The great firm of Krupp has a representative in all the chief towns of the Chinese empire. It has supplied the government for some years past with the greater part of its war material; and in this capacity of gun-makers, its members have been able to win their way into favor with the ruling powers. In this they have been aided by political considerations. China has nothing to fear from Germany. Moreover, the French have made themselves hated by their recent unjustifiable attack, and the Americans have damaged their position by their harsh treatment of Chinese immigrants. Favored by these circumstances, and possessing the opportunities that are open to him through an organized band of agents placed in advantageous positions, Krupp has made himself master of the situation. We now learn that a strong combination of capitalists and manufacturers is forming to work the Chinese railroad projects, and it is not hard to divine that these are Herr Krupp and his friends. A significant fact is, the accession to that firm of an eminent railroad engineer well acquainted with China.

NEW LOGARITHM TABLES FOR TOPOGRAPHY.

Written for the Engineering and Mining Journal by Benjamin Smith Lyman.

The accompanying four-place tables of logarithms of numbers and selected sines and cosines have been prepared particularly for use in computing latitudes, departures, and vertical-circle levels in topographical work done for a geological purpose; work that the geologist has frequent occasion to undertake for himself, because, although he can oftentimes make good use of other topography, it is much more desirable to have it done with special reference to his needs. We have then to consider what degree of precision he requires, what compactness his logarithmic tables consequently admit of, and what are the advantages of using them instead of protractor plotting and spirit leveling.

As regards the relative precision of different parts of a piece of work, it would be unwarrantable waste to expend labor of any consequence in making one part decidedly more precise than the rest. Take the case of combining by addition the errors of two operations upon one element (say the primary observation and the looking out its logarithm): If e' be one of the two errors, and e'' the other, and e the combined error, and suppose $e'' = e' + \epsilon$; then, $e = \pm e' \pm e'' = \pm e' + e' + \epsilon$, or $= -e' + e' + \epsilon$, or $= +e' - e' - \epsilon$, or $= -e' - e' - \epsilon$; four cases that would in the long run occur equally often. In magnitude, then, the average of $e = \frac{1}{4} [(2e' + \epsilon) + (0 + \epsilon) + (0 + \epsilon) + (2e' - \epsilon)] = \frac{1}{4} (4e' + 4\epsilon) = e' + \epsilon = e''$, the larger of the two errors; for, if ϵ be negative, we have the average of $e = \frac{1}{4} [(2e' - \epsilon) + (0 - \epsilon) + (0 + \epsilon) + (2e' + \epsilon)] = e'$; also, if $e'' = 0$, e is of course the same as e' . When, on the other hand, two elements (say a distance and the tabular sine of an angle) have to be combined by multiplication: if the two elements be a and b , and if e be the ratio of the error of the product to the product, e' and e'' the ratios of the two errors of the elements each to its own element, then $ab \pm abe = (a \pm ae') \times (b \pm be'') = ab \pm abe' \pm abe'' + abe'e''$; or $e = \pm e' \pm e'' \pm e'e''$. But $e'e''$ is so extremely small it may be neglected, and we have the magnitude of $e = \pm e' \pm e''$; that is, the same as before with errors combined simply by addition. The labor, then, that is spent in making one of two elements that are to be multiplied together, or one of two operations on the same element, more precise than the other, or, in short, any one part of the work more precise than the rest, would be wholly thrown away in an infinite series. It should, however, be borne in mind that, though this is true of the average result of an infinite series, the limit of the errors will be equal to the sum of the extreme errors of each operation; so that for any finite number of observations the lack of precision in any one part of the work will occasion an increased uncertainty as to the average result. And of course, where the labor of making one part of the work more precise is only trifling, it may be worth while.

The degree of precision required in a geologist's ordinary topographical work is far from being so low as for some kinds of surveying, yet is not so high as for tunneling or for his own or others' geodetic triangulations and base lines, that are intended as a check upon the accumulation of errors and uncertainties in very wide surveys. In geological topography, it is generally of little or no consequence, for example, whether the level of any one point be inaccurate to the extent of a foot or so, provided such errors can not accumulate to a greater amount. For the inevitable geological uncertainties are so out of proportion to those small errors that effort at greater precision would be unjustifiable waste. If, for instance, the desire be to ascertain to what depth a pit must be sunk at a certain point in order to reach a coal-bed that is exposed half a mile away, the ordinary irregularities of rock-beds make it so completely impossible to know, within any thing like a foot, the position of the coal-bed at the distance of half a mile, that it would make a slight uncertainty about the surface level of the spot a matter of no consequence. If it be desired to ascertain by the survey the amount of coal within a certain area, the variability in the thickness of all coal-beds makes it futile to labor strenuously after the extremest accuracy in the measurement of the superficial extent. Nevertheless, care must be taken not to let errors become large by accumulation, and so they must be kept small from the start. In general, for geological topography, it is not necessary to resort to more precise and costly methods for measuring distances than good, careful chaining or stadia reading; and that may be considered the basis that shall guide the degree of precision to be adopted for the rest of the work.

Let us now consider how precise good chaining or the stadia is, since we find that it is to be our standard of precision throughout. William A. Burt, in his *Key to the Solar Compass*, page 35, shows that, under very favorable circumstances, chaining repeated over the same mile will agree generally within five links, or $\frac{1}{2000}$, though under more usual circumstances the difference will average 16 links, or $\frac{1}{625}$, and is sometimes more than twice that. If the correct distance be between the two measurements, the error of each would, under the usual circumstances, average $\frac{1}{1000}$. Gillespie (*Land Surveying*, page 176) quotes some French writer, not named, as allowing a difference in chaining of $\frac{1}{100}$ on level lines, $\frac{1}{50}$ on moderate slopes, and $\frac{1}{10}$ on steep slopes. If these be taken as the extreme errors, perhaps the mean errors will be about one half as great. Gillespie likewise mentions, in regard to the difference in the sum of the east and west departures, or north and south latitudes of a polygon (that is, the difference in chaining twice either the length or the breadth of the polygon, combined with whatever angular errors have been made), that some surveyors allow a difference of $\frac{1}{100}$, others only $\frac{1}{150}$, others perhaps $\frac{1}{125}$ ("25 links in a survey of 100 acres"). If the angular work is of about the same degree of precision as the chaining, the difference from the chaining alone would about equal these fractions; and if, as before, we reckon the two measurements as one too large and the other too small, the mean error of each would be one half those differences, or one half of the fractions just given.

As for stadia work, Mr. Arthur Winslow (see Second Geological Survey of Pennsylvania, Report AA, p. 340; or the same passage, by some oversight copied incorrectly, in *Van Nostrand's Engineering Magazine*, xxx., 321), found by actual trial with a transit telescope of usual size, but said to magnify 28 diameters, and with a vernier on the stadia, that in 18 measurements the mean magnitude of the errors appeared to be $\frac{1}{150}$ of the distance measured. As the errors would be sometimes more

and sometimes less than what is just, they tend to balance each other, and amount, therefore, in sum to a less and less share of the whole distance measured, according to the square root of the number of measurements made for that distance; so that a mile measured with 25 stadia sights of about 211 feet each would have five times greater precision than a single sight, or say on the average an error of about $\frac{1}{25}$, as near as can be judged by so small a number of trials as the eighteen. In like manner, measuring the mile with 16 sights, the error would average about $\frac{1}{16}$; with nine sights, about $\frac{1}{9}$. Likewise, too, the best chaining, with an error of $\frac{1}{1000}$ in a mile, would probably have an average error of $\frac{1}{100}$ (half a link) in a measurement of 211 feet. It is evident, then, that the stadia work with a good telescope and sights of moderate length is much more, say about five times more, precise than ordinary good chaining; and with a five times weaker telescope, or with direct reading of the rod without a vernier through a moderately powerful telescope, is at least equally precise as chaining.

The stadia work, moreover, has the advantage over chaining of being just as precise over rough ground as over smooth. The use of the stadia instead of chaining appears to have increased very much in the last twenty years, owing to an improved knowledge of the stadia's greater precision when properly used, and of the ease with which adjustable cross-hairs can be inserted into telescopes so that the same rod can be used for leveling; and owing possibly also to improved telescopes. It may perhaps be safe to reckon stadia work in general precise to $\frac{1}{1000}$ for sights of moderate length, when particular care is used and the rod is read directly with an ordinary good telescope; and that this would be the result of exceptionally good chaining.

The exactness of 1 in 1000 need not be despaired of for a single measurement of a survey, except for such exact work as geodetic surveys, tunnel driving, or measuring city lots and the like. For, as we have seen, when each measurement of a survey is exact within one thousandth, sometimes more and sometimes less than what would be perfectly exact, the errors in excess tend to balance those in diminution, so that the result of a number of combined measurements is likely to have a smaller error than the average error of the components, and that in proportion to the square root of the number of the components.

We can now judge how close the angle readings should be in order to correspond with the measurements of distance. With a certain graduation and perfect powers of observation, as the real facts will be uniformly distributed through the space between the graduations, the errors in reading them all as belonging to the nearest graduation would be on the average one half of one half, or one fourth, of the space between the graduations. For example, in taking an angle with an arc graduated to degrees, the errors in the long run would average one fourth of a degree. In reading with a sufficiently good eye on an arc graduated to five minutes, the errors in the long run would average $1\frac{1}{4}$ minutes, of course leaving out of account gross errors, such as writing down the next graduation but one instead of the next. But in addition, there would always be with natural powers more or less uncertainty as to some observations which of two adjacent five-minute limits they should belong to, and consequently some error from time to time in their assignment to one graduation or the other, so that the average error in the long run will be always somewhat more than one fourth of the space between the graduations to which the reading is made. There appear to be no records at hand to show exactly what the amount of error would in general average for such cases; and it would, of course, in any particular case depend somewhat on the surveyor's care and his natural or acquired power of estimating the subdivision of the space between two adjacent graduations. It would perhaps be safe to set down the average as about one third—that is, two thirds of half—the space between two adjacent graduations. If, then, the graduation is to five minutes, the error in reading to five minutes would average about a minute and two thirds. But if, as in ordinary transits, the compass ring be graduated only to half degrees and the reading is attempted to five minutes, the errors would doubtless average a little more, though with a five-inch needle and a thirty-minute graduation the reading to five minutes is not accounted very difficult. It would perhaps be safe to consider the average error raised to two minutes. Of course, such errors,

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No.	0	1	2	3	4	5	6	7	8	9	10	No.	1	2	3	4	5	6	7	8	9	D
10	0000	0043	0086	0129	0170	0212	0253	0294	0334	0374	41	55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	42	56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	43	57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	44	58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	45	59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	46	60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	47	61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	48	62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	49	63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	50	64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122
20	3010	3032	3054	3076	3098	3118	3139	3160	3181	3201	51	65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	52	66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	53	67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	54	68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	55	69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	56	70	8451	8457	8463	8469	8475	8482	8488	8494	8500	8506
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	57	71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	58	72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	59	73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	60	74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	61	75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	62	76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	63	77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	64	78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	65	79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	66	80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	67	81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	68	82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	69	83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	70	84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	71	85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	72	86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	73	87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	74	88	9445	9450	9455	9460	9465	9470	9475	9480	9485	9490
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	75	89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538
45	6532	6542	6551	6561	6571	6580	6590	6600	6610	6618	76	90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586
46	6628	6637	6646	6655	6665	6675	6684	6693	6702	6712	77	91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	78	92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	79	93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727
49	6902	6911	6920	6929	6937	6946	6955	6964	6972	6981	80	94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	81	95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	82	96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	83	97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	84	98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	85	99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996

in excess, sometimes in defect, would in a large polygon tend to balance one another, just as the stadia errors do, so that the error of the result will be a smaller share of the sum of the errors.

An error of two minutes in the angle that a given line or radius makes with the meridian would remove the position of the end of the line a certain amount at right angles to the line. That amount, say the sine of two minutes, does not depend on the size of the main angle, but on the length of the radius, with which it should therefore be compared; and it is less than six ten thousandths, or about half a thousandth, of the radius or distance measured.

It is evident, then, that, even if we allow the error in reading to five minutes, with a thirty-minute graduation and five-inch needle to average somewhat more than two minutes, the precision is at any part great enough to correspond with the stadia, and still more sufficient with chaining; for at two minutes it is a little more precise than the

eyes, and by means of two type-faces and other typographical devices, no space is lost by empty lines to guide the eye among the figures. The tables in their present form can be pasted unfolded, each page on the fly-leaf of a large note-book; or, having one table-page above the other on very tough paper, with the central doubled edge between them so folded that it may be pulled out like a flap, and both pages seen at two glances, they can be pasted or pinned sidewise to the fly-leaves of a smaller note-book. The plan has been to have them photo-lithographed to a size small enough to go into one of the smaller note-books without folding; but perhaps more would be lost thereby in legibility than gained in any other convenience. The tables are also printed upon the two sides of a stiff card for use in the office.

The special aim of all this effort at tabular compactness is to enable the surveyor to compute the latitudes, departures, and vertical-circle levels in the field as soon as the observations are made; but in addition, such compact tables are very convenient for use in the office. The computations in the field are for the sake of making a correct plot on the spot at once, in a note book of paper ruled in squares.

It is certainly a great advantage to be able to plot the work correctly in the field as the lines are run, and that is a great good of the plane table. Many misconceptions are avoided; errors, if made, can be detected at once, and corrected at the most convenient and satisfactory time and place; and omissions are completely prevented; and if the levels are obtained along with the rest, the contours can be sketched in much more understandingly. The plane table has its inconveniences; and for geological topography at least, where the surveyor needs levels every couple of hundred feet on any line, the transit is more rapid and satisfactory than the plane table, especially in a wooded country. Particularly must the transit be preferred if, with these compact tables, the plotting can be done by latitudes, and departures in the field without greater, or even with less, effort or loss of time than plotting in the office with a protractor would require.

Plotting with a protractor on any ordinary scale requires very careful attention, much manual dexterity, and a great strain upon the eyesight, as well as good implements and a good table, in order to equal the precision of stadia measurements. What with the errors of the plotting and with those of the field work, a polygon will seldom close perfectly at first; and then the work must be carefully reviewed with a good part of the original outlay of labor. If the errors have occurred in the field, it must sometimes be revisited in order to detect them. On the other hand, if the latitudes and departures be computed in the field, so that the plotting can be done at once in the note-book with square-ruled pages, the field errors of importance can be seen at once and corrected on the spot. In spite of such advantages, it would, of course, be impossible in the field to use large logarithmic or traverse tables requiring several pages and perhaps a separate book. But the compactness of the present tables, pasted or pinned into the end of the survey note-book itself, enables the computation to be done easily in the field.

It is true the work can be plotted roughly on the spot in the note-book with a protractor and scale, or by guess, and many of the desired advantages of a correct plot in the field may be obtained; but such rough plotting does not save in any degree the labor and time needed for the final office plotting. On the other hand, the computation of the latitudes and departures done in the field is finished once for all, and the plotting of its results in a note-book made of cross-barred paper is only the equivalent in time and trouble of the sketching that must be done in the field at any rate.

Plotting with latitudes and departures has a certain special convenience over working with a protractor, even though it be done in the office; for no nice implements or perfect table is needed, and by means of the computation a satisfactory result can be obtained in any country tavern. For work in the office, voluminous tables are not quite out of the question, as they are in the field; but brief tables like these (if sufficiently precise, as we have just found them to be for a great deal of work) could be used much more conveniently and rapidly than a more bulky one. The eye takes them all in at almost a single glance, and the number sought is much more readily discovered, without the loss of time and energy necessary for searching through many leaves.

The method of latitudes and departures computed with logarithms is particularly convenient when vertical-circle leveling is combined with the horizontal work; for then the same logarithm of the distance that has been looked out for the latitude and departure is also used for the height, so that the leveling requires little additional labor. The comparative ease of vertical-circle leveling has often occasioned its use, even when the logarithm of the distance had to be looked out expressly for that alone.

The computation of each part of the horizontal work (the latitudes and departures) and that of the vertical mutually check one another, as far as the distances are concerned, so as to give greater certainty to them. The vertical-circle leveling is thereby, and by the prevention of the grosser angle errors through the single continuous graduation of the vertical circle, made so accurate as to be very useful for much topographical work, and the increased ease and speed, as compared with spirit leveling in a hilly country, is a very great recommendation.

An additional advantage of using the method of latitudes and departures, instead of plotting with the protractor, is, that an area can be calculated by them, when they have once been ascertained, more conveniently as well as more accurately than by the merely graphical methods that the protractor plot enables the use of. The labor is especially lightened when, as in our case, the logarithms of the latitudes and departures are already known.

There seems, then, to be good reason to think that the tables may be found useful to surveyors in general, and particularly in geological topography.

NORTHAMPTON, Mass., Nov. 4, 1885.

Combination among Austria-Hungarian Iron Manufacturers.—Efforts are making to establish a combination of the Austria-Hungarian iron manufacturers to regulate prices and production. It is proposed not only to adopt a schedule of prices for pig-iron, but also for the leading manufactured articles. A meeting has been held in Vienna, but no definite decisions have yet been arrived at. The Alpine Mining and Manufacturing Company has taken the initiative in the movement.

MODERN AMERICAN METHODS OF COPPER SMELTING.*

By Edward D. Peters, Jr., M.E., M.D.

CHAPTER XI.

GENERAL REMARKS ON BLAST-FURNACE SMELTING.

The introduction of water-jacketed cupolas and the very general adoption of the conical shape, whereby the gases escape with less velocity, and the ore is forced to descend in the neighborhood of the walls, has doubtless initiated this method of charging, which has been followed with advantage by those who prefer the brick furnace, and still adhere to vertical walls.

This mode of feeding, however, should by no means be blindly adhered to, as nothing exerts a more powerful influence upon the running of the furnace or has a more important effect in keeping it in normal condition than skillful and judicious feeding.

In the brick furnace especially, the position of feeder is one of vital importance, and the experienced furnace foreman will spend a large proportion of his time on the charging platform.

This matter has been discussed and exemplified in the section on large brick furnaces, and is worthy of the most careful study and attention.

The absolute size of the charge to be used must vary according to local conditions.

The most important of these are: the area and height of furnace; mechanical condition of ore; nature of fuel; and extent of reducing action desired.

Large and high furnaces naturally require heavier charges of ore and fuel; a charge made up almost entirely of coarse material may safely be fed in thicker layers than if composed principally of fine dirt, which opposes a powerful obstacle to the passage of the blast; a heavy, compact coke will bear a much weightier charge than light, fragile fuel, like soft-wood charcoal; and a more thorough mixing of ore and fuel, as effected by using small charges, will undoubtedly bring about a more powerful reducing effect than when the different strata are of sufficient depth to retain their relative position to a considerable extent.

While very numerous exceptions exist, the author prefers, in general, large charges to small ones, having found, as a rule, that the furnace runs more smoothly and regularly, and also that a slight saving in fuel is effected.

This observation will no doubt be challenged by many competent metallurgists, but is the result of too long experience to be disproved without actual trial.

In only one instance has the writer attempted to determine this point by actual experiment; but in the case referred to, the conditions of the trial were particularly favorable for a fair and impartial comparison.

The furnace was a 42-inch water-jacket, smelting a mixture of reverberatory copper slag and fine unroasted pyrites, with gas coke as a fuel. The foreman, who was a most skillful smelter, was directed during the entire experiment to give his attention to the consumption of fuel, using no more than was necessary to attain the best possible results, and the change in the size of the charge was made without directing his attention particularly to it, and retaining the same proportion of charge to fuel; leaving him to discover any necessity for a change in this particular.

The experiment was begun with large charges—1480 pounds of mixture—the relation of the fuel to the same being as 1 to 9.3. This was maintained for 72 hours, the furnace remaining in excellent condition, and averaging 57 tons per twenty-four hours.

The charge was then reduced to 740 pounds, just one half of the original amount, and twenty-four hours were allowed to elapse, to permit matters to find their normal level under the new conditions.

Within six hours of the substitution of the smaller charge, black noses began to form on the tuyeres, and the rate of smelting became decidedly slower. Several empty charges—that is, fuel without ore—were given at intervals; but it became evident, from increasing irregularities, that the furnace was growing cold. A slight addition was made to the fuel charge, and after a considerable number of trials, the normal ratio of fuel to ore for the new conditions was established, and the steady run resumed. A three days' average was taken, as in the former case, and showed the best possible ratio between charge and fuel to be as 8.6 to 1.

The charge was again halved, being now reduced to 370 pounds, and the last-named proportion of fuel maintained until circumstances compelled a change.

In brief, another three days' observation showed a further reduction in the ratio of ore to fuel—7.82 to 1 being the best attainable results. It is also interesting to note that, although great pains were taken to secure the same conditions in every particular during the entire course of the experiment, the matte decreased in tenor with the decrease in the weight of the charge—the average assay reports for the three periods of three days each, beginning with the heaviest charge, being respectively 46.4, 44.5, and 42.1 per cent—the amount of the same increasing with its poorness in a very nearly corresponding degree. The slag also (although this may have been a coincidence) showed lower proportions of copper assaying for the three periods respectively 0.61, 0.47, and 0.41, which is a greater difference than can be accounted for by the lower grade of the matte, and which in all probability, in common with the latter material, depended upon the more powerful reducing effect, due to the use of thinner charges, and a consequent more perfect mingling of ore and fuel. The capacity fell from 57 tons, in the first instance, to 51 in the second, and down to 41.5 in the third.

The experience at several Arizona furnaces contradicts the above results, quite small charges having been found to answer best, although this may be due to the fact that much of the ore there is fine, while a powerful reducing action is necessary to produce a clean slag.

A proper charge for a 36-inch furnace is from 500 to 800 pounds; while a 42-inch shaft should receive from 1200 to 1600, and a 48-inch furnace, 1800 pounds or more. The large elliptical slag-furnaces at the Lake Refining-Works are charged with about 2600 pounds of ore and flux, experience having shown the advantage of deep layers in the furnace shaft.

* Copy-right 1885, by the Scientific Publishing Company.

As may be imagined, the large Orford furnaces take still heavier charges, from 3000 to 4000 pounds being the ordinary standard.

The shape of the furnace is largely a matter of individual preference as may be seen by observing the almost equal number of skilled advocates for the round, rectangular, and elliptical form.

Beyond a certain limit, however, the rectangular form alone is used, owing to the feeble penetration of the light blast used in copper smelting.

Experiments made by Herreshoff and other metallurgists, including the author, seem to indicate a radius of 28 inches as about the extreme practicable limit for a 10-ounce blast. In a larger furnace, while the writer has never seen any evidence of an untouched central core, beyond the penetration of the blast, the capacity increases very slowly, if at all; while the same area, when changed into a rectangular form, gives proportionately greater results.

If the charge contains over 50 per cent of fine ore, the figures given above should be considerable reduced.

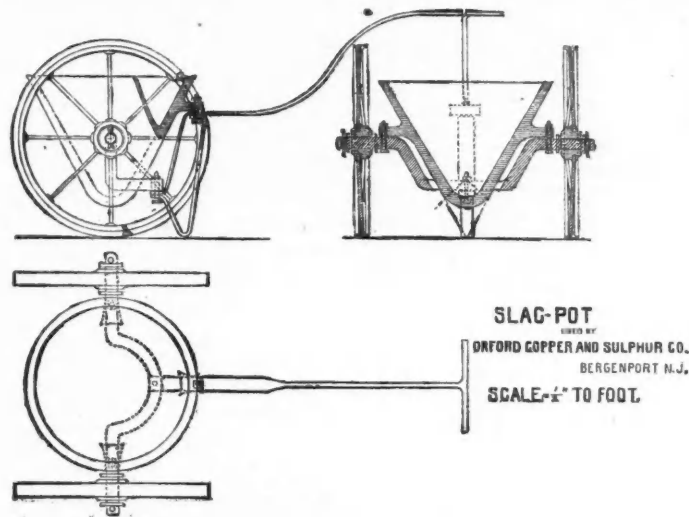
While the effects of a flaming throat are not so obviously detrimental in copper smelting as in the fusion of the more volatile metals, it still is found by experience that such a condition of affairs is incompatible with the best work, being invariably indicative of a faulty condition of the process.

With an open charge and long-continued high pressure of blast, it is almost impossible to prevent the heat from eventually rising, until the chimney and walls above the charging-door became so hot as to ignite the escaping gases instantaneously.

The ore near the top of the charge soon sinters together; the fuel is largely consumed before it reaches the zone of fusion; the softened lumps of ore stick to the side walls, forming bulky accretions, and the way is paved for the successive steps of "burning out," reduction of metallic iron, and "freezing up," already so frequently alluded to.

While it is sometimes impossible to prevent the early stage of this condition of affairs, when pushing the furnace to its full capacity with a heavy blast, the end results should be borne in mind and the remedy applied in time.

This consists simply in letting the charge sink—under a light blast—until the shaft is empty for a distance of three or four feet below the charging-door. One or more charges of fusible slag are then given, and



the furnace rapidly filled full with its normal burden. In this way, the overheated walls are cooled, the surface of the charge regains its normal temperature, and the furnace under a few hours of light blast is again ready for a period of hard driving.

In obstinate cases, the cooling of the throat with a spray of water is quite admissible and often of great benefit.

The question of the characteristics and comparative value of the ordinary fuels used in blast-furnace work has been discussed so exhaustively in most of the standard works on metallurgy as to render it useless to undertake any such task in a treatise like the present, devoted to a certain stated purpose.

The same may be said of fire-brick and other refractory materials, our own domestic brick being quite equal to any of foreign make for all purposes connected with blast-furnace smelting. It is hardly necessary to say that, among the numerous competing varieties of fire-brick, only those should be selected which long and thorough trial has shown to be suited to the purpose; the first cost should have but slight weight in the choice.

The manipulation of the products of fusion becomes a question of considerable importance in a country where wages are high, and where the large scale on which most enterprises are conducted renders the mechanical details of the process so much more prominent than in the European works from which we drew our first patterns.

The transportation of the slag from a furnace smelting five tons an hour, and where the edge of the dump advances at a rate of several feet a week, soon becomes a matter of considerable expense.

Aside from the removal by a current of water, mentioned in an earlier chapter, no advance has been made on the two-wheeled slag-pot, although so much difficulty has at times been experienced in removing the slag in this manner with sufficient rapidity as to necessitate the addition of a second fore-hearth and slag-run to the furnace, on the opposite side from the original opening.

Little need be said regarding the slag-buggies as furnished by the manufacturers of metallurgical appliances, except to urge the necessity of extreme lightness combined with strength. The attachment between pot and axle is rarely sufficiently strong, and the axle itself should be chilled or case-hardened to prevent its rapid destruction where the wheel takes its bearing. The accompanying cut shows the form of slag-buggy

adopted by the Orford Company, and is the best and strongest pattern known to the author.

The ordinary complement of slag-pots to a 50-ton furnace is 10, which number should be doubled if it is expected to allow the slag to cool before dumping, as should always be done if possible, in order that the bottom of every potful may be examined for shots of matte.

Great care should be taken to maintain the dump perfectly smooth, which may be easily effected by pouring pots of liquid slag over its entire surface. The sole duty of one experienced workman should be to examine the slag and keep the dump in order, by which means a control of the smelting is maintained and the labor of the pot-runners greatly lessened.

As slag-dumps are not infrequently situated on the margin of a river or lake, the danger of dumping entire pots of slag into water, when they are only partially cooled, should always be impressed upon the workmen. Terrific explosions sometimes result from the penetration of water to the liquid center of a cake of slag that appears quite solid on the outside.

The writer has seen from this cause, several men badly injured; the iron roof and siding partially stripped from a building 200 feet distant, and an entire town a mile distant alarmed by the explosion of a cake of slag.

(TO BE CONTINUED.)

The Poetsch System.—The Poetsch system of freezing a water-bearing stratum for the purpose of sinking through it is about to be applied in France to a shaft that has collapsed. This undertaking will be a peculiarly difficult one, and the result will be awaited with interest in all mining circles.

Cheap Sodium.—The manufacture of cheap sodium by an electrolytic process has been announced in France. An engineer of Lyons, M. Lossier, states that he will soon be in a position to sell sodium in large quantities at a price of about 25 centimes per kg., not much over one penny a pound. There would be no necessity for such an extremely low figure to be reached to insure a very large demand for the material. The process of M. Lossier consists, it appears, in decomposing with an electric current the chloride of sodium at a temperature of 900 degrees C., and it appears incredible that by any such process the price named is not absurdly low. In France, indeed, sea salt, which costs about 2½ centimes the kilogram to obtain, is sold wholesale at 10 centimes the kilogram, the duty being considerable. It appears that 3 kg. of salt are required to produce 1 kg. of chloride of sodium. It follows that at current prices the sodium not extracted from the combination is worth 30 centimes the kilogram, to which must be added the cost of fuel for melting and heating the salt, the expense of producing the current, general expenses, profits, interest, and depreciation, which would be extremely high. The price of 25 centimes appears, therefore, to be far too low, even if the salt be valued at the prime cost of production. It may be remarked that marine salt is at once one of the cheapest and most abundant materials known in commerce. If we assume a moderate area and depth of that portion of the globe covered by the ocean, the quantity of salt that it contains is estimated at six times the volume of the Alps. Unlike coal, the supply of which is being gradually but surely exhausted, marine salt is absolutely inexhaustible. It is therefore essentially a raw material of high value, for which many applications have yet to be discovered.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

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

GRANTED DECEMBER 15TH.

- 332,223. Device for Burning Gas in Furnaces. John Ashcroft, New York City.
- 332,242. Drill-Press. William Evans, Philadelphia, Pa., Assignor of two thirds to John H. Evans and Robert Evans, same place.
- 332,258. Steam-Pipe Covering. Charles Lamkin, Batavia, New York.
- 332,266. Device for Cleaning Water-Legs of Boilers. Charles H. Manning, Manchester, N. H.
- 332,267. Steam-Boiler. John H. Mars, Albany, New York.
- 332,288. Nut-Lock. George P. Rose, Fentonville, Mich.
- 332,300. Branding-Iron. August Stollstorff, Chicago, Ill.
- 332,318. Device for Transmitting Motion in Oil-Pumping Apparatus. George Allen, Franklin, Pa.
- 332,338. Spurt for Boilers. Henry P. Folsom, Brooklyn, New York.
- 332,357. Steam-Boiler. Vassili P. Orloff, Moscow, Russia.
- 332,458. Process of Manufacturing Fluxes. Henry F. Taylor, Neath and Briton Ferry, County of Glamorgan, and George Leyshon, Tividale, County of Stafford, Assignors to Taylor, Struvé, Eaton & Price, Neath and Briton Ferry, South Wales, England.
- 332,462. Gate for Casting. Charles Truesdale, Cincinnati, Ohio.
- 332,473. Amalgamator. Myron J. Amick, Portland, Oregon.
- 332,475. Apparatus for Manufacturing Iron and Steel. Benjamin Bayliss, Jr., Beltzhoover, Pa.
- 332,459. Steam-Engine. Robert Creuzbaur, Brooklyn, New York, Assignor to the Westinghouse Machine Company, Pittsburg, Pa.
- 332,500. Steam-Engine. Robert Creuzbaur, Brooklyn, New York, Assignor to the Westinghouse Machine Company, Pittsburg, Pa.
- 332,501. Steam-Engine. Robert Creuzbaur, Brooklyn, New York, Assignor to the Westinghouse Machine Company, Pittsburg, Pa.
- 332,502. Steam-Engine. Robert Creuzbaur, Brooklyn, New York, Assignor to the Westinghouse Machine Company, Pittsburg, Pa.
- 332,503. Mould for Casting. John E. Davies, Chicago, Assignor of one half to William W. Flinn, Highland Park, Ill.
- 332,504. Mold for Casting. John E. Davies, Chicago, Assignor of one half to William W. Flinn, Highland Park, Ill.
- 332,586. Rotary Pump. Joseph F. Breux, Philadelphia, Pa.
- 332,587. Core-Lifter for Rock-Drills. George F. Case, Denver, Colo.
- 332,592. Rock-Drilling and Tunneling Machine. Robert Dalzell, Waddington, New York.
- 332,594. Hydraulic Forging-Machine. Charles Davy, Sheffield, County of York, England.
- 332,613. Manufacture of Coke. Isaac M. Kelley, Imperial, Pa.
- 332,615. Middlings-Purifier. William Klostermann, Young America, Minn.
- 332,616. Middlings-Purifier. William Klostermann, Young America, Minn.
- 332,623. Lubricator. James Powell, Cincinnati, Ohio.
- 332,636. Converter for the Manufacture of Iron and Steel. Edward M. Butz, Alleghany, Pa.
- 332,656. Apparatus for Pressing Fluid Metal. William R. Hinsdale, Brooklyn, New York.
- 332,667. Steam Pipe Joint Packing. James B. Lyons, Norway, Mich., Assignor of two thirds to Frederick L. Hirschmann and Frederick W. Richards, both of same place.
- 332,669. Nut-Lock. Charles Maldner, Chicago, Ill.
- 332,670. Steam-Engine. Robert M. Marchant, London, England.

FURNACE, MILL, AND FACTORY.

The plant of the Cleveland Crucible Steel-Works, Cleveland, Ohio, which for the past year has been idle, has been leased by parties from Cuyahoga Falls, who are making some alterations and expect to be in active operation during the coming month under the style of the Cuyahoga Rolling-Mill Company, a partnership.

The principal barbed wire manufacturers of the United States met at Chicago, Ill., last week, and agreed to advance the price of all grades of their product one half cent a pound, such schedule of prices to take effect at once and continue in force until January.

The blast-furnace of the Pottstown Iron Company, Pottstown, Pa., which has been idle over a year, was put into blast on the 21st inst.

An amalgamation has been effected between the Ontario Steel Barbed Wire Company and the Ontario Lead-Works. The new company will be known as the Ontario Lead and Barbed Wire Company, with headquarters in Toronto, Ont., as heretofore.

Work at Osgood's new zinc-works, at Friedensville, Pa., is pushed forward. The intention is to have them in full operation by spring. The tower will be 30 feet in height and square. The blowers will be driven by a Corliss engine.

The Catoctin Iron Company, Frederick, Md., which had but few orders during the summer, is now, it is said, unable to fill the demand upon it for iron.

Des Moines, Iowa, offers to exempt from taxation for ten years all factories established there within the next twelve months.

It is announced that the Moxahala furnace, at Moxahala, Ohio, which has been idle for several years, is soon to be blown in.

There is a rumor that the nailers are going to rent the Stewart Iron Company's mill to make nail plates, and will get room and power from the stove-works to start a co-operative nail factory at Sharon, Pa.,

At Middlesex, there is a large force of men at work getting the Ella furnace ready for blast, the lease having been completed.

It is stated that P. L. Kimberly & Co. are going to build another blast-furnace in New Castle, Pa., alongside of the Etna furnace.

While testing the boilers at the Lochiel Rolling-Mill at Harrisburg, Pa., one of them exploded. Over one hundred persons were in the vicinity at the time, and six were injured.

It is stated that plans are about matured for starting co-operative nail-works at Wheeling, West Va. It is understood that a charter will be applied for in a few days. The probable location is Martin's Ferry.

LABOR AND WAGES.

Another crisis has been reached in the mining troubles at Bevier, Mo., between the white and colored coal miners. Work has again been suspended, and both sides are taking up arms. Immediately after receiving the volley of shots from the freight-car on the 23d inst., the negroes quit work and began to arm themselves. The discharge of fifty-two white men from the co-operative mine has caused a bitter feeling, and there is every indication that, unless the governor interferes, a bloody riot will take place.

There have been several attacks of the striking coal miners of the Monongahela Valley, Pa., on the working miners during the week; but it is thought that the strike is breaking. Rumor says that at nearly all the pits idle meetings are held daily, and the question of giving up the strike is warmly discussed.

The wages of several hundred employés of the Brooks Iron Company, at Birdsboro', Pa., will be reduced ten per cent on January 1st, in consequence of the falling off in the demand for iron. Their wages were recently increased ten per cent, in consequence of the nailers' strike in the West producing an active demand, which is now falling off.

TRANSPORTATION NOTES.

The Savannah, Dublin & Western Short Line is a railroad to be built from Savannah to Macon, Ga., a distance of 157 miles. It is to be standard gauge and constructed of steel rails. Estimates have been made for the equipment and steel rails.

There was no coal transported over the Delaware, Lackawana & Western Railroad on Friday and Saturday. It is estimated that this reduced the tonnage of the road nearly 80,000.

COAL TRADE NOTES.

ENGLAND.

A dispatch from Pont-y-Pridd, Wales, dated the 23d inst., reports that a terrible colliery explosion occurred at the Ferndale pit, near there, and that 400 miners were buried. Twelve dead bodies have been taken out and thirty miners have been rescued more or less injured. The explosion occurred in the upper of two seams. There were 750 men in the mine at the time of the explosion. The greater number were in the lower seam, otherwise the death list would have been much larger. At least fifty men were killed in the upper seam, and scores were terribly burned.

INDIAN TERRITORY.

New coal banks, it is said, are soon to be opened near the northern line of this territory by the Missouri Pacific Railroad Company. The company is willing to bind itself to mine a sufficient quantity daily to net the Cherokee Nation \$30 at a fixed rate per bushel.

PENNSYLVANIA.

ANTHRACITE.

The water pouring into the Harleigh and Ebervale mines at Hazleton has been turned into a new channel, and no further damage is expected. Work can not be resumed this winter, however, and a fund has been started in the neighborhood for the families of the miners made destitute by the disaster.

The mine of the Susquehanna Coal Company, at Nanticoke, has been the scene of a terrible disaster, resulting in the loss of 23 lives. On the 18th inst., the roof in slope No. 1 caved in, allowing a large amount of water that had gathered in a pond on the surface above to rush in through the earth's crevices and into the mine where the men were engaged at work. There was a panic at once. A great many of the men succeeded in making their escape at the slope, but the men who were at work in another part of the mine were entirely shut off by the water. Rescuing parties were at once organized and have worked faithfully trying to save their unfortunate comrades; but on the 23d, all hope of rescuing those entombed had been given up. Successive cavings in have blocked up the mine and filled it with black-damp and sulphurous gases. The officials of the company proposed to sink a shaft directly over the slope where the victims are supposed to be, and thus reach the bodies, perhaps in a few days, but after due consideration of the difficulties of the work, it has been abandoned. Work was begun on the 23d inst. on the new tunnel on No. 4 shaft to reach the blocked gangway in No. 2 slope, where the bodies of the men are supposed to be. The work will be pressed night and day with a strong force of miners, laborers, and rockmen. It is hoped that the bodies of the victims will be recovered in less than a month's time. The collieries resumed work on the 23d inst.

A cave-in occurred at Fairmount colliery, near Pittston, operated by A. Morris & Co., on the 23d inst. An area of about an acre settled a distance of several feet. So far as can be learned, no buildings were injured, but the track of the Lehigh & Susquehanna Division of the Philadelphia & Reading Railroad, which passed over the sunken tract, was rendered impassable, and passengers on the evening train north had to be transferred. The damage to the colliery can not be ascertained at present.

The colliery of the Northwest Coal Company, near Carbondale, was entirely destroyed by fire on the 22d. Loss, \$40,000; partially insured.

The Pennsylvania Coal Company has announced that nine of its most remunerative collieries would suspend operations. The collieries are shafts Nos. 4, 5, 6, 7, 8, and 11; tunnel No. 1 and slopes Nos. 2 and 4. The suspension is caused by the light demand for coal, and will be of indefinite continuance. By this suspension, over 1400 men and boys are thrown out of work, and the result will prove disastrous to the business interests and general prosperity of Pittston.

COKE.

A charter has been issued to the River Coke Company, of Pittsburg, for the purpose of mining coal, manufacturing coke and delivering the same, with the right to purchase and hold land for that purpose. The capital stock is \$300,000. The treasurer is John H. McCreary, of Pittsburg.

The Southwest Coal and Coke Company has purchased the Dillinger & Tarr plant of ovens, situated on the Southwest road, just south of Tarr's station, for \$85,000. The company now owns 668 ovens and

almost 2400 acres of coal in a body. The coal had been worked out at Tarr's and the ovens banked; but this plant is now firing up again, an abundant supply of coal having been secured by the recent purchase. It is thought that the Southwest Company may unite its Tarr's station and Dillinger plants by building about 100 new ovens, and mine the coal for both at the latter works.

Ninety per cent of the coke-ovens in the Connellsville region are in blast, and the remaining 10 per cent are expected to resume operations in a few days. The representatives of the railroad companies entering the coke district will meet in Pittsburg on January 12th, to arrange the percentage of tonnage.

GAS AND PETROLEUM NOTES.

Exports of refined, crude, and naphtha from the following ports, from January 1st to December 19th:

	1885.	1884.
	Gallons.	Gallons.
From Boston	8,359,360	7,310,462
Philadelphia	148,086,683	116,229,783
Baltimore	10,924,994	14,817,010
New York	359,549,214	373,985,761
Total exports	526,920,161	512,342,956

NEW YORK.

Armstrong, Phillips & Co., who are large owners and operators of oil and gas wells and bituminous coal mines in Pennsylvania, are negotiating with land-owners along the Helderberg Mountains, between Knowersville and Kingston, for leases giving them the right for twenty years to sink wells for gas or oil, and mines for gold, silver, and all other minerals. During the past summer, engineers and geologists of this company made extended investigations of the area named, and it is on reports made by them to the company that the drilling and mining rights are sought. The privileges asked for will cover thousands of acres in Albany, Schoharie, Schenectady, Greene and Ulster counties. It is stated that the company will put down three wells at once—one at Knowersville, one at Catskill, and one at Kingston—to test the question of the existence of natural gas in the region, if the privileges they ask for can be obtained. The first well will be sunk at Knowersville, and will be 1800 feet deep. Meetings of land-owners have been called at several places to act upon the company's proposition.

The Bradstreet Gas and Fuel Company has been incorporated under the laws of this State. The principal office will be at New York City. Capital stock, \$1,000,000.

OHIO.

Natural gas in paying quantities has been struck in Berea, Cuyahoga County, by parties who have been at work about two months. Five wells were sunk and two are producing about 6000 cubic feet every hour, with a slight increase. Shale gas was struck at a depth of 300 feet. The well from which so much was expected in the yards of the Cleveland Rolling-Mill Company is, it is said, apparently almost exhausted. It is sinking deeper, and has already gone down 3350 feet.

PENNSYLVANIA.

An application for an injunction to restrain Pittsburg or its agents from interfering with the laying of gas-pipes, was filed by the People's Natural Gas Company in Common Pleas Court, at Pittsburg, on the 18th inst. The bill complains "that Councils have refused to grant them the same privileges as enjoyed by the Philadelphia Company, thereby depriving the citizens of the advantages of competition."

A large vein of gas was struck last week at J. M. Guffey & Co.'s well No. 5, on the Wilson farm, in the Canonsburg field. The well opens up no new territory.

The Standard Oil Company has, it is said, completed arrangements for the consolidation and control of the natural gas-fields of Western Pennsylvania and to pipe the new fuel to Cleveland, Buffalo, and New York. We have referred to this scheme recently several times in the ENGINEERING AND MINING JOURNAL.

WYOMING.

The men arrested on the charge of conspiracy to obtain large tracts of coal lands in Central Wyoming fraudulently, as mentioned in our last issue, were to be arraigned on the 19th inst. W. W. Corlett, the most eminent attorney in Wyoming, has been employed for the defense.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY—TOMBSTONE DISTRICT.

HEAD CENTER CONSOLIDATED.—The mines of this company were sold some time ago to the Head Center & Tranquillity Mining Company. The company has retained its mill and hoisting-works, and the mill will probably soon be run on tailings, resulting in a few shipments of bullion for account of the Head Center Consolidated Mining Company.

TOMBSTONE MINING AND MILLING COMPANY.—Official advices state the production from January 1st to December 31st, 1885—December estimated—as follows: 2300 ounces of gold; 429,744 ounces of silver; and 1,456,009 pounds of lead. The Girard mill is running steadily, crushing about 65 tons of low-grade ore daily. Prospecting is carried on on a number of the company's properties.

VIRGINIA CONSOLIDATED.—The hoisting-works of this company, an extensive structure situated in the center of the camp, caught fire on the 15th inst., and were burned to the ground. Loss, total. The building cost, with machinery, it is said, \$13,000.

CALIFORNIA.

MONO COUNTY—BODIE DISTRICT.

Reports for the week ended December 14th:

BULWER.—In the south drift, 110-foot level, Stone-wall ledge, the vein is somewhat smaller, but the quality of the ore shows some improvement. On the Ralston vein, No. 2, south, there is no material change. They are pushing the lower slope south and putting in ore-chutes preparatory to stoping. They now have about 165 feet of backs, and being on the 200-foot level, will give a good run of ore for the mill.

CONSOLIDATED PACIFIC.—In the drift south on Fortuna vein, there are in the face about 13 inches of ore assaying from \$15 to \$18 a ton. North drift on No. 3 vein, the ground is very hard. The vein looks very well, with no change in size or quality of ore since last report.

STANDARD.—The ore-bodies hold strong. Ore shipped to mill, 659 tons. Bullion shipment will be made on Tuesday, the 15th.

SYNDICATE.—The mill has been closed down, there being no more ore at present to crush. There will consequently not be any more shipments for some time to come.

PLUMAS COUNTY.

INDIAN VALLEY.—The drift from the bottom of the shaft is in 30 feet. The width of the ledge continues 22 feet, with smooth walls. The ore is of excellent quality, and the entire width, as the drift progresses, is extracted. A stope has begun near the face. The drift extending toward the Union will tap that mine 212 feet below its deepest works. In order that the extraction of ore may be more rapid, arrangements are making to put in Burleigh drills. They will be used in the various drifts, also in sinking the Indian Valley shaft.

ROUND VALLEY CONSOLIDATED.—It is stated that this company will be a consolidation of several mining properties, including the Sunset, Arcadian, Antelope, and others.

CANADA.

PROVINCE OF NOVA SCOTIA.

EASTERN DEVELOPMENT COMPANY.—Work has begun at the Coxheath Copper Mine.

PROVINCE OF ONTARIO.

Arrangements are concluding for the sale of a part interest to American capitalists in the Beaver and two other mines in the Rabbit Mountain District, on all of which work on a large scale will begin at once, and mills will be built for the reduction and treatment of ores.

COLORADO.

CLEAR CREEK COUNTY.

SODA LODGE.—The case of T. A. Becker against H. Montague, as to the title and ownership of this mining claim, in the Grass Valley Mining District, resulted in the following verdict: "All of the Soda Lode Mining Claim, survey 1608, and the balance of said Soda lode, excepting said Soda lode as claimed by the defendant, in favor of the plaintiff."

DOLORES COUNTY.

GRAND VIEW.—Large quantities of ore are received every day from regular producers, and in irregular quantities from mines that accumulate a certain amount before shipping. The daily consumption of ore in the furnace is somewhat greater than at any previous time during the present run, and the cupelling-

furnaces will soon be built. One of the furnaces will then be used as a copper matte furnace, and to that extent increase the capacity. The company has decided to do away with the custom of indiscriminate assaying for customers.

GILPIN COUNTY.

ENTERPRISE.—This company has recently been organized in Chicago to work the Gilpin and Coaley mines, under a five years' lease with bond. The company also owns the Enterprise and Mountain Lion lodes, the Enterprise being an extension of the Gilpin. The officers of the company are: Dr. A. C. Stanton, President; Otto Erdman, Secretary and Treasurer. The company has a capital stock of \$100,000. Work will soon begin. It is said that the company is prepared to expend from \$10,000 to \$20,000, if necessary, in opening up the mines at a greater depth than has heretofore been reached. It has all the necessary machinery required, including facilities for smelting.

LAKE COUNTY.

All the right, title, and interest that the late David S. Draper had at the time of his death in and to 220,000 588,333 undivided parts of the L. M. Lode Mining Claim, known as survey lot No. 3092, on the southwest slope of Iron Hill, in California Mining District, was sold at auction in New York City, on the 23d, for \$50.

FOREPAUGH.—A third interest in this mine has been sold for \$25,000.

HIBERNIA.—This mine, which is worked on a lease, has begun to hoist and ship iron of a desirable character. The iron is taken from a place in the mine a hundred feet north of the 100-foot level in the shaft.

IRON SILVER.—It is reported that some rich ore has recently been encountered on the company's property.

NEW YEAR.—Operations have been resumed. The new pumping machinery is working satisfactorily.

PARK COUNTY.

LAST CHANCE MINING AND MILLING COMPANY.—The property of this company, which recently failed, has been sold under a trust deed to the Hathaway Bank, of Fairplay, for upward of \$10,000.

LONDON.—This mine has been leased, and operations will soon be resumed.

PITKIN COUNTY.

The Aspen Smelting Company has been taxed on the full value of the ore that it has had on hand at the time of making the yearly assessments. An attempt is making to collect the tax for 1884, which amounts to nearly \$10,000, and the case on attachment is pending before Judge Goddard. The smelter has lately become the property of the recently organized Aspen Smelting and Mining Company, and the new company desires to extend the works and add to them additional and necessary facilities for the treatment of these ores. The same company owns the Jerome Park coal-fields, and proposes to build a railroad to them. In view of this disposition to impose ruinous taxes on its ores, it anticipates being compelled to move its works to Garfield County.

SAN JUAN COUNTY.

A snow-slide came down the mountain into Minnesota Gulch on the 23d inst., sweeping every thing before it. The slide struck the mouth of the Prodigal Son mine, filling the 85-foot shaft and burying Burk Hovey and J. M. Scales, who were working at the bottom of the shaft at the time of the accident. The snow was packed so tightly that it was found to be impossible to move the bucket, which went to the bottom when struck by the snow. A rescuing party is at work, but all hope of reaching the imprisoned men alive has been abandoned.

SUMMIT COUNTY.

ROBINSON CONSOLIDATED.—Operations are in active progress. During the season, the property has had a number of difficulties with which to contend, paramount among them being the water that completely inundated and obscured the lower levels. The pumps were started, and with persistent endeavor and effort, gradually reduced the water. In the exploration-work from the twelfth to the fourteenth level, some fair mineral has been found. At present, all the levels from the fifth to and including the fourteenth are working, while the mineral is running from 30 to 50 ounces of silver to the ton, thirty tons of which are shipped to Argo daily. It is probable that the company will, upon the recommendation of the management, do some extensive prospecting after the next annual meeting in January.

DAKOTA.

LAWRENCE COUNTY.

CALEDONIA.—The superintendent reports, for the week ended December 14th, that the ore produced from the 425-foot level was 966 tons, and from the cave, 365 tons, making a total of 1331 tons. Another connection has been made between the 425-foot level and the chambers above, which gives a good opening to get at the good ore below the 300-foot level. They are preparing to sink a winze from the 425-foot level in a body of rich ore. The product of the mill for the first half of December was 801 ounces of bullion, valued at about \$13,200.

FATHER DE SMET.—The report for the week ended December 15th shows ore produced from the first, second, and third levels, 2075 tons.

IDAHO.

EMERALD.—The capital stock of this company, organized under the laws of California, is \$5,000,000. The company proposes to mine, mill, etc., in the East Fork Mining District, on the head-waters of the East Fork of Salmon River, in Custer County. Directors, Alfred Perintz, James Wolffsohn, William Adelsdorfer, Ben De Leon, and S. Bergman.

QUEEN OF THE HILLS.—The company has lately added by purchase two claims adjoining the property, and made valuable additions to the mill and mine. Another set of concentrating machinery is to be put in, thus doubling the capacity of the mill.

TYROLESE MINING AND SMELTING COMPANY.—This company has been organized under the laws of California, with a capital stock of \$10,000,000. The company will carry on operations in the same district as the Emerald Company, and is managed by the same directors.

ILLINOIS.

PROSPECTORS' MINING AND ORE CONCENTRATING COMPANY.—This company, of Chicago, has been incorporated to acquire mining properties and mill-sites by location, bond leases, or purchase in the territories of the United States and in Mexico; capital stock, \$200,000; incorporators, Alexander Gates, George C. Oakley, and J. E. Radley.

LOUISIANA.

Prof. L. C. Johnson, United States geologist, has just completed an extensive survey of the iron fields of North Louisiana. It is stated that his conclusion is, that these fields are not extensive. He pronounces the quality of the ore excellent, and thinks their working would prove remunerative.

MEXICO.

The Mexican *Financier* reports the following:

ARTEAGA.—This mine in El Chico is about 3 feet wide, and contains a "leader" of ore 10 inches wide that yields an average of 300 ounces of silver to the ton of rock, and is improving in size and value as depth is attained. The mine is only about 150 feet deep, and at this depth sufficient ore is extracted to leave a profit.

MEZQUITAL DEL ORO.—A London syndicate has been formed to buy this gold mine, State of Zacatecas. The price is said to be large. The contract requires the payment of the price in January, in the City of Mexico.

SILVER QUEEN UNITED.—Remarkable reports are sent to London from this mine. When it was put on the English market, the seller agreed to pay a 20 per cent annual dividend for five years, which meant that in that period he would repay, in full, the capital subscribed, while the shareholders would still remain owners of the property. This remarkable offer was based on the seller's belief that, with improved machinery and processes, he could save fully fifty per cent of the silver, that amount having been lost by the old-fashioned processes. It is asserted in London that 100 per cent dividends will be paid, and the mine managers continue to send to England statements regarding the quality of the ore extracted that, if true, indicate that the mine is one of remarkable richness.

TETITLAN.—This mine, in the El Chico District, is doing well.

MICHIGAN.

IRON MINES.

LAKE SUPERIOR.—The new shaft sinking by this iron company to the west of its main hematite shaft has reached a depth of 60 feet. Nearly all this distance has been in the ledge. The ground is slightly mixed with lean hematite, but the ore is not looked for until a depth of 265 feet is attained. An uprise to meet the sinkers is also in operation, and the shaft is

expected to be completed by the first of next March. Rand rock-drills are used.

NEW YORK.—It is stated that operations will be resumed in the spring.

PITTSBURG & LAKE SUPERIOR.—The company has sold the ore it has in stock, some 13,000 tons, and has contracted for the delivery of all the ore mined the coming season. This insures active operations at the Palmer for this winter and the coming year.

MONTANA.

LEWIS & CLARKE COUNTY.

ASSINIBOINE.—The company has begun opening a lower tunnel by which it can attain greater depth. The second block of stock of 5000 shares has nearly all been subscribed, and the trustees do not propose to offer any more stock for sale.

CRUSE MOUNTAIN CONSOLIDATED.—This company has been formed for the purpose of developing a group of mines at Marysville, comprising the Richmond, Ben Lomond, Mingo Valley, Champion, and G. D. Prentiss lodes. The capital stock is \$500,000. H. W. Child has been elected President, John W. Eddy Treasurer, and E. W. Bach Secretary. Work has begun on a tunnel to tap the Richmond lode.

EMPIRE MINING AND SMELTING COMPANY.—This company, which has purchased the Red Mountain Empire mine, has been incorporated with a capital stock of \$1,000,000—200,000 shares. The purpose is to proceed at once to the development of the mine and the extension of the 200-foot tunnel on the property. The design includes the erection of smelting-works near the mine to work its ore; and to accomplish this end, 50,000 shares of the capital stock of the company are to be sold at not less than fifty cents a share.

HELENE.—A contract has been let to sink 100 feet on this lode below the 150-foot level, and to run a hundred feet of level. When this is completed, it is the intention to put up steam hoisting-works, to be followed by works for the reduction of ores.

LEXINGTON CHIEF.—This company, organized with a capital stock of \$500,000, proposes to work the Lexington Chief mine, located in Scratch Gravel District, near Helena. It also owns the Iron-clad, Far West, and East Lexington claims, all partially developed.

MONTANA COMPANY, LIMITED.—The output for November is reported as follows: 2954 tons of ore crushed, valued at about \$77,500.

ROCKY MOUNTAIN TUNNEL AND MINING COMPANY.—The company has been incorporated, with a capital stock of \$500,000—100,000 shares, non-assessable. The tunnel-site is on the southeast side of Red Mountain, near the west end of the National lode claim and the Sallie Bell. Both of these leads are patented. There are about eight known leads contained in the National lode, all of which will be cut by this tunnel within a distance of seven hundred feet, and very much deeper than the old workings. The tunnel will run at right angles with the direction of the leads. The first 1200 feet of the tunnel are within the lines of two leads belonging to the company, the Polly and the Rocky Mountain, and no portion of the tunnel runs through any ground except that owned by the company.

NEVADA.

HUMBOLDT COUNTY.

PARADISE VALLEY.—This company has brought suit in the District Court at Winnemucca to set aside the application for a patent of Allen Middleton to 500 feet of the Red Deer mine, claimed by the plaintiff, J. V. McCurdy has also brought suit against Middleton for an undivided interest of 50 feet in the Red Deer mine.

NYE COUNTY.

NYE.—This company has been incorporated under the laws of California, with a capital stock of \$500,000. The following directors have been appointed: N. S. Trowbridge, J. M. English, Morton C. Fisher, William J. Donlan, and W. D. Johnston.

STOREY COUNTY—COMSTOCK LODE.

CONSOLIDATED CALIFORNIA & VIRGINIA.—During the week ended the 12th inst., there were shipped from the 1750 level 801 tons of ore to the Morgan mill, the value of which is stated at \$25.76 a ton. From between the 1300 and 1500 levels, 1425 tons were shipped to the Eureka mill, extracted under the Jones contract, during the same period. The value of this ore is given at \$25.48 a ton. The extensive surface improvements that have been in progress at the Con-

solidated Virginia shaft, through which all operations under the lease are now carried on, have been completed. It is stated that the ore crushed during the past few weeks shows a marked improvement in the grade.

GOULD & CURRY.—At the Gould & Curry west cross-cut No. 2, south of the shaft, a diamond drill has been started from the face, to explore the vein-matter through to the foot-wall. This method of exploration will probably be extensively adopted in prospecting the large deposits of low-grade quartz on the upper levels of the north end and middle mines, as it can be done more expeditiously and at only a tithe of the cost required to drive expensive drifts and cross-cuts.

HALE & NORCROSS.—Ore is now hoisted from the 3000-foot level. This ore is stoped out in driving the uprise toward the 2900 from the roof of the station over the top of the deep winze. The 3100 level east cross-cut No. 2, started from the north lateral drift at a point 70 feet north from the deep winze station, has been swung around to the northward, and is now advancing in a northeasterly direction, following the course of the diamond drill sent out ahead.

SIERRA NEVADA.—From the summit of the company's ground, on Cedar Hill, 36 tons of gold-bearing ore have been extracted, and shipped to be milled.

WASHOE COUNTY.

It is rumored that a smelting-furnace will be erected at Reno next spring, to reduce the extensive deposits of carbonate ore in Washoe County.

NEW MEXICO.

GRANT COUNTY.

BLACK HAWK.—The mine has been pumped out and work resumed on the lowest level.

FLAGLER REDUCTION-WORKS.—The works are running steadily on tailings. Regular shipments of sulphide concentrates are made. The machinery for working ore is gradually getting into place, and by the end of January the works expect to begin treating ore from their own mines, working the ore in combination with the tailings.

NEW YORK.

JEFFERSON COUNTY.

Notice of the discovery of a vein of gold and silver on the land of Charles La Duce, in the town of Theresa, has been filed with the Secretary of State by Charles Hardie and Liberty E. Robertson.

PENNSYLVANIA.

BERKS COUNTY.

All the slate quarries in the northern portion of this county have suspended operations, except the Big Bed quarry, near Steinsville. Depression in business is ascribed as the cause.

SOUTH AMERICA.

E. L. LLAUES GOLD MINING COMPANY.—This company has been incorporated under the laws of the State of New York, with a capital of \$1,000,000.

MARKETS.

Silver.

New York, Thursday Evening, Dec. 24.

DATE.	LONDON.		N. Y.		DATE.	LONDON.		N. Y.	
	Pence.	Cents.	Pence.	Cents.		Pence.	Cents.	Pence.	Cents.
Dec. 19	46½	102¼	46½	102¼	Dec. 23	46½	102¼	*	*
21	46½	102¼	46½	102¼	24	46½	102¼	†	†
22	46½	102¼	46½	102¼	25	....	....	....	....

* 102½@102¼. † 102½@102¼.

The fear of a stoppage of the coinage of silver in this country seems still to unduly depress the foreign market, and were it not that the Bank of England rate has advanced to 4 per cent, and that sterling exchange has greatly advanced, the price here would show this more clearly. We believe, from the best information from well-informed sources, that the coinage of the silver dollar will not be revoked absolutely, though it is quite possible some compromise may be made, perhaps increasing the weight of the dollar, as Mr. Seligman and others propose, to 480 grains, possibly by reducing the amount to be coined, or, as suggested by some of our best and most reliable authorities, by withdrawing the paper money below \$10, and making silver a subsidiary coinage legal tender to say \$20 or \$50, and coining the one or two millions a month in small coins. There can be little question but that the country could

keep in circulation \$200,000,000 of subsidiary coin if we had no paper money of a less denomination than \$10. Whether the circulation of silver would then be tolerated by the public, is quite another matter. Gold has begun to leave the country, and quite large shipments were made during the week to England and Germany.

Copper.—The copper market is strong, and we may quote Lake at 11½c., though there are reports of some brokers of Lake having been offered at 11¼c. Orford and Parrot have sold in quite large quantities at 10½c., and are strongly held with 10½c. an asking figure. Baltimore is 10½@10¾c. for best brands.

Sales of non-Lake brands about 400,000 pounds during the week. We refer to the copper production statistics given in our editorial columns, as showing the strong statistical position of this metal. The stocks in Europe scarcely equal five months' consumption, and our home stocks would scarcely supply our consumption for six weeks. Certainly, this is a strong statistical position, and when it is understood in Europe that our production is not increasing, and that we shall be able to export less next year than this, the foreign market will doubtless also revive.

There is a probability that one of the large Arizona producers will close in a few months.

The estimates, by well-informed insiders, of the production of the Tamarack Company for 1886 is "about 10,000,000 pounds." This may be taken as a fair basis for estimates.

Chili Bars have fluctuated in London from £41 on Saturday last, to £40 15s. yesterday. To-day, cables to the Metal Exchange quote £40 17s. 6d.

Best Selected, £45 10s.

Chili Bars on the Metal Exchange in this city are quoted about 10s. above London prices.

Tin.—There is nothing of importance in tin. Spot is quoted in London to-day £93. Our market here may be quoted 20½@21c. for spot.

The Billiton sale went at an average of 55½c., delivered 1886 in Holland.

Lead.—The lead market is strong, at a little below the importing price. Sales of 700 to 800 tons during the week are reported at 4'57½@4'67½c. spot, January and February. Foreign could be laid down here at 4'75c. The Richmond stock at the first of the present month was 5500 tons, of which 2000 tons were sold to San Francisco, and 3500 tons are available for shipment East. Of this, about 350 tons on the way have been sold, and the remainder is to be sent forward as rapidly as possible by steamer and sailing vessel. All of it is expected to reach here in April. After this has been taken into consumption, it is the opinion of some, that foreign lead will be required for our home consumption, for the present rate of production is not equal to our consumption. This is a sanguine view of the case, but not an unreasonable one when the statistical position of the market is considered. There are no stocks in this country outside of the Richmond Company's.

Lead pipe, 5½c. Sheet-lead, 7c. Shot, 6@7c.

In London, Soft Spanish is quoted to-day £12 2s. 6d.; Soft English lead, £12 12s. 6d.

Messrs. Henry Rogers, Sons & Co., London, report December 10th: We have to record a sharp advance in this market. The growing scarcity of soft lead without silver suddenly attracted attention, and the home trade, getting frightened, bought every thing that could be obtained up to £12 5s. At this point, a reaction would probably have set in, but the disturbed state of Spanish politics tended to further support prices, and as high as £12 7s. 6d. was paid in a few instances. The market, however, closes quieter at £12 2s. 6d.@£12 5s.

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

Business has been quiet and of a limited character, with quotations at 4'40c. and 4'46c. for spot; 4'35c. and 4'40c. asked for futures. Scarcely any thing offered.

Spelter is without change, and may be quoted 4'40@4'60c., according to brand, for Domestic, and 5c. for Silesian. New Jersey, 6¼@6½c.

Antimony is quite dull and unchanged at 8½@8¾c. for Hallett's; 9¼c. Cookson's here, and £36 for Hallett's in London.

Nickel.—We quote nominally 70c., but this figure is shaded by foreign brands

IRON MARKET REVIEW.

NEW YORK, Thursday Evening, Dec. 24.

Iron Ore.—Orders are abundant and pressing, but freights are so uncertain that there is an unwillingness to accept orders for distant delivery. The prices are advancing, and we may quote 9½@10¼c. per unit as an asking price.

Pig-Iron.—The market here is firm and with an advancing tendency. The prices have not yet been made for next year's delivery, but the general impression is, that prices may be advanced \$1 a ton, or say to \$19, \$17 or \$18, and \$16 or \$17 for No. 1, No. 2, and Forge; but these will probably be the limit in price for the opening.

At present, \$18, \$16@17 and \$15@16 are the nominal quotations.

The Thomas Iron Company proposes blowing in its remaining three furnaces, but the company appears disinclined to advance prices beyond the figures mentioned.

In the West, the markets are much stronger than here, and prices have advanced measurably. The feeling in this market is quite conservative, and is opposed to "booms" or rapid advances, and the present is not a good season of the year for inaugurating one.

Scotch Pig.—Very little is doing in this article, and we continue our quotations: Coltness, 50s.; \$20 New York. Summerlee, 51s.; \$19.50 New York. Eglinton, 42s.; \$18 New York. Freights are quoted 7s. 6d.@10s.

Bessemer Pig.—There has been an active demand and a good business in this article. We hear that some English Bessemer bought to come to this market has been resold in England. We quote here \$20@21 Foreign and \$20 Domestic.

Spiegeleisen.—The demand is large, and there has been a fair business on the basis of \$28 for 20 per cent English and \$27 for German.

Steel Rails.—The rail market continues active, with large inquiries in the market. We learn of sales of 6000 tons during the week, at prices equal to \$35 at Pittsburg and \$34 at Eastern mills. Orders for early delivery, when they can be supplied, can be placed at \$34 at Eastern mills, but \$35 is, we believe, the lowest price for future deliveries.

The order reported two weeks ago for 5000, with option of making it 10,000 tons, has been made 7500 tons, \$35 at the mill. The Pittsburg price for future delivery is understood to be \$36. Cleveland price, \$36.50. Large inquiries still in the market; one of 10,000 tons for the Union Pacific, and one of 6000 tons for a new Southern road.

Structural Iron and Steel.—Prices remain unchanged. Angles, 1'90@2c. delivered; Tees, 2½c.; Iron Beams and Channels, 3c.; American and Belgian, 2'60@2'75c.; Steel Angles, 2'30@2'40.; 3-inch to 4-inch square steel billets under 10 carbon are quoted \$32.50 ex ship.

Plate Iron.—Unchanged. Quoted at 2@2½c., according to quality; Common Tank, 2c.; Refined, 2½c.; Flange iron, 3¼@3½c.

Bar Iron.—We quote at 1'40@1'55c. for Common; 1'75@1'85c. Refined.

Steel Plates.—Quoted 3@3½c. for Boiler and Ship Plates; 3½@4c. for Flanges.

Merchant Steel.—We continue to quote American Tool Steel 8@10c.; special qualities, 12@15c.; Crucible Machinery, 4½@5½c.; Bessemer Machinery, 2@2½c.

Old Rails.—Are still scarce. We quote \$20@21 nominally, but rails can not be bought in quantity at even the highest of these figures.

COAL TRADE REVIEW.

NEW YORK, Thursday Evening, Dec. 24.

Statistics.

Chesapeake & Ohio Railroad Company's report of total output and distribution of coal and c-ke. Received from mines on line of Chesapeake & Ohio Railroad (including mines on Lexington Division) for the week ended December 14th and year from January 1st. Tons of 2000 pounds:

Kind of coal.	1885.		1884.	
	Week.	Year.	Week.	Year.
Cannel.....	698	141	30,131	22,161
Gas.....	5,330	9,276	315,474	303,827
Splint and block	6,485	7,797	192,940	142,169
New River, etc.	16,164	7,426	567,886	364,452
Coke.....	3,412	2,605	119,297	75,340
Total.....	32,089	27,245	1,225,728	907,949
Increase.....	10,102	.....	317,779	.....

Production Anthracite Coal for week ended December 19th, and year from January 1st:

Tons of 2240 lbs.	1885.		1884.	
	Week.	Year.	Week.	Year.
P. & Read RR. Co.	251,797	11,235,919	273,394	11,152,432
L. V. RR. Co.	150,105	6,030,397	158,502	5,983,877
D. L. & W. RR. Co.	98,023	4,890,627	113,319	5,073,930
U. & H. Canal Co.	75,528	3,843,154	89,581	3,888,431
Penna. RR.:				
N. & West Br. RR.	30,341	1,125,362	21,981	626,943
S. H. & W. B. RR.	3,288	199,814	1,689	140,962
P. & N. Y. RR.	12,267	1,034,826	13,354	537,942
Penna. Coal Co.	31,805	1,421,821	27,128	1,296,370
Penna. Canal Co.	.....	430,608	.....	430,708
Shamokin Div., N. C. RR.	24,518	1,011,358	21,814	1,043,987
Lykens Valley.....	*10,000	487,989	9,142	488,274
Total.....	687,672	31,711,875	739,884	30,863,856
Increase.....	.....	848,028	.....	.....
Decrease.....	52,213	.....	.....	.....

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

Production for corresponding period:
1880.....27,408,527 | 1882.....28,860,764
1881.....27,991,164 | 1883.....30,566,188

Production Bituminous Coal for week ended December 19th, and year from January 1st:

Tons of 2000 pounds, unless otherwise designated.	1885.		1884.	
	Week.	Year.	Week.	Year.
Philadelphia & Erie RR.....	2,680	29,085	.....	.....
*Cumberland Region, Md.....	39,762	2,715,444	33,707	2,802,302
*Barclay Region, Pa.	.....	.....	.....	.....
Barclay RR.....	4,431	222,232	4,204	283,527
*Broad Top Region, Pa.	.....	.....	.....	.....
Huntington & Broad Top RR.....	+	162,608	3,290	189,672
East Broad Top.....	.....	.....	.....	.....
Clearfield Region, Pa.	.....	.....	.....	.....
Snow Shoe.....	3,596	145,020	3,785	179,298
Karthus (Keating).....	4,407	133,809	2,064	56,397
Tyrone & Clearfield.....	61,046	2,806,555	64,061	3,065,652
Allegheny Region, Pa.	.....	.....	.....	.....
Gallitzin & Mountain.....	11,927	530,106	7,117	392,991
Total.....	127,849	6,744,859	113,228	6,989,749

* Tons of 2240 lbs.
† Report not received.

WESTERN SHIPMENTS. †				
Pittsburg Region, Pa.				
West Penn. RR.....	5,937	215,017	6,035	279,127
Southwest Penn. RR.	2,688	98,041	1,654	121,166
Pennsylvania RR.	4,567	230,793	3,294	263,130
Westmoreland Region, Pa.	.....	.....	.....	.....
Pennsylvania RR.....	31,008	1,160,221	26,406	1,293,876
Monongahela Region, Pa.	.....	.....	.....	.....
Pennsylvania RR.....	4,178	264,234	2,750	155,588
Total.....	48,378	1,968,216	40,079	2,112,887
Grand total.....	176,227	8,713,075	158,307	9,102,636

‡ Considerable gas-coal shipped East, of which no division is made in report.

Production of Coke on line of Pennsylvania RR. for week ended December 19th, and year from January 1st:

Tons of 2000 pounds.	1885.		1884.	
	Week.	Year.	Week.	Year.
Allegheny Region.	4,138	181,099	4,020	135,063
West Penn. RR.....	2,188	58,100	.....	24,865
Southwest Penn. RR.	58,743	1,825,482	24,793	2,026,502
Penn. & W. Region	5,845	235,185	4,703	197,321
Monongahela	3,172	95,762	184	70,051
Pittsburg Region.....	.....	.....	.....	136
Snow Shoe.....	652	23,562	384	22,742
Total.....	74,738	2,419,190	44,084	2,476,680

Anthracite.

Pittston coal has been selling at \$3.85 alongside for Stove, \$3.22 for Broken, and \$3.25 for Egg. This has caused the Delaware, Lackawanna & Western Company to put Stove coal at \$3.65 net, and Broken and Egg at \$3. Of course, these prices have demoralized the whole trade, and we hear of Stove coal as low as \$3.50 f. o. b.; Egg, \$3; Broken, \$2.95; and Chestnut, at \$3@3.25. There is a fair demand for stove, chestnut, and egg sizes. Chestnut is not nearly so plentiful as it was, and a week or ten days of good winter weather would greatly stiffen the prices of stove and chestnut coals, if the production were kept within reasonable limits.

It is stated that whereas, a year ago, there was a large amount of coal afloat, there is but very little at the present time. In fact, the trade is in very fair shape—better than it has been for years at this season. It now remains to be seen whether the companies will take advantage of the situation. So far, no decision has been arrived at as to what the production shall be for any portion of next year. Propositions have been made to fix the allotments for the first three months of 1886, and although most of the companies have expressed their willingness to accept a total differing but little from the production for the corresponding months this year, the Delaware, Lackawanna & Western Company, at least, is standing out for a much larger quantity. Of course, the Reading Company is

a little at sea pending the annual election, and it is difficult to conclude just what can be done with it. Although it is conceded that Mr. Gowen will probably be the next president, he may not be able to do any thing until after he forces his way into the receivership or dissolves it by paying the floating debt of the company, as he intimates that he can.

The result of the inaction of the companies as a whole is, that the Lehigh Valley Railroad is expressing considerable disgust, and threatens to cut loose from the combination entirely, which would mean that coal would sell for \$2@2.50 a ton for a while, and the stocks of the coal-carrying companies would look very sick indeed. We mention the stocks for the reason that the coal trade is very largely managed in the interest of stock speculation. If the situation were made so desperate as to cause holders to throw over large quantities of stock at low prices, we have no question that the formation of a very strong coal combination would be a very simple matter indeed.

A Philadelphia dispatch early in the week announced that advances in the prices of coal and freights would be made at the beginning of this month. We are informed that the demoralization of this market has shown that this will be impracticable.

Yesterday's Philadelphia Press says:

"The asked price is a fiction pure and simple; the net price is that which is demanded if it can be got, and the real price is what the buyer can get coal for, if he is smart. There has been some talk of advancing prices for the city and line trade in and about Philadelphia, which is regarded as ridiculous by coal men in view of the actual state of affairs. A meeting of the Lehigh & Schuylkill Coal Exchange will be held on Monday to take the matter into consideration. The question of the allotment for the first three months of the next year remains unsettled, and the whole matter of next year's business is in a state of uncertainty."

Proposals will be received by the Chief-Engineer of the Water Department, Philadelphia, Pa., until December 28th, for delivering coal at the several pumping stations and offices of the department for the year 1886. The coal is to be hard white ash, of the best quality, free from slate and other impurities, and to be delivered in the bins at the several stations and at the several offices at such times and in such quantities as shall be ordered by the Chief-Engineer of the Department.

Bituminous.

Although but little new business is doing, there is an active demand for coal on old contracts and more firmness to prices. The Cumberland trade has shown a strong inclination to oppose the Vessel-Owners' Association in the matter of arbitrary minimum freights and the new bill of lading. We understand that already this has caused some coal to be shipped entirely by rail, and that other large shipments are likely to be made.

There is a disposition all through the bituminous trade to admit that the business of this year has been unprofitable, and that prices of this coal have been unnecessarily low. All the signs point to an arrangement for next year that will be much more satisfactory than any ever before entered into. This year, the railroad companies took the matter in hand and made a grand fiasco of it. We think the proper parties to make the original draft of a plan for securing better prices for this coal are the producers, who have to sell the coal and are thoroughly familiar with the markets. After such draft is made, it can be brought to the consideration of the carrying companies, and we should think there should be no trouble in coming to an agreement with something like this year's output as the basis. A plan that would give reasonable assurance that the shippers would mine and the railroad companies would carry the same quantity of coal in 1886, with the prospects of being able to apportion, *pro rata*, a fair natural increase of tonnage, and that from 25 to 50 cents a ton more could be divided among them, would receive the warmest welcome on all sides.

We think the prices of bituminous coal will be higher at all points in 1886, and especially away from tide-water, where some demoralization may exist although not as great as during this year.

Buffalo.

Dec. 23.

[From our Special Correspondent.]

The holidays are the principal topic of interest and there are no changes to chronicle in either th

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.	NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.												
	Dec. 19.		Dec. 21.		Dec. 22.		Dec. 23.		Dec. 24.		Dec. 25.				Dec. 19.		Dec. 21.		Dec. 22.		Dec. 23.		Dec. 24.		Dec. 25.														
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.			H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.													
Alice, Mon.																									1,600	Allouez.....													
Amie Con., Co.	.04							.04		.04																Alta.....													
Argenta.....																										American Flag.....	.05		.05		.06		.05						5,500
Basicok, Co.																										Barcelona, g.													
Belle Isle, Ne.																										Sechelt Con., g.													
Bodie Cons., Ca.	1.05		1.00	1.50	1.65		1.55																		1,325	Belvidere.....													
Breece.....																									100	Belcher.....													
Bulwer, Ca.	.60	.59							.60																700	Best & Belcher, g. s.													
Cal., B. H.	2.25	2.20			2.15		2.00		1.90																1,500	Big Pittsburg, s. l.													
Chollar.....																										Bowman Silver.....													
Chrysolite Co.	.75						2.50		2.40																200	Bull-Domingo, s. l.													
Colorado Central																									200	Central Ariz'na, s.													
Cons. Cal. & Va., Ne.	1.85		1.40		1.45	1.35	1.40																		3,300	Chollar.....													
Crown Point.....																										Cons. Imperial.....													
Dunkin, Co.							1.90		1.35																	Cons. Pacific.....			.40										100
Eureka Cons., Ne.			1.30		1.00		1.90		3.80																870	Decatur.....													
Father de Smet, Dk.																									100	Durango, g.													
Franklin.....																										Eastern Oregon.....													
Gold Stripe, Ca.																										Goodshaw, g.													
Gould & Curry, Ne.																										Harlem M. & M. Co.													
Grand Frise, Ne.																										Kossuth.....													
Green Mountain, Ca.																										Lacrosse, g.			.11										3,800
Hale & Norcross, Ne.			4.20		4.00																				500	Lacrosse, g.			.11										
Hall-Anderson, N. S.																										Mariposa Pref. g.													
Homestake, Dk.																										Com., g.													
Horn-Silver, Ut.	2.50																								300	Mexican, g. s.													
Independence, Ne.			1.65	1.50	1.65																				1,100	Mono.....	4.10												100
Iron Silver, Co.																									200	New Pittsburg.....													
Leadville C. Co.	.80																								4,100	Noonday.....													
Little Chief, Co.	.27	.25	.29	.28	.28	.27																			2,000	North Standard, g.													
Little Pittsburg, Co.	.30		.32	.30	.33	.30																			300	N. Horn-Silver, s. l.			.08		.07								200
Martin White, Ne.																									300	O'Brien & Miller, s.													200
Moulton.....	1.25																								200	Potosi.....													5,400
Navajo, Ne.			.40																						30	Rappahannock, g.	.13		.13		.13		.13						
North Belle Isle, Ne.					.15																				30	Red Elephant, s.													
Ontario, Ut.			31.75																						700	Ridge.....													
Ophir.....	.75																									Silver Cliff, s.													
Osceola.....																										Somora Con.....													
Plutus.....	3.15	3.05	3.10	3.05		3.10	3.05	3.10																	1,400	South Belle, g.													
Quicksilver Pref., Ca.																									100	South Bulwer, g.													
Com., Ca.																										South Hite.....													
Quincy.....																										South Pacific.....													
Robinson Cons., Co.	.80		.97	.94	.90	.89	.90	.88	.85																1,750	State Line, 1 & 4, s.													
Savage, Ne.	1.80		1.90		1.95																				650	" Nos. 2 & 3, s.													
Sierra Nevada, Ne.	.70																								1,000	Sutro Tunnel, g.	.24		.24		.22		.22		.23				8,000
Silver King, Ar.			8.50	8.25			7.50																		210	Tamarack.....													
Spring Valley, Ca.																										Union Cons., g. s.													
Standard, Ca.							1.10		1.10	1.05															310	Utah.....													
Stormont, Ut.	.14																								400														
Tip Top, Ar.																																							
Yellow Jacket.....																																							

Dividend shares sold, 25,045. Non-dividend shares sold, 23,300

anthracite or bituminous coal trade, in supply, demand, or prices. Coke is also unchanged.

Lacking returns from one of our important railroads, the Buffalo, Lake Erie & Western, the annual statistics of the coal trade will not be ready in time for this week's issue of the ENGINEERING AND MINING JOURNAL, but your readers may expect them certainly a week hence.

Boston. Dec. 23.
[From our Special Correspondent.]

Somewhat unexpectedly, the market for anthracite has continued to weaken. That lower prices would prevail in December has been one of the points insisted upon all along; but a slump down to \$3.75@3.85 for Stove before Christmas was hardly looked for. Excellent Stove coal at \$3.90 f. o. b. at New York seemed a good purchase when that figure was reached; but the best coal can be had for \$3.85 to-day, and \$3.75 will buy very good coal, although perhaps having less reputation. The drop in Broken, and particularly in Egg, has also been large, quoting New York f. o. b. prices of \$3.10 for both sizes, which means a cut of 40 cents on Egg and about 20 cents on the larger size. At the same time, freights have been a little firmer than before the decline, and the delivered price is but little lower than before. Trade is very quiet at wholesale. Owing to this fact, partly, and to the increased transportation facilities, the greater accumulation of coal at tide-water is only natural.

A dull trade continues in bituminous coal. Shippers having contracts that run for several months yet are feeling a little troubled over the new bill of lading. The great bulk of bituminous tonnage coming to this port this year was sold at a delivered price; but if the new bill of lading is to be continued in force, it will cause more transactions to be made on an f. o. b. basis in the future. We quote, as before, \$3.50@3.75 delivered.

There is not a surplus of vessels at present. Rates have been quite firmly held, but show a little easing off, and there is a tendency to delay shipments where the coal is not needed at once. Vessels not belonging to the Coastwise Association are getting the preference, but the new bill of lading is accepted in most cases. We therefore quote rates exclusive of discharging:

New York, \$1@1.05; Philadelphia, \$1.30; Baltimore, \$1.30@1.35; Newport News, \$1.20@1.25; Richmond, \$1.25; Cape Breton, \$1.60@1.75; Bay of Fundy, \$1.40@1.50.

Trade is very quiet with the retailer, and will be until winter comes on in earnest. When that time arrives, a movement will be made to advance prices 25 cents a ton.

We quote:
White ash, furnace and egg..... \$4.75@5.00
" stove and nut..... 5.25@ 5.50
Shamokin, egg..... 6.00
" stove..... 6.25
Lorberry, egg and stove..... 6.50@ 7.00
Franklin, egg and stove..... 7.25@ 7.75
Lehigh, furnace, egg, and stove..... 5.25@ 5.50
" nut..... 5.50@ 5.75

Wharf prices are as follows: Broken, \$4.25; Egg, \$4.50; Stove, \$5.

FINANCIAL.

Mining Stocks.

NEW YORK, Thursday Evening, Dec. 24.

The volume of business in the mining market has been smaller, owing to the holiday; but the dealings have been well distributed throughout the list, and prices have ruled firm.

Considerable interest has been manifested in the Colorado stocks, and a number of shares of the leading companies changed hands. Little Chief showed the largest business, amounting to 4100 shares, at prices ranging from 25@29c. Some 3800 shares of Lacrosse changed hands at 11c. a share. Little Pittsburg was active at from 30@33c. Robinson declined from 97@85c. Plutus showed a business of 1400 shares at from \$3.15@3.05. Iron Silver has advanced to \$1.65. Reports state that some rich ore has been struck. A few shares of Colorado Central sold at from \$2.50@2.40.

this State, for the year ended September 30th, make the following showing:

Gross income.....	\$4,874,252	Dec.	\$514,896
Operating expenses.....	\$2,059,366	"	872,463
Rentals.....	2,020,919	Inc.	100,580
Taxes.....	225,086	"	53,273
	\$568,880	"	213,712

The freight tonnage increased 112,739. The passengers carried were 50,767 greater. The increase of fixed charges indicates an increase of indebtedness of from \$1,500,000 to \$2,000,000.

Pipe Line Certificates.

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

The oil market during the week got a bad break, selling down from 90% at the opening last Friday to 85% on Tuesday. From this, there has been a recovery of over 5 cents.

The trade oversold the market on the decline, and the certificates constantly passed into stronger hands. The present outlook favors higher prices. The break from 112 1/2 to 85%, or over 27 points, more than discounted any unfavorable features on the field. The well at Kane is producing 108 barrels and is said to be 25 feet in the sand.

The following table gives the quotations and sales at the Consolidated Stock and Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
Dec. 19.....	90 1/4	90 3/4	88 1/2	88 3/4	3,954,000
21.....	88 1/4	88 3/4	85 1/2	86 1/4	7,562,000
22.....	86 1/4	87 3/4	85 3/4	87 1/4	5,913,000
23.....	87	88 3/4	86 3/4	88 1/4	6,140,000
24.....	88 1/2	90 1/2	87 3/4	90 1/4	5,420,000
25.....					
Total sales.....					28,989,000

Meetings.

Meetings of the following companies will be held at the time mentioned:

Arizona Consolidated Hill and Mining Company, Metropolitan Hotel, New York City, January 4th, at twelve o'clock m., annual meeting.

Cambria Iron Company, No. 218 South Fourth street, Philadelphia, Pa., January 19th, at four o'clock p.m., annual meeting.

Gold Cup Mining and Smelting Company, No. 89 Water street, New York City, January 12th, from twelve to two o'clock p.m., annual meeting.

Hermann Mining Company, of New York, Room 115, Produce Exchange Building, New York City, January 5th, at four o'clock p.m., annual meeting.

Pennsylvania Oil Creek Petroleum Company, No. 727 Walnut street, Room 13, Philadelphia, Pa., January 12th, at half-past three o'clock p.m., annual meeting.

Pottstown Iron Company, No. 400 Chestnut street, Philadelphia, Pa., January 21st, at twelve o'clock m., special meeting to consider the advisability of applying for a re-charter.

Valencia Mica Company, No. 115 Broadway, Room 113, New York City, January 5th, at twelve o'clock m. sharp, annual meeting.

Dividends.

Barclay Coal Company, of Pennsylvania, has given notice that \$40,000 bonds of the Long Valley Coal Company will be paid the 31st inst., which, with \$5000 paid in July, makes \$45,000 that will have been redeemed during the year.

Ontario Silver Mining Company, of Utah, has declared a dividend (No. 115) of fifty cents a share, or \$75,000, payable on the 31st inst., at Messrs. Lounsbury & Co.'s, No. 15 Broad street, New York City.

Receivers of the Philadelphia & Reading Railroad Company will pay, on December 28th, the semi-annual interest on the four per cent certificates issued in payment for material and supplies, which was due on the 20th instant. The amount of these certificates, which were issued in June, 1884, is about \$1,000,000.

Plymouth Consolidated Gold Mining Company, of California, has declared a dividend (No. 32) of 25 cents a share, or \$25,000, payable January 5th, at the company's office, No. 23 Nassau street, New York City.

Valencia Mica Company, of New Hampshire, has declared the regular quarterly dividend of \$2.50 a share, and an extra dividend of the same amount, making a total of \$5 a share, payable December 31st, at the company's office, No. 115 Broadway, New York City.

COAL STOCKS.

Quotations of New York stocks are based on the equivalent of \$100. Philadelphia prices are quoted so much per share.

NAME OF COMPANY.	Par value of shares.	Quotations												Sales from Dec. 19th to Dec. 24th, inclusive.		
		Dec. 19.		Dec. 21.		Dec. 22.		Dec. 23.		Dec. 24.		Dec. 25.				
		H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.			
Barclay Coal.....	50	15 1/4	15													1,600
Cameron Coal.....	10	23 1/4	22 1/4													1,967
Col. C. & I.....	100	13 1/4	13													1,400
Ches. & O. RR.....	100															
Consol. Coal.....	100															
Cumb. C. & L.....	100															
Del. & H. C.....	100	97 1/4	97 1/4	96 3/4	95 1/2	95	94	95	93 1/2	95 1/4	94 1/2	94 1/2	94 1/2	94 1/2	94 1/2	5,834
D. L. & W. RR.....	50	129 1/4	127 1/4	127 1/4	127 1/4	127 1/4	127 1/4	127 1/4	125 1/4	127 1/4	127 1/4	126 1/4	126 1/4	126 1/4	126 1/4	264,913
Elk Lick Coal Co.....	50	48	48	47 1/2												657
Lehigh Valley RR.....	50	57	57						57	56 1/4						57
L. & W. C. & I Co.....	100															
Maryland Coal.....	100															
Montauk Coal.....	100															
Morris & Essex.....	50															310
New Central Coal.....	100															
N. J. C. RR.....	100	43 1/2	42 1/2	43 1/2	42 3/4	43 1/2	42 1/2	43 1/2	42	43 1/4	43					17,290
N. Y. & S. Coal.....	50															
Penn. Coal.....	50															
Penn. RR.....	50	53 1/2	53 1/2	53 1/2	53 1/2	53 1/2	53 1/2	53 1/2	53 1/2	53 1/2	53 1/2					1,271
Ph. & R. RR.....	50	20 1/2	20 1/2	20 1/2	20 1/2	20 1/2	20 1/2	20 1/2	20 1/2	20 1/2	20 1/2					2,638
Spring Mountain.....	50															
Westmoreland Coal.....	50			61												4

* Of the sales of this stock, 838 shares were in Philadelphia and 2000 in New York. Total sales, 297,941.
 † The quotations for these stocks are not percentage, but actual price.

ASSESSMENTS.

COMPANY.	No.	When levied.	Delinquent in office.	Day of sale.	Amount.
Apex, Utah.....		Nov.			.03
Belle Isle, Nev.....	8	Dec. 12	Jan. 18	Feb. 8	.10
Bulwer, Cal.....	2	Oct. 29	Dec. 10	Jan. 20	.20
Central Cons., Nev.....	4	Oct. 20	Dec. 1	Jan. 16	.05
Courier, Idaho.....	Nov. 4	Dec. 10	Dec. 29		.03
Daisy Cement, Cal.....	5	Nov. 19	Dec. 23	Jan. 12	.02
Eureka, Nev.....	Dec. 19				1.00
Far West, Dak.....	6	Nov. 12	Dec. 17	Jan. 2	.01
General Lee, Ariz.....	7	Nov. 28	Jan. 9	Feb. 8	.01
Golden Jacket, Nev.....	1	Oct. 27	Dec. 3	Dec. 26	.05
Goodshaw, Cal.....	Dec. 7				.25
Gould & Curry, Nev.....	51	Dec. 4	Jan. 8	Feb. 1	.25
Hale & Norcross, Nev.....	88	Dec. 9	Jan. 13	Feb. 4	.50
Hathaway Hydraulic Cal.....	8	Dec. 8	Jan. 18	Feb. 8	.15
Julia Cons., Nev.....	21	Nov. 4	Dec. 9	Dec. 30	.10
Justice, Nev.....	43	Nov. 25	Dec. 30	Jan. 19	.10
Mutual, Dak.....	1	Dec. 3	Jan. 7	Jan. 27	.3 1/2
North Belle Isle, Nev.....	9	Dec. 12	Jan. 15	Feb. 5	.15
North Gould & Curry, Nev.....	9	Nov. 23	Dec. 24	Jan. 11	.20
North Peer, Ariz.....	2	Nov. 7	Dec. 10	Jan. 4	.02
One Thousand and One Cons., Cal.....	19	Nov. 25	Dec. 19	Jan. 20	.3 1/2
Potosi, Nev.....	21	Dec. 1	Jan. 7	Jan. 28	.30
Ruby Hill, Nev.....	10	Nov. 16	Dec. 16	Jan. 15	.01
Russell, Cal.....	1	Oct. 15	*Dec. 29	*Jan. 19	.25
Tuolumne, Cal.....	1	Sept. 15	Nov. 13	Dec. 15	.55
Virginia Creek, Cal.....	3	Dec. 14	Jan. 19	Feb. 11	.05
Yellow Jacket, Nev.....	Dec. 15				.75

* Assessment postponed until above date.
 The assessment No. 3 of the Golden Fleece Gravel Mining Company, California, for \$20, levied October 26th, was recorded December 9th.

Boston Copper and Silver Stocks.

[From our Special Correspondent.]

BOSTON, Dec. 23.

There has been but very little doing in mining stocks the past week, and our report of the market embraces five days only. Calumet & Hecla has been in quite active demand for investment, and about all the sales have been at \$212; only a small lot sold at \$211; sales, 186 shares. Tamarack holds firm at \$90, at which ten shares only changed hands. Quincy was in better demand, and recovered a portion of the loss of last week, opening at \$50 1/4 and gradually advancing to \$52, with sales of 276 shares. Franklin has been unusually quiet but steady at \$10 ex dividend of \$1 a share; sales, 150 shares. Osceola, dull but firm at \$14@15, with sales 30 shares only. Atlantic sold at \$10, a decline of 1/4 from last week's sales; 290 shares sold. Pewabic declined from \$3 1/2@3, on 150 shares. Huron also declined 1/4; sale of 50 shares only at \$1 1/4. Total sales so far this week (five days), 1142 shares.

The market for silver stocks has ruled dull, but without material change in prices. Catalpa sold at 30@35c. (400 shares). Breeca, at 30c. (500 shares). At the Mining Exchange, Bowman Silver advanced to 25c., sales and bid. Dunkin sold at 25@22c. Empire, 8@9c.

3 P.M.—Market dull. Closing prices: Allouez, \$1 asked; Atlantic, \$10 asked; Calumet & Hecla, \$212 sales and bid; Franklin, \$9 bid, \$10 asked; Osceola,

San Francisco Mining Stock Quotations.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS.					
	Dec. 18.	Dec. 19.	Dec. 21.	Dec. 22.	Dec. 23.	Dec. 24.
Albion.....						
Alpha.....	.15				.20	
Argenta.....						
Bechtel.....						
Belcher.....	.85		.90		.90	
Belle Isle.....						
Best & Belcher.....	1.25	1.12 1/2	1.25	1.12 1/2	1.00	
Bodie.....		1.62 1/2	1.62 1/2	1.62 1/2	1.62 1/2	
Bullion.....						
Bulwer.....	.60	.60				
Chollar.....	.75	.75	.75	.75	.70	
Con. Pacific.....	.40	.45	.50	.50	.50	
Con. Cal. & Va.....	1.25	1.50	1.50	1.50	1.25	
Crown Point.....	.75	.80	.80	.75	.70	
Day.....						
Elko Cons.....						
Eureka Cons.....	1.50	1.25	1.00		1.12 1/2	
Exchequer.....						
Gould & Curry.....	.65	.70	.75	.70	.60	
Grand Prize.....						
Hale & Norcross.....	3.87 1/2	4.00	4.12 1/2	4.00	3.62 1/2	
Independence.....						
Martin White.....	.55	.60	.55	.60	.55	
Mexican.....	.55	.60	.55	.60	.55	
Mono.....	4.25	4.00	4.00	4.12 1/2	4.12 1/2	
Mount Diablo.....			4.00	4.00		
Nevado.....		.35	.35	.30	.35	
Northern Belle.....						
North Belle Isle.....						
Ophir.....	.75	.80	.80	.80	.70	
Overman.....						
Potosi.....	.15	.20	.15	.15	.20	
Savage.....	1.62 1/2	1.75	1.75	1.62 1/2	1.50	
Scorpion.....						
Sierra Nevada.....	.60	.60	.60	.50	.50	
Silver King.....						
Tip-Top.....						
Union Cons.....	.45	.40	.45	.45	.40	
Utah.....	.45	.50				
Wales Cons.....						
Yellow Jacket.....	.50	.60	.55	.45	.30	

\$13 1/2 bid, \$15 asked; Quincy, \$52 bid, \$52 1/2 asked; Tamarack, \$89 bid, \$92 asked; Catalpa, 30@35c.; Bowman, 25@27c.

OFFICE ONTARIO SILVER MINING COMPANY, MILLS BUILDING, 15 BROAD STREET, NEW YORK, Dec. 23, 1885.

DIVIDEND NO. 115.
 The Regular Monthly Dividend of FIFTY CENTS per share has been declared for November, payable at office of the company, San Francisco, or at the Transfer-Agency in New York, on the 31st inst. Transfer-books close on 26th. LOUNSBURY & CO., Transfer-Agents.

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DIVIDENDS.

PLYMOUTH CONSOLIDATED GOLD MINING COMPANY, 23 NASSAU STREET, NEW YORK, Dec. 4, 1885.
 DIVIDEND NO. 31.
 The Board of Trustees have declared a dividend of TWENTY-FIVE THOUSAND DOLLARS, the same being twenty-five cents per share of the capital stock of the company, payable on the fifth day of January, at the Company's offices in New York and San Francisco.
 W. VAN NORDEN, President.

SAN FRANCISCO, Dec. 15, 1885.
THE FATHER DE SMET CONSOLIDATED GOLD MINING COMPANY has declared dividend No. 50 of 20 cents per share, payable on 31st inst. at the office of Laidlaw & Co., 14 Wall St., New York. Transfers close on 22d inst.
 (Signed) H. DEAS, Secretary.

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 Louis Janin, M. E., San Francisco, Cal.
 J. C. Bartlett, M. E., Taunton, Mass.
 John Hays Hammond, M. E., New York City.
 Bainbridge, Seymour & Rathbone, Mining Engineers, London, England.
 Address V. M. C., care of this office.

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