

THE ENGINEERING AND MINING JOURNAL
MINING AND METALLURGY ESTABLISHED 1866

VOL. LXXIX

No. 5.

PUBLISHED EVERY THURSDAY
261 BROADWAY, NEW YORK.

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CABLE ADDRESS "ENGINJOUR" NEW YORK.

BRANCH OFFICES.

CHICAGO.....520 Monadnock Block
PITTSBURG.....701 Keystone Building
DENVER.....206 Boston Building
SALT LAKE CITY.....1529 Second East St.
BUTTE, MONTANA.....19 & 20 Owsley Block
SAN FRANCISCO.....168 Crocker Building
LONDON, ENGLAND.....20 Bucklersbury, E. C.

Subscription, payable in advance, \$5.00 a year of 52 numbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.

To Foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 32 marks, or 40 francs. Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Monday morning of issue week; changes of copy by the preceding Thursday.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; Palace Hotel, San Francisco, and the leading hotels in the principal cities.

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THE ENGINEERING AND MINING JOURNAL.

Entered at New York Post Office as mail matter of the second class.

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EDITORIAL.

THE PUBLICATION of the fourth article on the Mesabi Iron Range is necessarily postponed for a week, the receipt of the manuscript having been delayed by stormy weather and belated mails. The importance of the range to the iron trade of this country is shown by the notes on the Lake Superior iron trade, which will be found in another column. In 1904 the Mesabi furnished 55.7 per cent of the total shipments of lake ore, the highest proportion ever reached. In other words, this range supplied the ore from which 40 per cent of the pig iron of the United States was made, and its mines could have furnished a much larger quantity had they been worked to their full capacity. The Mesabi ores are a great and growing factor in the iron trade, and the account of their origin and methods of mining has a corresponding interest.

A GOOD EXAMPLE has been set by the Miners' Association of El Dorado county, in California, which has organized a club at its headquarters in Placerville, for the benefit of the mining men of the county. These headquarters will include a meeting room, reading rooms, etc., where all interested in the mining industry may meet, extend their acquaintance, and exchange experiences. The tendency of such a movement is undoubtedly to foster a spirit of harmony among mining men, as well as to stimulate the business of legitimate mining. At the same time it is much easier to secure united action on any question relating to the interests of the mining men of the county, since they have a recognized center for discussion and conference.

DIVIDEND PAYMENTS by American mines and metallurgical works in January were large, amounting to \$6,889,872, as reported by 56 companies to THE ENGINEERING AND MINING JOURNAL. Three-quarters of this total represented a good share of the profits earned by 32 metal mines from the higher market value of their products, especially copper. The total dividends paid by these properties was swelled by the increase in the quarterly declaration of the Boston & Montana Company from \$5 to \$10 per share, nearly all of which goes to the Amalgamated Copper Com-

pany; by the doubling of the Osceola Copper Company's semi-annual rate from \$1 to \$2 per share; the extra quarterly payment of 25c., making \$1 per share, of the Ajaska-Treadwell Company; the bonus of 30c. per share of the Alaska-Mexican Company, and the increase from 6 to 8 per cent in the annual rate of the Continental Zinc & Lead Mining & Smelting Company's preferred stock. Twenty-four gold, silver and lead companies paid dividends of \$2,736,209; 4 copper mines, \$2,361,050; 1 quicksilver, \$30,000, and 3 zinc properties, \$27,497. Fewer industrial companies divided profits, 24 having declared \$1,735,116, of which 4 coal and coke reported \$704,584; 3 iron and steel, \$227,800; 12 oil and gas, \$168,732, and 5 chemical and mineral companies, \$634,000.

Americans also shared in the dividends paid by 2 Mexican mines, amounting to \$229,500; 1 in Central America, \$15,000, and 2 Canadian, \$141,360, making a total of \$385,360.

A MOVEMENT IS on foot in the California legislature for the passage of an act providing for the appointment of mine inspectors, and the regulation of mining in the State. Heretofore there has been no official inspection of California mines, and little legal provision for securing the safety of miners. As the State has only one or two coal mines, no laws have appeared necessary to regulate ventilation and similar matters, and they have been left to the several operators. It does not appear that there has been any serious complaint as to imperfect ventilation, or the lack of safety appliances, and in most mines these have been supplied by the operators themselves, under the pressure of self-interest alone. The proposed law does not meet with the approval of mine-owners generally, and a good deal of opposition to it is expected in the legislature when the bill comes up for consideration, the plea being that it is unnecessary.

THE BOARD OF General Appraisers has recently passed upon an interesting question, in the importation of radium bromide. The collector of the port of Philadelphia had assessed a duty of 25 per cent ad valorem on the substance as a 'chemical salt'; the importers claimed that it was dutiable at a lower rate as a 'metal unwrought.' The collector's classification was sustained. The status of radium is unique. It is conveniently handled, in

analysis, with salts of barium, with which it is designedly contaminated. The radiant properties are exercised by the paradoxical energizer in the presumable form of a chemical salt. No success has attended any attempt at isolation of the metal as such; indeed, fractionation has rested, satisfied for the time, with obtaining the radium bromide as a salt, and that in almost infinitesimal quantity. The properties are substantiated; but the nature and individuality of radio-active substances are still problematical. A provisional atomic weight of 235 has been assigned to it; but instances are not wanting of good, though conservative authorities, who are not yet convinced that radium compounds are anything more than uranium, or barium, or bismuth, or lead under peculiar conditions. This view is probably ultra-conservative. Meanwhile chemists and physiologists are content to use what are salts of something, leaving to the future to disclose the hypothetical metal. If radium is a real metal, homologous with the calcium-strontium-barium group, its intensely basiferous nature might baffle—not to say delay—all attempts at isolation. Meanwhile we wait for further returns. It is certainly 'unwrought' as a metal, if not 'unwroughtable.'

THE PRODUCTION OF coke in the Connellsville region, in Pennsylvania, decreased 917,762 tons last year, as compared with 1903, according to the careful records kept by the Connellsville *Courier*. The total shipments in 1904 were 12,427,468 short tons. The reduction in output was due to the smaller demand from the iron furnaces during the first half of the year, while the lower prices which followed were also a discouragement to the operators. The average price of furnace coke was \$1.75 per ton at the ovens, while in 1903 it was \$3, the highest figure ever reached. Naturally, there was comparatively little new work done. The total number of ovens at the close of the year was 29,119, an increase of 1,027 over the report at the close of 1903. The greatest increase in coking capacity on record was made in 1901, when nearly 5,000 ovens were built, the construction of this large number being due to the development of the lower Connellsville region—the new part of the field—by the steel companies, later absorbed in the United States Corporation. Last year only 200 ovens were built in the upper end of the region, the

remainder being in the lower Connellsville field. In fact, the output of the older part of the field may be expected to decline from this on, as the coal is gradually worked out. All the ovens built this year were of the old beehive type, and there was no increase in the number of the by-product plants.

FOR SOME TIME past asphalt has been manufactured in California from petroleum residues, and it has been used to a considerable extent on the Pacific Coast. A good deal of the California petroleum has an asphalt base, and the quality of the product so manufactured is said to have proved very satisfactory. The manufacture has now reached a point where it exceeds the demand for it in the State, and recently two cargoes, amounting in all to 3,800 tons, have been shipped to the East, in order to find a market there. The material is shipped by sailing vessels at a moderate freight rate, and it is believed that it can be laid down in Atlantic ports at a price which will make it possible to compete with the present sources of supply.

The German Miners' Strike.

The strike of the German coal miners continues, and the number of men out has increased rather than diminished. The men adhere to their statement of grievances, and decline to consider any propositions which do not involve a substantial settlement of them all, as well as an increase in wages. Their demand, it will be remembered, includes a shorter working day, with the provision that time shall date from entrance into the mine, and not from the time of arrival at the working face, an increase in wages, and the abolition of various petty and vexatious restrictions as to work and conduct in the mines. There is also complaint that in some of the collieries ventilation is inadequate, and sufficient safeguards against accident are not provided; but this last accusation is denied by the mine-owners, and really does not seem to be supported by complete evidence. In the Rhenish-Westphalian district, in which the strike has its center, the business is almost completely controlled by the Coal Syndicate, which represents the mine-owners in all their dealings with the men. At first the syndicate proclaimed its intention of yielding nothing whatever, and even refused to

consider complaints, or to meet any representatives of the miners. The action of the Emperor, in appointing a commission to consider the points at issue and report—very much the same as the Anthracite Commission here acted on the motion of the President—was also distasteful to the syndicate, and there was a disposition to reject any overtures of this kind for a settlement. Some of the managers even urged that the syndicate should refuse to appear before the Commission, which was a very strong measure indeed, for Germany.

The latest advices, however, seem to show that the syndicate is in a more yielding frame of mind, and at a meeting held a few days ago, at Essen, the mine-owners decided to notify the government that they would not only appear before a Commission, but that they would agree to accept the judgment that such a Commission might render after inquiry. This would involve concessions to the miners, and remedies for grievances, should the Commission decide that they existed. The syndicate suggested also that the Commission appointed by the Emperor should be fully authorized to act by resolution of the Prussian diet.

This marked change in attitude seems to indicate that very strong political influences must have been brought to bear on prominent members. It is known that the Emperor has been exceedingly anxious for a settlement, and, naturally, he can do a great deal toward convincing his opponents, under the German system. He has probably used arguments freely with prominent members of the syndicate, and has evidently induced them to accept his views to a certain extent. Another point, which may have had some effect, is the active use of the strike, and of the statements of the mine operators, which has been made by the leaders of the Socialist party, who are naturally feared by the syndicate.

There is little doubt also that public opinion, apart from the Socialists, has been in favor of the miners. The justice of some of their complaints is generally recognized, and it may be added that the Rhenish-Westphalian coal syndicate is anything but popular in Germany. Its arbitrary action, its insistence upon high prices, and upon conditions which have proved both annoying and injurious to manufacturers, have inclined many people to favor anything which may seem to re-

strict its power. It may be added that the syndicate has not been in favor with the government, on account of its determined opposition to the policy of State control of the coal supply. The syndicate urged and brought about the recent refusal of the stockholders of the great Hibernia Company to sell their property to the Prussian government; and this was done, notwithstanding the generally known fact that the purchase was a project strongly favored by the Emperor. Possibly it is a remembrance of this which has inclined the authorities to insist upon the commission plan. At any rate, it is evident that they have taken no decided action against the miners. It must be said in favor of the latter, that they have generally kept the peace. Only a few local disturbances have been recorded since the strike commenced, and those were of very slight importance.

Pig Iron Production.

On another page is printed the report of the American Iron & Steel Association, giving in detail the production of pig iron in the United States in 1904. In the JOURNAL for January 5 the total was estimated at 16,563,938 tons; the final report gives it as 16,497,033 tons. The difference is 66,935 tons, or 0.4 per cent only, and was due to a slight over-estimate of the activity of the furnaces in December. The decrease, as compared with 1903, was 1,512,219 tons, or 8.4 per cent; but the total exceeded that of any year prior to 1901.

The total output, classified by the uses for which the iron was intended, is as follows, in long tons:

	1903		1904	
	Tons.	Per ct.	Tons.	Per ct.
Fndry and frge	5,281,200	29.3	4,358,295	26.4
Bessemer	9,989,908	55.5	9,098,659	55.2
Basic	2,040,726	11.3	2,483,104	15.1
Charcoal	504,757	2.8	337,529	2.0
Spiegel and ferro	192,661	1.1	219,446	1.3
Total	18,009,252	100.0	16,497,033	100.0

Charcoal iron, which is given separately, includes some iron of bessemer quality, and some basic. The larger part is used either for conversion into wrought iron or for special castings where a high degree of strength is required. The marked feature in this statement is the increased proportion of basic iron made and used. In fact, this class of iron showed an actual gain in quantity in a year of generally declining production. This again indicates the increasing use of the basic open-hearth furnace by steel-makers.

The production for two years past, arranged by districts, was as follows:

	1903.	1904.
N. Eng., N. Y. and N. J.	782,350	880,074
Pennsylvania	8,211,500	7,644,321
Ohio and Illinois	4,979,809	4,633,920
Mich., Wis. and Minn.	528,225	443,629
Maryland	324,570	293,441
Southern States	2,900,856	2,444,342
West of Mississippi	281,942	157,306
Total	18,009,252	16,497,033

In this classification, we have put Maryland by itself, because its production is mainly from imported Cuban ores in a single group of furnaces. West Virginia is included in the South, owing to the proximity of its iron-making region to that of Virginia, although it is possible that it should be rather with Ohio and Illinois; but West Virginia depends, like most of the Southern States, upon local ores, rather than those brought from the Lake Superior region. The increase in the eastern States was not due to any larger output from the New Jersey furnaces, or those in the Berkshire region which use local ores, but to the starting up of some of the great furnaces of the Lackawanna Steel Company, at Buffalo, which use Lake ores. This output will probably show a further increase during the current year. Pennsylvania continues to lead all the States, with a production of about 46 per cent of all the iron made in the country, and is likely to retain this prominence for some time to come, although the furnaces of Ohio and Illinois are slowly gaining. The Southern States showed a greater decrease than had been expected, and this would have been still larger had it not been for the fact that in West Virginia there was an actual gain in production.

This grouping of the output shows that last year fully 80 per cent of the total pig iron produced was made by furnaces using Lake Superior ores wholly or in part. In Ohio the use of local ores has almost entirely ceased, while in Pennsylvania it is confined to the ore from a single important group of mines.

The decrease in pig iron last year was really less than was anticipated, and is not a formidable one. It cannot be expected that our production should remain always at its full height. Occasional reactions must be looked for, and that of 1905 was very much less in proportion than we experienced in several former periods. The capacity of the blast furnaces materially increased in the last three years, and their actual output last year represents not more than two-thirds of the iron which could be

made were every furnace running, which, of course, cannot be expected. Making allowances, however, for necessary stoppages for repairs and re-building, the United States can now turn out somewhere between 23,000,000 and 24,000,000 tons of pig iron a year. At present the production is at the rate of over 20,000,000 tons a year. It is too early to predict whether this high pressure will be kept up, but the indications are certainly that the output for 1905 will exceed that of any previous year.

Market Conditions.

Feb. 1.

The metal markets are without special features this week. Somewhat better business is being done in copper, but there is no marked change. Tin is quiet. In lead, the usual business is reported. Spelter is weaker, with less pressure to buy.

Silver has been quiet, but prices are a little lower, though more demand for India is manifest.

The iron and steel markets show little change. There are anticipations of active trade, but matters are comparatively quiet for the time being. More business is reported in structural material.

The Western coal trade is still unsteady, and the effects of over-production are manifest. Demand is good, but sellers press on the market.

The seaboard bituminous trade shows no material change. Transportation conditions are giving much trouble.

The anthracite market has been favored by severe weather, and, accordingly, shows some activity.

Phosphate rock consists essentially of the neutral 'triple,' or tertiary phosphate, $\text{Ca}_3(\text{PO}_4)_2$; this is rather insoluble in the weak plant juices of the absorbent root hairs. To overcome this difficulty, it is converted into a soluble form, by sulphuric acid, resulting mainly in the so-called super- or acid-phosphate, $\text{Ca}(\text{H}_2\text{PO}_4)_2$; (this is also called primary calcium phosphate, mono-calcium phosphate, and dihydrogen calcium phosphate). Another salt is the so-called retrograde-, or reverted-, or citrate-soluble, phosphate, CaHPO_4 ; it is less soluble than the primary, but can be utilized by plants; (it is also called secondary calcium phosphate, and mono-hydrogen calcium phosphate). Super-phosphate also contains calcium sulphate which is itself, valuable for many soils.

Pig Iron in 1904.

The American Iron & Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in 1904; also practically complete statistics of the stocks of pig iron that were for sale on Dec. 31, 1904. Detailed statistics of both production and stocks will be found in the following column. The Association received reports of production directly from every furnace in the country, but it was refused by the owners the statistics of unsold stocks held by five small furnaces. From other and trustworthy sources, however, it received careful estimates of these stocks, so that the stock statistics presented are for all practical purposes complete and correct.

The total production of pig iron in 1904 was 16,497,033 gross tons, against 18,009,252 tons in 1903, 17,821,307 tons in 1902, 15,878,354 tons in 1901, 13,789,242 tons in 1900, 13,620,703 tons in 1899, and 11,773,934 tons in 1898. The following table gives the half-yearly production in the last two years in gross tons.

Periods.	1903.	1904.
First half	9,707,367	8,173,438
Second half	8,301,885	8,323,595
Total	18,009,252	16,497,033

The production of 1904 was 1,512,219 tons less than that of 1903. The production in the second half of 1904 was 150,157 tons more than that of the first half. The causes of the decline in production in 1904, as compared with 1903, are so well known that they need not be dwelt upon in this connection, but it is worthy of mention that the last four months of 1904 showed great and steadily increasing activity in production. This rate of production was continued and exceeded in January of the present year.

The production of bessemer and low-phosphorus pig iron in 1904 was 9,098,659 tons, against 9,989,908 tons in 1903, a decrease of 891,249 tons.

The production of basic pig iron in 1904, not including charcoal of basic quality, was 2,483,104 tons, against 2,040,726 tons in 1903, an increase of 442,378 tons.

The production of charcoal pig iron in 1904 was 337,529 tons, against 504,757 tons in 1903 and 378,504 tons in 1902. The production in 1904 was 167,228 tons less than in 1903 and 40,975 tons less than in 1902.

The production of spiegeleisen and ferro-manganese in 1904 was 219,446 tons, against 192,661 tons in 1903. The production of ferro-manganese alone in 1904 amounted to 57,076 tons. One company produced 946 tons of ferro-phosphorus in 1904.

A significant feature of the above statistics is the increased production of basic pig iron in a year of generally reduced production.

The stocks of pig iron which were unsold in the hands of manufacturers, or which were under their control in warrant yards and elsewhere at the close of

1904, and were not intended for their own consumption, amounted to 408,792 tons, against 623,254 tons on June 30, 1904, and 591,438 tons on Dec. 31, 1903. The American Pig Iron Storage Warrant Company held 55,350 tons of pig iron in its yards on Dec. 31, 1904, of which 17,700 tons, included above, were reported as being still controlled by the makers, leaving 37,650 tons in other hands. Adding this 37,650 tons to the 408,792 tons noted above gives a total of 446,442 tons that were on the market at the close of 1904.

The whole number of furnaces in blast on Dec. 31, 1904, was 261, against 216 on June 30, 1904, and 182 on Dec. 31, 1903. The number of furnaces in blast at the end of 1904 was 45 larger than on June 30 of the same year and 79 larger than on Dec. 31, 1903.

The total production, classified according to fuel used, with the number of furnaces in blast on June 30 and Dec. 31, was as follows:

	June 1.	Dec. 31.	Tons made.
Coke	170	206	14,931,364
Anthracite	28	38	1,228,140
Charcoal	18	17	337,529
Totals	216	261	16,497,033

It should be noted that a number of the anthracite furnaces use some coke mixed with the anthracite coal as fuel. The number of furnaces reported idle at the close of the year was: Coke, 94; anthracite, 35; charcoal, 39; total, 168. The list of idle furnaces always includes some which, for various reasons, are not likely to be put in blast again.

The production of pig iron by States for two years past is shown in the following table:

States.	1903.	1904.
Massachusetts	3,265	3,149
Connecticut	14,501	8,922
New York	552,917	605,709
New Jersey	211,667	262,294
Pennsylvania	8,211,500	7,644,321
Maryland	324,570	293,441
Virginia	544,034	310,526
North Car. and Georgia	75,602	70,156
Alabama	1,561,398	1,453,513
Texas	11,653	5,530
West Virginia	199,013	270,945
Kentucky	102,441	37,106
Tennessee	418,368	302,096
Ohio	3,287,434	2,977,929
Illinois	1,692,375	1,655,991
Michigan	244,709	233,225
Wisconsin and Minn.	283,516	210,404
Missouri, Col., and Wash.	270,289	151,776
Total	18,009,252	16,497,033

Three States, it will be seen from this table, showed an actual increase in production. These were New York, where the gain was due to the large furnaces of the Lackawanna Steel Company, in Buffalo, and New Jersey, where at least one new furnace contributed to the production in 1904. West Virginia also showed a considerable gain. The decrease was very generally distributed over the other States, and in Alabama it was much more considerable than had been expected from the preliminary returns, although the output in that State was almost equal to that of 1902.

Nickel is used in steel, in coins, in storage batteries, and in plating.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

PYRITE SMELTING.

The Editor:

Sir—Having given considerable attention to the smelting of raw sulphide ore, with hot blast and without coke, at Keswick, I am in a position to answer many of the questions you submitted to me a year ago.

Pressure of business has not given me time to attend to this matter until now, and, if not too late for your purpose, I will give you a summary of my experience. The time at my disposal even now does not permit of going into the subject with much theoretical detail, and I must be content, therefore, with a brief recapitulation of facts.

The ore is cupriforous iron pyrite, rich in sulphur and free from gangue. The first practice was to roast the coarse ore in large heaps. This practice was carried out on such a scale that it was found economical to load the roasted ore into railway cars by means of steam-shovels. The fine ore was roasted sweet in mechanical furnaces with water-jacketed arms and stirring columns. This type of furnace, now very common, was first developed at Keswick. In spite of an early failure in pyrite smelting, Mr. Fielding, managing director of the Mountain Copper Company, remained convinced that the practice was economically possible, and, therefore, encouragement and impulse were given by the board of directors to our efforts to increase the amount of raw sulphide smelted and to reduce the use of coke. About three years ago the heap-roasting of the coarse ore was finally abandoned, and it was smelted direct in its raw condition; later, the fine ore was no longer roasted, but also was smelted raw.

Your first question asks: "What types of ore are suited to the process?" My experience only relates to those containing iron and sulphur, and these, when smelted with a suitable flux, certainly can be smelted raw without the use of coke and with a satisfactory degree of concentration.

Your second question, "Is hot blast advisable?" I can answer in the affirmative. Several years ago, whilst studying the question of hot blast, I had occasion to converse on the subject with an eminent metallurgist. His opinion was distinctly unfavorable to the use of hot blast, on the ground that it was not logical to employ a roundabout process, to burn fuel outside the furnace in heating the blast, and then to conduct the heated air (with inevitable loss of efficiency) to the furnace, when the same fuel might be used direct in the furnace and to more effect. The argument impressed me for the moment, but, fortunately, on consideration, it occurred to me that it was not yet proved that we

obtained the full efficiency of the carbonaceous fuel, charged into the furnace at the top, and that, probably, some portion of this fuel might be consumed towards the top of the furnace, and before it reached the smelting zone, and thereby partly lose its effect.

One of the principal objects I had in view in the use of hot blast was, in the case of raw-sulphide smelting, to increase the concentration, or, in other words, to increase the oxidation so as to obtain a higher grade of matte in the first operation. Carbon is a reducing element and is counteractive in respect to concentration and oxidation. If, therefore, we could eliminate the carbon from the furnace, we should have more of the oxygen of the blast left for the oxidation of the sulphide and the grade of the resultant matte would be higher. I determined to try hot blast, and my early experiences demonstrated: first, that a certain quantity of carbon consumed outside the furnace in heating blast replaced a larger quantity charged at the top of the furnace as coke; second, that there was a marked increase in the concentration; and, third, that there was a great improvement in the running of the furnace. These experiences fully justify the answering of your second question in the affirmative.

In reply to your third question, I can say that carbonaceous fuel in the furnace can be, and is, entirely eliminated in the smelting of raw sulphide ores when the conditions permit of the oxidation of the iron sulphide, and the slagging of the oxidized iron at a certain rate per unit of time, and at a certain proportion per unit of charge.

Your fifth question I would answer by saying that lime is as useful in lowering the copper content of the slags in the case of smelting of raw as in the case of the smelting of roasted ores.

Your sixth question as to the percentage of zinc that can be profitably treated in the charge is difficult to answer. Zinc is as troublesome in the case of raw-sulphide smelting as it is in the case of the smelting of oxidized ores. As the percentage of zinc rises, more fuel must be used, whether the ores be roasted or raw. Pyrite containing 5 per cent zinc can be smelted with hot blast without the use of coke.

The answer to your seventh question, as to the desulphurization attainable, depends very much upon the nature of the flux, because the rapidity of the oxidation varies with the chemical character of the flux; 80 per cent of the sulphur should be volatilized as SO_2 .

Your eighth question, as to the possibility of the capacity of a furnace, reminds me that the furnace campaigns smelting raw sulphide ore entirely without the use of fuel are short. The furnace in its running period will run as nicely as with roasted ore and coke, but when the furnace gets into bad condition, and begins

to slow down, no attempt is made to save it in any way by the use of coke; and if it does not recover of itself, it must be tapped out and another furnace started in its place. The limitations of the process must be the economical ones, and, in that way, I would answer your ninth and tenth questions.

It has been demonstrated at Keswick that the use of coke can be entirely eliminated in the smelting of raw sulphide, even when the charge contains a large quantity of slag, converter slag, flue-dust, and furnace-cleanings, if the flux is sufficiently acid.

It may appear singular that raw-sulphide smelting has not been more practiced and that it is only recently, so to speak, that iron pyrite is being smelted with its own fuel. It is true that an appeal to theory indicates that the oxidation of iron pyrite should yield enough heat to raise the temperature of its smelting products to a state of fusion, but it was not found easy to put theory into practice. It is really easy if suitable conditions are present, and if one is prepared to dig out a furnace at a cost of \$50, rather than to save it at a cost of several hundred dollars' worth of coke. The fact is that in practice the heat afforded by the combustion of the pyrite does not leave very much margin for the pyrite smelting process. In the first place, one must recollect that there is a difference between carbon and sulphur in respect to combustion. It is possible to effect the oxidation of carbon in a furnace without the use of any excess of air. This is not the case with sulphur and sulphide, which cease burning before the surrounding atmosphere is exhausted of its oxygen, and whilst it already contains a certain, and not small, percentage of this element. The sulphur dioxide forms what is called an extinctive atmosphere, and when it has reached a certain proportion, or tension, say about 12 per cent, the reaction $\text{S} + \text{O}_2 = \text{SO}_2$ ceases entirely.

From a reference in Roberts-Austen's 'Introduction to the Study of Metallurgy' I infer that Plattner was aware of the effect of this limiting atmosphere in the roasting of sulphide, and that a certain excess of air must be employed. I have had the opportunity of observing this limit with various furnaces, such as blast furnaces, roasting furnaces, converters, etc., and have found it much below that which would be the case if no excess of oxygen were required, as it is. Here is one reason why it has not been found easy to reach the smelting temperatures by the simple oxidation of pyrite. Another reason that comes into prominence is the speed of the reaction. In practice we cannot escape from the element of time, an element respecting which the chemical reactions, as graphically set forth in our text-books, are silent.

There is a certain working temperature necessary to produce the minimum flow

of molten material from our furnaces, and to produce and maintain this working temperature a certain minimum amount of heat must be produced, per unit weight of charge per unit of time. If the heat production in unit of time should fall below this amount, the process of smelting will cease. The substances we employ in the charge must, therefore, produce heat at a certain rate. In the case of iron blast-furnace practice it has been shown by Lowthian Bell how the heat required, per unit of charge, is distributed to meet losses of heat (by radiation, expansion of blast, tuyère water, fusion of slag, and in escaping gases), and to carry on the chemical reactions of the furnace, such as the reduction of the ferric oxide. In the case of cold blast he found that, per unit of charge, a total of 1.73 cal. was required. Dividing this into two categories, I find that 0.79 cal. was required by the chemical processes, and 0.94 cal. (and in case of very high furnaces and hot blast as low as 0.67 cal.) for the physical heat processes. In the case of iron smelting, higher temperatures are required than with copper. For the purpose of illustration, let us suppose that the chemical reactions in the blast-furnace are neutral, neither yielding nor consuming heat. In that case about 0.7 cal. per unit weight of charge should provide for all heat requirements, and keep the charge melted and flowing. Since one unit weight of carbon gives 8.08 cal., 0.83 weight unit of carbon will give 0.67 cal.; 10 per cent of coke (containing 83 per cent carbon) burnt to CO_2 will furnish the heat for the work to be done, supposing that the chemical reactions in the furnace are neutral, and that we require for copper furnaces the same degree of heat as is required by iron blast-furnaces. FeS gives on combustion 1.29 cal. per weight unit. A charge of FeS would give the required heat of 0.7 cal., if 0.52 weight unit of the FeS were completely oxidized per unit of charge. The point in practice is to get the iron sulphide to oxidize at a sufficiently rapid rate. If the conditions are not favorable to the production of this rate, naturally the operation will fail.

I have not enough information to be able to name with the same degree of certainty, as in the case of iron blast-furnace practice, the amount of heat required per unit of charge to carry on the copper smelting operation. The matter is further complicated in the case of iron pyrite because we do not know just how much heat is produced by the oxidation of iron pyrite, and, secondly, we do not know in what manner the sulphur is burned. One-third of the sulphur of iron pyrite is volatilized below its melting point. This sulphur escapes at the top of the furnace, making a hot top, and does not produce its full value in the smelting operation. We all know, however, that we can smelt a charge consisting chiefly of roasted ore with less than 10 per cent coke with cold

blast. Ten per cent of coke containing 83 per cent carbon furnishes 0.67 cal. per unit weight of charge. We ought not to require so much, judging from iron blast-furnace practice. FeS gives per unit weight 1.29 cal., therefore, if we could burn 0.54 weight unit of FeS per unit weight of charge, and could consume this proportion of the charge at a sufficient rate, and slag the iron, the process should go on.

I have no experience with pyrrhotite, but on referring to the interesting account given by Mr. Freeland, of Ducktown,* in his case, I find that 0.292 Fe went to slag, and 0.165 S went to SO_2 per unit of charge. I will assume that the total of these two components, that is, .457, to be calorifically equal to FeS. Thus 0.457 by 1.29 cal. = 0.589 cal. generated per unit of charge. That does not seem to be quite enough, and I am, therefore, not surprised to find that 0.023 weight unit of carbon was also consumed. This quantity is calorifically worth 0.023 by 8.08 or 0.186 cal., or in all a heat production of 0.775 cal. per unit weight of charge, which, from comparison with iron smelting practice, should be enough. In our case at Keswick we can smelt raw sulphide without coke when about 0.21 of iron goes to slag and 0.24 of sulphur goes to SO_2 per unit of charge, and we use 0.10 cal. in heating the blast.

I do not know the calorific value of pyrite. One-third of the sulphur volatilizes below the smelting temperature and its heating effect is mostly lost in the gases. If we give to the FeS of the FeS_2 its value of 1.29 cal., and to the second atom of sulphur one-third of its calorific value as an element, we have in all for the 0.45 unit of pyrite:

0.43 FeS @ 1.29 cal.	0.55 cal.
0.12 S @ 2.2 cal. x $\frac{1}{3}$	0.09 "
Hot blast	0.10 "
	Total 0.74 cal.

produced per unit weight of charge, not allowing anything for the heat of combination of FeO and SiO_2 .

I hope I shall not be criticized for being too approximate in my estimates of the heat requirements of the blast-furnace, but we have no means yet of arriving at a very exact figure. I did get, however, a vast amount of help and encouragement when trying to find out how much might be reasonably expected to do the work. A charge chiefly of oxidized ores does smelt with an amount of carbon equivalent to 0.6 cal. per unit weight of charge and less. No allowance has been made in above estimates, which are confessedly approximate (and only employed for the purpose of focusing the subject from a point of view I found of great help) for the heat of combination between FeO and SiO_2 . There is the strongest reason for believing that this source of heat is important; so important that unless the silica used as flux be sufficiently acid, and

free and not combined, the pyritic process will not, in our experience, go on unaided by coke, and then the concentration is unsatisfactory. In cases where the only flux available is one mainly consisting of combined silica, a compromise process employing a certain proportion of the ore in a roasted form must be adopted. I found great aid in my efforts by keeping in mind that there was a certain minimum heat production necessary per unit of charge to keep the charge melting and running, and that it was somewhere about 0.70 cal. per unit weight, and also that there was a certain minimum weight to be smelted in a given time. The rate of chemical change had to be equal, therefore, to so many calories per second.

It is impossible for me to leave this subject without expressing my indebtedness to the work of Mr. Robt. Sticht, of Mt. Lyell, who is the practical pioneer of pyrite smelting, so far as I am concerned, because his work has been always an example and incentive to me. In carrying out this work at Keswick I was ably assisted by Mr. A. S. Haskell and Mr. J. A. Balch, respectively superintendent and assistant superintendent of the smelter there.

LEWIS T. WRIGHT.

FORMATION OF IRON PYRITE IN GRAVELS.

The Editor:

Sir—The following facts bearing on this subject may prove of interest to those who have read the valuable paper on the 'Origin of the Witwatersrand Gold' on page 80 of the JOURNAL of January 12:

On plate 11, Fig. 3 of my 'Prospecting, Locating and Valuing Mines,' I gave an illustration of such an occurrence. In the pits of the Sailor Flat hydraulic mine, near Nevada City, in California, petrified wood occurred in immense quantities and a great variety of forms, some of it opalized, some converted to rock, but still fissile along the grain; some carbonized; with every stage between these conditions. Large quantities of thin sheets of iron pyrite, amorphous on one face and crystallized on the other, occurred among the debris, and were probably formed by the same action shown in the figure quoted, where a log many feet in length was uncovered, which was entirely coated with a thin crust of iron pyrite, the brilliant facets of which made a beautiful object in the sunshine. The pyrite was white in color, and, if I remember rightly, was crystallized in cubes, but it was very unstable and decayed readily. The quantity was so considerable that I was induced to make a test, to see if it had commercial value, but there proved to be no gold present, and only traces of silver.

The origin of this pyrite was self-evident; it was derived from the circulating water, and formed in the space left between the gravel and the tree trunk by the shrinkage of the latter in the process of decay, the precipitant being organic

* This JOURNAL, Vol. LXXV, p. 664.

matter. In a similar way, on an ocean beach, might not decaying seaweeds, which would leave no structural evidence, have acted as a precipitating agent. The greater or smaller quantity of such material on different beaches at varying times might possibly explain some things now obscure.

Unfortunately, no attempt was made to ascertain whether the various classes of petrification, incipient or complete, occurred at different horizons in the gravel; but it is certain that the condition of the circulating water must have varied, either in time or in locality, to produce such diverse results.

R. H. STRETCH.

West Seattle, Wash., Jan. 21, 1905.

MR. LAWSON'S VAGARIES.

The Editor:

Sir—No apology is needed for repeated reference to the persiflage of a noted Boston speculator. The readers of the JOURNAL may be divided in their opinion as to the truth of his statement, the wisdom of his method, and the sincerity of his attack, on what he calls 'the System'; but this phenomenon offers other features which demand consideration. The careless jauntiness with which Mr. Lawson invoked the teaching of the moral law has been apparent, as has also his naive confession that he knows not real truth. The public has endured the series, which is as long as a Nebraska river-bed and about as deep. Mr. Lawson has been told that his free pen has a brilliant style; and he probably believes it, crude and florid as it is. But there is another element in his amazing make-up, which comes out more prominently than ever in the last number of what might be called Nobody's magazine. When Mr. Lawson begins to throw bouquets at himself, he leaves the arena of business, the rostrum of public opinion, the service of the people—to enter the consulting office of the professional alienist. Now we see—we feared it all along—Mr. Lawson is insane. Not only has his egotistic passion betrayed itself beyond recall; but he has reminded those of us who do not wish to be confined within the madhouse, that there is danger in abnormal mental tendency. Selfish vanity is common; and candid foreigners tell us that one weakness of the American is his love of publicity and attitudinizing. Technically, Mr. Lawson may not be insane; but beyond all doubt he is unreliable. He may never be forced to a retreat for his individual mental and moral derangement; he may stand, apparently in robust physical health, only as an extreme and exaggerated instance of the too-common American self-esteem; but his case certainly calls a warning to our nervous overworked millions who would avoid the asylum and the early grave. Whatever else his disabilities, Mr. Lawson is suffering from acute para-noia, or systematic hallucination. He has jested with the American people, as a

State's evidence and a demagogue; he may have told much half-truth; but he has unwittingly earned—in what he would presumably call his soul—the sharp reproof of the real Moral Law. Fortunately, his symptoms have exhibited themselves; the diagnosis is clear; and we turn down the page on a man who might have served the public had he not been hypnotized by the frenzy of his own self-conceit.

PILGRIM.

Boston, Jan. 21, 1905.

The British Chemical Trade.

Some \$68,000,000 worth of chemicals, drugs, dyes and colors, manufactured in the United Kingdom, were exported last year, principally to the United States, Australia, Germany, France and Belgium. Large as this amount is, and though it shows an increase over 1903, it compares rather unfavorably with the period that preceded the framing of the high tariff in the United States. The decadence of the British foreign trade is also explained by the increasing domestic production of the more important heavy chemicals in countries heretofore dependent almost entirely on supplies from Great Britain. In America the expansion of the chemical manufacturing industry is noteworthy, much assistance being rendered by cheap operating power, and the erection of works in close proximity to raw material supplies. Economic management is also attained by improving the processes of manufacture, with what success may be surmised from the declaration of dividends varying from 8 to 12%. Of course, somewhat better prices are obtained by certain chemical manufacturers in America than are quoted by their British competitors. For instance, borax, assessed at 5c. per lb., sells at New York at nearly three times what is asked in Liverpool. Great Britain imported 39,524,688 lb. in 1904 from mines in which the Borax Consolidated, Ltd., the monopoly, has obtained a revenue large enough to pay 5.5% dividend on its preferred stock, and 17.5% on the common in 1903. Copper sulphate, of which the British exports in 1904 totaled 70,243 long tons, principally to Austria and Italy, sold at a somewhat higher price than the smaller American shipments. For domestic delivery, however, American sellers realize more money than British manufacturers, because the duty is 0.5c. per pound. Exports of most soda compounds from Great Britain showed an increase as compared with 1903, but manufacturers have become alarmed at the successful invasion of German and French makers in English markets. In 1904 exports of soda compounds were valued at \$6,765,740, principally caustic soda, while imports stood at over \$500,000. Sodas are heavily assessed by America, encouraging the domestic industry. Bleaching powder, of which Great Britain exported 87,147,760 lb. in 1904 (about 71% going to the United States) has again begun a satisfactory

career. By the international agreement among makers, better prices have been established, though British exports to America have fallen off considerably, suggesting expansion in the United States production, and more equitable terms for Continental makers. Last year's imports of British bleach into America, amounted approximately to 61,411,840 lb., paying a duty of \$122,824. Great Britain imported in 1904, principally from Germany and France, 26,902,176 lb. bleach. The receipts of saltpeter from India aggregated 30,320,632 lb., which is more than in 1903, partly the result of lower prices. There has been a substantial increase in the imports of minerals used chiefly in the preparation of artificial fertilizers. Receipts of nitrate of soda were 129,526 tons, valued at £1,176,208; pyrite, 742,837 tons, £1,194,324, and phosphates, 419,221 tons, £619,997, principally from America and Africa. Brimstone imports from Sicily fell off to 19,427 tons, as a result of the gradual abandonment of the old Leblanc soda process.

Mine Accidents in Great Britain.

We have received the advance proofs of the report of fatal accidents in the mines and quarries of the United Kingdom during the year 1904. There were 1,012 accidents in coal mines; 31 in metal mines; 110 in quarries; a total of 1,153, against 1,151 in 1903, showing an increase of 2 only. There was a decrease of 24 in coal mine accidents, but an increase of 6 in the metal mines and of 20 in the quarries.

The number of men killed in these accidents, with the causes, is given in the following table:

	Coal mines.	Metal mines.	Quarries.	Total.
Fire-damp explosions	22	14	38	563
Falls of ground	511	6	88	88
Shaft accidents	82	6	3	3
Ascending or descending	28	2	11	41
Explosives	266	6	44	316
Miscellaneous				
Total underground or inside	909	28	96	1,033
Outside, or on surface	140	7	16	163
Total	1,049	35	112	1,196
Total, 1903	1,072	25	95	1,192

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Falls of ground were, as usual, the most prevalent cause of death, accounting for 48.7% of those in coal mines, 40.0% in metal mines, 33.9% in quarries; or 47.1% of the whole number. In the miscellaneous list, the chief cause of death was from haulage accidents; that is from injury by mine cars or trams.

Under the British classification, coal mines includes all mines of coal, fire-clay, stratified iron ore and shale. Metal mines are all other mines having workings underground. Quarries include every place (not being a mine), in which persons work in getting slate, stone, coprolites, or other minerals, and any part of which is more than 20 ft. deep.

This preliminary return does not give the number of persons employed, so that no averages can be calculated.

Mining Stocks.

(Full quotations on pages 245 and 247.)

New York. Feb. 1.

The local market is professional, and as a result quotations appear to hover around the point that is thought to be a fair price. Thus Amalgamated Copper moves rather systematically between \$71.875 and \$73.375, and Anaconda from \$16.50 to \$26.75. On curb Greene Consolidated, notwithstanding the change in the directorate, stands at \$26.75@27.25. It is understood that the old régime is again in control. Tennessee Copper was quiet at \$33@33.50, and British Columbia at \$5.25@5.50. The reorganization of the White Knob Copper Co., of Idaho, is nearly completed.

A sale of Homestake, of South Dakota, is noted at \$73.

Some interest was shown in American Smelters, the common touching \$86.75, and the preferred \$119.875.

The usual match order trading was done in the Comstock stocks, while business in the other gold and silver shares was small at little change in prices.

Some interest has been manifested in the higher-priced Comstock shares. Though sales are moderate, it would seem to indicate an expectation of holders that the unwatering of the lower levels will benefit the depleted treasuries of the companies. Meantime the assessment calendar is pretty well filled. Among the stocks traded in this week were Consolidated California & Virginia, at \$1.60@1.65; Hale & Norcross, \$1.30@1.35; Ophir, \$6.50; Overman, 35c.; Savage, 35@38c., and Yellow Jacket, 22@24c. per share.

Boston. Jan. 31.

It has been a mending market during the week, on ordinary business and happenings have been really unimportant. The increase in the Quincy Mining dividend to \$3 semi-annually, the declaration of dividend No. 2, of 50c., by the United States Mining Co., and the levying of a \$1 assessment by the Winona Copper Co. are the most important events. Aside from these, the fact that the Trinity Mining Co. contemplates the erection of a smelter of its own for the treatment of its own ores in Shasta county, Cal., came somewhat as a surprise at this time, and resulted in tremendous dealings yesterday and today, causing the stock to advance from \$7.75 to \$12, at which price it closed to-night. To-day alone, almost 45,000 shares were traded in, from \$10.12½ to the above named price, although it was reported that there were a great many manipulative tactics employed. Be that as it may, it created more interest in the market as a whole, and a number of other stocks showed more animation than for a long period.

Copper Range rose to \$70, closing at \$69.50, against \$65.75 a week back. Brokers note that this stock is getting more scarce all the time. United States Mining advanced \$1, to \$22.50, losing the 50c. subsequently. Notwithstanding the attacks made upon this property and the management by a Utah publication, the stock holds well. There is a good market for Greene Consolidated all the time, and the stock has gone up from \$25 to \$27.25. Shannon Copper was depressed to \$7, on the announcement of a cloudburst in that country, but the price has rallied to \$8. Centennial continues to be pressed for

sale, touching \$18, and closing 50c. better, against \$20.12½ a week ago. Bingham slid off \$1, to \$29.50, but has since advanced to \$33 on promises of a dividend in the spring.

Allouez is up \$1.75 for the week, to \$20.75; Osceola, \$2.50, to \$95; Tamarack, \$3, to \$133; Utah, \$1.50, to \$42.50; Wolverine, \$2, to \$108, and Calumet & Hecla, \$20, to \$680. Winona is much firmer on the assessment call, advancing \$1, to \$12.25. Amalgamated closed at \$74.50, and the feeling here is quite optimistic. St. Mary's Mineral Land has been active on the curb and has risen \$7, to \$62 per share.

Colorado Springs. Jan. 27.

The past week has been one of activity on the local mining exchange, and Cripple Creek shares have been in greater demand than for years. Tuesday over one million shares of stock changed hands, which has not been equaled since the opening of the new Mining Exchange about three years ago.

El Paso reached the highest point in its history, selling for \$1.73. Isabella has advanced from 30 to 43c. during the week, but dropped to 37c. Acacia sold up to 13½c. Anaconda advanced from 13 to 19c., but declined to 17½c. Dante sold to-day for 6¾c. Elkton gained from 69 to 75c., declining to 72c. Portland is selling at \$1.85. C. K. & N. sold up to 23c., but dropped off to 21c. Golden Cycle sold yesterday for 55c. Gold Sovereign sold up to 13½c. but declined to 12¾c. Findley has been selling close to 40c. Work went up from 16½ to 19c., but dropped off to 17¾c. per share.

Salt Lake City. Jan. 27.

Mining stocks have been less active this week than for a long time. Probably the greatest interest was centered upon the Park City stocks, which seemed to strengthen when others were inclined to shrink. There was a stiff demand for Daly-Judge, but bidders accomplished little in the effort to bring it out. Holders are not inclined to sell at present, although there has been an advance of fully 50% in the past three months. Thompson, which is an adjoining property, has courted favor on the strength of Daly-Judge developments, and considerable trading was done in it. Daly-West has continued firm. A systematic plan to bear Columbus Consolidated and frighten holders into selling has not proved successful. Ingot, the Mercur stock, which enjoyed a small boom a week ago, has lost ground again. New York Bonanza opened stiff, but has since suffered a shrinkage. Wabash has gained ground.

San Francisco. Jan. 26.

The market for the Comstocks has been fairly active, but towards the close there was rather a weaker tone, and the market was quite devoid of feature. Ophir sold at \$6.75, and Consolidated California & Virginia at \$1.70 per share.

On the San Francisco & Tonopah exchange business was rather quiet, but a fair quantity of stocks changed hands. Montana Tonopah sold at \$2.07, and Tonopah Midway at 53c. per share.

On the California exchange trading in oil stocks was quiet, and very little was done in the way of transfers, buyers being apparently shy.

Monterey. Jan. 24.

Exchange on New York remains at 202.125.

In mining stocks, Victoria brought \$59; Dos Estrellas, \$3.425; Torquesa, \$75; Rosario, \$25; La Union, \$15; Nueva Guatamocztin, \$48; Providencia, Guanajuato, \$1.44; La Paz, \$230; Amistad y Concordia, \$68, and Santa Gertrudis, \$75.

Coal Trade Review.**NEW YORK, Feb. 1.****ANTHRACITE.**

The hard coal trade, like many others, suffered from the severe storm that visited the eastern United States last week. Some mines had to close for three days, during which time the railroads were unable to supply any transportation. For a time, deliveries at the harbor points were at a standstill. This, however, had no serious consequences, for the reason that local dealers were equally unable to deliver their orders, and so made no active demand at the receiving points.

Shipments are now coming in regularly, and prices remain at the usual level: Domestic sizes, \$4.75 for broken, \$5 for egg, stove and chestnut; steam sizes, about \$3 for pea, \$2.25@2.50 for buckwheat, \$1.45 @1.50 for rice, and \$1.30@1.35 for barley, at New York harbor shipping points.

Traffic on New York city streets is in a bad way, while at the same time the cold weather creates a strong demand for domestic coal, so that, to meet their orders, the local dealers are put to much additional expense.

BITUMINOUS.

The Atlantic seaboard soft coal trade was practically closed down for several days by the severe storm. The main-line roads, being obliged to remove great quantities of snow, utilized their dock hands on the shipping piers to a great extent for this purpose, so that when this was finished, several days were required to pick up the broken threads. As a result, a considerable scarcity has prevailed, and prices on prompt delivery have accordingly advanced. Two or three days ago coal was selling at about \$3 for the ordinary steam grades, but these can now be bought for \$2.75@2.85, on account of the large amount of coal that the railroads have brought into the tide shipping ports since that time.

We are told that in one or two instances business is being considered for the new season. The showing thus far made indicates a stronger holding together on prices than was expected.

Trade in the far East shows a great many orders in the market outside of the regular ones. These are for the purpose of filling up storage room that has been emptied more than had been expected; a good regular demand prevails also.

The trade along the Sound is not having as much coal shipped to it as would be done if the New York, New Haven & Hartford railroad would use proper despatch in unloading. The different receiving ports in this district have been crowded with boats, and heavy demurrage is the rule.

Trade in New York harbor has a strongly speculative character at this time. The higher prices are inducing many sellers of coal to let cargoes that they may have on hand go to outsiders, at advanced prices, which regular customers would not care to pay, their shipments being usually postponed.

The all-rail trade is active and is calling for a large amount of coal at strong prices. It has, of course, been seriously affected by the severe weather of the last week. For a time, transportation was at a standstill, and the car supply has been short ever since.

Coastwise vessel shipments were altogether discontinued during the week. We hear of a number of wrecks east of Cape Cod, and most of the shipping ports are bothered by ice. From the amount of business being done, we judge that Philadelphia would quote \$1 to around the Cape, and 75@80c. to the Sound. New York harbor would quote 75@80c. to around the Cape.

Birmingham. Jan. 30.

Production continues to improve, and in the next few weeks it is believed that the output will be normal at the mines which have felt the strike of the union coal miners since last July. There has been a strong importation of labor recently and the mines are being filled up. The leaders of the union miners deny the reports of an increasing production of coal, and say that they will continue the strike indefinitely.

Coke production in Alabama is also improving. More ovens are in operation now than in nearly seven months. There is strong demand for coke, and none of the companies, with the exception of the Alabama Consolidated Coal & Iron Co., are in a position to sell any, needing their entire production for their own furnaces. J. M. Meighan, a well-known contractor, has a large force of men at work on a battery of 50 ovens for the Tutweiler Coal, Iron & Railway Co. Rumors are heard again that the Tennessee Coal, Iron & Railroad Co. is considering the advisability of erecting by-product ovens near Ensley. The Semst-Solvay Co. is completing a battery of by-product ovens in the vicinity of Holton, in Tuscaloosa county. The work on this plant was started on a couple of years ago, but for some reason was not pushed to completion. The work has been taken up again and efforts will be made to finish them at the earliest possible moment.

Chicago. Jan. 30.

The cold weather of the last two weeks, which, though not severe, has been steady, is beginning to affect anthracite sales, to the satisfaction of dealers, who have done a good business generally in the last week. There is a demand for small lots now—a car here and a car there—that makes a ragged business, but is only normal after the middle of January. Shipments have been somewhat affected by storms, but complaints are by no means so common as they were a year ago, and apparently railroad conditions are generally better. Chestnut continues to be somewhat scarce, but other sizes are in good supply. The dock stores have been largely drawn upon, and all-rail business is assuming larger importance each week. All-rail shipments have been somewhat badly tied up toward the last of the week by snowstorms, and the coming week seems likely to see more trouble from this source than in any previous week of the winter.

Sales of bituminous continue unsatisfactory to the trade, notwithstanding the cold weather, the demand not being large enough to absorb production under the most unfavorable conditions. There is much demurrage coal in the market at ruinously low prices, this condition ap-

plying rather to western than eastern coals. Even in domestic sizes and grades there is little activity. Illinois and Indiana lump bring \$1.70@1.80; run-of-mine, \$1.40@1.80, and screenings, \$1@1.40. Hocking sells fairly well at \$3@3.20, and smokeless—still troubled with transportation, but with enough coming forward to meet the demand—at \$2.90@3.10. The cry is being renewed that there should be curtailment of the production of western bituminous, but with apparently little prospect of such a step.

Cleveland. Jan. 31.

One of the interesting, although comparatively unimportant, movements in the coal situation here was the reduction of 25c. a ton in Massillon coal during the past week. Selected lump is now selling at \$2.30, f. o. b. at the mines, which is the midsummer price. The Massillon Coal Co. had endeavored to charge \$2.55 at the mines to Cleveland consumers, and \$2.30 at the mines in the territory immediately surrounding the center of production.

A meeting of the coal men will be held this week for the purpose of putting up the prices on lake coal for the ensuing year. It is expected that, in view of the heavy demand for the coal and the prospects for a good market, the price will be increased about 25c. a ton. Nothing has been done so far about rates on coal. The prospects are for good rates, since a heavy movement of all commodities, with the exception of grain, is expected.

Steam coal seems to be superabundant in the Cleveland territory. Producers have been trying to stem the tide and to keep prices up, but have met with little success, further than their ability to prevent a further decline. Steam coal prices are, however, but little above the midsummer level. The quotations which generally prevail are \$1 at the mines for both Ohio and Pennsylvania coal.

Slack is in good demand and scarce. The prices rule about as they have been, at 70c.@75c. at the mines for Ohio slack, and 60c.@65c. at mines for Pittsburg slack.

There is a good demand for coke, and the market is about steady, but there is nothing buoyant to the trade. The increased production and the ability of the ovens to move the material has overcome some of the recent strength. Good 72-hour coke is selling at about \$3 at the oven, and good furnace coke is selling at about \$2.60 to \$2.75 at the oven.

Pittsburg. Jan. 31.

Coal.—Navigation on the rivers is suspended. The Monongahela river is frozen, and all the mines are idle. The severe weather has caused a suspension at many of the railroad mines, and but for the large supply in stock, iron and steel mills in the district that use coal for fuel in addition to natural gas would be seriously affected. Prices continue on the basis of \$1.10 a ton for run-of-mine, at mine, but unless there is an improvement in mining, it is expected that a higher rate will prevail.

Connellsville Coke.—Production has increased, but there was a falling off in shipments, due to the railroad car supply being far below the requirements of the region. Furnace coke is quoted at \$2.50@2.75, and foundry at \$2.85@3.10 a ton. The production of coke in the Connellsville region for the week is given at 265,978 tons, an increase of 6,874 tons over the previous week. The shipments for the

week aggregated 10,542 cars, distributed as follows: To Pittsburg and river points, 3,930 cars; to points west of Pittsburg, 5,442 cars; to points east of Everson, 1,170 cars. This was a decrease of 53 cars compared with the previous week.

San Francisco. Jan. 26.

The market continues quiet, with no change in prices. Fuel oil is in steady demand.

For Pacific coast coals, in large lots to dealers, quotations are: Wellington and New Wellington, \$8; Richmond, \$7.50; Roslyn, \$7; Seattle and Bryant, \$6.50; Beaver Hill and Coos Bay, \$5.50; white ash, \$5.25. For Rocky Mountain coals, also in large lots to dealers, prices named are \$8.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside; Colorado anthracite brings \$4. For Eastern coal, quotations are largely nominal, supplies being light. Pennsylvania anthracite is \$14, and Cumberland \$13. For English coal, quotations are, ex-ship: Welsh anthracite, \$13; cannel, \$8.50; Wallsend and Brymbo, \$7.50 per ton.

Foreign Coal Trade. Feb. 1.

The coal production of Germany for the 11 months ending Nov. 30 is reported as follows, in metric tons:

	1903.	1904.	Changes.
Coal.....	106,714,278	109,633,117	I 2,918,839
Brown coal .	41,624,043	44,233,083	I 2,609,040
Total . . .	148,338,321	153,866,200	I 5,527,879
Coke made . .	10,509,084	11,244,023	I 734,939
Br'quettes			
mad.	9,531,359	10,422,835	I 891,476

The briquettes made are chiefly from brown coal, or lignite. Of the total mined in 1904, the Prussian collieries furnished 102,437,851 tons of coal and 37,470,656 tons of brown coal.

The largest cargo of coal ever sent to the Philippines was taken out of Baltimore recently by the steamship *Maine*. It was 9,500 tons of George's Creek coal, supplied by the Consolidation Coal Co. The cargo is destined for the naval station at Cavite, near Manila.

Iron Trade Review.

NEW YORK, Feb. 1.

The iron trade is temporarily quiet, especially so far as pig iron is concerned. Some large consumers are apparently anxious to make their contracts for the second and third quarters, but furnacemen are rather holding back, anticipating higher prices. It cannot be said, however, that buyers are worrying themselves particularly on this score, as the majority of them are inclined to think that quotations will not advance much over the present level. Meantime, current needs are generally filled, and there is no particular pressure to buy.

In finished material orders are improving somewhat, while in some branches of business there has been little new contracting, it begins to look as though the demand for structural material would be very strong, and many orders are coming in for such material, with more inquiries. It is hoped that the building trades will be more free from labor troubles, and, indeed, there are indications that this will be the case.

New business in rails continues very light, and the railroads are still holding back on the large orders. Light rails, however, are in quite active demand. Good judges say that the demand for girder rails for trolley roads will be comparatively light this year.

Nothing new has been heard about export trade, though it is reported that some negotiations are on foot for foreign deliveries on an extensive scale. It is impossible, however, to secure any confirmation of these rumors.

Birmingham. Jan. 30.

While there were not many sales made during the past week, the iron market in Alabama is strong and quotations firm. A report heard that quite a large lot of iron was sold in this district during the past week at \$14 per ton for No. 2 foundry, could not be verified. The shipments of pig iron from this district are steady. The railroads are doing all in their power to move the iron promptly, and are filling all requests for cars.

During the past week the furnace of the Central Iron Co., at Holton, in Tuscaloosa county, and the City furnaces of the Sloss-Sheffield Steel & Iron Co., both of which were recently repaired, were put in blast. Gadsden furnace, of the Alabama Consolidated Coal & Iron Co., has been out of blast for several days, allowing necessary repairs to be made. Preparations are being made to blow in No. 5 furnace at Bessemer, better known as Little Belle, belonging to the Tennessee Coal, Iron & Railroad Co. The supplies of coal and coke are steadily improving.

The following quotations for pig iron are given: No. 1 foundry, \$14@14.25; No. 2 foundry, \$13.75@14; No. 3 foundry, \$13@13.50; No. 4 foundry, \$12.50; gray forge, \$12@12.50; No. 1 soft, \$14@14.25; No. 2 soft, \$13.75@14.

There is no change in the steel situation in this district. Cast iron pipe foundries in this district are working on full time and shipments in this product equal to the production.

The statement is made that the American Bridge Co. is contemplating entering the Birmingham district. It is given out that a corporation will be formed, to be known as the Birmingham Steel & Bridge Co., which will be the nucleus for the larger concern. Structural steel and iron will be produced. There is great opportunity for such an industry in this section of the country. Much bridge and business house building is going on throughout the South and the material is being purchased in Pittsburg. The freight, which is quite an important item, could be saved by having a plant producing this material in the South.

Chicago. Jan. 30.

There has been little change in the iron market during the last week. Sales of pig iron continue to be of small lots mostly, with an aggregate volume that indicates a healthy tone to business, though not a boom. January has been disappointing to the most enthusiastic dealers, but fairly satisfactory to those of conservative temperament, who continue optimistic as to the future. The indications, they say, are for a good volume of sales in February and continued prosperity.

Prices continue firm, Southern No. 2 being quoted at \$13.50@13.75, Birmingham, or \$17.15@17.40, Chicago, and Northern at \$17.50@17.75. Southern agents are attempting to advance prices,

but under the conditions it is difficult to do so, and it is not probable that anything short of an increased demand for iron will accomplish this end. Many foundrymen favor a waiting course, in view of the present quietness of the market, and the demand for long-time contracts is abating, but this is doubtless only temporary; as soon as there is an upward start in prices, the demand will begin again. Business continues to be chiefly for the second and third quarters, with a somewhat large demand for early-delivery lots, at 25c.@50c. premium.

Coke is in lighter demand, and prices are about 25c. lower on Connellsville, the best 72-hour being quoted at \$5.40@5.65, with West Virginia at \$4.75 per ton.

Cleveland. Jan. 31.

Iron Ore.—The buying of ore has been continued on a larger scale than ever before. The report is that the heavy buying of the past few weeks has been such as to warrant the estimate of total output for the year at 28,000,000 tons or upwards. The prices have held firm at \$3.75 for bessemer old range; \$3.50 for bessemer Mesabi; \$3.25 for non-bessemer old range, and \$3 for non-bessemer Mesabi. Nothing has been done about chartering either wild or on season contracts.

Pig Iron.—The market has been tame as far as spot buying of foundry is concerned. Buyers are taking but little, having small needs. The furnaces have withdrawn their sales agents, awaiting developments. The market is firm for second quarter, but the furnaces are not anxious to sell. Some buyers wanted to cover their needs for the entire year, but have been unable to do so. The furnaces are not ready to quote on that remote delivery, anticipating higher prices. No. 2 foundry is now selling at \$16 in the Valleys. Bessemer pig is selling in small lots at \$16.50 in the Valleys, while the market for basic is nominal, at \$16 to \$16.50 in the Valleys.

Finished Material.—About the whole of the interest in the market has been in bar iron. Some of the larger buyers, finding their needs must be met, have been forced to cover at 1.70c., Youngstown, one lot of 2,000 tons having been covered at that price, followed by several other good sized lots. The price of scrap has not been lowered any. Bar steel buying continues good, but specifications against old contracts are still better. The building business in Cleveland is picking up. Some who need material in a hurry are forced to buy it of the jobbers at premium prices. On plates it is a matter of steady prices and shipments on specifications against old contracts. Billets sell at a premium, the prices on bessemer and open-hearth ranging about \$26.50 to \$27.50, Pittsburg. Sheets are steady and in good demand, at 2.50c. for Nos. 22-24 out of stock, with the same gauges selling in car lots at the mill at 2.20c.

There is a strong demand for light rails, with standard rails almost nominal, at steady prices. The small mills are getting good business in all materials, with prices running at a premium, with the exception of bar iron, where the smaller mills are inclined to undersell the market.

New York. Feb. 1.

Pig Iron.—So far as actual transactions are concerned, the market is quiet, most foundries being supplied for the present.

There is no immediate change in prices, and consumers have been trying to place contracts for the second and third quarters, but furnaces are rather inclined to hold back, possibly anticipating higher prices.

Trading in iron warrants on the Produce Exchange continues very dull, and there is no appreciable change in prices.

For Northern iron, large lots, New York delivery, we quote as follows: No. 1X foundry, \$17.75; No. 2X, \$17.50; No. 2 plain, \$16.75; gray forge, \$16.50. Some Virginia basic has been sold at \$17.65, the highest price yet reported.

Southern iron seems to be held firmly, on the basis of \$14. Birmingham, for No. 2 foundry. We quote for large lots on dock: No. 1 foundry, \$17.75; No. 2 foundry, \$17.25@17.50; No. 3 foundry, \$16.75; No. 4 foundry, \$16.25; No. 1 soft, \$17.75; No. 2 soft, \$17.25; gray forge, \$16.25.

Structural Material.—Some new business is reported. Beams and channels up to 15 in. are quoted at 1.645c. for large lots, and over 15 in., 1.745c. Angles are 1.645c. in large lots.

Steel Rails.—The regular quotation continues \$28 per ton at mill for standard sections. Light rails are in good demand, and prices range from \$23 for 35-lb. sections, up to \$28 for 12-lb. sections.

Bar Iron.—Bars continue unchanged, quotations for large lots being 1.645@1.745c. Store trade has been moderate, at about 2c. for ordinary lots.

Scrap.—The market remains quiet, with few important sales. There have been some exchange transactions, in which steel scrap was given for pig iron, but it is impossible to quote on these trades. No. 1 railroad wrought is quoted around \$20, machinery cast, \$14@15; heavy steel melting scrap is selling around \$16.50. These prices are for large lots, f. o. b. terminal points. Scrap delivered brings about \$1.50 per ton more.

Pittsburg. Jan. 31.

The iron and steel markets are not particularly active this week, but there is no lack of business. All the mills and furnaces in the Pittsburg district have enough orders on the books to keep them going for several months. The markets are firm, and prices are not likely to be advanced, although there may be a readjustment in some lines before the end of the quarter. Several pig iron deals were closed during the week. The most important reported was the purchase of 15,000 tons of bessemer pig iron by the Lackawanna Steel Co. The price is not named, as this was another deal where scrap was given in exchange for the iron, the United States Steel Corporation taking the scrap. A Pittsburg steel interest bought 1,000 tons of bessemer iron for delivery during the quarter, although it wanted a larger tonnage, the price being \$15.50, Valley furnace. There is either a great scarcity of iron or furnaces are holding off for a higher price. A great deal of pig iron is being consumed, and the production at present is nearly up to the capacity, being at the rate of 21,000,000 tons a year. The foundry and forge iron market is improved, and prices are firmer than a week ago. One sale of 2,500 tons of foundry No. 2 was made this week, the rate being \$16.25, Valley furnace. Sales of gray forge during the week aggregated over 5,000 tons. A number of inquiries are in for iron for delivery throughout the rest of the first half, but prices have not been agreed upon. Although it is early in the year, pig iron producers predict a greater

tonnage for 1905 than in any former year. There are more operative furnaces in the Pittsburg district than last year, and the output here undoubtedly will exceed all previous records. It is reported that the old demand for an eight-hour day will again be made by the officers of the International Association of Blast Furnace Workers & Smelters, to take effect on April 1. No attention will be paid to the demand, as the furnace owners have always refused like demands, on the ground that it is impracticable. The organization has no foothold in the Pittsburg district, and in the Valleys it is doubtful if the officers have control of a sufficient number of men to cause any interference with operations. It is understood that if conditions warrant, an advance in wages will be made by furnace owners who ordered a reduction when the price of pig iron fell off a year ago.

There is no question that the blast furnaces will be kept busy throughout the year if the steel building projects under consideration are carried out. In addition to the 500,000 tons or more of structural steel orders that are figured on as certain, negotiations have just begun for fully 90,000 tons, and contracts are likely to be closed within the next two weeks. It was officially reported at Pittsburg headquarters of the International Association of Bridge & Structural Iron Workers this week that the wage scales for the year had been adjusted in every district of importance in the country. As there are not likely to be any labor troubles, it is believed building operations will be more extensive this year than ever before. The only disappointing feature in the steel trade is the small tonnage for steel rails booked, compared with former years. The orders received so far do not exceed 750,000 tons. This does not indicate that the railroads do not intend to buy more, but that they will place orders as the rails are needed. It was reported here, but the report is not credited, that when the Republic Iron & Steel Co. completes its rail mill it will not enter the pool, and that prices may be cut.

A conference will be held here on Thursday between representatives of the Republic Iron & Steel Co. and the Amalgamated Association of Iron, Steel & Tin Workers, for the purpose of revising the continuous operation agreement entered into four years ago. Under it the Republic Co. was forced to pay last year's wage scale during July and August, pending a settlement by the conciliation board. The purpose of the agreement was to prevent the closing of mills on June 30, if a new scale was not agreed to, and the company, it is understood, now wants a change that will insure an early settlement. The investigation into the charges that the limit of output clause in the tin-plate wage agreement seems to have been dropped, as it has developed that it is not being observed at a majority of the mills.

Pig Iron.—Pig iron transactions, while not as large as the previous week, are regarded as very satisfactory. Sales of bessemer iron aggregate about 18,000 tons for the week, including the 15,000 ton exchange deal of the Lackawanna Steel Co. About 3,000 tons of foundry No. 2 and 5,000 tons of gray forge were sold. Prices quoted to-day are as follows: Bessemer, \$15.50@16, Valley furnace; foundry No. 2, \$17.10@17.60, Pittsburg; gray forge, \$16.25@16.35, Pittsburg.

Steel.—There is no change in the steel billet market. Consumers are getting deliveries on old contracts, and new orders cannot be placed at the pool price of \$21,

premiums of from \$2 to \$3 being asked. The plate mills are busy on old contracts, and some new business is being placed at the pool price of 1.50c. Steel bars are firm at 1.40c.

Sheets.—New business is light, but the mills are filled with orders for several months ahead. Prices continue firm, black sheets, No. 28 gauge, being quoted at 2.30c., and galvanized sheets at 3.35c.

Ferro-Manganese.—The market is stronger this week. 80 per cent domestic being quoted at \$45@46 per ton.

Cartagena, Spain. Jan. 14.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that exports for the week were one cargo (3,100 tons) dry ore to Philadelphia. Prices are strong and quotations are steady.

Ordinary 50% ore is 6s. 3d.@6s. 6d.; special low phosphorus, 6s. 9d.@7s. 6d.; special ore, 58%, 9s. 2d. Manganiferous ores range from 9s. 9d. for 35% iron and 12% manganese, to 14s. 6d. for 20% iron and 20% manganese. All prices are f. o. b. shipping port.

Chemicals and Minerals.

New York, Feb. 1.

Trade is seasonably quiet, and prices generally show little change. Expectation that the fertilizer market will suffer seriously from the proposed curtailment in the demand from the Southern cotton belt, owing to the low price of that commodity, has set statisticians to figure on the 1905 profits of the fertilizer combinations. The recent movement of the Virginia-Carolina Chemical Co. in the cotton belt to enlighten planters is suggestive.

The reduction of 20% in the prices of explosives for export to Mexico rather hints that the American combination is determined to hold this profitable trade even if it has to make a sacrifice to discourage the development of the Mexican dynamite and powder manufacturing industry. Of course should the Mexican government enforce the prohibitive import duty of 200% ad valorem the American monopoly will have to withdraw.

Experiments are being made at Portland, Maine, with a sample lot of 1,550 tons of talc from a new mine in Nova Scotia. If the pulverized mineral finds a ready market, a regular trade will be established.

Some interest has been taken in the re-organization of the well-known chemical manufacturing firm of Edward R. Squibb & Sons. The new company has a capitalization of \$1,000,000, of which \$350,000 is understood to be preferred stock. Besides manufacturing the finer chemicals, it is said, the policy of the company suggests early expansion. The president is Theodore Weicker, who has been connected for many years with Merck & Co., of New York. The new régime of the Squibb company, it is expected, will maintain the high reputation which the old firm has enjoyed for so many years.

Exports of bicarbonate of soda from New York last year amounted to 2,747,444 lb., principally to Argentina, and caustic soda, 2,609,964 lb., mostly to Mexico, South America and the West Indies. It is noteworthy that of the bicarbonate of soda exports Great Britain received 113,700 lb., Australia and New Zealand, 170,250 lb., and Belgium, 44,660 lb. Of the caustic soda shipments Japan received 14,670 lb., and Germany, 4,400 pounds.

Bleaching Powder.—There is a moderate demand at contract prices, \$1.15@1.25 per 100 lb., according to brand.

Copper Sulphate.—New orders are insignificant. Makers hold for \$5.125@5.25 per 100 pounds.

Acids.—Prices are firmer, and in sulphuric acid deliveries are somewhat better.

Nitric acid, 38°, 100 lb.	\$5.00
38°, 100 lb.	5.25
40°, 100 lb.	5.50
42°, 100 lb.	5.75
Oxalic acid, com'l, 100 lb.	5.00@5.25
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66°, bulk ton	21.00@23.00

Sulphur and Pyrite.—Aside from the usual contract purchases of pyrite for future delivery, business in sulphur is quiet. Completed figures showing the imports into the United States last year have just been issued. Brimstone imports were 128,885 long tons, against 188,888 tons in 1903, showing a decrease of 60,003 tons, or 32 per cent in 1904. Imports of pyrite, principally from Spain, were 413,585 tons, against 427,319 tons in 1903, showing a falling off of 13,734 tons, or 3%. Deducting the small re-exports, and reducing the balance to fine sulphur, there was consumed in the United States:

Source.	1903.	1904.	Changes.
Brimstone	186,237	123,864	D. 62,373
Pyrite	200,215	194,385	D. 5,830
Total, long tons	386,452	318,249	D. 68,203

The total decrease in 1904 is equivalent to nearly 18%, representing a depreciation in value of \$1,317,242, most of which will be felt by the Sicilian sulphur combination. It is worthy of remark also that the consumption of foreign pyrite last year constituted 61% of the total, which compares with 52%, the proportion in 1903. Imported brimstone, on the other hand, shows a gradual retrenchment, which was intensified last year by the expansion in the American production.

Importers quote best unmixed seconds nominal at \$21.25 per ton for shipments, while domestic producers ask \$21.45 for seconds at New York, and \$21.75 for prime. For delivery at Baltimore and Philadelphia an extra charge of 25c. per ton is made, and to Portland, Maine, 15c. Imported pyrite, containing 44@52% sulphur, is worth at New York, 10@11.5c. per unit for lump ore, unwashed, and 9@10c. for fines. Domestic lump ore, 42@44% sulphur, is quoted at 10@10.5c. per unit, and fines, 8.5@10c., f. o. b. shipping port. On the ton basis the sulphur contained in imported pyrite averages about \$10 per ton, which is less than one-half the cost of brimstone. Of course this does not represent the actual saving, for there is some expense in burning pyrite, but the difference nevertheless is large enough to encourage expansion in consumption.

A report is current that sulphur in quantity has been discovered in the crater of Sunset Peak, in the San Francisco mountains, about 20 miles northeast of Flagstaff, Arizona. J. J. Sanders, of Prescott, is said to have taken a bond on the property. Considering the limited demand for sulphur within the radius of economic transportation, development of the Arizona deposit seems doubtful.

Exports of brimstone from Sicily to the United States in the 11 months ending November 30 were as below, in long tons;

the average price in bulk per ton, f. o. b. Sicilian shipping points, being given to make the comparison more interesting:

	1903		1904	
	Quantity.	Value.	Quantity.	Value.
Seconds . . .	115,448	81s. 11.7d.	79,135	81s. 1.5d.
Thirds . . .	31,751	79s. Od.	18,323	78s. 2.5d.
Total . . .	147,199		97,458	

The decrease of 49,741 tons, or 34%, in quantity in 1904, represents, at the lower average prices this year, a reduction in the revenue of the Anglo-Sicilian Sulphur Co. of something like \$989,000. No wonder the Sicilian producers have become apprehensive of losing so valuable a customer as America, which in recent years has taken about one-third of the Sicilian exports.

Nitrate of Soda.—The market continues quiet. For 96% quotations are \$2.35 per 100 lb. for spot and to arrive, and \$2.30 for July to December. Ordinary 95% quality is 2:5c. less.

Concerning the Chilean nitrate of soda market, Messrs. Jackson Bros., of Valparaiso, write under date of December 24 that the market has been very dull during the fortnight. Producers being disposed to accept lower prices, transactions have been confined to small lots for immediate shipment, and 7s. 9d. has been accepted for one parcel. The only business of consequence has been 11,000 qtls. monthly from July to December, 1905. Sellers are asking 7s. 9s. for January-March deliveries, and 7s. 8½d. for July to December. In refined quality transactions have taken place at 8s. 5d. @ 8s. 4d. for January-February delivery. We quote 95% December 7s. 9d.; January to March, 7s. 9d.; and 96% January, 8s. 1½d.; all alongside. The price of 7s. 9d. alongside, with an all-round freight of 20s., stands in 9s. 7¼d. per cwt., net, cost and freight without purchasing commission.

Sulphate of Ammonia.—Speculators abroad have strengthened the market. Spot gas liquor, imported, is quoted at \$3.22 @ \$3.275 per 100 lb., and shipments at 5c. per 100 lb. higher. Domestic is quoted at \$3.15 @ \$3.225, according to position.

Phosphates.—Everybody seems to be waiting for something important to happen—superphosphate manufacturers for lower prices, and miners for easier freight rates. Statistically the market is in a good position. Exports from the United States in 1904, completed figures of which have just come to hand, amounted to 842,484 long tons, as against 785,259 tons in 1903. The increase in 1904 is 57,225 tons, or 7.3%. The bulk of last year's exports was high-grade rock to Germany, while the pebble phosphate went chiefly to France and Italy. Imports of phosphatic materials into the United States in 1904 totaled 130,214 tons, against 132,965 tons in 1903, and were principally from Belgium, and the West Indies.

Phosphates are quoted as follows, per ton:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla., hard rock . . .	\$7.25 @ 7.50	\$11.45 @ 11.65
land pebble . . .	3.75 @ 4.00	7.70 @ 8.40
†Tenn., 78% @ 80% . . .	4.00 @ 4.25	10.27 @ 10.67
78% . . .	3.75 @ 4.00	
75% . . .	3.25 @ 3.50	
‡So. Car. land rock . . .	3.25 @ 3.50	
river rock . . .	3.00 @ 3.25	6.38 @ 6.67
Algerian, 63% @ 70% . . .		7.04 @ 7.71
58% @ 63% . . .		6.15 @ 6.60
Tunis (Gafsa) . . .		6.00 @ 6.60
Christmas Isle . . .		13.28 @ 14.11
Ocean Isle . . .		13.60 @ 14.45
Somme, Fr.		11.39

* F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant. ‡ On vessel Ashley River, S. C.

Ocean freights are firmer, about as follows:

Ports.	So. Car.	Bone Al-geria.	Sfax, Tunis.
Baltic	\$3.24 @ 3.48		
Continental . . .	3.00 @ 3.12		\$1.80 @ 2.04
Mediterran'n . .	3.24 @ 3.36	\$2.88	2.04 \$2.28
U't'd K'gdom. . .	3.00 @ 3.24	2.76 @ 2.88	1.38 @ 1.50 1.98

Liverpool. Jan. 18.

The export trade in heavy chemicals, write Joseph P. Brunner & Co., is quiet, while deliveries to home consumers are good.

Soda ash is firm. For tierces, the nearest range is about as follows: Leblanc ash, 48%, £5 @ £5 10s.; 58%, £5 10s. @ £6 per ton, net cash. Ammonia ash, 48%, £4 5s. @ £4 10s.; 58%, £4 10s. @ £4 15s. Bags, 5s. per ton under price for tierces. Soda crystals are in fair demand at £3 7s. 6d. per ton less 5% for barrels, or 7s. less for bags, with special terms for a few favored markets. Caustic soda is in request and firmly held as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the Continent and a few other export quarters.

Bleaching powder is dull as regards export, and £4 15s. @ £5 per ton, net cash, is nominal range for hardwood, as to market.

Chlorate of potash is quiet at 3 1-16d. @ 3 3-16d. per lb., net cash, as to quantity and market.

Bicarbonate of soda is moving off steadily at £6 15s. per ton, less 2½% for the finest quality in 1 cwt. kegs, with usual allowances for larger packages, also special terms for a few favored markets.

Sulphate of ammonia is meeting with better inquiry and is slightly dearer at £13 @ £13 2s. 6d. per ton, less 2½% for good gray 24 @ 25% in double bags, f.o.b. here.

Nitrate of soda is in quiet request on spot at £11 5s. per ton, for ordinary, up to £11 10s. for refined, in double bags, f.o.b. here, less 2½% per cent.

Metal Market.

New York, Feb. 1

Gold and Silver Exports and Imports.

At all United States Ports in December and year.

Metal.	Year.			
	December.	1903.	1904.	1905.
G'ld Exp	\$1,434,656	\$13,429,415	\$44,346,834	\$121,138,415
Imp	17,230,298	3,336,134	65,267,696	84,803,234
Exc. I.	\$15,765,642	\$10,093,231	\$20,920,862	\$36,335,181
Silv Exp	6,515,653	4,292,161	40,610,342	50,312,745
Imp	2,078,655	2,252,955	23,974,508	26,087,042
Exc. E.	\$4,436,998	\$2,039,206	\$16,635,834	\$24,225,703

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending January 28 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week . . .	\$4,545,028	\$23,851	\$347,740	\$11,159
1905 . . .	12,561,466	135,736	2,642,053	72,905
1904 . . .	473,634	1,150,084	3,318,063	68,404
1903 . . .	26,120	598,060	1,329,673	108,340

Gold exports for the week were chiefly to France; imports mostly from Central America. Silver exports were principally to London; imports from Central and South America, and the West Indies.

General business continues to show activity and strength. Gold continues to go out in considerable quantities, both to

South America and Europe, and it is evident that the movement is not over yet.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending January 28, gives the following totals, comparisons being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts . . .	\$994,552,100	\$1,115,643,200
Deposits	1,023,943,800	1,189,828,600
Circulation	42,739,000	42,882,200
Specie	205,477,500	231,525,200
Legal tenders	75,637,500	92,911,500
Total reserve	\$281,115,000	\$324,436,700
Legal requirements . . .	255,985,950	297,457,150
Balance surplus	\$25,129,050	\$26,979,550

Changes for the week this year were increases of \$16,831,700 in loans and discounts, \$20,013,400 in deposits, \$7,495,400 in specie, \$2,253,700 in legal tenders, and \$3,245,750 in surplus reserve, a decrease of \$68,500 in circulation.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars:

	Gold.	Silver.
N. Y. Ass'd.	\$231,525,200	
England	172,012,015	
France	533,541,140	\$220,277,190
Germany	292,555,000	67,515,000
Spain	74,570,000	99,770,000
Netherlands	29,159,500	31,503,500
Belgium	16,176,665	8,088,335
Italy	111,845,000	16,139,000
Russia	502,885,000	28,660,000
Austria	242,005,000	62,685,000

The returns of the Associated Banks of New York are of date January 28, and the others January 26, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market has been quiet, with somewhat downward tendency, though no fall is anticipated. India is a moderate buyer, and currency is reported as still going into the interior.

The United States Assay Office in New York reports receipts at 46,000 oz. of silver during the week.

Shipments of silver from London to the East for the year up to January 10, are reported by Messrs. Pixley & Abell's circular as follows:

	1904.	1905.	Changes.
India	£1,064,289	£354,500	D. £709,789
Straits	38,103	2,800	D. 35,303
Totals	£1,102,392	£357,300	D. £745,092

Receipts for the week were £108,000 in bar silver from New York, £7,000 from Australia, and £2,000 Chile; total, £207,000. Shipments were £119,700 in bar silver to Calcutta, and £42,200 to Bombay; total, £161,900.

Indian exchange remains unchanged; if anything, a little stronger. All the Council bills offered in London were taken at 16.06d. per rupee, but the offers were larger than in the preceding week. The buying of silver for Indian account is improving.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	\$0.47½	\$0.49½
Peruvian soles and Chilean pesos43½	.46
Victoria sovereigns	4.85½	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	.82

Other Metals.

Daily Prices of Metals in New York.

Jan.—Feb.	Copper.		Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter.		
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.			New York, Cts. per lb.	St. Louis, Cts. per lb.	
26	15½ @ 15½	15	67½	29½	4.45	6.20	6.05
27	15½ @ 15½	15	67½	29½	4.45	6.20	6.05
28	15½ @ 15½	15	67½	29½	4.45	6.17½	6.02½
30	15½ @ 15½	15	67½	29½	4.45	6.15	6.00
31	15½ @ 15½	15	68	29½	4.45	6.15	6.00
1	15½ @ 15½	15	67½	30	4.45	6.15	6.00

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b. s. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars. Cathodes are usually quoted 0.25c. below the price of electrolytic copper.

SILVER AND STERLING EXCHANGE.

January.	Sterling Exchange.	Silver.		Jan.—Feb.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
26	4.87½	61½	28½	30	4.87½	61	28 1/8
27	4.87½	61½	28 1/8	31	4.87½	60½	27 1/8
28	4.87½	61½	28½	1	4.87½	60½	27 1/8

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Copper.—There has been no marked change since our last report. There is a continued scarcity of copper for early shipment, and the demand for home trade, as well as export, has been somewhat better during the week. Quotations are entirely unchanged, at 15½@15¾c. for lake copper; 15@15½c. for electrolytic in ingots, cakes and wirebars; 14¾@14¾c. in cathodes; 14¾@14¾c. for casting copper.

The market for standard copper in London, which closed last week at £67 15s., has been steady, and fluctuated within narrow limits. The closing quotations on Wednesday are cabled as £67 17s. 6d. for spot, £68 2s. 6d. for three months.

Statistics for the second half of January show an increase in the visible supplies of 100 tons.

Refined and manufactured sorts we quote: English tough, £70 10s.@£71; best selected, £72@£72 10s.; strong sheets, £78 10s.@£79 10s.; India sheets, £75 10s.@£76 10s.; yellow metal, 65½@63½d.

Exports from New York and Baltimore for the week ending January 31 were 3,367 long tons copper and 5 tons matte. Imports were 36 tons copper and \$8,010 worth of ore, quantity not given.

Imports of copper and copper material, with re-exports of foreign metal, for the full year are reported by the Bureau of Statistics of the Department of Commerce and Labor as below, in long tons:

	1903.	1904.	Changes.
Fine copper:			
Imports.....	61,030	63,547	I. 2,517
Re-exports.....	934	486	D. 448
Net imports.....	60,096	63,061	I. 2,965
Ores and matte:			
Imports.....	284,912	268,235	D. 16,677
Re-exports.....	5,150		D. 5,150
Net imports.....	279,762	268,235	D. 11,527

For the year 1904 the Bureau has reported the copper contents of ore and matte. Taking these, we find that the to-

tal quantity of copper imported last year was as follows, with the sources from which it came:

	Copper		Total.
	Fine copper.	in ores, etc.	
Mexico.....	43,735	9,288	53,023
Canada.....	7,898	6,717	14,615
Great Britain.....	8,559		8,559
Other countries.....	2,869	1,382	4,251
Total.....	63,061	17,387	80,448

The ores and matte from Mexico were 69,934 tons, with copper contents of 9,288 tons, an average of 13.3%. The Canadian imports were 183,102 tons, with copper contents of 6,717 tons, an average of 3.7%. That is, a considerable part of the Mexican imports consisted of matte, while the imports from Canada were chiefly ore. The imports from Great Britain were largely of copper sent here to be refined. Exports of copper and copper material from the United States for the full year are reported as follows, in long tons:

	1903.	1904.	Changes.
Fine copper.....	138,720	247,567	I. 108,847
Ores and matte.....	12,291	18,927	I. 6,636

The copper contents of the ores and matte are not reported. Estimating them, chiefly on the basis of value, we find that the total exports in 1904 were, approximately, 252,973 long tons of fine copper. This quantity exceeds the net imports by 173,911 tons.

Tin has been in good demand. Spot metal is very scarce and commands a heavy premium over tin to arrive and future delivery. The quotations at the close are 30c. for spot, 29c. for futures.

The foreign market, which closed last week at £131 2s. 6d. for spot, £130 12s. 6d. for three months, opened on Monday at £131 10s., and closed somewhat higher, the quotations on Wednesday being cabled as £132 for spot, £130 15s. for three months.

Statistics for the month of January show a decrease in the visible supplies of 100 tons.

Imports of tin into the United States for the full year are reported as follows, the figures being in long tons:

	1903.	1904.	Changes.
Straits.....	18,639	16,010	D. 2,629
Australia.....	257	287	I. 30
Great Britain.....	16,731	19,726	I. 2,995
Holland.....	1,057	692	D. 365
Other Europe.....	384	386	I. 2
Other countries.....	46	28	D. 18
Total.....	37,114	37,129	I. 15

The greater part of the metal received from Great Britain is Straits tin. The decrease in direct importations from the East was made up by the receipts through British ports.

Lead.—There is a fair demand at the lower prices established last week, and the market is unchanged at 4.37½ St. Louis, 4.45 New York.

The foreign market has been steady, and the closing quotations are cabled as £12 15s. for Spanish lead, £12 17s. 6d. for English lead.

Imports of lead into the United States, in all forms, with re-exports of foreign lead, are reported as follows for the full year; the figures are in short tons:

	1903.	1904.	Changes.
Lead, metallic.....	3,023	8,724	I. 5,701
Lead in ores and bullion.....	103,384	104,127	I. 743
Total imports.....	106,407	112,851	I. 6,444
Re-exports.....	81,915	83,887	I. 1,972
Net imports.....	24,492	28,964	I. 4,472

Of the imports in 1904, a total of 102,903 tons is credited to Mexico, and 8,952 tons to Canada. In addition to the re-exports given above, there were 56 tons of domestic lead exported in 1903, and 37 tons in 1904, a decrease of 19 tons.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as

follows: Lead is dull at the late decline. Missouri brands are held at 4.35c. and desilverized at 4.37½c. by sellers.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 14, that silver has been 14.65 reales per oz. Local quotation for pig lead has been 73 reales per quintal, which, on current exchange of 33.58 pesetas to £1, is equal to £12 3s. 3d. per long ton, f. o. b. Cartagena. Exports were 1,484 tons argentiferous lead to London, 327 tons desilverized lead and 1,208 kg. bar silver to Marseilles.

Spelter.—The reports from the Joplin district indicate that there has been an easing off in the ore situation, and on this account the offerings are somewhat freer than they have been lately. The market closes at 6.15 New York, 6c. St. Louis.

The foreign market, too, is somewhat lower at £24 12s. 6d. for good ordinaries, £24 15s. for specials.

Exports of spelter from the United States for the full year were 1,521 tons in 1903, and 10,147 tons in 1904, showing an increase of 8,626 tons last year. This was principally due to the large exports made to Europe in the second half of the year. Exports of zinc ore were 35,188 tons in 1903, and 32,063 tons in 1904, showing a decrease of 3,025 tons last year.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is easier and somewhat lower. Latest sales are on a basis of about 6.05c., East St. Louis. Consumers feel that the metal will sell lower, and on this account watch the antics of the market from the fence.

Antimony is unchanged. We quote: Cookson's at 8¼@8½c.; Hallett's, 8@8¼c.; Hungarian, United States, French, Japanese, Italian and Chinese, 8@8½c. per pound.

Imports of antimony into the United States for the full year were as follows, in pounds:

	1903.	1904.	Changes.
Metal and regulus.....	5,125,515	4,056,299	D. 1,069,216
Antimony ore.....	2,673,142	2,490,011	D. 183,131

As the ore will average about 40% metal, the imports in 1904 were equal, approximately, to 2,065,220 lb. metallic antimony.

Nickel.—Producers quote 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots is higher, according to quantity, running up to 60c. for small orders.

Exports of nickel, nickel oxide and nickel matte—which are all classed together in the returns—from the United States for the full year were 2,414,499 lb. in 1903, and 7,519,206 lb. in 1904, showing an increase of 5,104,707 lb. Imports of nickel ore and matte, so far as reported, were 7,245 tons in 1903, and 8,549 tons in 1904, showing an increase of 1,304 tons last year.

Platinum.—Quotations are firm at \$19.50 per ounce.

Platinum in manufactured forms is strong. Messrs. Elmer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 74c.; crucibles and dishes, 78c.; perforated ware, 85c., and cones, \$1 per gram.

Quicksilver.—Quicksilver continues quiet but steady, at \$40 per flask in large lots, while \$41.50 is the price for smaller orders. San Francisco prices are lower, \$39@40 per flask being quoted for domestic orders, with some discount for export. The London price continues steady,

at £7 15s. per flask, with the same figure quoted from second hands.

Exports of quicksilver from the United States for the full year were 1,344,615 lb. in 1903, and 1,611,365 lb. in 1904, showing an increase of 266,750 lb. last year.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kg. or over at 710 marks per 100 kg., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

Minor Metals and Alloys.—Thalium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany. Manganese tin alloy, 55%, is quoted 365 marks per 100 kg. for first quality, and 225 marks for second quality, both f. o. b. Bremen.

For other minor metals and their alloys, wholesale prices are, f. o. b. works:

Table listing prices for various metals and alloys including Aluminum, Nickel-alum, Bismuth, Chromium, Copper, Ferro-molybdenum, Ferro-titanium, Ferro-chrom, Ferro-tungsten, Magnesium, Manganese, Molybdenum, Phosphorus, and Tungsten.

Missouri Ore Market.

JOPLIN, Jan. 28.

The highest price paid for zinc was \$60, the same as the previous week. A rumor was afloat during the latter part of the week that \$63 had been paid, but it originated without any apparent foundation. The assay basis price ranged from \$52 to \$56 per ton of 60% zinc. Considering that the Edgar Zinc Co. withdrew from the purchasing market, a most satisfactory firmness was observed, though the purchases did not take up all the ore, and a slightly increased stock has accumulated in the bins at the mines, almost all of which, however, has been marketed. It is, therefore, quite probable that the purchases exceeded the shipments.

Lead ore declined in price, selling at \$57@59 per ton, against \$60@64 per ton last week. The output of this ore was materially affected by the lower price. A year ago zinc sold on an assay basis of \$31@34 per ton of 60% zinc and a high price of \$37, with lead at \$60.50 per ton.

Following are the shipments of zinc and lead from the various camps of the Missouri-Kansas district for the week ending Jan. 28, 1905:

Table showing shipments of Zinc and Lead from various Missouri-Kansas districts including Joplin, Cartville-Webb City, Duenweg, Galena-Empire, Badger, Neck City, Aurora, Granby, Alba, Oronogo, Prosperity, Sherwood, Zincite, Baxter Springs, Beef Branch, Stott City, Carthage, Central City, Diamond, and Spurgeon.

Totals 8,478,450 892,330 \$250,030
Four weeks 30,615,380 3,672,820 895.62
Zinc value, the week, \$224,315; four weeks, \$785,365
Lead value, the week, 25,715; four weeks, 110,255

Monthly Average Prices of Metals.

Table showing Monthly Average Prices of Metals for Silver, with columns for New York and London prices for 1904 and 1905.

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

COPPER IN NEW YORK.

Table showing Copper prices in New York, categorized by Electrolytic and Lake, with monthly data for 1904 and 1905.

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

COPPER IN LONDON.

Table showing Copper prices in London, with monthly data for 1904 and 1905.

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Table showing Tin prices in New York, with monthly data for 1904 and 1905.

LEAD IN NEW YORK.

Table showing Lead prices in New York, with monthly data for 1904 and 1905.

SPELTER.

Table showing Spelter prices in New York and St. Louis, with monthly data for 1904 and 1905.

Dividends.

Table listing Dividends for various companies, including Alaska-Mexican, Amalgamated Copper, Atlantic Copper, Cambria Steel, Camp Bird, Claremont Oil, Colo. & Hocking C. & I., Esperanza, Four Oil, Gold King, Greene Con. Copper, Imperial Oil, Jeff. & Clearf., National Carbon, New Century Zinc & Lead, Nova Scotia Zinc, N. Y. & Hond., Rosario, Oil City Petroleum, Osceola, Pacific Coast Borax, Peerless Oil, Penna. Con., Peñoles, Phila. Gas, Pittsburg Coal, Pocahontas Coll., Portland, Providencia, Quincy, San Francisco, San Rafael, San Rafael, aviada, Silver King, Soledad, Sorpresa, Spearfish, Tenn. C. & I., Tenn. Copper, Thirty-three Oil, Tilt Cove Copper, Twenty-eight Oil, Union Nat. Gas, United Petroleum, U. S. Steel, United States, Utah, United Zinc, Va.-Car. Chem., and Victoria Y An.

*Monthly. †Quarterly

Assessments.

Table listing Assessments for various companies including Andes, Beck's Salt, Big Casino, Bunker Hill, Caledonia, Columbus Con., Con. Cal. & Va., Confidence, Elsie, Eureka Con. Drift, Gould & Curry, Jenny Lind, Lower Mammoth, Mayday, Mohican, Patterson Creek, Petro, Potosi, Raft River, Seg. Belch. & Mides, South Eureka, Union, Utah Con., West Century, and Yellow Jacket.

Salt Lake City.

Table showing Salt Lake City market data for Jan. 27, including company names, par values, high and low prices, and share counts.

Total sales 148,623 shares.

STOCK QUOTATIONS.

Colorado Springs (By Telegraph).

Table with columns: Company, Jan. 30 (H, L), Jan 31 (H, L). Includes Anaconda, C. K. & N., Cripple Ck. Con., Doctor Jack Pot., Elkton Con., El Paso, Isabella, Moon Anchor, Old Gold, Portland, Vindicator Con., Work.

Ishpeming, Minn.* Jan. 28.

Table with columns: Company, Par Val., H., L. Includes Black Mountain, Calumet & Arizona, Calumet & Pittsburg, Junction Development, Lake Superior & Pittsburg, Pittsburg & Duluth (full paid).

*By The Wallace H. Hopkins Co.

St. Louis, Mo.* Jan. 2

Table with columns: Company, Par Val., Bid., Ask. Includes Am. Nettie, Colo., Center Creek, Central Coal & C., Central C. & C., Pf., Central Lead, Mo., Columbia Lead Mo., Con. Coal, Ill., Doe Run Lead, Mo., Granite Bimet., Mont., St. Joe Lead, Mo.

*By our Special Correspondent.

Montreal.* Jan. 28.

Table with columns: Company, Par Val., High., Low., Sales. Includes Dominion Coal, Dominion Coal, Pf., Dom. I. & St., Dom. I. & St., Pf., Montreal Steel, Montreal Steel, Pf., Nova Scotia St., N. S. Steel, Pf.

*Montreal Stock Exchange. Total sales, 2,654 shares.

San Francisco.* Jan. 12

Table with columns: Company, Location, pening (H, L), Closing (H, L), Sales. Includes MacNamara, Mont. Tonopah, Ton. Belmont, Ton. Midway, Ton. Mg. Co., Ton. North Star.

*San Francisco & Tonopah Exchange. Total sales, 17,050 shares.

San Francisco (By Telegraph).

Table with columns: Company, January (30, 31). Includes Belcher, Best & Belcher, Caledonia, Challenge Con., Chollar, Confidence, Con. California & Virginia, Crown Point, Gould & Curry, Hale & Norcross, Mexican, Ophir, Overman, Sierra Nevada, Union Con., Yellow Jacket.

New York.

Large table with columns: Company, Par Val., Jan. 25 (H, L), Jan. 26 (H, L), Jan. 27 (H, L), Jan. 28 (H, L), Jan. 30 (H, L), Jan. 31 (H, L), Sales. Includes Alice, Amalgamated, Anaconda, Best & Belcher, Brunswick, Caledonia, Challenge, Chollar, Chrysolite, Con. Cal. & Va., Elkton Con., Federal Mining and Smelting, Preferred, Greene Consolidated Copper, Greene Consolidated Gold, Hale & Norcross, Homestake, Horn Silver, Iron Silver, Isabella, Justice, Mexican, Mollie Gibson, Moulton, Ontario, Ophir, Overman, Phoenix, Portland, Potosi, Quicksilver, Quicksilver, pf., Savage, Sierra Nevada, Silver Hill, Small Hopes, Standard Con, Tennessee Copper Common, Union Consolidated, United Copper, Utah, Yellow Jacket.

† Ex-Dividend. Total sales, 423,345 shares.

Boston.

Table with columns: Company, Par Val., Jan. 25 (H, L), Jan. 26 (H, L), Jan. 27 (H, L), Jan. 28 (H, L), Jan. 30 (H, L), Jan. 31 (H, L), Sales. Includes Adventure Con, Allouez, Amalgamated, Am. Z. L. & Sm., Anaconda, Arcadian, Arnold, Ash Bed, Atlantic, Bingham Con., Bonanza, Boston Con., Calumet & Hecla, Centennial, Con. Mercur., Continental Zinc, Copper Range, Crescent, Daly West, Elm River, Franklin, Granby Con., Greene Con., Guanajuato Con., Humboldt, Isle Royale Con., Mass Con., Mayflower, Michigan, Mohawk, Montana Coal & Coke, National, New Idria, Old Colony, Old Dominion, Osceola, Parrot, Phoenix Con., Quincy, Rhode Island, Santa Fe, Shannon, Tamarack, Tecumseh, Tennessee, Trinity, Union Cop. L'd. & Mg., United States, U. S. Coal & Oil, Utah Con., Victoria, Winona, Wolverine, Wyandot.

† Assessment paid. Total sales, 229,746 shares.

STOCK QUOTATIONS.

Coal, Iron and Industrial Shares.

Table with columns: Company, Par Val., Jan. 25, Jan. 26, Jan. 27, Jan. 28, Jan. 30, Jan. 31, Sales. Lists various companies like Allis-Chalmers, Am. Agri. Chem., etc.

*Pittsburg Exchange; †Philadelphia Exchange; all others, New York Stock Exchange; Total sales, 834,591 shares.

London. Jan. 20.

Table with columns: Company, Par Val., Latest dividend. (Amt., Date.), Quotations. (Buyers, Sellers). Lists companies like American, Alaska-Treadwell, Anaconda, etc.

Mexico. Jan. 21

Table with columns: Company, Shares Issued, Prices, Mex. (Bid., Ask.), Company, Shares Issued, Prices, Mex. (Bid., Ask.). Lists companies like DURANGO, GUANAJUATO, GUERRERO, HIDALGO, etc.

Paris. Jan. 12

Table with columns: Company, Location, Par value, Latest dividend, Prices (Opening, Closing). Lists companies like Acieries de Creusot, Anzin, Coal, etc.

c—Copper g—Gold, i—Iron, l—Lead, n—Nickel, s—Silver, z—Zinc.

London (By Cable).*

Table with columns: Company, Jan. 31, Company, Jan. 31. Lists companies like Camp Bird, Con. Gold Fields, De Beers, etc.

*Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Magnesia.—What is the consumption, use and value of magnesia? Is the present production equal to the market demand, and what impurities, if any, are in the mineral now being used commercially?

C. L. P.

Answer.—Approximately 40,000 tons of crude magnesite, imported principally from Greece and Styria, in Austria, are consumed annually in the United States. The largest consumers are manufacturers of carbonic acid for preparing artificial mineral waters, and brick makers, whose business is growing rapidly because magnesite has proved a superior refractory material for lining basic open-hearth steel furnaces and rotary cement kilns. Grecian magnesite, considered the purest, in the crude state analyzes from 94 to 98 per cent magnesium carbonate, 0.08 ferric oxide, and 0.52 silica, which are the more important constituents. It sells ex-ship New York at \$6.50@7 per long ton. Calcined Grecian mineral, selling at \$16.50@17 per ton, contains chiefly from 82.46 to 96.25 per cent magnesia; 0.85 to 10.92 lime; 0.56 to 3.54 ferric oxide and alumina combined, and 0.73 to 7.98 per cent silica. Variations are due to the quality of crude mineral sintered. Bricks made from calcined magnesite, either Grecian or Styrian, or both combined, contain from 89 to 98 per cent MgO, and are worth from \$155 to \$200 per thousand, according to quality and seller. There are numerous other industrial uses for magnesia, specially prepared as a metal or salt, and each product has its market value, as shown in the wholesale prices-current published monthly in the JOURNAL. To enumerate the objectionable features of these so-called compounds would create animus and prejudice the business of the respective manufacturers. This would be unfair, and as the inquiry is rather indefinite, would, perhaps not be an adequate reply.

Sparking Points for Gas Engines.—Can you tell me what metals, or alloys, are used for the sparking points in gas engines using electric ignition?—M. A.

Answer.—A detail of importance to the economic operation of oil and gas engines is the method of igniting the charge. For a long time the so-called "hot-tube" has been employed, but electric ignition is now gaining favor, because it renders better service. There are two principal types of electric igniters, the 'contact' and the 'jump-spark.' The 'contact' method,

however, appears to be preferred by reason of the simplicity of its parts, and its adaptability to low-pressure currents, particularly in places where engines are exposed to moisture. Generally the electric spark is produced within the combustion chamber of the engine at a definite point of the piston stroke. Naturally in such position the electrodes are subjected to high temperatures, and their points must therefore be of extremely hard, non-oxidizing and refractory metal. Different metals for tipping the electrodes have been tried without success, although alloys of platinum, iridium, nickel, etc., are considered serviceable. Mushet steel—a hard, tool steel named after David Mushet, the inventor—has been used for igniter points, but the resulting intense heat disintegrated the metal. The alloy made from the metals in the platinum group is satisfactory, for the melting point is very high. Being very hard, the so-called platinum sparking points must be ground to shape, and, it should be said, they are seldom uniform, owing to the high melting point of the metal. There are five standard styles of these points, four being pea-shaped, while one kind resembles a blank cartridge. They vary in price from \$1.80 each up, according to size, and are classed as follows: Style A has a diameter of approximately 0.100 in.; B, diameter 0.135 in.; and thickness, 0.075 in.; C, diameter, 0.160 in., and thickness, 0.100 in.; D, diameter, 0.095 in., length, 0.188 in.; E, diameter, 0.188 in., and thickness, 0.125 in. A special steel brazing solder is supplied for attaching these points to the electrodes of the 'contact' type, as well as to the tremblers of induction coils, and the spark shifters of the 'jump spark' igniters. A special alloy is made in the form of wire for the 'jump spark' plugs.

Another suitable composition for igniters is 'Meteor' metal, which is increasing its sales. Ordinarily this product is marketed as wire in straight lengths of 2 or 4 ft., though sheets and other shapes will be made by request at an additional cost. Prices for round wire per rod of 4 ft. are as follows: Diameter, 0.050 in., 50c.; 0.062 in., 75c.; 0.072 in., \$1; 0.094 in., \$1.25; 0.102 in., \$1.50; 0.125 in., \$2.50; 0.156 in., \$3.50; 0.1875 in., \$5; 0.250 in., \$7.50 per rod.

KITE-PHOTOGRAPHY IN GEOLOGY.—From an article in *La Nature*, Paris, we learn that Emile Wenz, of Reims, France, has recently applied kite-photography with success to geological pictures, and it is predicted that the field-geologist of the future will find a kite and its camera essential to his outfit. In a very rough country, broken by ravines, etc., there would seem to be especial advantage in being able to study the contour by this means. M. Wenz succeeded in taking good photographs from a height of over 650 ft., and found them very valuable in the production of maps.

Recent Decisions.

SPECIALLY REPORTED.

RIGHTS OF PRIOR PLACER LOCATORS AGAINST SUBSEQUENT LOSE CLAIMANTS.—The owner of a prior placer mining location may maintain an adverse suit against an application for a patent for a subsequent lode location within the exterior boundaries of the placer claim, made by persons entering on the same, against the will of the placer locators, for the purpose of prospecting for unknown lodes or veins. The validity of a placer location is not affected by the lapse of many years since its original location without the issue of a patent for same.—*Clipper Mining Company vs. Eli Mining & Land Company* (24 *Supreme Court Reporter*, 632); Supreme Court of United States.

INADVERTENTLY TAKING ORE FROM LAND OF ANOTHER.—One who takes ore from the land of another without right, either recklessly or with the actual intent to do so, is a willful trespasser; but one who takes such ore inadvertently, or with the honest belief that he is exercising his own right, though without right, is not a willful trespasser, and may avail himself of the lower measure of damages. Mere negligence of the character described by "inadvertence," in ascertaining the limits of the land or rights of the owner, while not sufficient to show recklessness, fraud or bad faith requisite to establish a willful trespass, is competent evidence on an issue of willfulness or innocence.—*Resurrection Gold Mining Company vs. Fortune Gold Mining Company* (129 *Federal Reporter*, 668); United States Circuit Court of Appeals.

LOCATION BY SUBDIVISION INCLUDES TRACT, THOUGH LINE IS ERRONEOUSLY PLACED.—The laws of the United States, section 2324, provide that lode locations must be distinctly marked on the ground, so that the boundaries may be traced. Section 2329 provides that placer claims shall be subject to entry and patent upon similar proceedings; but where the lands have been previously surveyed by the government, the exterior limits of the entry shall conform to the legal subdivisions of the public lands. Section 2330 provides for subdivision of 40-acre tracts into 10-acre tracts, and that no location shall exceed 100 acres for any one person. Section 2331 provides that, where placer claims are upon surveyed lands, and conform to legal subdivisions, no further survey or plat shall be required. Section 2334 provides for the survey of lode claims, and for the subdivision of placer claims into smaller quantities than 160 acres. The court held that it is contemplated that placer claims will ordinarily be sold by legal subdivisions, and where the notice states that such a subdivision has

been located as a placer claim it need not further state its boundaries, nor need the locator place stakes or marks upon the ground to show the lines of the claim. Where the stakes were erroneously set at some distance from the line, yet the notice claiming the subdivision prevented another from acquiring title to the strip left out, by mistake.—Kern Oil Company vs. Crawford (76 *Pacific Reporter*, 1111); Supreme Court of California.

Abstracts of Official Reports.

Greene Consolidated Copper Company.

This company's property includes concentrating and reduction plants of the latest design, completely equipped for the treatment of the output from its mines at Cananea, Sonora, Mexico. The report covers the year ending July 31, 1904, but recent information, given in a supplementary report, by the President, dated Nov. 21, will be included in this abstract.

During the year, a policy of retrenchment in expenditure has been enforced, the fund of experience being now sufficient to dictate the most economical method either of management or of technical detail. As a result, the cost of the output during the second half of the year, as compared with the first, shows a reduction of 1.217c. per pound, and this in the face of constant effort to enlarge the utilization of second-class and low-grade ores, involving additional activity in the concentrating department. The total cost is now less than 8c. per pound.

Among the elements contributing to this economy may be mentioned the scheme of 'selective mining.' A little expeditiousness among the surveying and the assaying corps, makes it possible to classify the product of any particular stope according to its commercial value and its treatment requirements, before the ore has to be removed from the working place. By thus adjusting the output to the momentary needs of the reduction plant, the use of barren fluxes is obviated, with an attending increase of efficiency.

A conservative attitude is taken towards the capital expenditure account. Only those betterment expenses are charged to capital which increase capacity or improve efficiency, all prospect and development work, except outlet shafts and transportation tunnels, being included among working costs.

Concessions covering a railroad, a waterpower and a smelter, have recently been acquired. The proposed railroad will run east from the Sonora to the Mexican Central Railway, passing through, or close to, Cananea. By tapping the Aros river, it is estimated that 30,000 h.p. can be generated electrically, with great economy over the steam plant now in use. The smelter concession carries valuable privileges. A railway is

projected to reach the pine forests of the Sierra Madre, which, at the present rate of consumption of timber, 2,000,000 ft. per month, would be an economical source of supply.

The output of the mines during the year was 489,352 tons of ore and 147,099 tons of fluxing materials, limestone and iron. Development work comprised 7,483 ft. in the vertical direction and 27,207 ft. of drifting and tunneling. The most recent feature is the discovery, at the deepest point yet reached, of a body of hard sulphide ore of exceptional richness. As one of the chief embarrassments has been the superabundance of soft ores, necessitating the re-treatment of large amounts of flue-dust, this latest find holds out great promise. Contrary to the former practice, estimate of the ore reserves is carefully avoided, probably as a compromise between the President and his professional advisers.

A large part of the mill was remodeled during the early months of the year, so that nearly two-thirds of the year's output was made in the latter half. The ore treated amounted to 207,224 tons net, and the output of concentrate was 59,065 tons, showing a ratio of 3.51 to 1. Since full operations were resumed, the daily capacity has averaged 900 tons, at a cost of \$0.78 per ton.

The smelter treated 308,215 tons of ore and concentrate, an increase of 33.8 per cent over the preceding year, at a cost of \$1.40 per ton less than the average for that year, but without any additions to the equipment. This result was accomplished by more careful attention to the details of the process, one outcome of which was to reduce the proportion of coke in the charge by 26.7 per cent. The average blast furnace charge during the year was:

Copper-bearing ore and concentrate.....	52.38%
Coke.....	11.49 "
Iron ore.....	11.63 "
Limestone.....	9.84 "
Chips and slag.....	5.30 "
Flue dust.....	9.36 "
	100.00

The output from the smelter during the year was:

Copper (electrolytic assay).....	52,915,947 lb.
Silver.....	505,702 oz.
Gold.....	3,569 oz.

This was all in bullion, except the contents of 11,606 tons of flue dust shipped, or in stock.

Roasters and reverberatories are being built as rapidly as possible for the purpose of treating the increasing volumes of flue dust, of which the dust chambers are collecting 280 tons a day, in spite of every precaution in feeding. This will also give the plant an elasticity highly favorable to the treatment of such varied ores.

The net profit for the year was \$1,075,315, in which the value of stocks on hand was estimated at cost. From this an appropriation of \$107,988 was made, to cover depreciation of plant, leaving a balance of \$967,327, for distribution. The

total capitalization is \$8,640,000. Two 3% dividends, aggregating \$518,000, were paid during the year, the balance being applied to betterments.

Improved Challenge Ore Feeder.

This feeder is of the well-known "Challenge" type, in which the ore is delivered by a hopper onto a disk, which is inclined slightly from the horizontal. This disk is supported and rotated by a spindle keyed at right angles to the center of its face, which spindle is journaled in boxes on the front face of the hopper, thus making one-half the disk project beyond the hopper. The ore rests on approximately one-quarter of the disk, inside the hopper, and it is carried out through an opening in the front of the hopper as the disk is rotated. This opening, being about 12 in. wide, permits feeding coarse material, and an adjustable gate, which is fitted across it, prevents the weight of ore in the hopper from forcing the ore ahead any faster than it is fed by the rotation of the disk. A guide-wing encircles the outer projecting edge of the disk, thus preventing any ore falling off the disk until the point of feed is reached, and a heavy cast-iron scraper wing crowds the ore ahead as the disk is rotated, thus causing ore to be delivered through the feed opening, which is about 15 in. wide.

All surfaces, both that of the hopper-bottom, of the guide and of the scraper wings, are machined true, thus giving a tight bearing against the finished surface of the disk. Thus wet or sticky ore can be fed as accurately and positively as an ore which is dry. All the above (with the exception of the carefully machined joint between the disk and hopper) is common to any of the feeders of the Challenge type now on the market. It is in the mechanism for revolving the disk that this feeder is said to be an improvement on other makes. As all mill men, mill operators and others familiar with the stamp-mill are aware, while the Challenge type of feeder is unexcelled for feeding ore to a stamp battery, or for feeding any wet or sticky ore, the clutch mechanism for rotating the disk is usually a source of constant trouble and annoyance. Owing to the severe duty and sudden shocks to which they are subjected in practical operation, it is necessary to be constantly adjusting most of these mechanisms to take up wear, and when all available wear is taken up and repairs are necessary, the construction is such that it is necessary to shut down the feeder for at least several hours, and, in some cases, it is a matter of days.

In this improved feeder the clutch mechanism has no delicate parts to break, and any lost motion is automatically taken up for a long period of time. When the automatic take-up has reached the limit of its travel, it can be readjusted in one minute, without even stopping the feed. The

only part which should not last indefinitely is a friction washer 8 in. in diameter, cut from 8-in. five-ply rubber belting. This will last several months, and

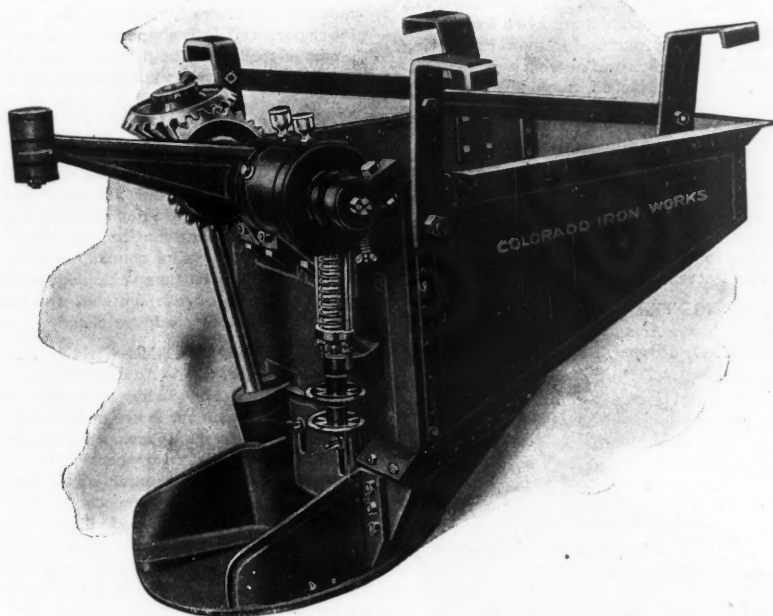
A California Traction Engine.

The use of traction engines in California for heavy haulage is becoming quite

hour, with a boiler pressure of only 90 lb., at a very low cost for fuel. The work done with a train of wagons on an ordinary road is of corresponding estimates.

The boiler is of the submerged-tube, vertical type, and is tested at 220 lb. hydrostatic pressure. The submerging of the tubes prevents leakage from overheating. The engines are duplex, with cylinders 8 in. diam., and 11 in. stroke, fitted with balanced piston valves, guides of the Corliss type, and connecting rods of marine pattern. The reversing mechanism, it is claimed, is an improvement over the link type, insuring positive action and durability. The transmission gears are proportioned on generous lines, and are made of cast steel throughout, to prevent danger from breaking. The power is transmitted from the engine shaft to the driving wheels through the medium of only one countershaft, the whole transmission containing only five journal boxes.

In designing traction engines it is necessary to take into consideration their weight, power and the rough uses to which they are subjected. The traction wheels in particular, upon which the greater part of the weight is carried, and upon which the whole engine force is centered, receive the jars and strains incident to travel over rough roads. Adjustable spokes require constant attention and adjustment, and consequently, in this engine, a more rigid and permanent construction has been adopted. The rims consist of two or more rings of channel

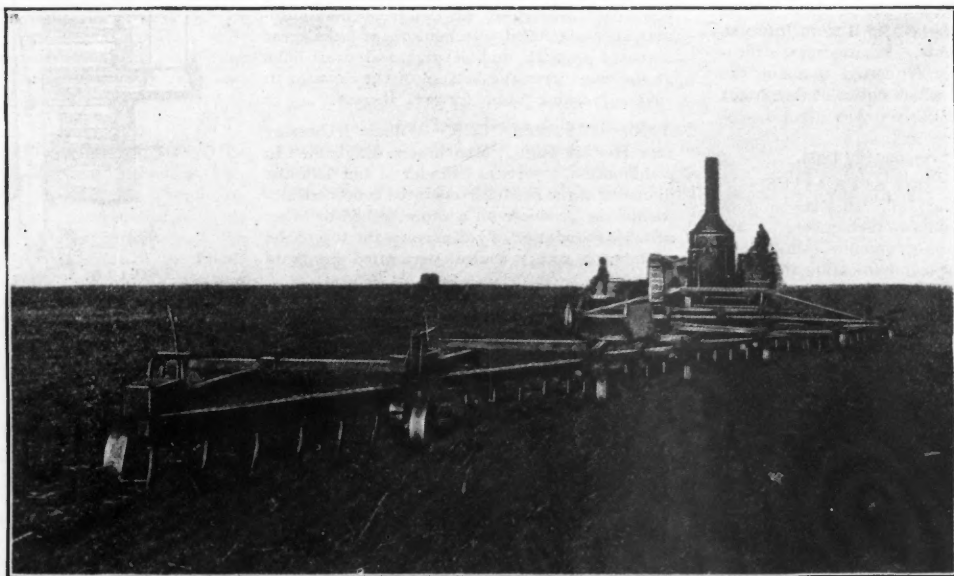


THE "PERFECT" ORE FEEDER.

can be replaced in less than five minutes, without stopping the operation.

The amount of feed can be adjusted while the feeder is in operation, the handwheels governing this being within easy reach from the floor back of the mortar.

usual, and the makers of that State, spurred by competition, have made many improvements in engines of this class. The accompanying illustration shows an engine of recent design and construction, built by the McLaughlin Manufacturing



TRACTION ENGINE DRAWING GANG OF PLOWS.

The clutch mechanism is enclosed in a dust-proof casing, equipped with oil cups. This feeder is furnished either stamp or belt driven, and equipped either with bracket hangers or with rollers and track.

This feeder, known as the "Perfect" pattern, is manufactured by the Colorado Iron Works Company, of Denver, Colo. Its shipping weight is about 1,000 pounds.

Company, of San Francisco. In this design the greatest possible simplicity and the best proportions, together with a proper distribution of weight, have been aimed at, in order to obtain the greatest drawbar efficiency, which is, after all, the test of the engine. The particular pattern shown was used for plowing, and hauled a gang of 40 plows at a speed of three miles per

steel, having the flanges extending inwardly. The abutting flanges are riveted together, thus making the rim very rigid. Moreover, if it is desirable to widen the face of the wheel, it can be done by riveting on an additional section. The spokes are flat steel bars, riveted in sockets in the hub, and meeting in truss form between the hub and rim. They are also

riveted to the rim, thus constituting positive braces to the wheel in every direction, while the tensile strain on the spokes themselves is reduced to a minimum.

These machines are remarkable for the ease with which they are handled, hauling heavy loads over steep grades and around sharp curves without difficulty. They are built to use either oil, wood or coal for fuel.

The statement was made recently that no graduate of a certain noted mining school ever let a furnace freeze. This certainly is not a desirable testimonial. Furnaces will freeze occasionally, even when in the hands of men of experience and judgment; and for a man to say that he never had a furnace freeze, is only saying, in other words, that he has had but little or no experience with furnaces. With all men, veins will fault, ore will slime, slime will float, mercury will sicken and flour, crushers will clog, tables will fail, slag will set, and a thousand other similar troubles, seen and unseen, will wait, each its opportunity to annoy. Real experience is measured, not by the boast of having had no obstacles; but by the proof of difficulty overcome, and, possibly, turned to advantage.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending January 17, 1905.

780,026. GAS-PRODUCING APPARATUS.—

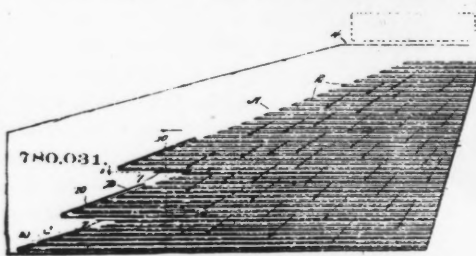
Robert S. Craig, Chicago, Ill. In a gas-producing apparatus, a combustion-chamber, a carbonaceous-material supply communicating therewith, a fixing-chamber communicating at its top with said combustion-chamber, a second fixing-chamber communicating at its bottom with the bottom of the first-mentioned fixing-chamber, a receptacle having a pair of compartments, one of which forms a vaporizing-chamber and the other of which a condensing-chamber, said vaporizing-chamber provided with a water-inlet and said condensing-chamber with an air inlet and outlet, said receptacle further provided with a water-outlet, means for establishing communication between the top of said second mentioned fixing-chamber and top of said receptacle, a vaporizing-coil extending in said vaporizing-chamber and communicating with a hydrocarbon-supply, said coil further communicating with the top of said combustion-chamber, a wash-box communicating with said receptacle, and an air-pipe communicating at one end with the air-outlet of said condensing-chamber and at its other end with the combustion-chamber below the fuel therein.

780,027. DREDGING APPARATUS.—Joseph Edwards, Brooklyn, N. Y., and Walter H. Gahagan, Boonton, N. J. In a dredging apparatus, the combination with the suction-pipe, the mouth of which is adapted to lie upon the bottom of the place to be dredged, of an inclosing hood or envelope surrounding said suction-pipe

for a certain distance and open at the ends, together with braces for supporting the envelope in place upon the pipe, said braces being adjustable so as to regulate the mouth of the hood relatively to the mouth of the pipe.

780,030. COAL-HANDLING MACHINE.—Samuel B. Fleming, Chicago, Ill. In an apparatus for unloading coal from cars and delivering into a suitable hopper, the combination of a framework, a boom projecting from said framework carrying a sheave, a shovel provided with a supporting-sheave, a cable attached to said shovel, then passing around the boom-sheave, then back under the shovel-sheave, said cable attachment and mounting of the shovel-sheave being immediately at the back of the shovel, said cable then passing over a guide-sheave on said framework to a winding-drum and a second cable attached to the other end of said shovel, then passing over a guide-sheave to a winding-drum, the winding-drum, and actuating means for said drum.

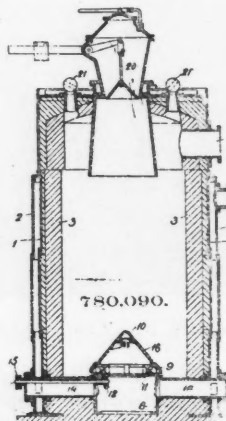
780,031. CONCENTRATOR-TABLE.—Frank E. Forster, Clifton, Ariz., assignor of one-half to William H. De Roseau, Clifton, Ariz. A table



for reciprocatory concentrators having a plurality of sets of riffles the upper edges of which are disposed in the same plane, each set being arranged to overlap the next lower set.

780,034. EARTH-HANDLING MACHINE.—William A. Heusner, David E. Graves, and Carl H. Dudley, Oberlin, Ohio. In an earth-handling machine, a supporting-frame and an endless elevator therein, and means to raise both ends of the elevator simultaneously, comprising hand-controlled mechanism at the front and automatically-controlled mechanism at the rear actuated through said elevator, and draft-links at the front from the bottom of the elevator to said supporting-frame forward thereof.

780,090. GAS PRODUCER.—William J. Crossley and Thomas Rigby, Manchester, England. In combination a vertical cylinder of but half the diameter of the producer mounted concentrically within the producer on a concrete bed or other suitable foundation, a ball-race on the top of the cylinder, a rotary conical perforated fire-grate



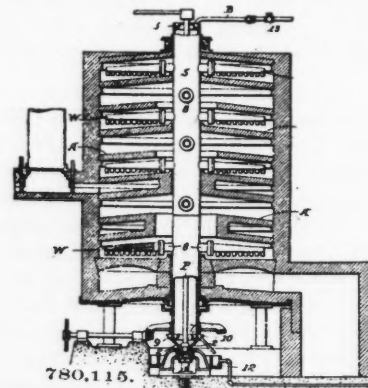
mounted on the ball-race, horizontal pipes for the supply of air and steam to the interior of the cylinder, bevel-teeth on the base-plate of the cone, and a bevel-pinion gearing therewith and fixed on a shaft passing along one of the horizontal air-pipes and terminating outside the producer.

780,050. BRIQUETTING-MACHINE.—Howard E. Marsh, New York, N. Y., assignor to National Fuel Company. In a briquetting-machine, the combination of a series of movable molds connected to form a sectional belt, cylinders over which the said molds are movable, one of the cylinders having molding-cavities therein, molding-plungers in the molds, and a flexible belt movable transversely between the upper and lower portions of the connected molds and under a part of the latter, the belt being formed with a central dip to elevate the side edges thereof.

780,059; 780,060 and 780,061. PUMP.—Gustav B. Petsche, Philadelphia, Pa., assignor to the Southwark Foundry & Machine Company, Philadelphia, Pa. In a pump, a cam, in combination with, resilient means for actuating said cam, whereby it is enabled to remain stationary when the resistance to its motion exceeds a determined amount, a valve controlling the flow of fluid to or from the pump-chamber, and means, actuated by the movements of the cam, for opening and closing said valve.

780,109. AMALGAMATOR.—Bertie A. Langridge, Boulder, Col. An amalgamator, comprising an exterior casing having a feed-pipe entering its upper portion, fan-shaped spreader-plates located in the upper portion of the casing and each being fluted or bent from its inner corners outward to its outer edges, said inner corners lying directly adjacent to the inlet-pipe and the flutes or bends gradually increasing in width and depth toward the discharge edges of the spreader-plates, two additional triangular plates located between the spreader-plates at each side of the inlet-pipe, all of said plates forming essentially a low pyramid, and amalgamating devices below the same.

780,115. ROASTING-FURNACE.—August T. R. Meyer, Kansas City, Mo., assignor to the United Zinc and Chemical Company, Kansas City, Mo. A furnace having hearths and a shaft or pipe with



stirrer-arms extending over the hearths combined with a water-supply pipe at the top of said shaft, and conduits arranged to direct water from said pipe downward along the inner face of the shaft.

780,128. BRAZING COMPOUND.—Frank A. Reynolds, Lewiston, Me., assignor to Stephen H. Manning, Lewiston, Me., and Herschell C. Parker, New York, N. Y. A brazing compound, consisting of aluminum, an oxide and copper combined.

780,142. SCREENING MECHANISM.—Robert H. Thorpe, Montclair, N. J. In a screening machine, the combination with a screen, of means for actuating the screen with a quick movement in both directions, said means including a solenoid connected to the screen, and means for automatically controlling the solenoid.

780,145. BELT CONVEYER.—Louis K. Vaughan, Oroville, Cal. The combination with a conveyer-belt, of a traveling protective shoe of less width than the belt and lying centrally within the belt and readily separable therefrom.

780,167. MOLDING APPARATUS FOR ARTIFICIAL STONE.—Alfred Gaspar, Markan-

städt, near Leipsic, Germany. In a mold in which a series of swinging division-plates are employed to divide the mold into a number of compartments, the combination with a removable bed-plate, of two-armed levers fulcrumed on the mold and each having one arm arranged to bear against the under side of the bed-plate, a shaft supported on the other arms of the levers and pivotally supporting the division-plates, said arms being so arranged that on the bed-plate being raised from the mold the division-plates are withdrawn in a lateral and downward direction.

780,173. MACHINE FOR EXPANDING METAL.—Charles J. W. Hayes, Detroit, Mich., assignor to Frank P. Cleveland, trustee, Detroit, Mich. In an expanding-machine the combination with an abutment of means for advancing a slitted sheet to project a strand thereof beyond said abutment and means for bending said strand about the end of said abutment.

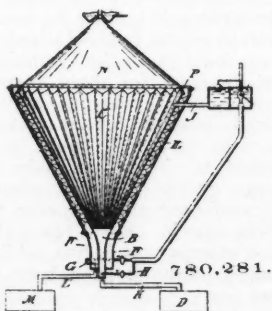
780,179. MINER'S-LAMP ATTACHMENT.—Alton L. Hileman, Haysville, Pa. In combination with a cap and plate secured thereto, keepers on the plate, said keepers being suitably spaced, a bar loosely mounted in the keepers, a pin on the bar adapted to abut the keepers to limit the longitudinal movement of the said bar and a lamp supported by the bar.

780,183. BRICK, PEAT, OR LIKE PRESS.—Heinrich Horn, Gera-Untermhaus, Germany. In apparatus of the character described, a frame, rolls carried by the same for guiding the compressed slab to be cut, a holder of the cutting-wires, rolls for guiding the slab, a slide carrying these rolls on the said holder, a horizontal guide for the slide on the frame, a crank for imparting to-and-fro movement to the said slide, means for establishing a yielding and positive connection between the said slide and crank, and means for imparting intermittent turning movement to the said crank.

780,191. ELECTROCHEMICAL SEPARATION OF METALS.—Woolsey M. Johnson, Hartford, Conn. A process for the separation of metals which includes immersing an electrode in an acid solution of ferrous ammonium chloride, subjecting it to electrolytic action and depositing upon another electrode, the electrolytic solution being from time to time subjected to a commutation process.

780,279. METHOD OF CLEANSING OILWELLS.—William E. Gardner, Pittsburg, Pa., assignor of one-eighth to Frank D. Thompson, Chicago, Ill. The method of cleansing oil-wells which consists of first closing the bore of the well at a suitable point adjacent to the upper end of the oil-bearing strata and then subjecting the walls of the bore thereof in the oil-bearing strata to the action of heated fluid.

780,281. APPARATUS FOR RECOVERING ZINC OR OTHER SULPHIDES FROM THEIR ORES.—James H. Gillies, Melbourne, Victoria, Australia. In an apparatus for recovering zinc and other sulphides from their



ores by the wet or chemical process and in combination, a receptacle, a series of radial overlapping inclined V-shaped catchment-chutes so placed as to guide the rising metallic gaseously-supported particles and on their falling

receive and automatically discharge the same, said catchment-chutes being so arranged that each slightly overlaps its neighbor on one side, a central escapement-channel into which said particles fall, and means for removing said particles from said channel.

780,293. METAL-LEACHING PROCESS.—Thomas B. Joseph, San Francisco, Cal. A process of extracting gold, silver, copper, zinc and nickel from ore containing the same when in a suitable condition, which consists in subjecting said ore to the leaching action of a solution of water, containing sodium cyanide and ammonium bicarbonate.

780,308. COMPOSITION FUEL.—Andrew Schmidt, Pittsburg, Pa. A fuel composed of slack or coal-dust, and a binder of palm-oil, magnetic oxide of iron, tin, copper, and pulverized lime.

780,337. FURNACE FOR BURNING ORE BRIQUETTES.—Gustaf Gröndal, Djursholm, Sweden. A furnace of the channel type for burning by gas-heating ore briquettes carried on trucks and consisting of a compartment for preliminary heating, a cooling-compartment and a burning-chamber of a somewhat greater height situated between these compartments, such furnace having channels in the walls and roof for passage of a part of the air for combustion, these channels being connected with each other and with one or more openings in the wall of the inlet of the gas to the burning-chamber the compartment of the furnace for preliminary heating being of greater height than the cooling-compartment.

780,342. GRINDING-MILL.—Joseph H. Hubbell, Dayton, Ohio, assignor to Buckeye Iron & Brass Works, Dayton, Ohio. In a mill of the class described, a pair of cooperative rotative rolls, each having peripheral teeth arranged in longitudinal rows and depressions between the said rows, said depressions being separated longitudinally of the rolls and alternating laterally with the teeth of the respective rows, the depressions on one roll registering with the teeth of the other roll, on the rotation thereof.

780,349. METHOD OF TREATING MOLDING-SAND.—Frank E. Johnson, Greensburg, Pa., assignor to John T. Kelly, Brooklyn, N. Y., and George M. Jones, Pittsburg, Pa. The method of treating molding-sand, which consists in taking the sand after having been used in a mold, reducing the same to a fine condition, tempering the same either before or after reducing, and then returning the same to the molds to be reused.

780,352. HEATING COMPOSITION.—Emil Kafka, New York, N. Y., assignor to Fireless Heating Company, New York, N. Y. A composition of matter, comprising lead acetate, sodium sulphate, and sodium acetate.

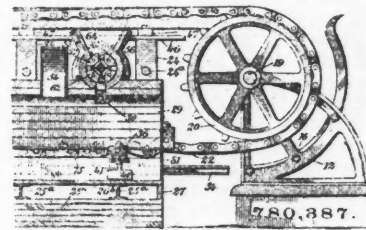
780,372. LADLE MECHANISM.—James C. McCoy, Metuchen, N. J. A ladle mechanism, comprising a track, a carriage mounted thereupon and movable relatively thereto, means for tilting said track to different angles, and mechanism connected with said carriage and adapted to move the same independently of the inclination of said track.

780,383. TINNING-MACHINE.—Charles C. Roberts, Ansonia, Conn. In an apparatus of the class described, the combination with a roll for coating a plate with a suitable fluid, of feed-belts provided with cams for actuating said roll in a direction to permit the movement of the feed-belts, and plate-holding means connected with said belts.

780,397. LOCATION ATTACHMENT FOR TRANSITS, ETC.—Frederic Whitney, Dawson, N. Mex. A device for locating or centering a transit, or like instrument, over a fixed point, comprising a casing, means for attaching said casing to the stem of the instrument, a reflector mounted therein so that it will be inclined to the axis of the stem when the device is attached thereto, said casing having apertures in adjacent walls in front of the reflector, and an eye glass

or lens in one of said apertures inclined to the mirror at the same angle as the latter to the axis of the stem when the device is attached to the same.

780,387. FURNACE FOR ROASTING ORES, ETC.—William W. Tobey, Iola, Kan. In a kiln for roasting ores and the like, the combination of a furnace, traveling mechanism disposed adja-



cent thereto, rake-carrying bars connected with said traveling mechanism, and shields secured to and encircling the portions of said rake-bars that enter the furnace whereby the said bars are protected from excessive heat.

780,448. METHOD OF CRYSTALLIZATION.—Victor Schutze, Riga, Russia. A method of obtaining crystals, which consists in causing a hot concentrated solution to pass slowly along, and periodically subjecting said solution in its passage to successively-increasing degrees of cold.

780,464. IRON-PYRITES BRIQUETTE AND MODE OF MAKING SAME.—Uteley Wedge, Ardmore, Pa. A mode of preparing pyrites fines or pyrites smalls for desulphurization, consisting in moistening powdered pyrites, mixing the pyrites fines or pyrites smalls therewith, and forming the mass into blocks or briquettes.

780,467. BLAST-HOLE LOADER.—William T. Wright, Bisbee, Ariz. A device comprising a cartridge-receptacle, and a plunger working within said receptacle provided with means for holding a fuse.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ending December 31, 1904.

28,590 of 1903. COATING IRON WITH COPPER.—S. Cowper Coles, London. Coating iron articles with copper, by heating them in intimate contact with finely divided cuprous oxide.

2,376 of 1904. PIGMENT.—M. Herrison, Paris, France. A white pigment consisting of silicate of alumina, a barium salt, and oxide of zinc.

4,217 of 1904. BARIUM OXIDE MAKING.—Siemens Brothers & Company, Berlin, Germany. Manufacture of porous barium oxide by heating a mixture of the carbonate and nitrate with a carbonaceous reducing agent.

4,796 of 1904. REFINING NITRATE OF SODA.—J. C. W. Stanley, London. Improved plant for obtaining pure nitrate of soda from caliche.

17,796 and 17,826 of 1904. BORE-HOLE INDICATOR.—H. F. Marriott, Johannesburg, Transvaal. Improved electrical apparatus for continuously indicating the dip of bore holes.

20,160 of 1904. TREATING ZINC TAILING. J. H. Gillies, Melbourne, Australia. Improved apparatus for recovering sulphides from zinc tailing by means of agitation in an acid solution.

20,264 of 1904. COAL MINING MACHINE.—W. E. Hamilton, Zanesville, Ohio, U. S. A. Improved method of mounting undercutting coal mining machines.

23,492 of 1904. ARTIFICIAL EMERY.—A. Gacon, Paris, France. Manufacture of artificial emery by heating bauxite with a mixture of coke, nitrate of soda and sawdust.

Special Correspondence.

San Francisco. Jan. 24.

Attempts are again about to be made to work the black sand deposits in the San Andres foothills of Monterey county. The sands are auriferous, but the gold is so fine that all attempts to save it with any profit have been futile thus far. A number of new or patent processes have been tried from time to time, but all proved unsuccessful. It is now the intention to work these deposits for the utilization of the magnetic iron contained in them, the associated gold to be considered as a by-product only. The magnetic iron is to be separated from the ordinary sand by some new system in which magnetism is used, and is subsequently to be smelted. Several attempts in this direction have been made at other points on the California coast line, but with no practical success. The iron is of fine quality, and appears to be abundant where the deposits are found.

When the Kern River Power Co., which is to supply Los Angeles and other cities with electric power, turned the water out of a part of Kern river into its canal near Kernville, some 12 miles of the river bed were left bare, and a number of claims for placer mining were located. Already some of the miners have struck gravel which pans out well, and others are prospecting these claims. The river beds throughout the mountain and foothill region of the upper portion of the State all carry more or less gold, but most of the accessible bars have long since been worked out. In many places the beds are still being worked by the old-fashioned wing-dam and China-pump system, but even this plan is less and less practiced as the available ground becomes exhausted. It seems odd that when half of the river bed is worked by wing-damming, the miners make money, but when large enterprises for turning the water out of the river are undertaken, a loss often follows. In fact, it may be admitted that where large sums are put into such enterprises, long tunnels run and dams put in, a loss has ensued. The largest ever undertaken in this State—the Big Bend and the Golden Feather, both in Butte county—entailed losses up into the millions. It was invariably found that the early day miners, with their primitive wing-dam methods, had already taken out most of the gold from the gravel in the river beds. In the case of the Kern river, however, no money was put into a mining enterprise, but the profit is expected from generating and selling power. At the same time a long section of the river bed is freed from water, and the miners can work as individuals, with no investment to speak of.

The eight horticulturists who sued the Mountain Copper Company, of Shasta county, for \$34,500 damages to their trees and crops by smelter fumes, lost their case and have to pay a thousand dollars or more costs. Expert witnesses showed that no damage had been done by smelter fumes. Indeed, it was proven by these experts that the condition of the orchards was generally due to neglect and lack of knowledge of horticultural methods. The trees had not been properly cared for to prevent disease. The jury decided the matter in less than five minutes' consideration, so must have been thoroughly convinced that smelter fumes had not caused any damage. Numbers of other fruit growers having orchards in the same vicinity had not suffered any damage. The case has attracted much attention. The Mountain Copper Co. has al-

ways paid for any damage, without suit, where it was plainly shown; but in this instance they considered themselves blameless, and the jury has confirmed their opinion.

A measure now before the State Legislature makes provision for the establishment and maintenance of a home for the aged and disabled miners of the State. A board of five trustees is empowered to purchase land and put up the home, at a cost not to exceed \$25,000. The bill provides that all miners over 50 years of age, who have property of the value of less than \$300, and all disabled miners of whatever age, who have property of the value of less than \$300, may be admitted. The object of the home, according to the bill, is to render the inmates more comfortable and happy than their condition would be if admitted to the county hospitals. It may be noted that no provision is made apparently for the ordinary current expenses of this proposed institution. Ten or twelve years ago a bill was passed by the State Legislature providing for a miners' hospital, where all disabled miners might be cared for, but the bill made no provision for the expenses, and no special appropriation. California has, therefore, an official miners' hospital—on paper—but nothing practical ever resulted from it. One difficulty is that miners from adjoining States naturally gravitate toward the metropolis of the coast—San Francisco—and the State of California would eventually have to take care of many persons belonging elsewhere.

Another bill now pending action of the Legislature is intended to care for the safety of the miners, and provides for the proper working of all the mines of the State. The bill creates the office of mining inspector, with a deputy. The measure provides that it shall be the duty of the inspector to make regular visits over the State and investigate the conditions under which the different mines are operated. He must enforce the law and report failures to comply with it, in cases where there has been a penalty provided. All inflammable material must be reported and the condition of the mine carefully observed. A deputy inspector is provided for in the bill. The salary of the inspector is fixed at \$3,000. In a coal mining region such a law would doubtless be necessary, but in a gold mining State like California, where the mines have been working some 55 years without inspection, the benefit to result is somewhat doubtful. All the mining representatives in the Legislature will, without exception, oppose such a law. In the first place, a competent mining engineer may not be secured to fill the position at the compensation provided for in the bill, and the deputy must even accept a lower salary. The owners of large mining properties fear "graft" under such conditions. The power placed in the hands of an inspector and deputy might easily be abused, unless men beyond reproach or suspicion were given the positions. Some years ago the then State mineralogist, in his annual report to the governor, suggested that he be given official authority to examine mines, with a view to the safety of miners, and some preliminary steps were taken to put the project into the form of law. The mining representatives in the Legislature, however, threatened to cut off the entire appropriation for the State Mining Bureau, and thus abolish the office of State mineralogist, in case anything was done in the direction indicated. This shows the temper of the mining men in relation to the appointment of a State mine inspector in California.

The Department of the Interior recently, after a long fight in the Land Office, decided in favor of the mineral claimants at Harrison gulch, Shasta county, against the town site claimants. The town had been built up on the surface land of the Bonanza mining claim. Now Andrew Fletcher, Frank Large and E. P. Sherk, owners of the claim, who brought suit to eject all occupants in the land, have also commenced suit in the Superior Court for \$50,000 damages and \$10,000 for rent and profits of the land.

Denver. Jan. 27.

On Jan. 21 damage suits aggregating over \$221,000 were filed in the district court of Cripple Creek by Frank J. Hangs, attorney for the Western Federation of Miners, against about 40 prominent business men, mine owners and members of the Citizens' Alliance and Mine Owners' Association. In each case the charge of inciting rioting is made against the defendants. The suits are brought in the name of Charles H. Moyer, W. D. Haywood and members of the federation.

On Jan. 21 the large ore house on the Stratton's Independence mine, valued at about \$40,000, was burned. The building will at once be reconstructed.

The news of the murder of John K. Mackenzie, of the firm of Dickman, Mackenzie & Potter, of Chicago, and Dr. Robert C. Coy, by Yaqui Indians, 35 miles west of Torres, Sonora, Mexico, was received here with much regret. They were on a trip to examine some mining property. A party was organized at Cobachi, which took the trail, but the Indians escaped and the party brought the bodies in.

The referees, who are hearing the testimony in the case of the Morning Glory against the Mary McKinney have been at work at Colorado Springs during the past few days. It was a surprise to the defendants, when the plaintiffs produced the records of the ore shipments of the Mary McKinney Company, which had been missing, but not located.

The annual report of the Vindicator Consolidated Gold Mining Co. showed that the profits for the past year were \$174,785, and that a total of \$1,225,000 in dividends has thus far been paid. The company is in a very flourishing condition, having a cash balance on hand of \$85,912.94 on Jan. 1.

According to the November report of the Camp Bird mine, the total expenses for all purposes during that month were below 30% of the value in the ores. This included mining, milling, transportation and development. On Feb. 4 a dividend of \$147,600 will be paid.

United States District Attorney Cranston has brought suit against the executors of the Stratton estate, in the United States Court, at the instance of the Commissioner of Internal Revenue, for about \$5,000 covering the difference between the actual and the required number of war revenue stamps, which were and ought to have been attached to the bill of sale of the Independence group of mines, when Mr. Stratton transferred the property to the English company in 1899. The value of the attached stamps was \$4,850, while it is alleged that it ought to have been nearly \$5,000 more.

H. R. Cassell, the English metallurgist, is at present in the Cripple Creek district, experimenting with the low grade ores of the Independence mine. There are about 2,000,000 tons of ore on the dump, which average about \$3 per ton.

Houghton. Jan. 27.

Arrangements for the organization of the Erie-Ontario Development Co. have been perfected, and the concern will take over the options on 640 acres of mineral land, forming a square mile tract, about half way between the Winona and Champion mines, on the south range. The lands are located in sections 29, 30, 31 and 32, and 53-35, and the options were procured by Fred W. Nichols, of Hancock. The property comprises the old Erie and Ontario companies' lands, 160 acres belonging to the Union Copper Land & Mining Co., and sundry other tracts. The Erie and Ontario properties were prospected to a slight extent, following 1855, by the Cleveland, O., firm of which the late Senator Marcus A. Hanna was an active member for a number of years. The new company will have a capital of \$50,000, divided into 5,000 shares of a par value of \$10 each, one-half of which is payable immediately, and the remainder on July 1. H. F. Fay, of Boston, who is at the head of the Allouez, Miskwabik and other local companies, will be president of the new organization, and George C. Endicott will be secretary-treasurer, which office he fills for all the Fay properties. Captain James Chynoweth, of Calumet, will be the Michigan director and superintendent of the mine. All other directors are Eastern men. Mr. Nichols financed the local end of the enterprise, and Hornblower & Weeks, of Boston, the Eastern end. It is proposed to begin exploratory work on the property at once. It carries the outcrop of an amygdaloid lode for one mile. Many years ago, when the Erie and Ontario companies were active, several pits were sunk on the outcrop and much heavy copper was taken out. The new concern will investigate the formation as fully as possible, and the work to be undertaken at once will consist of test pitting on the outcrop. Conditions for beginning this work now are excellent. There is scarcely any overburden, as the outcrop is exposed. Furthermore, the land is heavily timbered, protecting the work from inclement weather. This will enable the company to investigate the lode quickly and without loss of time or labor.

Work on the extension of the boiler plant at the Champion stamp mill, at Freda, is progressing rapidly. The steel work on the addition to the boiler house was finished some time ago by the Wisconsin Bridge & Iron Co., of Milwaukee. Four Stirling boilers are being installed, and it is expected that they will provide sufficient additional steaming capacity to care for the mill extension. The four Stirling boilers were purchased from the Trimountain Mining Co., and have a rated capacity of 250 h.p. each. They will have an induced draft and a Green fuel economizer. A new Sturtevant fan is being installed to furnish the draft. The fuel economizer is under construction. The present battery of boilers consists of five 250 h.p. Springfield boilers of the Scotch marine type, with Green economizer, Sturtevant blower and Detroit automatic stoker. Coal is brought to the boilers by gravity tram and reduced to uniform size by a grinder before fed to the grates by the automatic stoker. Ashes are washed into the lake through a launder by jets of water. Exhaust steam passes through dry condensers, thence to a hot well, from which water is fed into the boilers at a high temperature. The new battery will relieve the strain on the old set and permit a thorough overhauling. The new boilers will not be equipped with automatic stokers.

Rock shipments from the Isle Royale company's new exploratory shaft, on section 11, are averaging one to two cars daily. Sinking has reached a depth of 125 ft. The skip road has been completed to 115 ft., and a skip is in commission replacing the kibble which was used on a plank skidway before. Drifting north and south on the first level is under way, length of openings exceeding 300 ft. Lateral openings are being carried forward as drift stopes. South of section 11, on section 10, a diamond drill is probing the lode near the Atlantic's section 16 property. The Isle Royale lode traverses the Isle Royale company's lands in section 10 for half a mile.

Duluth. Jan. 30.

The situation with regard to ores for sale this year is interesting. Everybody who has ores to sell is sold up. Some of the selling miners are already buying ores for their own furnaces. Joseph Sellwood, Pickands, Mather & Co., M. A. Hanna & Co. and Corrigan, McKinney & Co. are about the only people who have any Mesabi ores for sale, and the latter are now opening a new mine and are buying ores, it is reported, in order to take care of their own business. Sellwood has sold about 250,000 tons Leetonia and the same La Rue, and somewhat less Cypress. M. A. Hanna & Co. have their Consumers' Ore Co., which gives a small tonnage, and their agency of Leonard and Pickands, Mather & Co. are too closely connected with the Lackawanna Steel Co. to permit very large sales from their mines. The independent producers have been holding closely together this year, with a distinct understanding, and the business has gone along very satisfactorily to them all. With the base price agreed upon of \$3.75 for old range bessemer, 56% natural, and .045 phosphorus, \$3.50 Mesabi, with the same analysis, \$3.20 old range non-bessemer, with a 53% natural, and \$3 Mesabi, same analysis, there is the first approximation to the disappearance of the long existing differential against Mesabi, which has in past years varied to a most unjust and inequitable figure. Then the improvement in price over last year is not far from 65 cents a ton on some grades, which is a very good advance. That it is not too much is evidenced by the way furnacemen have taken up the ores offered, and their insistence that they be given opportunity for more at the same rate.

The North Shore Abrasive Co., which has been erecting works at Split Rock bay for grinding feldspar, has completed them and is now awaiting spring for getting extensively into business. It has a very large deposit of material, well situated for economical delivery to mill. The company expects to mine its material and crush it at minimum cost, and to supply a large amount of fine abrasive for sand-paper and polishing works.

The Minnesota Mining & Manufacturing Co., whose works, for a similar purpose, are further down the north shore, and whose product is classed as a corundum, is also closed for spring. Extensive tests made with polishing and cutting wheels made from this material show it to be excellently adapted for high-grade abrasive work.

The Pickands, Mather Co. is to resume at its Troy mine, south from Fayal, and will employ about 100 men. The mine is an underground property, with about 80 ft. of surface, and will make a fairly large tonnage this year.

The Rogers Iron Co. has discharged its superintendents at both Susquehanna and Iroquois mines, and is not likely to mine

there the coming season. Susquehanna has two shafts down, connected, and has drifts run in the ore at main levels ready for mining. There is also a big triple expansion pump, and the mine is very well equipped for large and economical production. It was closed last May, but a superintendent was maintained and the pumping plant continued active. At Iroquois there was a bad cave of surface into the milling pit, covering it and filling raises and craters, which stopped mining. The surface at this mine is 80 ft. thick, and a cave of this sort was serious.

The Lincoln mine of the Interstate Mining Co. is resuming and will employ about 250 men from now on. The mine is expected to ship about 200,000 tons this year. The mine is electrically equipped underground and is a large property producing a high-grade ore.

The Republic Iron & Steel Co. will reopen its Kinney mine, which has been closed for a year and the mine made ready for a big output. The company's other Mesabi mines are to add men and will be running heavily this year. Probably the Union will resume, while Franklin and Bessemer will be pushed.

At the Burt mine the Oliver Iron Mining Co. has let a contract for 1,000,000 yd. of overburden to Porter Brothers, of Duluth, in addition to the 2,000,000 yd. now being moved under a contract with Winston & Dear. The mine will be an enormous affair when all this surface has been taken off, and it will be several years before the job is done.

Leonard and Laura mines, both on the Great Northern road, are shipping ore all-rail to furnaces in northern Tennessee, the road's cars coming back with coal from that region for northwestern distribution. This is a long haul, and the amount liable to go there is limited, though two or three years ago several hundred thousand tons of Mesabi ores went into Virginia and northeastern Tennessee.

Deadwood. Jan. 27.

D. N. Heizer, secretary of the Spearfish Gold Mining & Reduction Co., in response to numerous requests for a statement of the condition of the company, has mailed to the stockholders a recapitulation of the operations covering 22 months—from January, 1903, to October, 1904, inclusive. He shows that the mine has been making an average of \$6,026 per month—a total for the period considered of \$132,587. The dividend the company has been paying totals approximately \$7,500 per month, so that the profits have been falling nearly \$1,500 per month short of that amount. This explains the failure of the company to meet the dividend due Dec. 25, of \$22,500, to cover the quarter ending Jan. 1. In the 22 months included in the table the total production was \$415,165; total operating cost, \$282,577. The average assays on the ore for the period was \$4.373, and the recovery \$3,438 per ton, an average of 86.2 per cent. The total tonnage for the period was 120,747, or 5,488 tons per month.

New bodies of ore have been opened by the Horseshoe company in the old Horseshoe shaft, the workings of which have just been cleared of debris and water. The bodies are of fair size and of good average value. The mill is operating 90 stamps, handling approximately 400 tons per day. John Gross, who has made an excellent reputation for himself in managing the Maitland cyanide plant, is in charge of the Horseshoe mill and is giving good satisfaction.

The carpenters have the work of framing timbers for the Queen of the Hills mill well in hand, and the superstructure will be raised next week. The Queen of the Hills company has contracted with the Consolidated Power & Light Co., of Pluma, for electric power to operate the mill. The transmission line from this company's generating station at Pluma to the mills of Deadwood will pass directly over the Queen of the Hills ground, and the Queen of the Hills plant will be the closest of any reduction works to the generating point. It is hoped to have the mill completed early in the summer.

Upon application of one of the minority stockholders, Judge Carpenter, in the district court at Denver, Colorado, issued a writ of alternative mandamus ordering the officers of the Hidden Fortune Gold Mining Company to open the stock books for the inspection of the stockholders. The secretary of the company could not be found, having taken his departure and carried the books with him. It is the common belief that the Hidden Fortune officials do not care to make the business public, and for this reason the secretary is keeping out of the way.

The mine and mill of the Hidden Fortune are doing well. The property is one of the best in the Black Hills, and the mill is well equipped for handling ores. The clean-up for the month of December resulted in a bar of bullion worth \$17,500.

Salt Lake City. Jan. 27.

The Utah Copper Co.'s mill, at Bingham, is being crowded to its capacity, and is handling close to 800 tons of ore daily. Superintendent Janney expects to make a record in February. Barring any mishaps, he will endeavor to put through 24,000 tons. The product being made runs about 34 per cent copper. Last week the average was better than 34 per cent. The management will close a contract in a few days for an electric haulage system in the mines.

The Yampa smelter, at Bingham, is calling upon the mine for a little more than 400 tons of ore daily, and is turning out 50 tons of 18 per cent copper matte. When the reverberatory goes into commission, a few weeks later, the quality of the product will be further improved, and will enable the treatment of anywhere from 600 to 700 tons of ore daily.

The Columbus Consolidated Mining Co. closed down its concentrating mill at Alta a few days ago, and the plant will probably remain down until after the annual election, which occurs on Feb. 7. A water shortage is the prime reason for the shut-down. There has been scarcely more than enough to keep the plant going at one-third its capacity, while some days the power derived from the electric plant has been weak, due to the low stream. Ordinarily there would have been no trouble of this kind, but the snowfall in the camp and in the State generally, according to the oldest inhabitant, has been the lightest in history. Settling tanks will likely be added to the mill equipment, as considerable of the values has been lost in the slime during the late run.

The blasts at the United States Mining Company's lead smelter at Bingham Junction will be turned on in a few days. The roasters have been in commission for over a week.

Dr. U. Withee, of Ogden, Utah, and associates have purchased the Black Diamond group of claims in the Bullfrog (Nev.) district. A company will be organized which will undertake the development of the property.

The annual report of the Yankee Consolidated, operating in the Tintic district, shows that 10,080 tons of ore was mined in 1904, 60% of which was first class, and netted the company \$24.75 per ton, while the second class netted \$8 a ton. From ore sales \$182,024 was received, and the profits were \$62,043, and the year ended with a bank balance of \$73,238. The mining expenses amounted to \$48,766, and the prospecting and development account shows expenditures of \$41,262. In eighteen months since the last report 6,040 ft. of underground workings were made, at an average cost per foot of \$6.83, or \$4.09 per ton of ore mined. Among the items of improvements was an air compressor plant installed at a cost of \$10,813.

Spokane. Jan. 26.

Promise that the Great Northern railway will soon be extended from Republic, Wash., into the Okanogan district of Washington, has revived interest in that old camp. The Grand View Mining Co. has prepared for the installation of an electric plant, and some of it is on the ground. A 20-stamp mill, shipped in late last fall, will be erected as soon as the snow gets off the ground. Electric power will be used. The company is developing its group on Mount Chopaca. Stockholders in the Mineral Hill Co., operating a mine near Conconully, expect to put in an electric plant on Salmon creek, to handle machine drills, and perhaps to furnish power for an electric railway from the mine to the boat line on the Okanogan river. It is a high-grade silver producer. James Hagerty is proceeding with the installation of the electric power plant for his Similkameen Falls Power Co. The Palmer Mountain company plans to build an electric plant on Toats coulee, and to erect a large compressor. Surveys are being made. The Copper World is being developed with a two-compartment shaft. The Six Eagles company, a Hagerty promotion, in which Wooster, O., people are interested, has closed for lack of funds. Properties under development include the Security, the Lone Pine, the Nighthawk, the Favorite, the Ruby and the Douglass Mountain.

Byron N. White has closed a contract with the United States Zinc Co., of Pueblo, Colo., for 2,500 tons of zinc ore from his Slocan Star mine near Sandon, B. C. It will run about 35 per cent zinc and 45 ounces of silver. Shipments will be made through Spokane for about three months. Manager Anderson, of the zinc company, was here recently to secure zinc ores. The price he pays is secret, but is less than the price for lead.

As the stockholders in the Golconda mine at Baker City, Ore., have not been able to get together, Charles H. Carter, of Pendleton, Ore., has brought foreclosure suit against the company for \$25,000, and he asks for a receiver.

Extreme cold weather throughout the country north of Spokane has interfered seriously with the water supplies. The Granby Consolidated smelter at Grand Forks, B. C., has closed two furnaces. Electric power, furnished by waterfalls, has been particularly impaired.

Burch & Burbidge, of Spokane, operating the Crane Flat placers near Granite, Ore., have turned the property over to the Western Mining & Development Company, for \$65,000. The property is being equipped with a dredge, formerly installed near Murray, Ida. The new company is a close corporation, in which Messrs. Burbidge and Burch are interested. They were formerly with the Bunker Hill & Sullivan Co., at Wardner, Idaho.

Butte. Jan. 25.

The Montana Zinc Co., which has overhauled the 60-stamp mill of the Alice company to reduce the zinciferous ore of the Alice mine, started its rolls Jan. 24 on a 500-ton test run. The concentrator and electric separators are to be started Jan. 25. Mining men in the State are greatly interested in the outcome of the test. They are here from many of the mining centers to watch it. Many of them have mines carrying this character of ore and are anxious to know whether they are to have a market for their product, believing that the success of the enterprise means the establishment of other plants in Montana for the treatment of this class of ore. A week or 10 days will be required to complete the run.

The Montana Gold Co., which owns mines and a mill in Granite county, will resume work in its mines Feb. 1. Legal complications necessitated a suspension about a year ago. Up to that time the company had extracted about \$100,000 in gold from its ore.

Eastern men have taken hold of the placer ground in Goodrich gulch, Madison county, and will install hydraulics to work it. The property is owned by F. C. Lavigne and others and has yielded some gold by the hand-sluing method.

The Eveline mine of Butte is yielding oxidized gold and silver ore. A shipment of 100 tons is being made. The Jennie Dell Company, operating the claim adjoining on the west, has secured a lease and bond on the mine.

In the Lump Gulch district of Jefferson county much development work is being done and considerable ore extracted from some of the opened claims. The workings of the Liverpool have reached a depth of 750 ft. and drifting at the bottom is in progress. The ore of this mine is rich in silver, averaging 100 oz. per ton. It carries gold and lead, the percentage of the latter being large. A 12-inch streak of \$75 ore has been struck in the Lady Smith. The Clara Bell has been sold to A. B. Keith & Son, who are developing it. A tunnel is being driven to tap the vein of the Carbonate Chief at a depth of 800 ft. It is now in 1,000 ft., and will have to be driven 150 more.

Ore that carries \$100 per ton in silver, gold and lead was struck in the extension of the Bertha, near Wickes, Madison county, last week. The operators, H. Freyler and others, are working at a depth of 300 ft. The vein is said to be an extension of that in the Bertha.

The Geyman company, of Butte, is extracting 50 tons of copper-silver ore per day from its mine. The ore is concentrated in the company's plant and the concentrate sold to the United Copper Company.

Bisbee. Jan. 28.

Reports from Magdalena, across the Mexican line from Nogales, are that the Black Mountain company has been cutting gold-bearing quartz for the past two or three weeks, running \$25 and \$28 to the ton, with a good deal of it up to \$35. This is higher than the company has ever expected. One hundred stamps, ordered a short time ago for the company's mill, are under construction, and will be installed the coming summer. It is intended to double the mill as soon as these stamps are dropping and the mine is in shape to furnish ore for the additional heads.

At the Shattuck-Arizona, where they have been sinking rapidly for the past few weeks, they are now cutting excellent rock, with some copper stains. One of the

best records ever made in this or any other camp has been made here of late in sinking the main three-compartment shaft.

Probably the holding company for American Development ground, which took claims southeast from Junction nearly a year ago, is to be transformed into a development company very soon, and it is unlikely there will be opportunity for the public to get any stock, as owners of the holding stock will take all the development issue. There will doubtless be a great pressure for this stock, as the company's ground looks exceedingly good, and its projectors are the same men who were responsible for the successes of the Calumet & Arizona group; in fact, American is looked upon as a sixth member of this group. The American holding company has 12,000 shares, and the development will probably have 50,000, par \$10 each. Aside from Shattuck, all the developments in this camp for the past year have been toward this ground. A large group of claims still further south have just been bought by a number of northern men, and will be held till actual developments upon American have proved whether mineralized ground continues so far to the south.

The Houghton Development Co., which is not more than three miles from American, in a direct line, is still driving a tunnel, but during the 15 months it has been working there has gone only about 1,400 ft. into the hill. The iron blowout, for which the tunnel was started, has not been cut. The company has made no shipments of lead-silver to smelter.

In sharp contrast with the work in Houghton is that in Higgins, where the tunnel is driven about 300 ft. per month. This drift is still 400 ft. from beneath the ore cut in previous workings, and toward which it is heading. The company has until April to find a mine and take up its bond. The general opinion here is that it will be unable to make sufficient showing in the time to enable it to take up the bond. But it is possible that if the company is doing good work up to April it may be given further time.

Officers of the Wolverine & Arizona company state that their call for an assessment on the stock is being promptly met by most holders, and that the reorganization of the company is assured. It is said by attorneys that if stockholders do not care to take the new assessable stock, nothing can compel them to do so, as the company was started as non-assessable.

Toronto. Jan. 27.

Information has been received at the Ontario Bureau of Mines that the Star of the East gold mine in Kaladar township, Addington county, has a five-stamp mill in successful operation. After a run of 14 hours the first cleaning up showed \$300 worth of gold. The shaft has been sunk to a depth of 150 ft. and the vein is strong and promises well.

The annual meeting of the British-American Development Co. was held in Toronto last week. A report from the Queensborough iron pyrites mine, Hastings county, now being developed, was of an encouraging character, indicating that in a few months the company would be in a position to make regular shipments of the output. It controls several other pyrite deposits, the working of which will probably be undertaken shortly.

A report by A. P. Low on the explorations made in the Hudson Bay Territory and adjacent regions has just been published at Ottawa in connection with the report of the Marine and Fisheries Department. Mr. Low explored the coun-

try around Pond's inlet. The small rivers and streams have cut deeply into the plain and their banks show the stratification of the sands, clays and gravels. Small pieces of lignite were found in the river beds, pointing to the conclusion that the formation may correspond to the coal bearing areas of Greenland. Similar coal has been found in the drift in two places along the east coast of Baffin's island between Pond's inlet and Cumberland gulf, showing that the tertiary deposits may be quite extensive. It is doubtful whether the deposits are sufficiently extensive or the coal of a quality to warrant the cost of mining and transportation; but the presence of these deposits may prove important by reason of the possible deposits of alluvial gold in them, and the report suggests that it would be well in the future to test the beds of streams flowing through them for gold.

Sir Sandford Fleming, of Ottawa, president of the International Portland Cement Co., has taken steps toward the establishment of a cement plant at Kananaskis falls, N. W. T. There is a fine and extensive deposit of cement in the neighborhood and an expert has reported favorably on the enterprise.

W. G. Trethewey, who is largely interested in the silver mines of Cobalt, Ont., has gone on a trip to the Pacific Coast.

A syndicate of English capitalists propose to erect large cement works at Sydney, N. S., having a capacity of 500 barrels per day. They will utilize for this purpose the slag of the Dominion Iron & Steel Co.'s works, which now goes to waste.

The elections for the Ontario legislature took place on Jan. 25, and resulted in the defeat of the government of G. W. Ross by an overwhelming majority. The result is likely to be attended with considerable change in the mining regulations of the province, which have been the subject of much criticism by the opposition during the campaign. J. P. Whitney, the leader of the opposition, who will shortly be called upon to form an administration, has pledged himself to create a department of mines with a cabinet minister at its head, in place of the present bureau of mines.

Among those interested in mining who have secured seats in the newly elected legislature are J. W. Pearce, of North Hastings, and R. R. Garney, of Manitoulin Island.

The Manitoba Peat Co. of Winnipeg, has been incorporated with a capital of \$200,000. The incorporators are Robert I. Whitla, John Woodman, Donald R. Dingwall, Charles W. Clark and Robert Taylor, all of Winnipeg.

The Dominion Iron & Steel Co. have closed a contract with the Grand Trunk Railway for the delivery of 25,000 tons of steel rails from their mills at Sydney, N. S., where the rail plant is expected to be in operation about May 1.

Victoria. Jan. 24.

Boundary.—Corrected figures show that in 1904 there were 506,252 tons of ore smelted at the Granby company's smelting works, Grand Forks, Boundary district, as compared with 401,921 tons in 1903, 312,340 tons in 1902, 230,928 tons in 1901 and 62,387 tons in the 19 weeks the smelter was in operation in the latter part of 1900. The total tonnage treated from the time the first furnace was blown in on Aug. 21, 1900, to Jan. 1, was 1,603,828 tons, of which about 1,550,000 tons was ore from the Granby mines, at Phoenix. The Skylark Development Co., Ltd., has been

organized to acquire and operate the Skylark, between Greenwood and Phoenix. The authorized capital is \$250,000, in \$1 shares, of which 124,000 are treasury shares. This property was worked about seven years ago, when shipments of quartz carrying good values in silver and gold were made. Last year a local syndicate obtained it under a bond, and after working it for a few months turned it over to the above-mentioned company. The Montreal & Boston Consolidated Copper Co. last week made a second payment of \$20,000 on the Athelstan and Jackpot fraction mineral claims. It is stated that there is still a balance of \$50,000 due on the purchase of this property. The work of sinking a two-compartment shaft at the Emma mine, in Summit camp, has been commenced by the B. C. Copper Co. The diamond drill has shown that there are bodies of ore of good grade at depth, so a new shaft is being sunk to open them up. The Betts & Hesperus Mines Co., of Chicago, expects shortly to commence shipping ore from its Betts and Hesperus mine, situated within half a dozen miles of the Granby Company's smelter. A small power plant has been installed and a wagon road made to the railway, which passes within a short distance of the mine workings.

Slocan.—The negotiations for the sale of 2,500 tons of zinc concentrate from the Slocan Star mine, mentioned last week, have been concluded, the purchaser being the United States Zinc Co., of Pueblo, Colorado. The average assay value of this by-product from the Slocan Star company's silver-lead ore is stated to be about 36 per cent zinc and 60 oz. silver. The Last Chance mine, also near Sandon, has made a carload trial shipment from a big shoot of zinc ore recently met with in the upper workings of the mine. The grade is represented as being higher in both zinc and silver than that of the concentrate from the Slocan Star. The experimental lot is also being sent to the United States Zinc Co.'s works. Machinery for the zinc enriching works at Rosebery, Slocan Lake, has arrived from England. The erection of the building was in progress until a few weeks ago, when work was suspended pending the arrival of the machinery. John R. Roberts, president of the miners' union at Silverton, has been committed for trial on a charge of shooting at Montague S. Davys, a well-known mining engineer, of Nelson, B. C. Mr. Davys, who is lessee of several mines in the Nelson and Slocan mining divisions, had had much difficulty with white cooks, so employed a Chinese cook at the Hewitt mine. The miners' union requested that no Chinaman be employed in the camp, and on Mr. Davys stating his intention to conduct his business in his own way, Roberts threatened to 'fix' him. Later a bullet was fired through the window of a hotel bar while Mr. Davys was standing within, and it passed so close that he felt the sting of it on his cheek. A local resident swore that he saw accused fire the shot.

Monterey Jan. 24.

Rumors of the erection of a smelter in or near Chihuahua persist. The latest is based on the fact that Manuel Prieto is seeking a concession from the Chihuahua government for the establishment of a smelter, and many think that it is for the American Smelting & Refining Co., as that company has several times indicated its intention of erecting a smelter for that territory as soon as the output and the extensions of the Kansas City, Mexico & Orient and the Chihuahua & Pacific

railroads should enable it to do so without crippling the El Paso plant. It is claimed that that time has arrived, and that surveys have been made for the plant at the intersection of the Mexican Central and Kansas City and Mexico & Orient railroads. All this may be true, and possibly the American Smelting & Refining Co. is behind such a move, but by those best posted it is believed that if a trust has a hand in it, it is only with the idea of holding back the movement for an independent smelter, since the trust plant has been determined upon at Velardeña, in Durango. While it is true that this 1,000-ton plant—which, by misprint, was recently given as a 100-ton plant in this JOURNAL—will be almost wholly a copper matting smelter, it is certain that the company will not consider one at Chihuahua until this is completed, which can scarcely be this year. The independents may not be scared off, however, for the quantities of low-grade ore in the vicinity that will not stand freight to El Paso make it attractive, and the move will have a strong backing. The opening up of the Hearst coal fields in eastern Chihuahua will also simplify the problem and help to indicate on Chihuahua ultimately as the proper location for a north Mexico smelter. The concession of W. C. Greene for a 200-ton smelter requires work to begin in six months from January 14, 1905, but this plant will probably be built either on the site of the old Juarez smelter, across the river from El Paso, or somewhere on the line of the Sierra Madre. The smelter of the Eucinillas Mining Co., at Camargo, is finished, and will be blown in as soon as the railroad connecting it with the mines is completed, perhaps the latter part of next month. Messrs. Ryan and Dudley have the contract for building the railroad from the San Isidro station of the Chihuahua & Pacific railroad to the Calera mines, and Mr. Ryan is negotiating with H. B. Lawrence for the Buena Vista mines, adjoining the Calera. Dennis Sullivan, of Denver, is there with J. W. Phillips, of Cripple Creek on some mining business.

In Durango, Charles Brock is surveying for a railroad from Santiago Papasquairo, to the Mexican International railroad, to the San Andres mines. A. D. Maloy is working on the promotion of a \$5,000,000 gold company for the driving of a 10,000-ft. tunnel through the mountains to Guanacevi, cutting all the veins of that district, and giving the camp a much-needed outlet. The placing of the new tariff on dynamite has been again indefinitely postponed.

London. Jan. 21.

The South African mining market has been causing city people a good deal of anxiety during the last two or three weeks. It was generally anticipated that the new year would show a firm and hopeful market, and on the strength of this supposition several prospectuses were issued. The most important of these was the West Rand Consolidated Mines, Ltd., which was a consolidation of a number of interests (shares and claims) belonging to the Albu, Goerz, Neumann and Friedlander groups. The company had been registered two years ago, but the public flotation had been postponed owing to bad times. In addition to actual business of this sort, many rumors were disseminated relating to forthcoming new companies under the patronage of other leading houses. Afterward came rumors that these flotations, actual and prospective, had for their object the artificial support of the market. On the top of these came reports in the

press of a universal strike among the Chinese laborers, and announcements at meetings of shareholders to the effect that the government were about to check further imports of Chinamen. A large number of selling orders came from the Continent in consequence, and the market has been very shaky. All these adverse rumors appear to come from the anti-Chinese party, but whether they are disseminated for the purpose of reaping a bear profit, or only to annoy the leading houses, is not quite clear.

A year or more ago I mentioned that the Mysore and the Champion Reef mines in India had acquired adjoining properties, which were in the nature of deep levels. It is now proposed that the Nundydroog Co. shall follow the same course and take over the properties of the Oriental Gold Mining Co. The latter company has been worked unprofitably for some time, and it is now considered advisable to operate the properties conjointly with those of the Nundydroog. At the same time it has been decided to provide the Nundydroog with electrical machinery, driven by the Cauvery water power, in the same way as the other mines, and to widen and sink deeper the two main shafts. A scheme for issuing new capital is to be placed before the shareholders in the course of a few weeks.

It comes as a considerable surprise to hear that the Smelting & Refining Co. of Australia is not making profits nowadays, and is contemplating the issue of further capital. The history of this undertaking is an interesting one. It was started by Mr. John Howell, after he left the Broken Hill Proprietary ten years ago, but scarcity of customs ores soon caused it to close down. After lying idle for some years, it was revived by Reginald Ward and A. A. Blow. The financial obligations under which the reconstructed company labored made it appear improbable that a success would be made. However, by dint of remodeling the works, obtaining rebates on railroad carriage, and general business ability the company was placed on a sound basis. Apparently everything was going quite smoothly. About six months ago the monthly profits suddenly changed into losses. The reports and statements issued by the company are very reticent as to the cause of this alteration, but there is no doubt that it is due to the policy inaugurated of cutting down smelting charges in order to get business. The company depended on rich gold ores for profits, as little could be made on lead ores, and recently the supply of these better class ores has been considerably curtailed. The competition for ores seems to have become keen and cutting of rates was inevitable. Some inconvenience and loss has also been suffered by the long delay in the shipping of the nickel ores contracted for with a New Caledonia company. The furnaces were built and ready six months ago, but the supply is only just beginning to come to hand. The company has also suffered by Mr. Blow's continued absence on other business. There appeared to be no strong guiding hand of a responsible manager on the spot during his absence. He has now severed his connection with the company and returned to America, a course of action which is taken to indicate that his hopes of the ultimate future of the company are not very rosy. At the present time the directors and shareholders are slightly at sea, and do not know how to raise the additional capital considered necessary to put them in a more favorable position as ore buyers. Really, the responsible management should be concentrated in Australia, and not in the hands of a London board.

Johannesburg. Jan. 2.

Some time ago J. H. Curle wrote an article on the white workmen of the Rand, which caused considerable comment among the miners. Mr. Curle claimed that one of the worst features of the economic position here was the inefficiency of the white workmen, and I am sorry to say that his remarks were very near the truth. Truth hurts sometimes, and grandiloquent writers, in articles to the local press, have tried to refute Mr. Curle's insinuations. Whenever cheap colored labor is plentiful, there seems to be a tendency to inefficiency on the part of the skilled white artisan. Witness the economic history of the Southern States. Of course there are many hard-working, efficient white artisans here, but the average white man, although he receives a higher wage, compares unfavorably with his brother in other camps where all white labor is employed. The white artisan's inefficiency is not felt as much on the mines of the central Rand, near Johannesburg, as on the eastern and western sections of the Rand. Two things draw workmen to the central Rand, namely, the attractions and excitements of a modern city, and the fact that they work with Kaffirs, and not Chinese. Almost all the Kaffirs are now concentrated on the mines near town, leaving the outside mines to the yellow men. Such exaggerated stories were circulated about the Chinese before their arrival that the idea of working with them was very unpopular, hence the rush for the Kaffir mines. The white artisan is selfish. The Chinaman was new to him, and instead of trying to help break him in, he decided to try elsewhere before accepting a position on a Chinese mine. Many good men loafed about town for a long time rather than go to work on outside mines.

In comparing the results obtained with Chinese with those from Kaffirs, it must be remembered that the Chinese miners have been at a big disadvantage as regards white labor. It is not an exaggeration to say that on those outside mines, where the Chinese have been working three months, the management are now having more worry from the poor class of white miners than from the Chinese. The average inches drilled per Chinaman per shift is very encouraging, but the white miner in charge is often so careless or ignorant, that the holes drilled break about half the rock they would break were they placed properly. Heretofore there has been little redress. Nothing was gained by discharging the white man and putting on another equally poor.

Of course this state of things will end. The Kaffir mines are full now, and even the best white artisans must work with the Chinese or starve. When he gets accustomed to the Chinaman, the artisan seems to like him as much as the Kaffir.

On account of the scarcity of labor in the past, the mines were forced to break most of the rock with machine drills. Now that the Chinamen are coming in, hand stoping is getting common, and the demand for good hand stoping white miners is much greater than the supply. Good machine rock drill miners are also very scarce.

The new year opens with very rosy prospects. In a few months' time we will likely have that doubtful blessing—a big boom. It looks as if the gold production for January will be the greatest on record. There will be a very big decrease in February, however, on account of the three days' holiday which the Chinese coolies insist on having for the celebration of their New Year.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. Frank Klepetko is at Houghton.
Mr. Geo. A. Schroter is in New York.
Mr. John A. Church has returned from Texas.

Mr. Franklin Guiterman has returned to Denver.

Mr. Morris Griffin, of San Francisco, is at Chicago.

Mr. A. H. Bromly is at Spruce creek, Atlin, B. C.

Mr. H. L. J. Warren, of San Francisco, is ill at Salt Lake City.

Mr. R. H. Channing has returned to Salt Lake from New York.

Mr. J. C. Carrera is in Chihuahua, Mexico, on professional business.

Mr. Philip L. Foster is about to leave New York on a journey to Bolivia and Peru.

Mr. Samuel Brady, manager of the Michigan Copper Mining Co., is in Alabama.

Dr. J. M. Bell, government geologist of New Zealand, sailed for that country on Feb. 2.

Mr. E. W. Skeats has been appointed professor of geology at Melbourne University.

Mr. Fred D. Fuller has returned to Baker City, Ore., from a business trip in the East.

Mr. W. A. Wilson has been examining properties in the La Plata mountains, Colorado.

Mr. Samuel Newhouse has been elected general manager for the Majestic Copper Co., of Utah.

Mr. Alfred Harvey is with the Velardeña Mining & Smelting Co., in Durango, Mexico.

Mr. William Young Westervelt, of New York, is examining mines in Pinal county, Arizona.

Mr. S. G. Pierson, of the Colorado Fuel & Iron Co., has returned to Denver from the Pacific Coast.

Mr. T. J. Helwig, of the Standard Fire Brick Co., Pueblo, Colo., has been recently in Salt Lake City.

Mr. James Douglas is in Canada, where he will deliver lectures before the students of several colleges.

Mr. John Morgan has been appointed superintendent of the South Kalgurli mine, at Kalgoolie.

Mr. R. B. Gleisberg has resigned the general management of the Associated mines at Kalgoolie.

Mr. J. S. Groo has been appointed superintendent of the Blue Jay Extension Mining Co., in Utah.

Mr. J. F. Mitchell-Roberts has resigned as metallurgist to El Cobre mines, Cuba, and is now in New York.

Mr. Jos. S. Qualey, of New York, is examining the Parciouera mine, of Santa Eulalia, Chihuahua, Mexico.

Mr. C. M. Woods, manager of the Denver Fire Clay Co., has recently been in Utah, on professional business.

Mr. F. Lynwood Garrison has sailed for San Domingo, where he will be for several months on professional business.

Mr. M. M. Johnson, of the staff of Samuel Newhouse, has gone to British Columbia on professional business.

Messrs. T. M. Rogers and W. C. Potter, of the Guggenheim Exploration Co., are making examinations in Chihuahua.

Mr. Norman Stewart, superintendent of the Clipper mine, at Alma, Colo., has returned from a business trip to the East.

Mr. Robert McKinley, manager of the Idore Mining Co., Idaho, is in the East on business connected with the company.

Mr. Edwin Anderson, manager of the United States Zinc Co.'s plant at Pueblo, Colo., has been recently in Salt Lake City.

Mr. G. H. Robinson, general manager of the Britannia copper mines at Howe Sound, B. C., was recently at Salt Lake City.

Mr. O. N. Brown, general manager of the Spearfish company, of South Dakota, has returned from a visit to the Pacific Coast.

Mr. J. Duffin has been appointed second assistant superintendent of the Cananea Consolidated Copper Co., at Cananea, Sonora, Mexico.

Mr. A. E. Hyde, Jr., has resigned as manager of the Annie Laurie Mining Co., of Utah, to devote his attention to personal mining interests.

Mr. C. S. McHenry has resigned as first assistant superintendent of the Cananea Consolidated Copper Co., at Cananea, Sonora, Mexico.

Mr. Patrick Mullen has been appointed general mine inspector for the United States Steel Corporation and the H. C. Frick Coke Company.

Mr. Chester F. Lee, of Seattle, has gone to Searchlight, Nev., to make examinations. Before returning he expects to visit the Goldfield district also.

Mr. W. J. Olcott, general manager for the United States Mining Co., has been chosen vice-president of that company, to succeed Dr. Nelson P. Hulst, who recently resigned.

Mr. H. E. Kirk has been appointed first assistant superintendent of the Cananea Consolidated Copper Co., at Cananea, Sonora, Mex., to succeed Mr. C. S. McHenry, who has resigned.

Mr. A. J. Bettles has returned to Salt Lake City from inspecting the new milling plant of the Revenue company, in Montana, which was designed and constructed under his direction.

Mr. Robert H. Richards, professor at the Massachusetts Institute of Technology, has just returned from a visit to Virginia, where he was engaged in introducing improvements in a pyrite concentrator.

Mr. Randolph Bolling has resigned his position in the blast furnace department of the Bon Air Coal & Iron Co., of Allens Creek, Tenn., to accept a similar position with the Embree Iron Co., of Embreeville, Tenn.

Mr. Alva C. Smith, formerly superintendent of the Cleveland Furnace Co., Cleveland, Ohio, has resigned to take charge of the Riverside blast furnaces of the National Tube Co., of Wheeling, West Virginia.

Mr. Harrison Clement, formerly mining and mechanical engineer for the Bingham Consolidated Mining & Smelting Co., and Mr. V. P. Strange, consulting mining engineer, and manager of properties in Goldfield, Nev., have opened offices as engineers and contractors under the name of Clement & Strange, at 307 Dooly Block, Salt Lake City.

Obituary.

Edward Payson Cone, secretary of the Black Diamond Anthracite Coal Co., died suddenly from apoplexy January 23, in New York, aged 70 years.

Charles White Hubbard, for many years partner of the late Charles Lockhart, whose death is chronicled in this column, died at Pittsburg, January 26, aged 78 years. Mr. Hubbard was formerly president of the American Axe & Tool Company.

Edward Hemphill Mullin, confidential representative of the General Electric Co., died at Milburn, N. J., Jan. 25, aged 46 years. Mr. Mullin was a well-known newspaper writer on technical subjects, and filled editorial positions on the staffs of several New York newspapers. He was vice-president of the New York Electrical Society and a director of the American Institute of Electrical Engineers.

Charles Lockhart, a director of the Standard Oil Co., and at one time president of the corporation, died January 26, at Pittsburg, Pa., after an illness of several months. Mr. Lockhart, with John D. Rockefeller, William G. Warden, Henry M. Flagler, and others laid the foundation for the Standard Oil Company. He was also a director of the Western Union Telegraph Co., president of the Pittsburg National Bank of Commerce, and was founder of the International Navigation Company.

Societies and Technical Schools.

University of Washington.—A number of the teachers and students in mining at this institution visited the mines of the Sunset Copper Mining Co. at Index, Wash., during the holidays.

Pennsylvania State College.—A circular from this institution states that the reorganization of the mining department some three years ago has resulted far beyond the expectation of its friends. In that time it has passed in attendance from the 19th to the 10th rank in the United States, and has become the largest mining school in Pennsylvania. The laboratory facilities and means of instruction were increased last year, and they are to be added to from time to time as the available funds will permit. An undergraduate society devoted to mining and metallurgy has been recently organized by the senior and junior students in the department.

Trade Catalogues.

The American Steel & Wire Co., of Chicago, Ill., in a circular recently issued, illustrate some varieties of electrical wires and cables.

The Lake Shore Engine Works, of Marquette, Mich., has issued a circular describing the Flodin self-oiling car for which it has applied for a patent.

The Compressed Air Machinery Co., of San Francisco, has issued an artistic booklet, with illustrations, which describes Word Brothers' improved drill-maker and sharpener.

The Penberthy Injector Co., of Detroit, Mich., has issued its new catalogue, which describes and illustrates its entire line for the year 1905, including, besides the well-known Penberthy automatic injector, auto-positive injectors, ejectors, forced-feed oil pumps, oil and grease pumps.

Industrial.

The Denver Laboratories Co. has been formed by H. C. Parmalee, Rudolf Gahl and Charles H. Bryan, to do assaying and work in industrial chemistry. The location is at Denver, Colorado.

The H. D. Crippen Manufacturing Co., of New York, will soon make a shipment to Parral, Mexico, of a three hundred horse-power DeLaval steam turbine, for use at the plant of the United States Mining Company.

The Isthmian Canal Commission announces that proposals will be received for stone crushers for use in constructing the Panama Canal. Communications may be sent to the Isthmian Canal Commission, Washington, D. C.

The Rogers Locomotive Works, at Paterson, N. J., have been sold to the American Locomotive Co., otherwise known as the Locomotive Trust, which now controls all similar plants in the United States, excepting the Baldwin works, of Philadelphia.

The firm of A. L. Ide & Sons announces that it has established a New York office at 11 Broadway, through which all export New England and Middle States business will be transacted hereafter, the management being entrusted to J. G. Robertson.

The J. Geo. Leyner Engineering Works will furnish the machinery for the construction of the three-mile government tunnel, which will be part of the irrigation project in southern Colorado. The water will be taken from the Gunnison river.

The Joshua Hendy Machine Works, San Francisco, Cal., are introducing a gravel mill made of three stamps of 1,000 lb. each. The shipping weight, with frame and Challenge ore feeder, is approximately 16,000 lb. It has a capacity of 140 tons of gravel for each 24 hours. The firm will be glad to send its new catalogue, giving complete details, upon request.

The Peteler Portable Railway Manufacturing Co., of Minneapolis, Minn., announces that it has disposed of its business and property to the Kilgore-Peteler Co. The new company also absorbs the Kilgore Machine Co., manufacturers of the Kilgore steam shovel and saw mill machinery. Mr. Francis Peteler, the founder of the dump car business, retires at an advanced age, having established the company in 1870. Mr. Phillip Peteler and Mr. Charles B. Peteler will continue with the new company and will give their personal attention to the manufacture of cars.

The Westinghouse Electric & Manufacturing Co. has sold to the Syracuse Railroad Construction Co. apparatus for the complete equipment of the Rochester, Syracuse & Eastern railroad. The contracts include two 1,500 kw. turbo-generator outfits, which will generate current at 3,300 volts, 3-phase and 25 cycles. Each turbo-generator will be furnished with a 50 kw. exciter mounted on the turbine shaft. The equipment also includes two 500 kw. rotary converters and six 400 kw. rotary converters; twenty-four transformers, with a total capacity of 6,500 kw., a 13-panel switchboard for the main generating station, and three sub-station switchboards of 5 panels each, as well as protective and detail apparatus. Motor equipments included in the contract call for twelve quadruple equipments of Westinghouse 110 h.p. motors, as well as eight quadruple and two double equipments of motors of other sizes.

General Mining News.**ARIZONA.****COCHISE COUNTY.**

Phelps, Dodge & Co.—The output of this company's properties for the year ending December 31, 1904, is officially given as follows: Copper Queen Co., 58,967,870 lb.; Detroit Copper Co., 16,623,251 lb.; Montezuma Copper Co., 5,827,113 lb.; total, 81,418,234 lb. This output was in the form of blister copper, which averages about 99% fine.

MARICOPA COUNTY.

Arizona Pacific Mining Co.—A good body of ore is reported opened in this company's property, at Woolley. It has been decided to re-equip the property at once, and machinery for that purpose is now on the way.

Bonanza & Gold Eagle Mining Co.—This company, operating the old Harqua Hala mines, is reported to have netted a bar of bullion worth \$2,800 from a run of 11 days. A modern cyanide plant is on the property.

Saddle Mountain Mining Co.—On the Queen mine, of this company, there is said to be over 4,000 tons roasted, ready for treatment. Active developments are also being made on the Boggs and Hackberry.

MOHAVE COUNTY.

Chloride Gold Mining Co.—Development is being pushed on this company's property, at Chloride.

Lucky Boy.—At this mine, at Chloride, there is said to be a carload of high-grade gold and silver ore awaiting shipment.

Samoan.—This mine, near Chloride, has been equipped with a new plant of machinery. Ore has been opened up on several levels.

PINAL COUNTY.

El Dorado Mining Co.—A good vein of ore in gold and silver, with lead and copper values, is reported to have been opened up on this company's property, near Dudleyville.

YAVAPAI COUNTY.

Merchants' Mining Co.—This company has completed contracts for development work on several of its claims near Prescott.

Mt. Union Consolidated Mining Co.—This company's mill, near Prescott, is nearing completion.

Postmaster.—It is reported that a good body of ore has been found on this property, at Big Bug.

Treadwell.—The smelting plant at Mayer is completed and is ready for operation.

CALIFORNIA.**AMADOR COUNTY.**

Madrone.—Another run ore taken from the old dump showed an average value of \$88 per ton.

Marsino.—Marsino & Sons, of Volcano, are surveying for the grade of a new 700-ft. tunnel which is to be run the coming summer.

Mitchell.—This mine near Pine Grove is to be started up again shortly, the title having been cleared and the former lien holders having full control.

CALAVERAS COUNTY.

Jones.—J. S. White and partners have this gravel property, near San Andreas, under bond, and have commenced work on it.

INYO COUNTY.

Southern Belle.—The rails for the tramway to connect the mill with the tunnels

at this mine near Laws, A. E. Vandercook, superintendent, have arrived and the mill has started up.

Sherwin.—C. A. Forman, who has these mines, near Independence, under bond, intends sinking them deeper than has been done, to prove their worth.

KERN COUNTY.

In the bed of Kern river, near the old Keyesville district, very rich gravel has been found. The water has been turned out of the bed for some 12 miles, into the Kern River Power Co.'s canal, leaving the bed accessible for mining.

MADERA COUNTY.

Grub Gulch.—Mr. Gifford, representing Los Angeles capital, has bought the Tiger and taken a bond on the Searchlight. Superintendent Porter, of the Gambetta, is expected shortly to resume operations on that property. The Lucky Bill will shortly be worked again.

MONO COUNTY.

The claim recently found by M. Brazzanovich near the Tower mine at Benton has been bonded for \$5,000 to Morris Lynch, of Tonopah, Nevada.

NEVADA COUNTY.

Buckeye Mining Co.—This company is preparing plans for a new 10-stamp mill for its mine in Willow Valley. The drain tunnel recently tapped the ledge and a good-sized body of ore is exposed.

Central Consolidated Mining Co.—This company has bought the Assisi quartz mine adjoining its other property at Banner. The mine has been idle for years, but since the resumption of work at the old Greenhorn and Central mines, it has become of value.

Zeibright Mining Co.—Ten more stamps are to be added to the present ten of this mine at Bear Valley, Fred Zeitler, superintendent. The ledge is a wide one; 16 men are employed at present.

PLACER COUNTY.

Santa Fe Gold Mining Co.—This company has applied for a government license to work by hydraulic system the Santa Fe mine near Westville, draining into John Dick creek, which reaches one of the forks of the American river.

SAN BERNARDINO COUNTY.

Blue Ridge.—For this mine in Gold Roads district, 22 miles northeast of Needles, a 10-stamp mill has been provided and is being put in place. The development of that section of the county is proceeding more rapidly than ever before.

SHASTA COUNTY.

Original Quartz Hill Mining Co.—Men are working on a new road to connect this mine with the county road so as to begin shipments of ore to the smelter at Keswick.

Reed.—At this mine, Old Diggings district, under bond to James Sallee and D. B. Hunt, 25 men are employed, and a tram has been built from the mine to a set of bunkers. Shortly 40 tons of ore a day will be sent to the Mountain Copper Co.'s plant at Keswick.

Uncle Sam.—The Dakin company, owners of this old mine, is being reorganized under the name of the Virginia Mining Co., and extensive development work will be resumed at once. This mine was a large producer while it was owned by the Sierra Buttes Mining Co. There are still

large quantities of ore blocked out for milling, and still larger quantities of fluxing ore which will be sold to the smelters.

SAN DIEGO COUNTY.

High Peak and Helvetia.—Two large boilers for these mines have arrived at Julian and the new hoists and other machinery are on the road.

Nobles Consolidated Mining Co.—General Manager J. B. Wauchope, of this property, near Descanso, expects an early adjustment of financial troubles and a resumption of operations. The owners are English capitalists and the mines will revert to the Nobles Bros. unless the purchase price is paid within six weeks.

TUOLUMNE COUNTY.

Elkins Mining Co.—This company has come into the possession of the Rainbow, Iron Cross and Mount Key group near the south fork of the Stanislaus, near Pine Log, and are preparing for active operations.

TRINITY COUNTY.

Lappin.—At this mine, Deadwood, John Reatham, manager, intends running the lower tunnel in about 900 ft. to drain the property and facilitate ore extraction. Sixteen men are employed.

COLORADO.

BOULDER COUNTY.

Caribou District.—Since the completion of the Colorado and Northwestern railway to this district several properties are preparing for making shipments. The St. Louis mine will ship all its low-grade ore, which was formerly milled, to the Golden smelter. C. A. Trollope will ship from the Morgan a large quantity of ores running from \$10 to \$20 per ton. Indianapolis parties are going to install a gasoline plant on the Sweet Home mine. The Isabel and Pandora are producing considerable high-grade silver ores. The Boulder County Mining Co. is running its mill on tungsten ores and is shipping concentrate reported to sell for as high as \$350 per ton in Eastern markets. The company is running a cross-cut tunnel, now in nearly 2,000 ft., to cut its Boulder County and other well-known silver mines. Denver parties have taken a lease on the Eagle Bird mine and are unwatering the shaft and preparing for general developments.

Ward District.—The majority of operations is on the leasing system in this camp and some good grade ores are being shipped as follows: Orme & Co., one car gave returns of \$94 per ton; Lee & Co., one car gave returns of \$50 per ton; lessees on the B. & M. shipped three cars running \$61.48, \$25 and \$12 respectively, while the lessees on the Ward Rose got values of \$61 per ton on a car lot of twenty tons. The new freight rates, as well as the lower rates for smelting ores, are proving a stimulus for lessees.

CLEAR CREEK COUNTY.

Harrison.—This group of eighteen patented lode claims has been sold by John Morgan to the H. A. Reidel Investment Co., of Colorado Springs and Denver, the consideration being reported at \$100,000. The property is on the north side of Trail creek. The Banner Development Co. will operate the property, having filed papers of incorporation with a capitalization of \$600,000. A first class equipment will be installed and regular developments will be carried on, as the company is reported to have ample funds for liberal operations.

Beauzy.—This property, located on Spanish Bar, near Idaho Springs, has recently been bonded and leased to J. H. Shepherd, of Idaho Springs, and after doing a little development work, he has opened into a streak of high-grade ore carrying average values of over \$60 to the ton, assays going as high as \$177 per ton. The ore is lead, copper and zinc, and was found on the foot wall of the tunnel. The property is owned by Bullis & Shaffer, of Idaho Springs, who bought it in for taxes.

Treasure Vault.—Alfred Down and Richard Davis, of Idaho Springs, working a lease on this property, received returns from a shipment of ores which netted them at the rate of \$22 per day to the man. This is one of the few veins in the district carrying tellurium.

Centurion Mining & Milling Co.—The annual report of this company, operating near Idaho Springs, shows returns from sales of ores of \$30,513, the average value of ores shipped being \$47.26. The property has been equipped with a first class plant of machinery, and it is claimed that good ore reserves have been created.

Orinoco Mining & Tunnel Co.—The main tunnel is now in a distance of 500 ft., and ample capital has been raised to complete the tunnel, as well as to install machinery for heavier operations. S. W. Miller, Idaho Springs, is manager.

Una Mining & Milling Co.—Manager A. J. Carlson, of Idaho Springs, has returned from an Eastern visit, where he conferred with the directors of this company, and ample capital has been raised to drive the Gold King tunnel its entire distance of 3,000 ft., and machinery may be installed.

Leavenworth Mountain Mining & Tunneling Co.—Kansas capital has become interested in a group of 23 claims, which are to be developed liberally through tunnel workings. R. H. Blackman, Silver Plume, is in charge.

Sampling Works.—On account of increasing receipts of ores the Idaho Springs sampling works of the Independent Smelting & Refining Co. will be equipped with larger crushers and rolls. J. Kemp, Idaho Springs, is manager.

GILPIN COUNTY.

Perigo Mines, Land and Town Site Co.—This company owning the Perigo and other well-known lode and placer property, and valuable real estate holdings in the Independent and South Boulder district, has declared a dividend of five per cent on its capital stock of \$500,000, amounting to \$25,000. T. H. Potter and J. E. Lightbourn, of Central City, are the principal owners, and heavier operations are planned on the Perigo property for this year.

Gowder Mines Syndicate, Ltd.—This company paid about 140 per cent. dividends in 1904 on its capital stock of \$75,000, and is rated as the second best dividend payer in British gold stocks. Arrangements are being made to install a six drill air compressor, for sinking operations, as the shaft ground is extra hard. T. Dunstone, Black Hawk, is superintendent.

Independent Sampling Works.—Owing to increased business this sampling plant at Black Hawk is to have a number of improvements in the shape of larger crusher and rolls. The plant is operated by the Independent Smelting and Refining Company, operating their own smelter at Golden, and D. H. Allen, Black Hawk, is manager of the sampling works.

Russell Mining Co.—Missourians are interested in this company operating the Russell group in Russell district, and they are preparing to install electric machinery on their property. F. L. Paxton, Russell Gulch, is superintendent.

South Boulder Creek.—Frank Augustus, of Rollinsville, has interested Iowa capital in the erection of a 10-stamp mill of an initial capacity of 25 tons daily, which is to be erected on this creek during the early spring, for the treatment of custom ores.

Lamberson & Warren.—Nevadaville parties have taken a sub lease on this property from the Nevada Consolidated Gold Mining & Milling Co., and will commence shipping concentrating as well as low-grade smelting ores of the lead kind.

Colorado.—Centreville, Iowa, parties have taken a lease and bond on this group in Gambell gulch, and will carry on active work after cleaning out the main tunnel and putting in new track. The property is credited with producing a large amount of good surface ores, and is a little north of the well-known Gold Dirt property.

LAKE COUNTY—LEADVILLE.

Several months ago the smelters were complaining at a scarcity of silicious ore, in consequence of which they were unable to run all of the furnaces. Fortunately this condition has been changed by the opening up of several bodies of this ore in the Penn, Big Six, Ibex and others.

Arkansas Valley.—The increase of the tonnage from the district has been so great since the first of the year that another furnace and several roasters are in course of construction at this plant. When completed the smelter will have nine blast furnaces and will be in a position to handle the extra tonnage. At the present this overplus is being stacked in different parts of the yards for future use.

Mike.—This and the Little Sister claim, operated by the United Mines & Development Co. on lower Rock hill, where two drill holes were put down and the Leadville formation found in place, also bunches of mineral, will sink a shaft about 300 ft. east of the first drill hole on the Mike. Work has started and the shaft is going down through the wash, which is 48 ft.; the lake bedding is 400 ft. thick, then comes the block porphyry and the blue lime at 680 ft. Commodious surface buildings are being erected, and a good plant of machinery will be installed, and the shaft sent down 700 feet.

Ten Mile.—This mine, at Robinson, will resume operations in a few days. A meeting of the stockholders of the company was held here recently and sufficient funds subscribed to carry on the work.

New York Tunnel.—This is being driven into Mosquito range from this side to catch the extension of the London mine; the tunnel is in 400 ft. and is being driven ahead. From South Mosquito basin another tunnel is being driven to catch the eastern extension of the London, and it also is in 400 feet.

Venture-Sugar Loaf.—A tunnel was driven 100 ft. on this property and an upraise made which went up 60 ft., where a good body of ore was opened, and the lessees are now in a position to ship 200 tons per month. The character of the ore is sulphurettes running well in silver.

Bertha.—This property, on Breece hill, is under lease to the Hume Brothers. A fair body of ore was opened at 85 ft. from the surface, and shipments are now averaging 15 tons a day. Two or three streaks

in the ore shoot are very rich with the balance low grade; a judicious mixing of the ore sends a good grade to the smelter.

Corona.—This mine, lying between the A. Y. and Minnie and the Colonel Sellers, California gulch, is sinking the shaft another 50 ft., so as to be able to get under the ore. Work will be completed by the end of the month, when drifting will be started.

Alhambra Placer.—Denver and Eastern parties have secured a lease on this ground and will sink a shaft in the near future. This ground lies north of the Nil Desparendum, and is on the trend of the Reindeer shoot.

President Shaft.—This property, on the southern slope of Rock hill, Iowa gulch side, has reached the contact and encountered mineral which is low grade. The shaft will be sunk a little deeper, when drifting will be started, and the ground thoroughly prospected.

Triumph.—This mine will resume operations by the first of the month. The shaft is down 750 ft., and in the upper levels the orebody split, one part going into the Ibex ground and the other to the east. The lessees when they resume work will drift from the bottom of the shaft to catch the ore shoot to the east. The ground at the bottom is heavily mineralized, and it is expected that drifting will not have to be carried very far before the shoot is caught.

SUMMIT COUNTY.

King Solomon Tunnel & Development Co.—The annual meeting was held recently in Chicago and the reports show that there is \$15,000 in the treasury, which is to be expended in development work, and the company decided to install a power drill in its tunnel. Col. James H. Myers, Breckenridge, was elected vice-president and general manager.

Salt Lick.—Lemuel Kingsbury, of Breckenridge, has secured an option and made two payments on these placers, owned by W. F. Forman and others, the placers being located north of Dillon and 12 miles north of Breckenridge. The gold from these placers is of high grade, selling for upwards of \$18 per ounce at the United States Mint. Col. Kingsbury expects to expend about \$40,000 in equipment and labor on the property during the ensuing season.

Old Union Mining & Milling Co.—The new machinery for the 100-ton concentrating mill of this company in French gulch, has arrived, and is being installed, and the mill is to be ready for running by March 15. The company expects to treat custom as well as company ores for some time.

TELLER COUNTY—CRIPPLE CREEK.

Stratton's Independence, Ltd.—The ore house on this property was burned down the first of the week, involving a loss of about \$20,000. Through the hard work of the men the other buildings were saved. The cause of the fire is not known.

Gold Sovereign.—This company distributed this week to its stockholders a dividend of one-half cent per share. This is the first dividend paid by this company. The money to pay the dividends was derived from royalties from ore shipped by lessees. There have been a number of lessees that have made money lately.

Independence Consolidated Gold Mining Co.—A number of leases are being let on this property, and it is the intention of the company to work the property in the future. The property has been in litigation for some time, and very little work

has been done on it, but now that the litigation has been settled, a large amount of work will be done. Some of the lessees are well-known mining men. Among others is R. R. Russel, who formerly took out a large amount of ore on this property.

Mine Owners' and Operators' Association.—At a recent meeting of this association the following gentlemen were elected members of the executive committee: Wm. Bainbridge, A. T. Holman, C. W. Howbert, A. E. Carleton and Mr. Becker. Mr. Bainbridge was chosen president and Mr. Holman vice-president. Mr. T. B. Burbridge was elected secretary and treasurer.

Last Dollar Gold Mining Co.—It has been decided to lease the larger part of this property, and already a number of applications are in. The company reserves part of the property for its own use.

IDAHO.

BLAINE COUNTY.

Wood River Zinc Co.—A 200-ton mill is to be built by this company at Deer Creek.

BOISE COUNTY.

Lost Placer.—It is reported that a smelting plant will be erected on this property, near Boise, in the spring. Jay A. Czizek is manager.

Montana.—It is reported that \$50,000 has been raised for development work on this property. Jay A. Czizek is manager.

Leviathan.—A good body of sulphide ore is reported opened up on this property, at Pearl. An ore house is to be constructed in the spring.

ELMORE COUNTY.

Basil.—This property, 20 miles north of Pine, is being worked by a tunnel which is in 140 ft. A mill is to be built.

IDAHO COUNTY.

Crooked River Mining Co.—A cyaniding plant is to be erected at once on this company's property, at Stites.

Boise Exploration & Mining Co.—This company has secured the Lawson placer property, at Resort, near Warren. Work will probably be started in April.

SHOSHONE COUNTY.

Oom Paul.—Extensive improvements are said to be contemplated at this mine, at Burke, at an early date. Already over \$20,000 has been expended.

INDIANA.

Conditions in the bituminous coal fields of Indiana have undergone no change during the past week, notwithstanding the severe weather. There seems to be an abundance of coal in all the markets and the demand is so slight miners are idle nearly half their time. Prices have also decreased and the outlook is not very encouraging.

GIBSON COUNTY.

A company has been organized with headquarters at Francisco to develop the coal fields in that vicinity. Two good veins of coal have been struck.

KNOX COUNTY.

Lynn.—This coal mine, owned by the Lynn Coal Co., has been closed down. The company is now driving a shaft down a vein 100 ft. below the one previously worked. This vein has been reached by test holes and coal of excellent quality nearly 7½ ft. in thickness has been found 250 ft. below the surface.

VANDERBURG COUNTY.

E. R. Wood has been appointed receiver of the Evansville & Ohio River Coal Company. The company is capitalized at \$300,000, and \$75,000 has been invested in a new mine. The receivers will issue receivers' certificates of stock to carry on the business until the company disposes of its output.

INDIAN TERRITORY.

CHOCTAW NATION.

Kala-Inla Coal Co.—This company has recently opened a mine between Hartshorne and Gowen on a spur of the Chicago, Rock Island & Pacific railway, on the outcrop of the Hartshorne vein of coal, and in what is known as the Grady basin. The coal is about 3½ ft. thick and pitches about 15% from the outcrop. Bache & Denman, Ft. Smith, Ark., are the proprietors.

CREEK NATION.

Creek Coal & Mining Co.—This company has just been organized and is opening a mine at Henryetta on the Frisco, Indian Territory.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

Challenge.—Sinking has reached the ledge in the shaft which the St. Mary's Mineral Land Co. is sinking on this property. It is evidently bottomed in the west vein of the Baltic lode and considerable copper is in evidence.

Tamarack.—Parts of the new drum for the old Nordberg hoist at No. 5 shaft are on the ground and going into position. It is expected that the hoist will be ready for service in a short time when work will be resumed in the other two compartments of the shaft.

Rhode Island.—Results at this property during the past month have been more encouraging than for a year past. A stretch of 75 ft. of ground showing considerable copper has been opened on the Pewabic lode, drifting being in progress 750 ft. from No. 2 shaft at the eight, or 1,000-ft. level. Sinking in No. 2 shaft continues, the shaft being nearly to the ninth level, which will be established at a depth of 1,300 ft. As soon as the shaft reaches the 10th level cross-cutting to the Pewabic lode, west of the shaft, will be started and the formation will be investigated by drifting after it has been reached.

Calumet & Hecla.—Besides the usual operations on the Calumet conglomerate, this company is conducting considerable development work on the Kearsarge and Osceola lodes. No. 19 and No. 20 shafts penetrate the Kearsarge belt on the north-eastern portion of the property. Both have been provided with efficient surface plants and are shipping rock to the stamp mills at Lake Linden. No. 21 shaft is simply for exploratory purposes, but it is likely that it will be furnished with a better equipment in the spring. About 100 men are employed in No. 13 shaft on the Osceola amygdaloid bed and rock shipments are being maintained from that opening with quite favorable results.

NEW MEXICO.

OTERO COUNTY.

Standard Lithographic Stone Co.—This company, which owns several claims on which work has been in progress for

some time, is putting up extensive works for the preparation of lithographic stone for the market. The stone found on the company's property has been carefully tested, and has been found equal to the best Bavarian stone. The company is making arrangements to put it on the market on a large scale. The plant includes a gang of 20 saws, a polishing machine, compressed air drills and other machinery. Power will be furnished by a 50-h.p. engine. The machinery has been received and is now being erected, but it will probably be two months before it is in complete working order. In addition to the machinery for preparing the stone, the company intends also to put up a plant to make cement and other by-products from the waste and refuse incident to quarrying and preparing the stone. This will be the first place where lithographic stone is worked in this country on a commercial scale.

Adjoining this property are several claims on which excellent stone has been found. These are owned by Alf. F. Pokorny, of La Luz. It is understood that he is making arrangements to dispose of a share of this property and to work it on a considerable scale. The claims mentioned include all the stone of good quality known to exist in the neighborhood. The location is at High Rolls, six miles north of La Luz.

PENNSYLVANIA.

ANTHRACITE COAL.

The Exeter colliery of the Lehigh Valley Coal Co., at West Pittston, has been shut down owing to a novel dispute that has arisen between the operators and the miners. The Red vein in this colliery is very dangerous, 25 men being killed there last year. The company notified the miners that they would not be permitted to leave the mines until the laborers had finished loading in order to see that everything was done to obviate accidents. The miners resent this action, as they say it is equivalent to increasing their day's work four hours, for which they receive no extra pay. This is an exceptional case, the circumstances being local and peculiar. The differences will probably be arranged amicably.

A number of new washeries have been erected recently up and down the anthracite valleys. Some of these replaced those that have been burned down, while others are new plants.

Some minor changes have been announced among the foremen of the Pennsylvania Coal Co., but none that affects the higher officers.

Philadelphia & Reading Coal & Iron Co.—This company's statement for December and the six months from July 1 to Dec. 31, is as follows:

	December.	Six months
Earnings	\$3,681,643	\$16,887,204
Expenses	3,375,850	15,702,745
Net	\$305,784	\$1,184,459

For the six months the earnings increased \$1,166,254, and the expenses \$1,421,025; the result being a decrease of \$254,771 in net earnings.

UTAH.

BEAVER COUNTY.

Frisco Contact.—It has been decided to equip this property with gasoline hoisting machinery, the order for a steam plant having been countermanded upon the company's failure to secure a supply of water from a neighboring company.

JUAB COUNTY.

Lower Mammoth.—At the annual meeting of stockholders a board of directors was chosen, consisting of Simon Bamberger, Sidney Bamberger, John Dern, H. G. McMillan, A. C. Ellis and W. S. McCornick, all of Salt Lake. The company has an indebtedness of about \$19,000.

May Day.—Ore shipments from this property have been considerably lessened. The mine contains a large tonnage of milling ore.

PIUTE COUNTY.

Trapper's Pride.—This property is undergoing expert examination preparatory to a vigorous development campaign to be inaugurated shortly.

SALT LAKE COUNTY.

Bingham Consolidated Smelter.—The copper bullion shipments from this plant during the week aggregated 304,625 pounds.

Ramore Mining Co.—This is a Montana corporation, with a group of four claims—the Ramore, Glandore, Gertrude and Sulphur Cap. They lie about a mile southeast of the Park-Central, and about two miles south of the Mountain Boz, and have been more extensively exploited than any other group of claims in the district. A quartz vein traverses the Sulphur Cap, on which a shaft has been sunk 66 ft. From the bottom, two drifts have been driven four feet wide, the width of the vein at that depth; one of them is in 100 and the other 20 ft.

Utah Consolidated Smelter.—Copper bullion shipments made during the week ending Jan. 14 aggregated 357,988.

Utah Copper.—The concentrate produced at this company's mill last week averaged a little better than 35 per cent copper.

United States Smelter.—The copper bullion shipments from this plant during the week amounted to the aggregate of 246,049 pounds.

WASHINGTON.

FERRY COUNTY.

Washington.—This mine adjoins the Park-Central on the southeast. One tunnel of 20 ft. and another of 25 ft., have been driven on a 4½-foot quartz vein, which assays well in silver and copper.

Wasco.—This group combines the Bumblebee, Humming Bird, Columbia and Wasco claims. They are traversed by two well-defined quartz veins, which have been exploited by open-cuts, a shaft and a tunnel. The latter penetrates the hill on the Wasco ground 276 ft., on a nearly due east course, and crosses several quartz stringers which assay well in silver, copper and lead. The highest gold value shown was \$2.50 per ton. One of those stringers, measuring 2 ft. across, was encountered at 182 ft. in from the portal. The lead and copper minerals are fine-grained galena and chalcopyrite. The ore, when freshly broken, has a handsome appearance. The tunnel terminates beneath the apex of the largest cropping on the group, at a depth of 135 ft.; but that cropping does not appear to be connected with any of the stringers crossed in the tunnel. It is from 20 to 25 ft. wide, has been partly cut into along a smooth foot-wall, and strikes diagonally across the formation toward a contact of hornblende schist on the east.

PHILIPPINE ISLANDS.

Philippine Gold Mining, Power & Development Co.—The *Far Eastern Review* gives some interesting particulars with regard to this company. It was organized

by Mr. H. J. Robinson, one of the mining pioneers in the islands. He located a number of claims in the Benguet Co. They are on Batwang creek, a short distance from its confluence with the north Batwang river, not far from the town of Baguio. They are about three and one-half miles from the government road, which is now under construction from Dagupan to Benguet. The development work to date consists of about 4,000 ft. of adits and cross-cuts, and has shown the existence of a large body of free-milling ore, with occasional rich pockets. No hoisting will be required, as the work will be done entirely through the adits which are run in from the level of the creek, and the ore developed above that level is sufficient to last for a long time. The North Batwang river furnishes power enough to run all the company's machinery, and no steam plant will be required. An electric plant is in course of erection, which will supply all the power needed for mining and milling, and will also furnish light for the company's operations, and for the town of Benguet. The first milling machinery purchased has been received, and is now being erected at the mine. It is a 10-stamp mill made by the Joshua Hendy Machine Co., of San Francisco. The mill building is completed with an assay office, and quarters also have been built for the miners from Japan, but most of the workmen are Igorotes, who are paid 50c. per day. The directors of the company are: James F. Kemp, W. S. Gray, A. W. Marshal, Geo. B. Griswold and John J. Meyers. The president is James F. Kemp, of Washington; vice-president, A. W. Marshal, of San Francisco; secretary and manager, W. S. Gray, also of San Francisco, where the main office of the company is located. Mr. H. E. Robinson is superintendent of the mines. The company intends to make a thorough test of the property with the 10-stamp mill before putting up further machinery.

Foreign Mining News.

ASIA.

CHINA—CANTON.

Weihaiwei Gold Mining Co., Ltd.—This company shows in its report of the first month's crushings that out of 1,900 tons crushed, 87 oz. of gold and 59 oz. of silver were extracted, and from concentrate 79 oz. of gold and 468 oz. of silver. The report caused a slump in the shares on the Shanghai market, and they fell from \$28 to \$18, and are now weak at \$20, the par value.

Chinese Engineering & Mining Co.—This company is again trembling between two flags. The proposal to attempt to place this largest of all Chinese mining companies again under the Chinese flag is being watched with interest throughout China. Mr. Gustav Detring, Commissioner of Customs at Tientsin, the adviser of Chang Ying Mao, the original concessionaire, left recently for England to open negotiations for the proposed flag-changing.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending Jan. 21 were as follows, in tons: Granby, 6,990 tons; Mother Lode, 2,984; Brooklyn, 1,938; Sunset, 63; Mountain Rose, 99; Emma, 627; Oro Denoro, 99; Senator, 264; Last Chance, 20. Total for week, 12,884 tons; total for year, 41,212 tons.

DIVIDENDS.

Gold, Silver, Lead, Quicksilver and Zinc Companies—U. S.

Coal, Iron and Other Industrials—United States.

Table with columns for Name of Company and Location, Authorized Capital, Shares (Issued, Par Val), Dividends (Total to Date, Latest Date, Latest Amt.), and Name of Company and Location, Authorized Capital, Shares (Issued, Par Val), Dividends (Total to Date, Latest Date, Latest Amt.).

Canada, Central and South America, Mexico.

Table with columns for Name of Company and Location, Authorized Capital, Shares (Issued, Par Val), Dividends (Total to Date, Latest Date, Latest Amt.).

NOTE: These dividends are published gratuitously. Readers are invited to send any additions or corrections which they think necessary to complete our list

Chemical Evolution.

The periodic sequence is a wide and valuable arrangement of the chemical elements; but it contains several apparent inconsistencies, not to mention many vacant seats. Among the confusing statements may be mentioned the reversed atomic weights of nickel and cobalt in one group, and of iron and tellurium in another. In the most recent and most accurate atomic-weight determination, nickel certainly is a little below cobalt; yet the chemical relation would seem to reverse this, putting cobalt nearer iron, and nickel nearer copper. Again tellurium appears to be the homologue of sulphur and selenium, and should have a lighter atom than iodine; but the atomic weight determinations, while not strictly accordant, yet seem to put tellurium at 128, and above iodine, which is near 127. Now iodine is a well-defined halogen, falling into its place under fluorine, chlorine, and bromine; and tellurium, as mentioned above, seems a well-defined 'metalloid.' The discrepancies in these cases are not yet explained. They may serve as promising starting points for new discovery. They may involve contamination with small quantities of unknown elements. They may involve the new idea (borrowed from radium chemistry) of atomic disintegration, or concretion. But whatever the explanation, one conception is coming out more clearly with every new fact and theory, namely, the doctrine of the evolution of the chemical elements.

We are familiar with the hoary dignity of the nebular hypothesis, and with the more recent story of organic evolution; but back of the comparatively recent and youthful nebulous whirl—back in what may reasonably be called the more original period of the cosmos—when time was really young—at least in our part of the universe—back there somewhere, the elements were probably evolved from a simple form of matter by a system of their own. Imagination must guide us in reading between the lines of the Periodic Sequence this fascinating story of 'the ether babies.' Indeed, the first few volumes of this 'Descent of the Elements' are missing, but we can fill out the story fairly well. There was a something, and it had parts. It was hot, hot beyond description. These modern refrigerators called suns and stars are only cold-storage remnants of celestial history. This something was squeezed to a solid. It broke off in shells—each shell forming a series long or short. Each shell stretched its elbows as it tore away from the parent mole, and so we find the remarkable order of varying atomic volume, with regularly increasing weight. The dream is so vivid—it wakes us to reality—but the echo of the dream is true

all the same. Some day modern science will seriously and soberly consider this new aspirant for recognition in the history of evolution. The atom is waiting to tell his story to the chemical Lamarck, or Darwin, who has the ear to hear.

May the inconsistencies and omissions in the Periodic Sequence grow—and they are many—till the very gaps shall force out the reluctant confession. Confusion in atomic-weight order, confusion in rare earth identification and fractioning, confusion in multiple spectra of one element, confusion in allotropic form, confusion in argonoid element, in helium radiation, and in electron emanation, impossible distribution of atomic weight, missing elements in one place, superfluous twins and triplets in others—it all means something. The story of the elements is yet to be written; indeed, carbon is the only one that has thus far accumulated very much of a chemistry. But when it shall be written—this new chapter of atomic birth and growth—men will give thanks for another page in the old Nature story which is never old.

Canadian Mining Institute.

The circular from the secretary's office gives notice that the annual general meeting of the Institute will take place in Montreal, March 1, 2 and 3. The headquarters will be at the Windsor hotel. The opening business session will be held on Wednesday morning, March 1, commencing at 10 o'clock, when the annual reports will be presented, scrutineers appointed for the ballot, and other business transacted. The time of other sessions will be announced later. The annual dinner will be held in the Windsor hotel on Friday evening, March 3.

The usual half-rate concession will be made by the railroads to members attending the convention.

The following preliminary announcement is made of the papers to be read and discussed at the meeting:

1. President's address; Eugene Coste, Toronto.
2. Carboniferous of New Brunswick; H. M. Ami, Ottawa.
3. A New Mining District in the North of the Province of Quebec; J. Obalski, Quebec.
4. The Advantage of Combining Topographical and Geological Surveying in New Regions; Robert Bell, Ottawa.
5. Electric Furnace Construction; E. T. Snyder, Oak Park, Illinois.
6. Cheap Production of Pigments Direct from Sulphide Ores; C. B. Jackes, Toronto.
7. The New Plant at Copper Cliff, Ontario; A. P. Turner, Copper Cliff, Ontario.
8. Gröndal's Process of Briqueting; E. Haanel, Ottawa.
9. Varieties of Serpentine in the Asbestos District of Quebec; John A. Dresser, St. Henri de Montreal, Quebec.

10. A Correction in the Classification of Our Gold-rock Formation; F. Hille, Port Arthur, Ontario.

11. The Bornite Ores of the Pacific Coast in British Columbia and the Yukon; William M. Brewer, Victoria, British Columbia.

12. Uniform Mining Statistics in Canada; Eugene Coste, Toronto.

13. The Geology of the Goldfield District, Nevada; E. P. Jennings, Salt Lake City, Utah.

14. Colliery Surveys and Mapping; W. D. L. Hardie, Lethbridge, Alberta.

15. On the Occurrence of Hematite North of Little Current, Georgian Bay; S. Dillon Mills, Toronto.

16. The Possibilities of Steel Manufacture in British Columbia; William Blakemore, Nelson, British Columbia.

17. Mining Laws; J. M. Clark, Toronto.

18. The Artesian and Other Deep Wells on the Island of Montreal; F. D. Adams, Montreal.

19. Manufacture and Use of Wrought Pipe; Frank N. Speller, Pittsburg, Pa.

20. Notes on Some Hoisting Machinery; F. Cirkel, Montreal.

21. Concrete; R. W. Leonard, St. Catharines, Ontario.

22. Mining Possibilities of Arctic Canada; A. P. Low, Ottawa.

23. Notes on the Life History of Coal Seams; J. C. Gwillim, Kingston, Ontario.

24. Value of Undeveloped Mining Claims; G. R. Mickle, Toronto.

25. Mining Statistics; F. Hobart, New York, N. Y.

26. Canadian Metallurgical Products for the Far East; F. Hobart, New York, N. Y.

27. Need of a Provincial Museum in Ontario; W. A. Parks, Toronto.

28. Bankhead Coal Mines; C. M. Henretta, Fernie, British Columbia.

29. Iron Pyrite in Eastern Ontario; E. L. Fraleck, Belleville, Ontario.

30. Crude Oil Fuel; J. N. S. Williams, Punene, Maui, Hawaii.

31. Canadian Mica Mines; E. T. Corkill, Bristol, New Hampshire.

32. A Canadian Dellwik-Fleischer Water Gas Plant; E. A. Sjostedt, Sault Ste. Marie.

Papers have also been promised by the following members, the subjects not being announced as yet: W. C. Miller, Toronto; A. E. Barlow, Ottawa; Chas. Fergie, Westville, N. S.; Frederick Keffer, Anacosta, B. C., and C. W. Dickson, Kingston, Ontario.

Some elements can be set free by forced oxidation, as chlorine and bromine; some by reduction with heated carbon (CO), as copper and iron; some by heated hydrogen; some by sodium; but the great refractory group of the rare earths in the left center of the periodic sequence, which resist most other agents, yield to aluminum.

The Mesabi Iron-Ore Range.—IV.

By DWIGHT E. WOODBRIDGE.

Contrary to the general impression, open-pit mining has been more or less common along Lake Superior since its first mines opened. Of course original openings on most ranges were pits, and so remained until the problems of economical operation at depth forced miners underground. Open-cast work began in Marquette county in 1854, and the ore was taken out of the pits in wagons, buckets and wheelbarrows, and in every other imaginable way. It has been the magnitude of these open mines on the Mesabi, and the vast product therefrom, that have dwarfed similar operations elsewhere and made the Mesabi, in popular esteem, the exemplification of everything in the way of stripping. The steam shovel has been employed in mining on the Lake since Capt. Joseph Sellwood, in 1884, first dug ore out of the Colby, on

scale was made at the Biwabik mine. This work was under the direction of John T. Jones, of Iron Mountain, acting for Peter L. Kimberley and associates. Subsequent to April, 1892, a large amount of money was spent in exploration, and the steam-shovel method of stripping and mining was decided upon. This was in spite of a heavier surface than most mining men believed it practicable to strip, and the operation was watched with the greatest interest throughout the entire Lake Superior region. It was generally looked upon by old range miners as of the utmost importance to them, for they believed their doom was sealed if the Mesabi was to be opened as cheaply as Mr. Jones stated. Preliminary work was of the most extensive and costly nature; an electric light plant was provided, tracks, steam shovels and cars were purchased and the

arose. Not the least of these was the question as to how deep it would pay to strip, and after the stripping was done how to mine the exposed ore. It was generally contended on other ranges, and by those who did not appreciate the tonnage in single orebodies, that a very few years would see them mined so deep that the difficulty of handling ores out of mines would be so serious as to force the abandonment of the new system. Two general methods of open-pit work were adopted, one to strip a comparatively large area and then, usually after loosening the ore by blasting, to load it by means of steam shovels into standard-gauge railway cars alongside the shovels. The other method is perhaps most properly called the 'stripping-milling,' and is a combination of surface and underground workings. The ore is stripped of its surface covering of earth and boulders, then loosened by hand or powder, and milled down through raises. These connect with drifts estab-



MAHONING MINE IN 1904.

the Gogebic range. It is probable that the extended use of this machine in Lake Superior mining, both in open-pits and for loading stocks from underground mines, is saving the mines of the district more than \$5,000,000 a year, and is permitting a tonnage that, otherwise, would not be attainable. It would be utterly impossible to secure enough men to produce the tonnage annually demanded from the Lake region if all operations were without the use of this, or some other equally efficient, labor-saving machine, and the cost of labor would be such as to render worthless much of the vast store of ore now adding to the world's wealth.

Methods of open-pit mining have included steam shoveling, milling and steam-shovel milling; of underground, caving, longitudinal back-stoping, slicing, square-set and slicing and caving combined. On the Mesabi, in addition to the three varieties of open-pit work, the square-set, slicing and caving-slicing are in common use. On the Vermilion the overhead stoping system is employed at Soudan and the caving method at the soft ore mines of Ely.

As has been stated before, in this series, the ores of the Mesabi are soft, and lie in beds whose greatest diameters are nearly horizontal, and at no great distance from the surface; open-pit mining, therefore, is especially applicable to existing conditions. This was recognized in the early days of the range, and a notable attempt at removing overburden on a large

job started. The severe winter of 1892-3 and the subsequent financial stringency, together with a stripping deeper than had been anticipated, on account of the lean character of much of the upper ore, combined to defeat plans and change estimates, and a smaller quantity of ore than had been hoped for was produced in 1893, though the total of 151,500 tons broke all records for a first season. The mine passed successively into possession of the Biwabik Bessemer Company and the Biwabik Mining Company, and the original plans of Mr. Jones have finally been carried out, with slight modifications. This mine has shipped up to date 5,508,856 tons, the product of 1904 being 648,000 tons. The Biwabik job was by far the largest and most important operation undertaken on the Mesabi range at that time, and the developmental problems presented there were exceedingly difficult. There have been removed from this mine the enormous amount of 4,000,000 yards of overburden that contained, in addition to the customary gravel, much hardpan and a great quantity of granite boulders, all of which added to the difficulty of the stripping operation. Until the completion of a great through-cut, by which trains of ore and stripping might be passed directly through the mine without switching, the operations were complicated by the extreme difficulty of handling cars to, and loads from, the shovels.

With the opening of the Mesabi and its unusual placement of ores, new problems

lished 50 or 60 ft. below the top of the ore, or, in shallow deposits, along their floors. From the raises the ore is loaded into cars, trammed to shafts, dumped into skips and hoisted to surface.

It is plain that, in a general way, the use of the first method of open-pit mining has not the elasticity of application possible to milling; it should properly be limited to such favorable conditions as are presented by a large orebody with approaches not exceeding 3 per cent grade. The excavation of long, deep railway approaches in adjacent drift is expensive, especially if not over ore, and militates against the steam-shovel method of taking the product. Still, seven times as much ore is mined upon the Mesabi range with steam shovels as by milling.

Exact estimates of relative costs are unnecessary in order to institute comparisons between the various forms of open-pit mining. In estimates that have appeared from time to time, and have usually reached grossly inaccurate conclusions, the output of one steam shovel and attendant locomotive has usually been taken as from 3,000 or 4,000 tons (a few years ago) to 5,000 tons or more (now) per day of ten hours. These estimates to the contrary, a shovel crew that will maintain an output of 3,000 tons per day for a season through is exceptionally active and fortunate, and is to be commended. Contracts for removing surface at these mines in the earlier days averaged 40c. per yard; now, owing to improved methods, standard-

gauge equipment and greater operations, they are not in excess of 30c. A yard is from one to one and one-fourth tons. Cost sheets of stripping, in fairly favorable locations, sometimes run for months, including repairs and depreciation, from 15c. to 18c. per yard, and some, in very difficult work, have not been in excess of 18.5c. to 20c. These were not contract figures, but actual costs. It is not probable they have been equalled in many cases. Individual conditions probably had more or less to do with these low costs. The expense of moving ore is less than that for moving overburden. The record work for steam shovels in Mesabi range ore has been as follows:

Mine.	Burt.	Mountain.	Mahoning.	Stevenson.
Date.....	August 6, '03.....	August 13, '04.....	1902.....	July 28, '04
Make of shovel.....	Marion 91.....	Marion 91.....	Bucyrus.....	Marion 98
Weight of shovel.....	93 tons.....	93 tons.....	65 tons.....	100 tons
Capacity of dipper.....	5 tons.....	5 tons.....	3½ tons.....	6 tons
Gross tons loaded.....	5,096.....	4,826.....	4,100.....	7,109

These shovels loaded into cars of an average capacity of 35 gross tons, and in order to make the records it was necessary for the dippers to scoop full loads about 100 times an hour for the full day of ten hours. Much time is necessarily lost in frequent change of shovel position, in the 'spotting' ahead of cars to the shovel, and in the removal of loaded trains, hence the skill required to make such records is great. It must be remembered that any such output as that of record days, or record weeks, is not to be maintained through the season. There is usually insufficient tail-room for steadiness of operation, and accidents and unexpected delays must be frequent. Loading these 'ore farms' of the Mesabi cannot be considered equivalent to loading stockpiles, where a cost of 2.5c. per ton is frequently reached, since conditions are very different.

The possible depth of stripping is a question that has been threshed over time and again. In the early days of the range it was considered that if there was a foot in depth of ore to every foot in thickness of overburden, the surface might be stripped, providing that the total thickness of overburden did not exceed some certain figure, usually from 35 to 40 ft. This was advanced practice. I remember very well a scholarly paper in the *Transactions of the American Institute of Mining Engineers* for 1897, in which it was stated that it would be impracticable to strip more than one foot of surface for every two feet of ore beneath, and that this was the dividing line at that time. But more recently, and in advanced operations, these ideas have been materially changed. The increased cost of timber and timbering, which is now from 10 to 12c. per ton of ore mined underground on the Mesabi, has had a material effect in this modification of views; so has the labor market. Wages are a very important part of the cost, and wages, as a rule, are high, necessarily higher in the north-west than for the same grade of work

further east. Then, too, there is less danger of labor complications when the work is done on the surface by the fewer number of men required for steam-shovel operations than by the greater number used underground, for an equivalent tonnage. Other considerations have tended toward a deeper stripping and a greater ratio of overburden to ore, heavier and more economical machinery being among these. Then, further, where could enough men be secured to permit the present output if it were all from underground?

Theoretically the problem can be figured by taking a prism whose bases are the surface of the ground and the bottom of the ore to be mined, and computing its

contents, making allowance for berms and slopes and entrances. Most published estimates have been inaccurate because they have not allowed enough for these items; and disaster has befallen those who have not made due allowance. Roughly speaking, ore will weigh about two tons to the overburden's one, or nearly so, and a yard of ore is about two tons. The 30c. one must pay the contractor for removing a yard of surface will uncover nearly a ton of ore; if the latter is half as thick as the stripping. If it costs 10c. a ton to steam-shovel this stripped ore into railway cars and get it out of the mine, and to carry on the necessary pumping—and 10c. is an ample charge in most cases—the cost of stripping and mining combined, with ore half the thickness of stripping, will not exceed 40 to 45c. This is a sufficient saving, as compared with underground costs, to pay for the removal of lean ore, such as has to be moved from the shovel but cannot be sold, for the waste in bank slopes, in approaches, and in berms, that in the case of a long and narrow excavation are a material consideration. It is quite possible that, as time passes, it will be found that scarcely a large mine of the Mesabi has been opened underground that might not have been more economically handled by some open-pit method—providing always that the deposit is uniform and clean, and not mixed with rock, sand, or other material. Of course, the initial costs of stripping are exceedingly heavy, and a large investment is required to take advantage of the system. Many times such investments are not possible or advisable. The matter resolves itself, to a certain extent, into the conditions governing individual cases.

Steam-shovel mines must be drained, and this frequently means a system of drifts beneath the pit, and also a pumping plant. One large open-pit, whose yearly product approximates 1,000,000 tons, is handling 1,580,000 gal. per day the year through. The expense of driving drains must be added to all other costs,

while in other systems of mining this is not true.

The proportion of ore mined on the Mesabi range in 1903 by steam shovel was 43 per cent, and for 1904 it was 50 per cent of the whole.

The milling system was inaugurated at the Chandler mine, of the Vermilion range, in 1888. The railroad reached Ely and the mine September 28, and 57,300 tons were mined and shipped before the close of navigation that fall. Mr. Sellwood was in charge of the mine, and so successful was this method that it attracted attention at once, and its merits were recognized. Of course milling at Chandler was soon superseded by caving, for the amount of ore under a light earth surface was small. In milling, after a given amount of stripping has been done, a large part of the ore uncovered may be removed before further earthwork is necessary. The initial cost per ton of ore is therefore much less than in the larger opening required for steam shovel. When a block of ore has been removed the pit may be utilized as dumping ground for further stripping, and in this way not only will the cost of removing waste be very much less, but the question of where to dump it will be eliminated. This has been, in cases fresh in mind, a serious matter. In a stripping job now under way the waste dump is two miles from the pit, making a long haul. By using an adjacent pit for waste, gravity would be made to do very much of the work. In removing ore under the milling system, shoveling is almost entirely avoided until the bottom is reached. A shaft must be sunk and frequent raises put up through ore to its surface. This is an additional cost, but of slight moment per ton of ore developed thereby, and the ore to be mined will be drained by these raises. As high as 40 tons of product per man per 10-hour day has frequently been made in milling mines, and full days' hoisting, through a single shaft, has been at the rate of 90,000 tons per month. In a full month the Auburn mine hoisted 67,000 tons. But 40 tons per man is by no means a safe estimate, nor can it be done when proper deadwork is going on ahead of the stopes. It is probably safe to say that in mines of otherwise equivalent conditions, milling of ores will run at least 25 to 30c. per ton cheaper than caving, square set and slicing; also that milling exceeds steam-shovel costs in mines of reasonable output by from 10 to 15 cents.

In milling, raises are usually placed about 40 ft. apart in the drifts, and are properly timbered to serve as chutes, with pockets and spouts at their base, through which the ore is drawn into tram-cars. When these are mined down, a second series is put up to handle the pyramid of ore left between the first. In loosening ore the work is usually done by powder; holes are drilled around the sides of the craters by driving down pointed steel

rods varying in length. These holes are chambered by several sticks of dynamite and then filled with, say, two or three hundred pounds of powder. Much of the

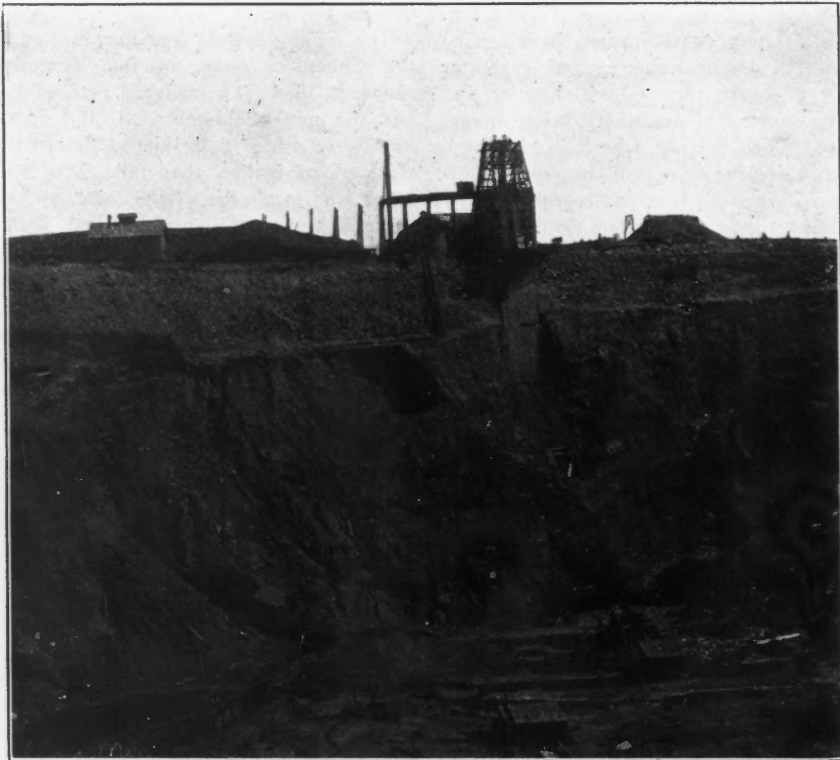
and plans for moving a much heavier surface are under consideration. But it is impossible for any method of mining that requires timbering to approach the prod-

method lends itself most favorably to the largest deposits.

In the 13 years of Mesabi development more than 16,000,000 cu. yd. of overburden has been taken from its mines, at an approximate expense of between five and six million dollars, and the mines have produced 78,800,000 gross tons.

The new magnetic arc lamp gives a long flaming white arc which radiates light in a horizontal direction. With 300 watts, it gives as much light as the ordinary arc with 450 watts. It operates by direct constant-current generators of 4 amperes, each lamp taking about 80 volts. The arc must be protected from side draughts.

The Department of Commerce and Labor seems to have more than a suspicion that there exists a large illicit trade in diamonds between South Africa and the United States. The following is found in Official Report No. 2,117, entitled, 'Precious Stones Industry': "Evidently this whole diamond business is the closest and most powerful of trusts, for not only is the trade conducted in an 'underground' way, concealed from all public scrutiny, but it seems to be managed independently of all custom-houses intervening between Cape Colony and the United States. . . . Surreptitious trade is now greatly favored by the secrecy with which the trade is conducted,



MILLING AT AUBURN MINE.

ore is broken directly into chutes when blasted, and the cheapest labor serves to drop the rest; no ore is lifted by hand. In both steam shovel and milling the loss of ore is practically nothing. The variation of milling called 'steam-shovel milling' is simply the use of the shovel to load tram-cars in the open-pit that is too deep for the use of locomotives in drawing out trains of ore. It is not really a class of milling at all, but is shovel mining applied to conditions that are liable to come in many operations when the depth of the pit becomes so great that hoisting by some other means than the locomotive is necessary. The shovel is placed beside a belt-line track, running about the pit and to the shaft, where tram trains dump into capacious pockets which fill the skips as they come to rest. Trimming in these belt-lines is by mule or hand. At Fayal No. 2 a shovel has been working at the depth of 150 ft. where the surface over ore was 90 ft., altogether too deep to permit the excavation of an approach up which a locomotive could be effective. In this form of pit, while the shovel may be working around the bank, a lower level may be attacked through a drift, and an opening made where the shovel can start a fresh cut.

About 7 per cent of Mesabi production is won by the milling system, and the number of mines at which this method is in use is extending. Stripping to a thickness of 80 and 90 ft. has been inaugurated,



MILLING PIT IN ADAMS MINE AT EVELETH.

uct from a system whose ton-costs of mining, stripping removed, are actually less than the timbering charge underground, especially when the steam-shovel

the values being declared in South Africa and concealed in Europe, and the whole business being carried on independent of European official record."

Gravel-Mining Costs in Alaska and Northwest Canada.*

BY CHESTER W. PURINGTON.

The data in the following table have been compiled from statistics collected during a recent inspection of the placer fields in Alaska, Yukon Territory and northern British Columbia. Of the statements furnished by operators, only those which are considered reliable have been used. The work attempted had no relation to the sampling or valuing of mining properties, and time did not permit, ex-

tracts of Alaska. The Interior province includes the Atlin district of British Columbia, the Klondike district of Yukon Territory, and the Fortymile, Eagle, Birch Creek, Fairbanks and Rampart districts of Alaska. The Seward Peninsula province includes the Nome, Council and Solomon districts of Alaska. The Nizina district of the South Coast province, and the Port Clarence, Fairhaven, and Kugrok districts

made to a depreciation fund. The fund is equivalent to the cost of plant and maintenance of same during the life of the property, plus six years' simple interest on the investment at five per cent. Each annual payment was divided by the season's output in cubic yards, and the amount thus obtained added to the daily working expenses, to get the total output cost per yard, as far as possible. Prices paid for mining property are taken no account of, as they represent an unknown factor. In cases where expensive plants

Capacity in cubic yards per 24 hours. Cost in Dollars and Cents per Cubic Yard. * * *

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Hydraulic; no pumping of water.	Hydraulic; with use of hydraulic lift.	Open cut; shoveling into sluice-boxes, including stripping top dirt; no pumping.	Open cut; horse-scraping.	Open cut; shoveling; wheeling to bucket; cable-tram to sluice.	Open cut; shoveling into cars; track and incline to sluice.	Open cut; shoveling into buckets or skips; skidding or tramping; and derricking to sluice.	Open cut; shoveling into sluice; tailings by hydraulic lift.	Open cut; steam-shovel excavating; track and incline to sluice.	Open cut; steam-scraping; generally on stripping work or tailings.	Dredging.	Drifting partly frozen or thawed ground requiring timbering.	Drifting and thawing solidly frozen ground; little or no timbering.	Winter drifting and spring sluicing of dumps.	Mining or stripping overburden by ground-sluicing.	Hydraulic by means of pumped water.	Booming with self-dumping water-gate.
	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.
SOUTH COAST PROVINCE:																	
Number of operations considered.....	6	6	6														
Capacity, cubic yards in 24 hrs.....	833	350	54														
Thickness of deposit in feet.....	30.3	25	5.6														
Thickness gravel worked in feet.....	30.3	25	3.7														
	.20	.31	2.01														
INTERIOR PROVINCE:																	
Number of operations considered.....	13		20		8					6			7			4	
Capacity, cubic yards in 24 hrs.....	1049		63	105	162	450	233	184	800	92	1062	50	75	50	150	830	250
Thickness of deposit in feet.....	37.4		8.6	20	17.5	14	15	8	22	15	35	60	26.4	26.4	9	33	7.5
Thickness gravel worked in feet.....	37.4	.235	3.5	10*	4.5	5	9	6	22	8.7	35	4	4.36	4.36	9**	33	6*
	.24		2.39	.60	2.14	2.43	1.75	1.25	1.46	.49	.49	4.25	3.38	5.14	.17	.65	.07
SEWARD PENINSULA PROVINCE:																	
Number of operations considered.....	4	10	5													3	
Capacity, cubic yards in 24 hrs.....	658	145	200				550		1000		700	80	20	83	173	250	
Thickness of deposit in feet.....	12	6.6	5				15		30		8	20	35	85	4	23	
Thickness gravel worked in feet.....	12	3.3	5				11		27		8	7	4	4.3	4**	23	
	.89	1.87	.46				.91		.52		.43	4.49	3.66	4.61	.10	.93	

* "Muck" and top gravel. ** "Muck" or fine sift and ice, from 50% to 75% ice. *** Lost time, prices paid for mining property, and cost of equipment other than mining (railways, wagon-roads, etc.), are not included. Any estimates based on the figures here given should take into account these expenditures otherwise the costs will be too low.

cept in a few cases, of the measuring of the ground.

Owing to the varying conditions governing the cost of mining in the North, the territory has been divided into three provinces. The South Coast province includes the Juneau, Porcupine and Sunrise dis-

tricts of the Seward Peninsula, none of which were visited, are separately considered.

In preparing the sheet, the working costs of 118 different operations were first tabulated with reference to the method employed and to situation. A second table was then prepared, in which the working cost was augmented by an amount per cubic yard based on allowance for depreciation of plant. A general figure of six years was taken as the average life of an individual property, and, except in the case of winter drifting operations, 120 days as the working season. It was then assumed that five annual payments are

have been installed the amortization was separately figured for each case. In cases of shoveling-in and small mechanical plants, the installation and maintenance cost was taken at an average amount for a group of operations in each district. Where the operation implies an additional stripping of overburden, which is always separately charged, the cost was distributed and added to the gravel extraction cost.

From the second table, where the costs were reduced to one figure for each district, a third table (the above), was prepared, giving as nearly as possible the average cost for each of the seventeen

* The figures given above are extracted from a forthcoming report on the 'Costs and Methods of Gravel and Placer Mining in Alaska,' and here published by permission of the Director of the United States Geological Survey. The data furnish as near approximations as the nature of the work permits. The cost of all supplies, rates of transportation, cost of labor, and description of water, timber and fuel resources in all important parts of the territory, as well as full descriptions of all the methods of mining employed, will be given in the final report.

separate methods considered in one or more of the three provinces. Where the operations from which the averages are derived exceed two in number, the fact is so indicated in the table.

The attempt has been made to reject figures which were evidently not representative. The final figure arrived at is not, however, always satisfactory. For example, under No. 5 (the method of working open-cut by shoveling into wheelbarrows, wheeling to bucket, hoisting and conveying to sluice by self-dumping carrier or cable), \$2.14 is representative for the Klondike, where seepage water is generally pumped from the pit, and many operators pump the water for sluicing. On the other hand, a plant in the Birch Creek district of Alaska, mining only 22 cu. yd. per day, and handling the water by a drain, operated at a cost of \$1.50 per cubic yard. In No. 13 (drifting solidly frozen ground, steam or hot-water thawing, hoisting and conveying with the use of the self-pumping bucket), the cost in the Klondike is \$1.95; while the higher figure given is arrived at by combining the expensive American camps of Fortymile and Fairbanks, where the cost is \$4.63 and \$3.56 respectively.

The high cost of hydraulicking with use of hydraulic lift, in the Seward Peninsula, is caused by the difficulty of moving the gravel to the bed-rock sluice,¹ and the expense of the ditches and installations. Hydraulicking by means of water under natural head without the use of the hydraulic lift, or some other means of elevating the material, was not seen in the Seward Peninsula. It is known that a hydraulic plant is in successful operation at Bluff, 50 miles to the east of Nome, but no data are available. In the interior, only bench gravels are hydraulicked. Steeper grades for sluices can be obtained, and the gravel is more easily moved. The high duty of the miners' inch in the Klondike is a large factor in bringing down the cost of No. 1 and No. 16. It should be distinctly understood, if hydraulicking costs in the interior appear attractively low, that the water supply is exceedingly variable, and that no reliable estimate can be made beforehand of the output of a given season's operations. Furthermore, while much of the bench gravel was originally rich, the pay-streaks have been largely drifted out, and the gold is not disseminated through the upper portion of the gravel to the extent that it is in California. With regard to the pumping of water for hydraulicking, the practice cannot be too strongly condemned. He is a bold man who attempts it, and a singularly fortunate one who makes a financial success of it.

Mr. Stephen Birch, operating in the Nizina district of Alaska, has courteously furnished, for this report, a summary of the costs of working placer ground on

¹This difficulty is due, not only to the exceedingly gentle grades of the streams, but also to the shingly character of the material handled.

Dan creek. These figures are given herewith, as they imply a total charge of invested capital, in addition to working costs against one season's operations.

By ground sluicing through 20-in. flume, 6,803 cu. yd., \$8,781.44, or \$1.14 per cubic yard.

By use of 8-in. cotton pressure hose and nozzle, through 20-in. flume, 1,600 cu. yd., \$1,457.00, or \$0.91 per cubic yard.

Use of pick and shovel only, through 10-in. sluice-box, 2,320 cu. yd., \$5,100, or \$1.87 per cubic yard.

273-ft. tunnel, 6 by 6 ft., timbered, \$1,017.00 or \$3.72 per running foot. Or 407 cu. yd. of gravel removed, which cost \$2.50 per cubic yard.

Mr. Birch adds: "While the cost may seem high, it is because of the fact that it includes the tools and material now on hand, which were necessary to remove this gravel. Now, if this work is continued for a number of years, the depreciation of the tools, etc., could be charged proportionately. These prices may not be a criterion for future operations in that country, but were our first cost of operation, and any strangers going into that section of country would be apt to run up their costs to these figures."

The cost of shoveling into sluice-boxes in the remote parts of the Seward Peninsula reaches to \$5 per cu. yd., and even higher. Some drifting operations have been carried on in the Kugrok and Fairhaven districts, on which figures are not at hand.

Dredging estimates furnished by reliable interior operators, place the cost at 80c. per cu. yd., where gravel must be thawed by points ahead of the dredge. In the Seward Peninsula it is estimated that if the property is sufficiently large for a ten-year life to be allowed, a dredge can be operated at the cost of 30c. per yard. The field for dredges in placer mining in Alaska, is extremely limited. In the Seward Peninsula it is not impossible that some of the wide, shallow creek deposits will be worked successfully by means of the steam scraper. The cost of an experimental operation on Ophir creek was said to be under 20c. per yard.

The costs of operating by two mechanical systems, in the Seward Peninsula (involving the labor of men in shoveling into cars and tramping, in the one case to the bottom of an incline, and in the other to a bed-rock sluice leading to hydraulic elevator throat), are unfortunately not available for publication. The derricking system, No. 7, however, both in the interior and the Seward Peninsula, appears to be superior in point of cost to either of the above mentioned, for the working of the average Alaska open-cuts.

Frozen ground cannot be attacked with success by the steam-shovel. Even where it digs the gravel successfully, if men follow it to clean bed-rock by hand, the cost of operating is sometimes doubled. The

steam-shovel has, however, a field in northern placer mining.

Regarding mechanical operations in general, the important principle should be emphasized that the main expense is getting the material into the receptacle which conveys it to the sluice or washing plant. Tramping, even for a long distance and to a considerable elevation, adds a very small proportionate amount to the total cost of working. The establishment of a permanent washing plant, economically situated, as regards water supply and dump, should be considered by every Alaskan miner who proposes working the shallow creek deposits which characterize that country. The isolation of the washing operations, together with the adoption of the most economical system of tramping possible, will go far toward attaining the ends of adequate grade and room for tailing, which are the *sine qua non* accompaniments of successful gravel mining.

Foreign Iron and Steel Trade.

The value of the iron and steel exported from the United States during the full year 1904 is estimated by the Bureau of Statistics at \$128,553,613. As compared with \$99,135,865 for 1903, this shows an increase of \$29,417,748 over the previous year. These figures cover not only raw materials, except ore, but also rolled products, engines, machinery and tools.

The amounts, in long tons, of the leading items for the two years stand as follows:

	1903.	1904.	Changes.
Pig iron	20,379	79,025 I.	28,646
Bars	59,543	75,549 I.	16,006
Rails	31,137	416,250 I.	385,113
Structural steel	30,641	55,514 I.	24,873
Wire	108,521	118,581 I.	10,060
Nails and spikes	42,644	45,108 I.	2,464

The tremendous increase in the exports of steel rails, will be noticed. The heaviest shipments, 216,801 tons, went to Canada; Japan and Asia received 101,738 tons; South America, 28,347 tons and Mexico, 23,871 tons. Shipments to all of Europe amounted to only 17,581 tons.

Imports of iron and steel, and their manufactured products during 1904 were valued at \$21,621,970, showing a decrease of \$19,633,894 from their valuation in 1903. The principal items, in long tons:

	1903.	1904.	Changes.
Pig iron	599,574	59,500 D.	520,074
Billets, blooms, etc.	261,570	10,801 D.	250,769
Scrap iron and steel	82,921	13,461 D.	68,460
Bars	43,393	20,912 D.	22,481
Rails	95,555	37,776 D.	57,779
Wire-rods	20,836	15,313 D.	5,523
Tin-plates	47,360	70,652 I.	22,292

The movement of iron ore between this and other countries during the same period is shown by the following:

	1903.	1904.	Changes.
Exports	80,611	213,865 I.	133,254
Imports	980,440	487,613 D.	492,827

Excess of imports over exports 899,829 273,748 D. 626,081

Imports came mainly from Cuba. Exports consist principally of Michigan ores that are shipped to Midland and Hamilton, Ontario.

The Peat Industry.

By ARTHUR P. HALL AND RICHARD C. TOLMAN.

Since the coal strike in 1902, considerable interest has been shown in the fields of peat lying idle in many parts of the United States and Canada. The possibility of utilizing such deposits as a source of fuel is by no means a new discovery, as peat has long been a successful competitor with coal in many parts of Europe, and especially in Germany, Holland, Ireland, Sweden and Russia. Many propositions for the development of the industry in this country have been entertained, but most of them have failed, as the result of ignorance of the essential properties of peat, on the part of the promoters.

To state it in as few words as possible, peat is the product resulting from the

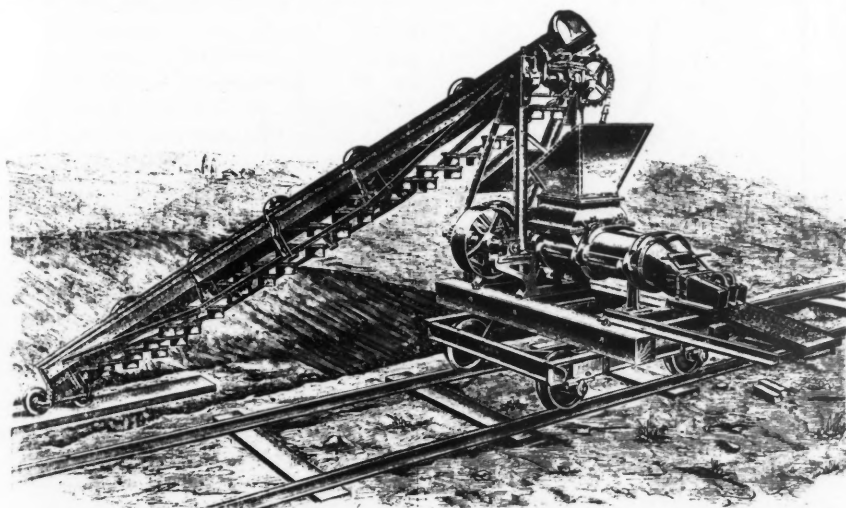
commonly friable, will not stand transportation, is not suitable for coking, and is usually quite bulky, although the specific gravity may run all the way from 0.2 up to 1.3. In the Grand Duchy of Oldenburg where the production of spade peat has been systematically carried out, with wages of 50 to 60c. a day, the labor cost for the production of spade peat has been found about 75c. a ton. In America the high rate of wages prevailing and the impossibility of successfully transporting spade peat by reason of its friability would prevent this method of production from becoming common.

2. Briquetted peat is produced by compressing dry powdered peat, with heavy machinery, into regularly shaped blocks. During the last summer, as far as we know, there were but two briquetting

machines, all of which are dependent on the same principle, that when raw peat still containing at least 80 to 85% water is thoroughly mixed and kneaded it loses its fibrous structure and, on drying, shrinks firmly together into a compact mass of about one-fifth the original volume. Machine peat made from American material ordinarily has a sp. gr. of about 0.9, is tough enough to be cut like wood with a saw, and will take a moderate polish. The Hodge peat ship, and the machines of Dolberg, Heinen, Anrep, Schlick-eysen, Leavitt, Atkinson-Norton, Strenge and many other manufacturers, all depend on this principle.

In Germany, the most common form of machine is similar to that illustrated in the cut. The apparatus is mounted on car wheels and is moved ahead on the bog as the layer of peat is dug out. The machine is driven by a portable engine (not shown in the cut); the peat is thrown by the diggers directly on the elevator, is transferred to the hoppers, passed through the rapidly revolving blades inside the machine, by which it is thoroughly mixed and kneaded, and then leaves the machine in three long strands which are cut into brick-shaped pieces, and carried, either by cars or by hand, to be spread on the drying field. The greatest part of the expense in operating a machine of this kind is the wages cost, since five men are needed for digging and throwing the raw material on the elevator, and five more for placing the peat bricks on the drying field. In Germany with wages of \$1 a day, machine peat fuel can be produced at a total cost of about \$1.70 a ton; but in most parts of America the high cost of labor, and the comparatively low cost of coal or other competing fuel, would make such a process unprofitable. In order to adapt the process to American conditions, the digging and spreading of the peat on the drying ground must both be done by machinery. The most successful attempt to accomplish this is that of Oltmann Strenge, a peat manufacturer in Oldenburg. The writer has visited his works on two different occasions, and for use in high bogs of suitable quality, can speak most favorably of the process. Without describing the details of the machine, the peat is dug by a form of bucket dredge, conveyed by an elevator to the main body of the machine, where it is mixed and kneaded, and finally spread on the top of the bog in a layer about 1 ft. deep and 50 ft. wide, which when firm enough, is cut into bricks and allowed to finish drying. The machine is driven by a 30-h.p. engine and moves slowly ahead on the bog at the rate of about 300 ft. a day. The price of a machine is about 35,000M. (\$8,500), and in Germany the cost of production is 50 to 75c. per ton.

As mentioned above, machine peat is suitable for coking. It gives a fine coke, containing no sulphur nor phosphorus,



PEAT MACHINE.

partial decomposition of vegetable matter protected from the full action of the air by the presence of water. The net result of such decomposition is to decrease the percentage of oxygen and to increase the carbon and incidentally the heating value of the substance. Peat is made either by the gradual filling up of ponds or other flooded districts to build the so called 'low bogs,' or is formed in 'high bogs' which, although standing above the natural water level of the region, suck up and hold enough water in their own mossy structure to provide the conditions necessary for the formation. As found in the bog, peat usually contains 85 to 90% water, and when air-dried still holds at least 15% moisture. The analysis of an air-dried peat of good quality would be about 15% moisture, 5% ash, 48% carbon, 4% hydrogen, 27% oxygen, 1% nitrogen, and a heating value of about 9,000 B. T. U.

Peat is prepared for use as fuel in three forms:—(1) as hand or spade peat; (2) as briquetted peat; (3) as machine peat.

1. Spade peat is obtained by cutting out of the bog regularly shaped blocks, using a special form of spade called a 'slane' and stacking the blocks on the upper surface of the moor to dry. The product is very

plants in the world in actual operation; the Dobson plant at Beaverton in Ontario, and the plant near Stettin of the Presstorff-fabrik Langenberg. The writer has visited both of these plants, and, although the processes have many promising features, they must still be considered in the experimental stage. The cost of manufacturing by the Dobson process is given as \$1 per ton, or, including cost of bog, depreciation of plant, interest on capital, and royalty, as \$1.80 per ton. The simple manufacturing cost at the factory near Stettin is given as \$1.40 to \$1.75 per ton. The briquetted fuel is very clean and handsome, and bears transportation fairly well; it is, however, unsuitable for coking and it is very doubtful if the cost of production can be brought low enough to make the use of this form of fuel common in America.

3. The simplest and most practicable way of working the raw material into a satisfactory fuel, which is not too bulky, which will stand transportation, and which is suited for coking, is to make the so called machine-peat. The process is car-

¹ Report of the Bureau of Mines of Ontario, 1903.

² 'Versammlung des Vereins zur Förderung der Moorkultur im deutsche Reiche.' (1902.)

and specially fitted for replacing charcoal in metallurgical work. For many years peat has been coked in piles similar to those of the charcoal burner, and recently a German engineer, Herr Ziegler, has constructed an oven adapted for making peat coke. The gases formed are sufficient for heating the ovens. The by-products—ammonia, methyl-alcohol, acetic acid, tar, etc.—are saved. A five-oven plant at Oldenburg has recently been tested by the Prussian Government with very favorable results.

As an example of the extent to which the peat industry has been developed in Germany, the works of the Norddeutschen Torfmoor-Gesellschaft, at Triangel in Braunschweig, may be mentioned. The works have been in profitable operation for the last 30 years, and at present are provided with 10 electrically-driven peat machines, which produce during the season 200 tons of machine peat daily. It sells for \$2.50 a ton. About one-quarter of the product is coked, and is sold for \$12.50 a ton. The total yearly product is 20,000 tons of machine peat, 5,000 tons coke. Two peat-straw factories are also connected with the plant; these use the lighter peat, which is less adapted for fuel, and they turn out daily 100 to 150 tons peat-straw, which sells for \$3.25 to \$4.50 per ton, according to quality.

In testing peat and peat bogs, samples should be systematically taken from different depths and different locations on the bog. When it is merely a question of using the material as fuel, no very elaborate analysis is necessary, a determination of the ash, sulphur, and heating value of the substance, as well as the specific gravity and strength of the finished fuel, being sufficient. In cases where the peat is to be coked, a determination of the quality and quantity of the coke and various by-products may also be profitably made. The writer has had the opportunity of working for a number of months in the laboratory of Dr. Fritz Frank and Dr. Eduard Marckwald in Berlin. These gentlemen are experts in the testing of peat for use in the Ziegler process.

The future of the peat industry in America is at present problematical; the province of Ontario contains many experimental plants, and work is being done on bogs in the New England and middle Atlantic States, but no very definite results have as yet been obtained. In our opinion, some form of the process for machine peat may be expected to prove successful. To those who are really interested in the development of the industry, the necessity of keeping aloof from the many schemes, whose promoters promise impossible returns, is too evident to be dwelt upon. Bogs should be carefully examined, samples analyzed, and detailed plans of the proposed process be submitted to some expert, before any investment in a peat enterprise is made.

The Copper Deposits of Cape Colony, South Africa.

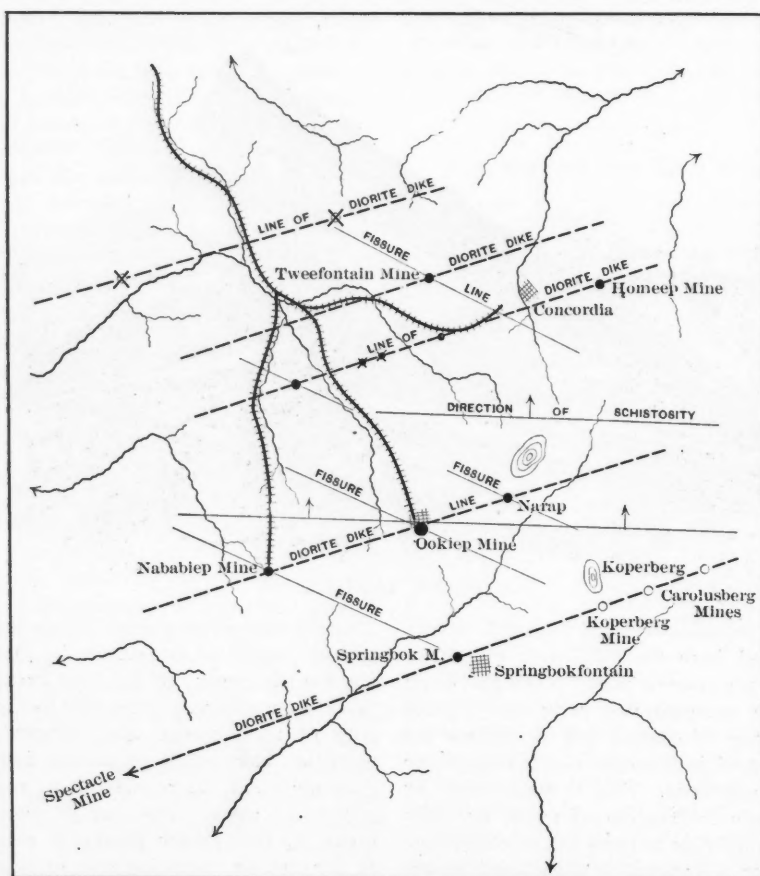
BY WALTER HARVEY WEED.

Namaqualand, which forms the north-western portion of Cape Colony, has been one of the notable producers of copper for a half century. The deposits were worked by the natives before the European occupation of the country, and Von Stet, one of the early governors of the colony, attempted to work them as early as 1685. The mines have been successfully and continuously operated since 1852 by two English companies, with an annual production of about 7,000 tons. The machinery and equipment of the mines suffered from the Boer raids in 1902, but was restored in 1903 and operations resumed.

3,000 ft. above sea-level, is mildly rugged and covered by vegetation.

The ore consists mainly of chalcopyrite and bornite, mixed with country rock (diorite). The Ookiep deposit has been remarkably rich, averaging 21 per cent. Those of the other mines are much lower grade, that of Nababep being 6.90 per cent for 1903.

The region is one of old crystalline gneiss and schist, whose bands run east and west, and dip at a low angle northward. The gneiss is traversed by a series of fractures, having a general north-east course, and marked by dikes of di-



THE OOKIEP-CONCORDIA COPPER DISTRICT
LITTLE NAMAQUALAND, S.A.

The mines are situated 100 miles from the coast, and 300 miles north of Cape Town; a railroad connects them with the seaport of Nolloth, a few miles south of the mouth of the Orange river. The operations of the Cape Copper Company, the larger of the two companies, are familiar from the annual reports published by the company, but exact information concerning the nature of the ore occurrence has been wanting. A recent geological description of the deposits has been published in German by J. Kuntz. As it shows the type to be unusual, the following translation of the original article has been prepared.

The district has an elevation of about

3,000 ft. above sea-level, is mildly rugged and covered by vegetation. The ore consists mainly of chalcopyrite and bornite, mixed with country rock (diorite). The Ookiep deposit has been remarkably rich, averaging 21 per cent. Those of the other mines are much lower grade, that of Nababep being 6.90 per cent for 1903. The region is one of old crystalline gneiss and schist, whose bands run east and west, and dip at a low angle northward. The gneiss is traversed by a series of fractures, having a general north-east course, and marked by dikes of di-

orite. Sometimes these dikes are visible for many miles, the line of dark rock contrasting strongly with the light-gray granitic gneiss in which it occurs. Such an exposure is seen running from Springbok to Carolus, in the southern part of the field. Elsewhere the diorite is only seen at intervals, though the exposures, as at Ookiep, all line up, and in a direction parallel to that of the exposed dikes. The orebodies form curious lenticular masses in this diorite dike. This rock ordinarily carries traces of copper, as shown by the green-stained outcrop, but the workable deposits appear to be formed at points where the dike is crossed by barren north-west fissures extending across the gneiss.

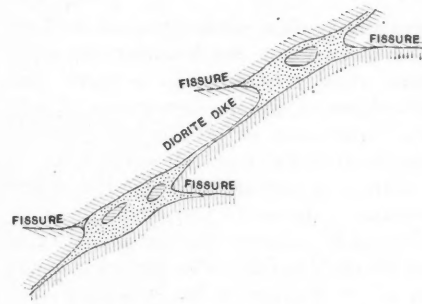
This is readily appreciated from the accompanying section of the Tweefontain orebody, in the northern part of the district. The horizontal section across the two upper orebodies of the mine shows each lenticular mass to have projections or tongues, two of which, at opposite corners, are formed by the continuation of the diorite vein; the other two run out into a barren fissure, with northwest-southeast course. The exposures are good, and the intersection of eruptive dike and fissure is plainly visible. At the Ookiep mine, the largest and richest orebody of the region, there is a similar cross-section and relation, but the covering of sand and humus prevents one from tracing the fissures on the surface. This orebody was 1,032 ft. long, 230 ft. wide, and 328 ft. in height; it is now nearly worked out, the last report of the company stating that extensive prospecting (see figure) having failed to show any favorable indications, the work will be discontinued. The ore is composed of bornite and chalcopyrite, and is much richer than that of the other deposits of the region, averaging 21 per cent. It is suspected that the conjunction of the diorite dike—empty fissure and an iron-bearing stratum of the gneiss, may be responsible for the greater richness of this particular deposit.

The sketch map from Kuntz's paper shows fifteen of these deposits, all workable, situated at the intersection of the diorite dikes and northwest fissure. Another factor may have been the occurrence of bands of iron-bearing gneiss, which meet the two fissure lines at their point of intersection. The low eastward dip of the elongated lenses of ore seems to conform to the intersection of the dikes and the gently dipping gneisses. The Ookiep orebody occurs under these conditions.

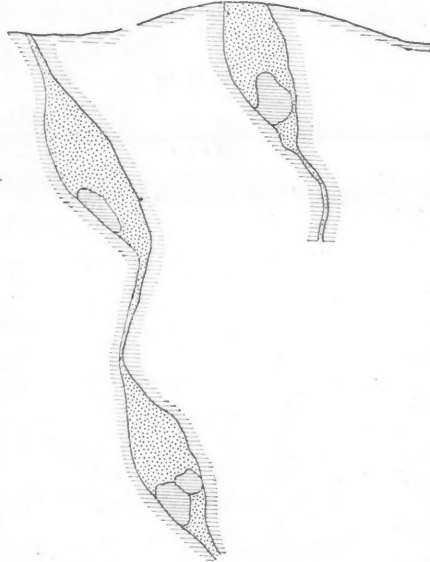
The copper ore occurs as an accessory constituent of the diorite, and is mixed with the feldspar, hornblende, augite and mica of the normal rock, the hornblende being apparently the first mineral replaced. No data are given to show the character or extent of replacement. The Ookiep dike contains the deposit of Narrap to the eastward, and Nababeep, to the west, the diorite being plainly seen to be the ore carrier at each place. The Nababeep body is a very large one, but the ore occurs scattered through the diorite. It yielded 6,121 tons of 6.90 per cent ore in 1903. It is developed by a shaft 600 ft. deep. The Narrap deposit is smaller, and has recently been reopened, the shaft being now 330 ft. deep. The Cape Copper Company operates the three mines last named, and the Koperberg and Carolusberg mines on the next dike south. The mines of the Namaqualand Copper Company, situated on the first dike line north of Ookiep, has been abandoned because the ore is mostly pyrrhotite and low in copper.

An excellent view of the entire district may be observed from the summit of the Tweefontain hill. The diorite dike pass-

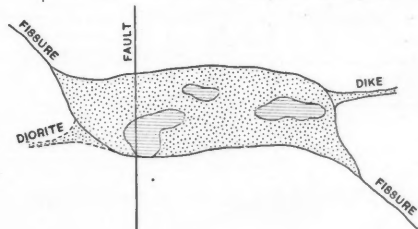
ing through the hill can be followed by the eye far to the east and west, showing



HORIZONTAL SECTION THROUGH BOTH THE UPPER ORE BODIES OF THE TWEEFONTAIN MINE (KUNTZ)



SECTION OF THE ORE BODIES OF THE TWEEFONTAIN MINE (KUNTZ)
Ore body stippled, Included fragments of country, lined



SECTION THROUGH THE OOKIEP MINE (KUNTZ)
VERTICAL AND HORIZONTAL

Ore body stippled, Included fragments of rock crosslined.

a dark patch on the mountain sides. To the southward, the Concordia dike line is seen, and the abandoned mines of the Namaqualand Copper Company. Still

farther south the Nababeep-Ookiep-Narrap line is visible, with the mines of the Cape Copper Company, and the southern horizon is bounded by a dark line of hills between Carolusberg, Koperberg and Springbok, the so-called Spectacle line, the mine of that name lying farther west.

The occurrence of these deposits in and along diorite dikes recalls the analogous deposits, unfortunately so far unremunerative, found in diabasic dikes cutting through Algonkian and Cambrian rocks, near Two Medicine lakes, northern Montana. The dikes are traceable for many miles, over mountain, cliff and valley, and contain irregularly distributed bunches of chalcopyrite ore.

British Ammonium-Sulphate Trade.

A feature has been the continued increase in production at gas works, partly explained by the improved trade in the manufacturing districts. Oil-shale works also have shown an appreciable increase in their output of ammonia, Scotland being especially benefited thereby. With regard to the Mond power-gas process it is learned that its use has not been extended as rapidly as was predicted; hence the increase from this source has been only 2,500 tons (9,300 tons in 1904, as against 6,800 tons in 1903). An increase of 2,000 tons has also been shown by the Tyne carbonizing works, as the result of the operation of a new plant. As estimated, the production of ammonia, converted into sulphate (including that used in the manufacture of ammonia soda and other chemical processes) from all sources in the United Kingdom, was as follows, in long tons:

	1903.	1904.
Gas works	150,000	154,000
Iron	19,000	19,000
Shale	37,500	39,500
Coke and carbonizing works and producer gas	27,500	32,000
Total	234,000	244,500

It is noteworthy that exports to Germany, the United States and other countries last year amounted to 177,000 tons, while the domestic consumption was only 68,500 tons. Stocks on hand December 31, 1904, were 11,000 tons, or about 1,000 tons more than at the corresponding period in 1903.

Prices in 1904 showed quite an advance over 1903. At Hull, England, the increase was equivalent to about \$2.10 per ton, the opening price being £12 7s. 6d., and the closing, £12 16s. 3d., which was the highest point. The price fell to £11 11s. 3d., in August. Apparently speculators have had a hard time, for September found them short of stock at advancing prices. A good feature of the market was the higher price obtained by makers for forward shipments.

Prospects for 1905 are favorable, though it is thought consumption on the Continent and in the United States, where nitrate of soda is largely used as a fertilizer, will not show an increase.

Iron Mining in the Birmingham District, Alabama.

By W. R. CRANE.

The iron mines of the Birmingham district are prominent in the industry of the United States. Mining is changing from its period of open-cut to underground working; and, although the cost may have increased slightly, yet it has not materially affected the cost of production, as the yield has been augmented by change in method, and substantial growth is assured. Furthermore, the Birmingham district is served by a tributary of the Rock Island.

The ore occurs in the Clinton formation of the Red mountains, a low range of hills. Two ridges extend northeast-south-

occasionally there are displacements of 100 ft. or more. In one instance, the main mine slope terminates in a chert wall at a depth of 800 ft., the stratum of iron ore having been cut off abruptly; the displacement of the foot-wall is 100 feet.

Horses of various shapes and sizes are common. Masses of clay, shale or sandstone protrude into the iron strata from below, while occasionally similar material occurs in the ore, being prolonged into both roof and floor, thus cutting out the ore entirely. A large horse was observed at slope No. 15 of the Ishkooda group of

irregular deposition of ore, or disturbed strata; in either case, the top and bottom are usually poor. Slips are clay-filled vugs in the solid ore, extending usually vertically and along the cleavage; they are dangerous. Furthermore, all such phenomena are often the cause of water in the mine.

The deposits are uniform as viewed along the outcrop; but, as the workings are shallow, seldom exceeding 1,000 or 1,800 ft., change in thickness with depth cannot be determined. The individual strata range in thickness from 2 to 22 ft., often aggregating 35 ft. Shale partings break up the continuity of the beds; for instance, a 20-ft. stratum may, in the

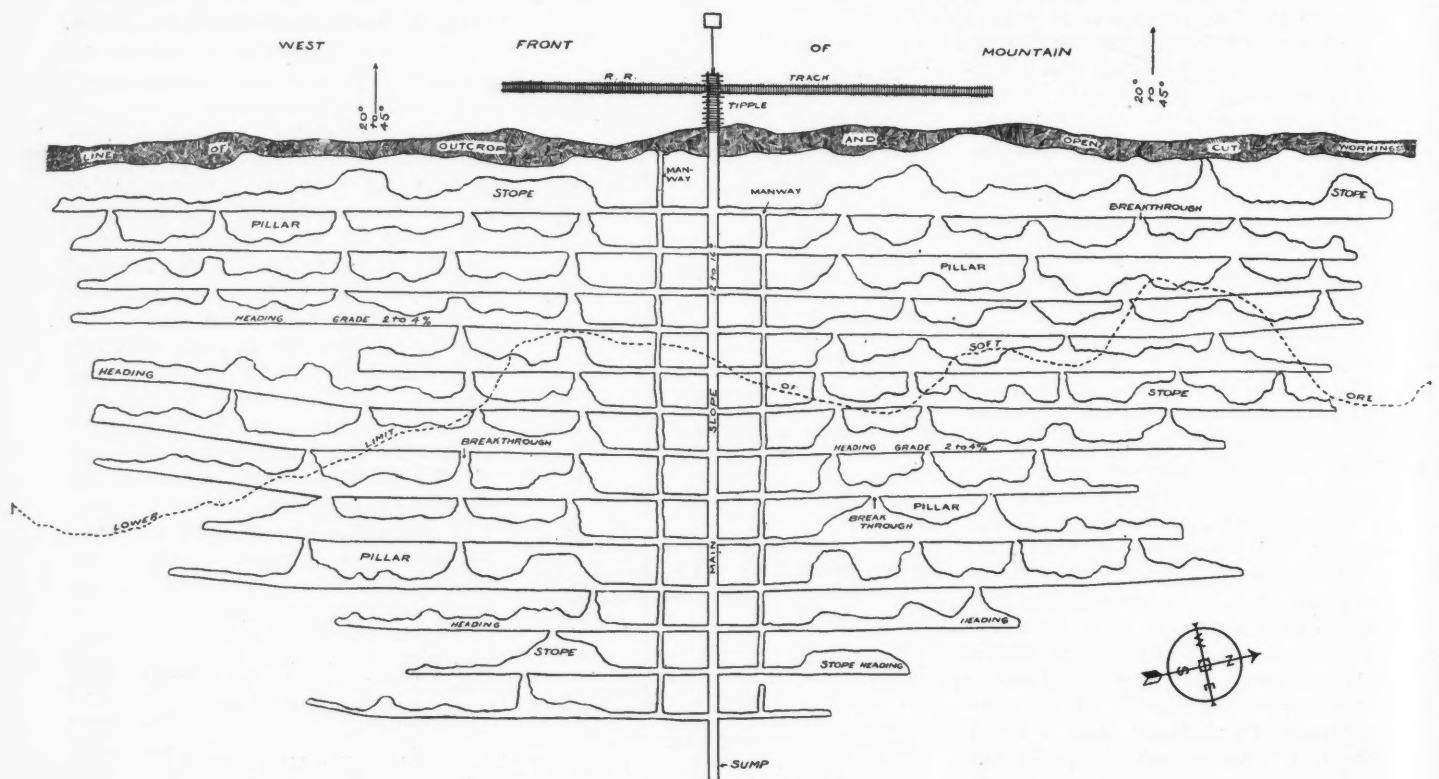


FIG. 3. TYPICAL MINE WORKINGS.

west, and border a valley, the eroded crest of an anticline. On the valley sides of these flanking ridges are found the beds which have been exposed by the erosion that removed the crest. The strike is regular, but there are several sinuosities, which are accompanied by a change of dip. The dip ranges from 8° up to about 50° , and in a few instances to as high as 85° , the usual inclination of the mine slopes being 10 to 20 degrees.

Mining is largely confined to the eastern outcrop, which is worked extensively for 150 miles. In the neighborhood of Birmingham, the outcrop has been stripped, and work has been prosecuted underground for 15 miles. Much of the deposit is remarkably free from folds, faults and other disturbances; yet this cannot be said of the deposit as a whole, for many minor faults of only a few inches or feet of throw are found, while

mines, Fig. 1. It was in the open-cut and was completely worked around; it stands 20 ft. high, with a diameter of 30 ft., and is cylindrical, being smooth and uniform. It is composed of clay, shale, sandstone and iron ore, the whole mass being a jumble of the materials named above. The clay and shale occur as lenses between sandstone and iron. Long vertical cracks seam the sides and subdivide it into blocks. These cracks show the direction of the joint-planes or the 'cleat' of the ore, being formed in the foreign mass while encircled by the ore. The mixed mass thus intruded may be the filling of a pot-hole, which had been formed in the iron stratum and the underlying formation.

Bells, similar to those in coal mining, are common (see C, Fig. 2), as are also clay veins and slips (A and B, Fig. 2). Bells are dangerous; they may cause roof-falls; while clay veins and slips show

course of a mile, divide into two, or more, well defined parts, owing to partings, which vary from a fraction of an inch to 18 inches.

There are two sets of cleavage planes, having nearly the directions of northeast-southwest and northwest-southeast, respectively, both being slightly deflected toward the north. Both sets range from 4 to 6 ft. apart, thus dividing the deposit up into diamond-shaped blocks.

There are two kinds of ore in the district, aside from that of the Siluro-Cambrian beds (which occupy the center of the valley included between the parallel ranges of the Red mountains). These ores (the hard and soft red-hematites), are intimately associated with each other in the same stratum; they were formerly of the same composition. The leaching of surface water is responsible for the change in lime content. The percentage

of iron in hard and soft ores is close to 37 and 48, while that of lime is 16 and 1.5 respectively. They may be designated as high- and low-silica, or self- and non-fluxing ores; the variation of lime is more

been worked by open-cuts, which often are 75 to 100 ft. deep, and 10 to 15 rods in width.

The room-and-pillar system of mining, with robbing of pillars, is employed, when

found to begin 150 ft. from the outcrop. The point at the change of grade is called a 'nuckle,' or a 'nuck.'

From both sides of the main slope, passages are driven in the ore, known as headings. As much hauling is done in these, they must have a proper grade; 3 per cent is average. The running of headings is independent of the grade and direction of the main slope; consequently, in many cases, the headings make (at the points of intersections with the slope), acute angles on one side and obtuse on the other, which complicates haulage to surface. Furthermore, the headings are run parallel with the outcrop, while the slope is usually driven as close as practicable with the dip.

In car-haulage on the slope, it is found to be better practice to stagger or offset the headings in order that the switches on opposite sides may not come at the same point on the main slope-track. The offset is 15 to 25 ft., varying with the width of rooms or lifts. Again, with car-haulage, the headings connect with the slope by upward-curving passages, which are so formed as to permit the

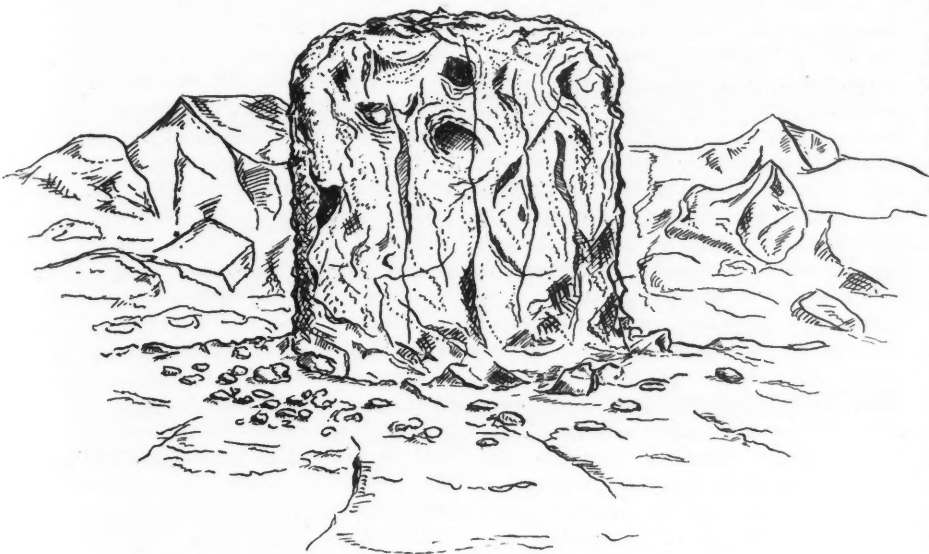


FIG. 1. HORSE OF CLAY, SHALE, SANDSTONE AND IRON ORE AT ISHKOODA MINE.

marked than that of silica. The hard ore is used more than the soft, and has an average composition of: SiO_2 , 13.4%; Fe, 37%; CaO, 16.2%; Al_2O_3 , 3.18%; P, 0.37%; S, 0.07%; CO_2 , 12.24%, and H_2O , 0.5 per cent.

In many mines the lower limit of soft ores has been passed, as it averages close to 300 ft. of bed, measured with the dip. The whole stratum may alter near the top or bottom, more commonly the latter, being particularly pronounced where there are two or more strata. The bottom of a stratum may thus have been acted upon, and occasionally the top also; rarely, however, has the whole been completely altered to a depth of 300 ft. Prominent cleavage planes, clay veins and other local disturbances are often responsible for sudden irregularities in the lower limit of the altered area, owing to the downward passage of water; this is illustrated in Fig. 3.

Beside the hard and soft ores, there is another known as 'fossil' ore, which has the same characteristics as the non-fossiliferous, and may be hard or soft, according to leaching action. This is composed of fossils, usually quite small, which give a granular appearance. All ores of this formation, the Clinton, are distinctly red.

As previously indicated, mining formerly was done by open-cut work, the outcrop being stripped and the ore removed largely by hand. This system has not been wholly abandoned; for, where the ore outcrops at favorable points, it serves as a simple, cheap, and rapid means of producing an abundance of ore. Practically the whole outcrop, for 15 to 20 miles east and south of Birmingham, has

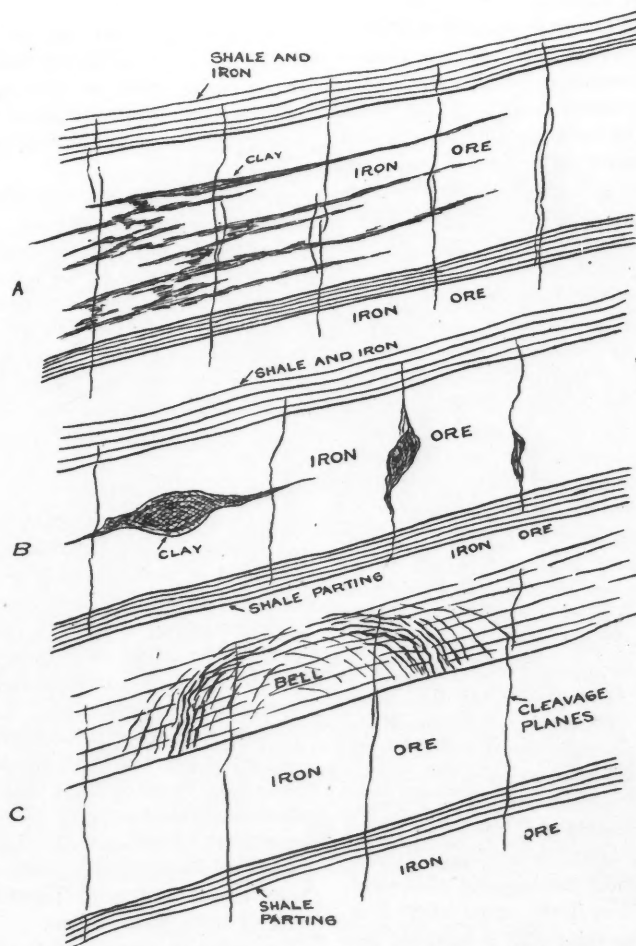


FIG. 2. A AND B ARE CLAY VEINS AND SLIPS; C, A BELL IN THE IRON ORE.

the mining is underground (Fig. 3). The mines are opened by slopes, which begin at the bottom of the open-cuts and run approximately on the dip. The dip often varies; the steepest portion is usually

heading- and slope-tracks to unite at the proper angle; while with skip-haulage, there is no connecting track, and consequently the headings are begun at the required points on the sides of the slope

and driven at the desired angle. The offset, with skip-haulage, is very slight, which arrangement brings the openings of the headings directly opposite each other. With skip-haulage it is also necessary to depress the slope-track in order that the skip may receive its load from the pit car on the heading track. When all the iron is worked, the cutting out or depressing of the slope-track is done in the underlying formation; although, occasionally, when the lower portion of a stratum (or the lower one of two strata) is soft, the slope is driven the whole thickness of the iron, only the upper portion being mined, thus throwing the heading-track some distance above the slope-track. The headings are driven every 50 to 55 ft. along the slope, thus subdividing the deposit into lifts or levels, which are worked independently. In both systems of haulage, the width of headings is 15 ft., and is so maintained for a distance of 100 to 150 ft., when it suddenly increases to 25 or 30 ft., which is usual for room-headings. The portions remaining, after driving the 25-ft. headings, are called pillars; these are robbed after the headings have been driven as far as is advisable. Owing to change in dip, they may increase in width, but average 25 to 30 ft. At 75 ft. from the slope (on both sides of, and running parallel with it), are manways, which are continued for the whole length of the slope, connect all the headings, and on one side, at least, connect with the surface. The manways are 5 ft. wide, from 5 to 7 ft. high, and are usually timbered. Either side of a slope may be so connected with the surface; when possible, both sides are connected, thus making exit easy.

Beyond the manways, at a distance of 50 or 75 ft., at the point where the headings abruptly increase in width, it is customary to form 'break-throughs,' or 'up-sets,' passages cut through the pillars. After forming the first break-through, it is the practice to make other and similar openings from 50 to 150 ft. along the pillars, which are kept some distance behind the face of the heading. There is no regularity in their placing. The object of the break-throughs is threefold, namely, for running air- and water-pipes, for ventilation, and for operation preliminary to pillar-robbing. After driving the headings as far as practicable, and after having removed as much ore as can safely be done, the robbing of the pillar is begun. At the outer ends of the pillar, a break-through is formed, and the pillar is removed (or robbed), by cutting off transverse slices, which is continued slopeward. Pillars are robbed in the upper levels first, thus giving the mine-plan a terraced appearance. The object of this is to protect tracks, cars and laborers from falling ground.

As a rule, the pitch of the beds is sufficient to insure the gravity transference of broken ore to the heading-track below.

When the pitch is too slight, it is often necessary to run branch-tracks up the slope to the face of the pillar. These are run diagonally, thus increasing the grade but slightly.

In working between hard and soft ore, it is often necessary to run diagonal, branched tracks, even though the inclination may be sufficiently steep to run down all hard ore. The soft ore is often earthy, consequently a slope large enough for hard ore may be too slight for soft. If a pillar is composed of both hard and soft ore, it is customary to employ two different methods of working (Fig. 4). By timbering and longitudinal slicing, the soft may be entirely removed; the hard ore is then removed by ordinary means.

As previously stated, the lines of cleavage run northeast-southwest and northwest-southeast—one parallel with the strike, and consequently with the headings, the other parallel with the main slope. These lines of cleavage are persistent in their respective directions, and operations must be modified, with change in direction of strike and dip. They affect all mining operations, but most of all the robbing of pillars, or extraction proper.

Dynamite of 40 per cent strength is employed (size of sticks $1\frac{1}{4}$ in.). Charges are fired by fuse in driving headings, manways and break-throughs, also in robbing pillars; electrical firing is employed in slope-driving.

Rand air-drills of $3\frac{3}{4}$ in. size are used, being mounted on columns. The holes vary from 4 to 10 ft. in depth, and are $1\frac{1}{2}$ in. in diameter at the bottom. Air is furnished to the drills at a pressure of 75 to 80 lb. The air pipes range as follows: Slope pipe, 4 to 6 in.; laterals in sections, 3 to $2\frac{1}{2}$, $1\frac{1}{4}$ to 1 in., and 30 to 50 ft. of flexible hose connections.

The handling of ore at the working face is a gravity system. The transference from working face to make-up stations or partings is accomplished by animal haulage, although occasionally hand-tramming is employed; trains of two or four cars are hauled by mules.

The handling of the ore, delivered to the partings in pit-cars, is done in one of two ways: by train-haulage on the slopes, or by skip-haulage. The former was employed when underground mining was just begun, and is still practiced. In many cases train-haulage has been discarded and skip-haulage substituted. This has several advantages, namely: increased output at lower cost; fewer attendants (ratio 1 to 8, or 1 to 10); and the simplifying of mine management.

The different systems of haulage necessitate different arrangements of slopes. With train-haulage, the cars run from the headings to the slope-tracks, while with skip-haulage, the pit-cars simply run between the working face and the slope, the heading being elevated or the slope-track

depressed, to allow the pit-car to dump into the skip on the slope-track.

With car-haulage, trains or 'trips' of five to eight cars are hauled by a winding-engine, from the partings, to the tippie at the surface, and are returned to any particular heading, the switch of which has been set to turn the cars that way. When a heading makes too acute an angle with the slope, it is difficult to haul trains over the short curves. Deflecting sheaves or rollers are necessary, at the entrance to each heading, to prevent the winding-rope from rubbing on the upper rib.

Only one size of car is used in the mines, when car-haulage to the surface is employed. These cars have a capacity of about two tons, and run on a track of 36 in. gauge. They are wooden, and are braced by strap-iron. Skips are operated in a manner similar to that for the trains of cars, except that they are intended for slope-haulage only. Both methods of haulage are engine planes pure and simple. The slope-track, for skip-haulage, stands 8 ft. 6 in. below the heading-track.

The skips range from 8 to 15 tons. They are of steel, open at top and front. The fore end is provided with a gate, which is kept closed by the bail, except when being emptied. The gauge of track for skip-haulage is 60 inches.

The heading- or pit-cars, used with skips, are of metal, being lower and wider, and having a wider gauge (42 in.). They are more stable, easier to fill, and more readily handled.

The partings and tracks therein are arranged to permit two cars to dump at the same time, usually one at the fore and the other at the rear end of the skip (Fig. 5). This is provided for by having a double tippie in each heading or by zig-zagging the headings.

The excessive wear and high cost of maintenance have been responsible for the adoption of the skip method of handling ore; repair for some mines has been reduced fully one-tenth by the change. The weight of rails in car-haulage, both in headings and on the slopes, is 30 lb.; while for skip-haulage, in the slopes only, it is 60 pounds.

To permit dumping at several points (as into the bin and the waste chute at the same time), a change in inclination of the skip must be effected at a point below that necessary for ore dumping. A second section of track connects the main and elevated tracks. By means of the approaches, and also by means of the hinged portions of the track (which are in reality switches), a skip can be discharged either into the ore bin or waste chute.

The waste, from slope sinking, is loaded into a second skip, connected to the main skip, and is thus hauled to the surface, both skips being raised and lowered together. By a switch, the two skips can discharge into their respective places with little loss of time.

Owing to the flatness of the deposit, the roof, when robbed of its natural support, must be supported. The method of timbering consists of posts; in case of bad

the meantime are split up and drawn off laterally into the headings; the currents are added to, and impelled upward, by the exhausts from the air drills.

for considerable distances to adjacent mines. Usually, however, each plant has its own individual steam-plant. Second-motion hoists are common, with drums and post brakes; they have a capacity of 50 to 100 tons per hour. Steel cables of 1 1/8 in. diameter are used for slope winding.

Owing to the steepness of the mountain side, it is often necessary to have considerable distance between the tippie and hoist. The tipples proper are sloping constructions, the main floors having the same angle as the mine slopes in most cases. Directly below the feed-hopper is situated a large spindle-crusher, which is supported by the same trestle-work construction that contains the hopper, waste chute and dumping track.

Torches are largely used for illumination in the slopes and partings, while candles are employed at the working face. Electric lights, incandescent, are being installed for slopes and partings. Electric signalling is also gradually supplanting gongs.

Special railroad cars haul the ore to the furnace; they carry 60,000 to 100,000 pounds.

During the past summer there has been

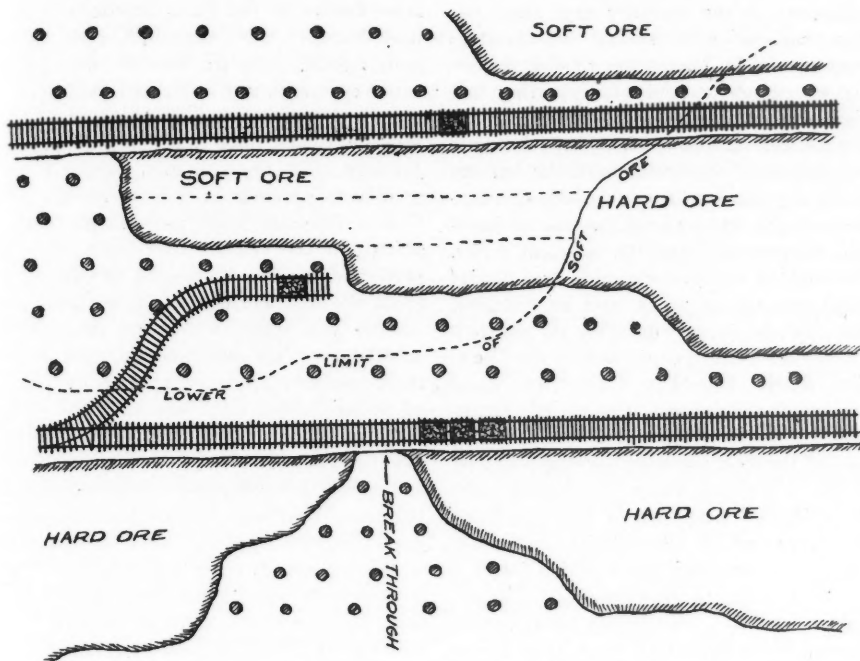


FIG. 4. METHOD OF WORKING SOFT ORE.

ground, timbers are built into square-sets. Lagging is used with the sets, in slopes, headings and manways. The slopes are often timbered their whole length, supports being placed at those points where weaknesses develop. Sets are seldom employed in the headings, except in the partings.

Steps are formed in the manways for passage of both men and animals; it is customary to reinforce the edges with 4 to 6 in. split poles, flat side down. Heart pine is used from the neighborhood; it has an average life of five or six years.

The water encountered depends largely upon whether that locality has been disturbed by folding or faulting. Many mines are free from water; while others adjacent are often wet. It is not uncommon to see streams several inches deep and a foot wide, flowing in the headings. To prevent this from running down the slopes, it is often practicable to divert it to the sump. It is usual to drive the slopes from 25 to 30 ft. to provide sump room. Occasionally the main slopes have drains; but the method above described is more common. When most of the water is encountered in the upper levels, it is common practice to form sumps in the headings. The heading sump is usually given sufficient capacity to hold 12 hours' drainage of the mine.

The mine pumps are driven by both air and steam, more largely by air.

The system of ventilation employed is simple but effective, and is largely natural. Air currents entering the mine slope pass downward to its foot, and in



FIG. 5. PIT-CAR DUMPING INTO SKIP.

Change in method of handling ore has been instrumental in bringing about a change of surface—and particularly of power equipment. Centralization of power plants seems to be the order of the day. At present air and steam are often generated at a central station and piped

great activity in mine development, and in new equipment; this has been possible by slackening of work due to labor troubles. These improvements will make themselves felt, in the near future, in a much increased production of ore, and at reduced cost.

Books Reviewed.

Geologic Atlas of the United States. Huron Folio, South Dakota. Washington; Engraved and published by the Geological Survey. Three maps and eight pages text.

This publication has particular reference to water. The quadrangle covers an area of 857 sq. miles, and contains portions of Beadle, Sanborn and Jerauld counties in eastern South Dakota, Huron, Wolsey and Woonsocket being the only towns situated within its boundaries. The James river traverses it from north to south.

The surface is flat, its lowest and its highest point differing by about 200 ft. A thick mantle of drift is everywhere present, so that the only available geological data are the meager and unreliable records of well borings. The survey, therefore, has been undertaken, and the maps prepared, with the sole purpose of pointing out the accessibility of artesian water supply. This is conveniently done by sketch maps showing, with contours and shading, the depths at which the top and the bottom of the water-bearing strata may be reached; and by a colored pattern map, indicating the areas within which flowing wells may be expected.

The basement rocks, reached in only a few borings (at a depth of 1,000-1,200 ft.), consist of Archean granite, overlain by patches of the "Sioux" quartzite, of Algonkian age. Paleozoic rocks are entirely wanting, the oldest sediments above the Sioux quartzite being the Dakota formation, of Upper Cretaceous age. This is the principal water-bearing horizon and supplies all the largest wells in both Dakotas. It has a thickness of about 350 ft., comprising sandstone and slate, the latter carrying calcareous and pyritic concretions. Its surface is reached at an average depth of 700 ft.; and a flow is usually encountered within the next 100 ft. Water is contained in three distinct strata, the flows from which vary in amount, pressure and quality.

In succession, above the Dakota sandstone, the Benton shale, the Niobrara chalk and the Pierre shale have been identified. These are capped by Pleistocene till, or boulder clay, morainic material, and stratified river detritus. The till has an average thickness of 70 feet.

Geological Survey of Canada. Report on the Origin, Geological Relations and Composition of the Nickel and Copper Deposits of the Sudbury Mining District in Ontario. By Alfred Ernest Barlow. Ottawa, Canada: Public Printer. Pages, 236; with maps and illustrations. Price, 25 cents.

This volume is part H of the annual report of the Geological Survey. It includes a number of illustrations, and is accompanied by two map sheets, showing, re-

spectively, the geological features and the relative positions of the more important mines in the Sudbury and Victoria mine areas. Besides these, there are several smaller maps. The geology in the region comprised in the Sudbury map sheet has been revised, with special attention to tracing out the boundaries of the various masses of norite, and of separating this nickel-bearing eruptive from the older greenstone. It shows clearly the intimate association of the norite with the various nickel deposits, and the invariable development of the latter along the line of junction between this and the adjacent rocks. The map of the Victoria mine area covers about 220 square miles, and its principal new feature is the outlining of the two smaller bands of norite, south of the Canadian Pacific Railway. One of these crosses the southeast corner of Drury township and extends across the southern part of Denison township terminating east of the Vermilion river. It contains the Worthington mine, which has produced the richest ore in the district, and other mines. On the other hand, which forms a prominent ridge to the south of McCharles and Simon lakes, on the Whitefish Indian reserve, no deposit of economic importance has been discovered. The boundaries of the intrusive mass of younger granite, extending across the northern and central parts of Graham township, and thence into Snider and Waters township, have been carefully outlined.

The report gives an exhaustive summary of the previous researches and descriptions of the nickel and copper deposits, which shows evidence of original investigation and has materially added to the knowledge of the nature of the occurrence of these ore bodies, from the discovery of nickel at the Wallace mine in 1846 to the latest reports. Reference is made to Dr. A. P. Coleman's paper on 'The Sudbury Nickel Deposits,' published by the Ontario Bureau of Mines in 1903, as the most comprehensive and satisfactory description of these deposits that has yet appeared; and it is stated that during the coming season Dr. Coleman proposes to continue his work with the intention of ultimately publishing a monograph containing in succinct form all essential information in regard to these deposits.

A history of the development of the nickel and copper deposits is presented, giving some interesting details as to the earlier enterprises in copper mining which labored under great difficulties, owing to the inaccessibility of the region. It was not until 1883, when the Canadian Pacific Railway was in course of construction, that the first discoveries of any consequence were made. Since then the belt characterized by the presence of Huronian rocks has been overrun by prospectors and miners. The history of mining development in the Sudbury region is in the main that of the Canadian Copper Company, for it was the first combination of

capital that seriously undertook the business of mining, and the only one which has continued operations without serious interruption from the commencement until the present time. The McAllister mine, later known as the Lady Macdonald, and now No. 4 of the Canadian Copper Company's group, was the first of their properties on which any work was done. This was in the summer of 1885. Later in the fall the Evans mine was opened up. In January, 1886, the Canadian Copper Company was founded to operate the Copper Cliff, Stobie and Evans mines. Work was started at the Copper Cliff mine May 1, 1886, and the first shipments of ore made from the district were obtained from its surface workings. The other two mines were opened up subsequently, and these three together produced all the ore treated in the Copper Cliff smelters until 1898. The first blast furnace installed at the old, or East Smelter, was blown in on December 24, 1888, and a second under the same roof was started the following year. In July, 1900, the work of stripping at the Creighton mine was begun. This is at present the largest mine in the district, and the main source of supply. According to Dr. Coleman, its output for some time in 1902 reached 17,000 tons per month. The old Copper Cliff continues to supply about 1,000 tons of ore per month, and its lowest level is 1,052 ft. below the surface. No. 2 mine, opened about 1898, and the Flood, which was first operated in 1900, complete the list from which the present supply is drawn. Perhaps the most important event in the development of the nickel industry was the organization, in April, 1902, of the International Nickel Company, in which the properties of the Canadian Copper Company are included. It must not be assumed, however, that all the available, or important deposits of nickel-copper sulphides have passed under its control; for, in addition to the Victoria mines of the Mond Nickel Company, which contain a large reserve of high-grade ore, there are many others throughout the district capable of economic development.

After giving some account of the other nickel-mining enterprises which have been established from time to time in the Sudbury district, with varying results, the report deals with some of the reasons which have contributed to the failures so frequently recorded in connection with the industry. For some time after the beginning of mining work in the region, the demand for nickel was small and uncertain, and the world's annual consumption did not exceed 700 or 800 tons of the pure metal, which could readily be produced by any one of the three companies then operating in the district. Before the discovery was made of its advantageous employment as an alloy of steel, no great future seemed assured for the nickel industry, and it took a number of years more before the consumption increased to

1,500 tons per annum. At the present time the consumption exceeds 10,000 tons yearly, and a much larger demand can be looked for in the future. The only anxiety which exists, and which has been often urged against any large employment of nickel steel, relates to the source of supply and the possible exhaustion of the deposits known to exist. All authorities are in substantial agreement, however, that the supply of high-grade ore in the Canadian deposits is amply sufficient for many years to come. Another factor in bringing about the failure of some of the Sudbury mining concerns was the assumption that each individual deposit subjected to operation was a mine capable of yielding a permanent supply of nickel ore of the desired grade. Owing to this confidence in the size, suitability and permanence of the orebodies, no special effort was made to obtain control of other available sources of supply, which were sure to be needed when extensive refining operations were in progress. A third cause, which, perhaps, assisted more than any other to bring about the frequent suspension in mining and smelting operations, was the lack of the necessary technical knowledge and experience on the part of those engaged in the management. Some of the companies succeeded in reaching the stage of producing matte, but found themselves obliged to sell this product to refiners at prices which came far below their expectations. It soon became evident that, to share in the benefits of the industry, the same individuals or companies must control the whole of the operations necessary to manufacture the finished product. Some corporations engaged expert metallurgical advice and undertook numerous costly experiments to secure an effective process by which the nickel and copper could be extracted and separated from each other. The expense thus incurred, and frequent failures in preliminary trials resulted in the closing down and abandonment of some works.

The report deals at length with the general physical features and geology of the region, and the minerals found associated with the nickel and copper. It also includes references to the character of the more important nickel deposits of the world; details are presented of the mining, smelting and refining operations of the Sudbury ores, with statistical tables of production, prices, etc. The aim of the volume is to satisfy the demand that has for some time existed for specific and accurate information as to these orebodies by presenting in a comprehensive form the results of the more valuable and critical investigation with regard to their occurrence and development.

The efficiency of a gas-engine, with varying load, is as high as 25 per cent, which is much more than that of a steam-engine using the same heat from a boiler.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Transvaal Iron. Johannesburg, Transvaal; Reprinted from the Rand Daily Mail. Pages, 20.

Wyoming. Report of the State Geologist. Henry C. Beeler, State Geologist. Cheyenne, Wyo.; State Printer. Pages, 40.

Der Bergwerksbetrieb Oesterreichs. 1903. Prepared in the Ministry of Industry. Vienna, Austria: Public Printer. Pages, 316.

Crushing and Amalgamation in Modern Stamp Milling. By R. M. Aitken. Wellington, N. Z.; Government Printer. Pages, 8.

Kalender für Elektrochemiker. Mit Beilage. Compiled by A. Neuburger. Berlin, Germany: M. Krayn. Pages, 504 and 336. Price (in New York) \$1.40.

Statistik Aarvog for Kongeriget Norge. 1904. Prepared in the Central Bureau of Statistics. Christiania, Norway; Aschebroug & Company. Pages, 184.

Die Arbeitseinstellungen und Aussparungen in Oesterreich. 1903. Compiled for the Ministry of Industry. Vienna, Austria: Alfred Hölder. Pages, 312.

Annual Report of the Commissioner of Patents for the Year 1903. F. I. Allen, Commissioner. Washington; Government Printing Office. Pages, 1,088.

United States Geological Survey. Bulletin No. 239. Rock Cleavage. By Chas. K. Leith. Washington; Government Printing Office. Pages, 216; illustrated.

Russia. Report of the Minister of Finance to His Majesty, the Emperor, for the Year 1905. St. Petersburg; Published by the Imperial Academy of Science. Pages, 84.

Geological Survey of Canada. Bulletin. The Ores of Copper in Nova Scotia, New Brunswick and Quebec. By R. W. Ells. Ottawa, Canada: Public Printer. Pages, 60.

Report of the Comptroller of the Currency of the United States. Volume I, 1904. William B. Ridgely, Comptroller. Washington; Government Printing Office. Pages, 728.

Poor's Railroad Manual Appendix. Bond List. Pages, 180. 1905. *Directory of Railroad Officials.* Pages, 132. New York; Poor's Railroad Manual Company. Price \$2.50.

American Tool Making and Interchangeable Manufacturing. By Joseph V. Woodworth. New York; Norman W. Henley Publishing Company. Pages, 560; illustrated. Price \$4.

Sur les Gisements de Minerai de Fer de Sydvaranger; Finland and Norway. By G. Henriksen. Paris, France: Société des Publications Scientifiques et Industrielles. Pamphlet, 8 pages.

Specialization in Manufacture. By A. E. Outerbridge, Jr. Philadelphia; Reprinted from the *Annals of the American Academy of Political and Social Science.* Pamphlet, 8 pages.

United States Geological Survey. Geology of the Perry Basin in Southeastern Maine. By George Otis Smith and David White. Washington; Government Printing Office. Pages, 108; illustrated.

Lehrbuch der mechanisch-metallurgischen Technologie. Erste Abtheilung. By A. Ledebur. Braunschweig, Germany: Friedrich Vieweg & Sohn. Pages, 400; illustrated. Price (in New York) \$4.25.

Lake Superior Iron Ore Association.

A meeting of representatives of Lake Superior iron mining companies and of selling firms representing such companies was held recently in Cleveland, and steps taken to establish a permanent organization on broad lines, its chief object being the gathering and distribution of information of special value to the interests concerned. The organization will be known as the Lake Superior Iron Ore Association. Wm. G. Mather, president of the Cleveland-Cliffs Iron Company, was elected president; E. W. Oglebay, of Oglebay, Norton & Company, vice-president and treasurer, and Wm. B. Treat, secretary. The office of the association will be in charge of Mr. Treat, in Cleveland.

The association will pay particular attention to the collection of statistics of iron ore stocks on docks and at mines, of ore shipments from mines during the season of navigation, and of shipments from lower lake docks throughout the year. An important part of its work will be the compilation of analyses of the various Lake Superior ores and the distribution of this information among miners, shippers and consumers of ores.

In considering the expansion of metal rods subjected to heat, only the length is commonly taken into account. Sometimes, however, the total expansion is involved, and it is well to remember that this is not found by linear measurement.

Molybdenite is a soft, blue-gray mineral closely resembling graphite; its streak, however, on white paper, has a strong greenish tinge, while that of graphite is a brownish black. A piece of graphite placed in contact with a bit of zinc in a solution of copper sulphate will be quickly plated with metallic copper, while a specimen of molybdenite, similarly treated, will be coated slowly, or not at all. The mineral is the sulphide of molybdenum; it has considerable importance in the manufacture of steel of high tensile strength, but the consumption is not great, and the price, therefore, is subject to wide and rapid fluctuation.

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.

Letters should be addressed to the Editor. We do not hold ourselves responsible for the opinions expressed by correspondents.

Orthography in Geography.

Sir—The ENGINEERING AND MINING JOURNAL, issue of Jan. 19, contains an item under the title of 'Orthography in Geography,' in which the writer says: "Temiskaming is too familiar to Canadians to permit of a blunder, though it is a jumble of letters."

Permit me to point out that the official spelling of this lake is "Timiskaming," as determined by the Geographic Board at Ottawa, some two years ago.

CHAS. A. BRAMBLE.

Montreal, Can., Jan. 27, 1905.

Gold Mining in France.

Sir—In the mineral statistics and reviews which appeared in the first number of the JOURNAL for this year, you say that during the year no new goldfield was opened. You forget our old France. In December, 1904, the first gold mill in France was put in operation at our mine, la Lucette, near Laval. This mine is an antimony mine, the monthly production of which exceeds 150 tons of regulus of antimony. The gangue is formed of quartz with gold-bearing mispickel. With the aid of my friend, J. S. MacArthur, on the technical side, and Baron Leonino, on the financial side, I succeeded in erecting and starting a 10-stamp mill supplied by Fraser & Chalmers. This mill is running steadily, and the daily production amounts to about 1 kg. of gold, in the form of a rich concentrate, carrying 3 to 4 kg. of gold to the ton. This concentrate is treated by smelting.

With the aid of the same parties, I am arranging to instal a 40-stamp mill, with a cyanide plant. This mill will be similar to the one which we are running at our other mine, la Belliere, in the Vendée. There we are working an ancient Roman mine in a deposit of quartz, carrying gold-bearing mispickel, or arsenical pyrite.

JULES STRAP.

Paris, Jan. 24, 1905.

The Stock Exchange and Lawson.

Sir—"Can the leopard change his spots?" Few, if any, of the intelligent readers of Thomas W. Lawson's numerous articles, printed in *Everybody's Magazine*, and of his spread-eagle advertisements in the daily press, believe that he is actuated by an altruistic impulse; though in the December disturbance he undoubtedly forced the System to buy thousands of shares to support the market.

To a man up a tree, it seems that, after having made far more money in a short time than would be possible but for the

opportunities the New York stock exchange offers those who know the tricks of the trade, he incurred the displeasure of certain powerful financial interests, the managers of which turned him down. To get even with them, and at the same time to feather his own nest, he is trading on his intimate knowledge of the methods of Wall Street syndicates.

Many of his statements are true; they come home to all business men with earnings greater than their immediate needs, who, being naturally interested in making investments which would yield good income, have been swindled out of their hard-earned savings by the false statement and the tricky manipulation of the Wall Street crowd.

The manipulator is a thorough judge of human nature; he knows that the public buys when stocks are going up, and sells when they are going down. Hence he uses 'wash-sales,' which means giving one broker an order to buy, and another to sell; thus he makes the 'lambs' believe that a large amount of stock is being bought and sold, and that prices are going up, when as an actual fact the only real sales are those to the lambs. Similarly, the market is depressed by 'matched orders.' To explain this, a quotation is given from the *New York Times*, Jan. 15, 1905: "There is much in a name very often, and were it not that Wall Street takes refuge behind words, there would be little left of the market respectability of many a property and many a brokerage house that hold high places in the financial world. The 'wash sale,' in effect, is no sale at all; it is the mere outward form of a stock transaction which represents no actual transfer of the stock, nor even the formal delivery of the stock. In other words, a pretense of a sale, which is made for the purpose of affecting the market, for a stock, without any act other than a verbal transaction between the brokers, who for themselves, or on order from somebody else, report a trade they have really never made. This is washing out and out. On the Stock Exchange this crude method is seldom resorted to, inasmuch as the penalty attached to the offence is too great, suspension from the Exchange at least, and perhaps expulsion. But neither is it necessary. The 'matched order,' a term which borrows respectability, accomplishes the same purpose even more effectually; and, while it involves more trouble, it is attended by far less risk. A matched order is an order given to a broker to buy or sell a certain stock, usually at some fixed price, another broker at the same time being given an opposite order, enabling the first broker to buy from or sell to a broker acting for the same principal. Thus one order is matched against the other, the effect being practically a cancellation of both orders. In this case the transaction goes through as though the trade were genuine. Thus the principal, after

his orders had been executed, would have neither more stock nor less than he had in the first instance.

"In a different category is the 'cross sale,' which is often confused with the other two, but which is in no wise connected with them, being, in fact, a perfectly legitimate transaction. A cross sale is one made by a broker who happens to have both buying and selling orders in the same stock from different principals at prices which meet, enabling him to report the stock as sold to one customer and as bought to his other customer. Thus the orders cross in the hands of the broker, whence the name given the transaction.

"Of the numerous classes of sales, the really legitimate ones are probably much in the minority. 'Washed sales' and 'matched orders' are two cousins so nearly akin that there is only the word to differentiate them. Some would add the 'cross sale' to infuse respectability into the group."

I do not mean to imply that honest investment with a fair chance is not possible in Wall Street; but the actual character and condition need emphasis, much of the apparent trading being fictitious.

If Lawson has succeeded in making the lambs sell at recent prices, and if they will keep out of the market, the System will find itself out of business and with an immense amount of so-called 'securities' on hand which will earn only a fair income when the companies represented are carefully managed. The System will not sell its own stock on a declining, nor buy on a rising, market. Why should the public sell so as to permit it to buy low and sell high, and repeat the process indefinitely?

The speculative element cannot be separated from any investment and, in the public mind at least, it is particularly identified with some lines of business which it is the function and the privilege of your JOURNAL to represent. You must feel all the more keenly a responsibility to support every movement which tends to greater honesty and cleaner candor. It demands some acquaintance with methods and some skill in judgment to detect the actual bona-fide sale. Unfortunately, at present the public has no means of judging correctly the character of any advertised sale. The real responsibility for this, the real responsibility for any substantial improvement, rests mainly with the Stock Exchange; to right this wrong, at least, to remedy this defect, if it is simply a defect. Radical and forced legislation can do but little; the case concerns the Stock Exchange, and that body must, and undoubtedly will, see that there shall be some reasonable rules of stock transfers looking to a practical side, namely, the open and prompt statement of actual sales.

EXPERIENCE.

New York, Jan. 28, 1905.