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Contents	PAGE
Editorials:	
The Indian Tax on Silver.....	495
Accidents in Metalliferous Mining....	496
The Potash Salt Question.....	496
Rail Production in 1909.....	496
Respecting Press Agents.....	497
Just a Business Proposition.....	497
Bore Holes as Safeguards in Coal Mines. F. S. Parrot	498
Sodium-Hyposulphite Method for De- termination of Copper. C. M. Young	498
California Gold Output.....	499
Copper River Railroad..... L. Wernecke	499
*Consulting a High Stock Pile.....	500
Compressed Air in Mines. W. L. Saunders	500
*Slag Wall and Culvert Construction....	501
Tailings Dam of the Cananea Consoli- dated Copper Company. L. D. Ricketts	502
Goldfield Consolidated Mines Company..	503
Explosion in the Pettebone Mine.....	504
The Anaconda Statement.....	504
*Snowslides in the Cœur d'Alene District	504
Rail Production in the United States....	504
American Institute of Mining Engineers	504
*Oliver Continuous Filter at Minas del Tajo... G. A. Tveddy and R. L. Beals	506
Utah Copper Company.....	507
Quantitative versus Qualitative Think- ing..... R. W. Raymond	508
*A Modern Mine at Auboné in French Lorraine..... E. Walsh	509
Mining Census.....	510
Fatal Accidents in American Metal Mines..... Frederick L. Hoffman	511
*Ore Dressing in the Cœur d'Alene Dis- trict—VI..... Edward S. Ward	514
Sprague Process for Treating Furnace Gases..... C. B. Sprague	519
Prices of Manganese Ore.....	520
Stationary versus Moving Hoisting Plants..... J. P. Jackson	521
*Filling Abandoned Workings with Culm or Sand..... Henry M. Payne	522
*Progress in Fuel Briquetting. Robert Schorr	524
The Cherry Mine Disaster and Its Les- sons..... Sim Reynolds	525
Mineral Production of Idaho for 1909. F. Cushing Moore	527
Need of Complete Record of Prospect Drill Holes..... H. C. George	528
Personal, Obituary and Societies.....	529
Editorial Correspondence.....	530
Mining News.....	533
Market.....	538
Mining Index.....	545
Current Prices of Chemicals, Rare Metals, Earths, etc.....	548
*Illustrated.	

The Indian Tax on Silver

A wholly unexpected turn in the silver market came this week, when the Indian government announced that the duty on silver imported into that country would be increased on March 1 from 5 per cent. in the value of the metal to 4 annas per troy ounce. At current exchange the anna is worth about 2c., so that the new duty is very nearly 16 $\frac{2}{3}$ per cent. The immediate effect of the announcement was a drop of 1 $\frac{1}{2}$ c. per oz. in the price of silver, and the anticipation of a further fall.

The price of silver is regulated by the Indian demand, which absorbs between 50 and 60 per cent. of the silver production of the world. A sudden advance in the price of the metal in India is sure to produce a check in this demand, although a gradual rise will have little effect, provided conditions are good, as they have been in India for some time past. For this reason it is probable that the fall in prices will not reach the full extent of the increased duty; it may go a cent or two further, but it may also be followed by a partial recovery. Much depends on the spring crops in India; a good season will increase the buying power of the people, or a poor one diminish it.

The unsold stocks of silver in India are not believed to be very large. On the other hand, Chinese stocks are large and there has been some apprehension that the Chinese banks would send considerable quantities of the metal to India in settlement of rice bills and other accounts payable. It is possible that this may have had something to do with the advance in the duty. No explanation

has been given by the government so far for the imposition of the higher tax, and we do not know whether it was done for revenue purposes only, or for other reasons. Its chief interest to us is in the way in which it will affect our own producers.

The decline in the value of silver affects the silver-lead smelting companies in two ways: First, by depreciation of the large stock in ore and base bullion that is necessarily carried at all times; second, by restricting the ore supply, in the smelting of which profits are chiefly derived. The custom smelter reckons that fluctuations in metals will balance in the long run. This generally happens unless some radical change in conditions, such as the close of the Indian mints in 1893, precipitates a metal to a new low level from which it does not materially recover.

However, except for such a cataclysm, the effect of a decline in silver is apt to be overestimated. Taking the American Smelting and Refining Company as an example, it probably has about 20,000,000 oz. of silver in ore, etc., at all times. A decline of 1c. per oz. corresponds to \$200,000 on this stock. The recent decline may or may not be recovered; it is probable that at least a part of it will be. Moreover, silver is not the chief metal handled by the American Smelting and Refining Company, nor is it a large producer in the proper sense, its function being chiefly that of the broker or middleman. It may suffer seriously, however, by a decline in silver which restricts production of ore by other interests and consequently subtracts from the supply offered to the smelting company. Of late the supply of ore, par-

ticularly in Colorado and Utah, appears to have diminished, and any decline in silver which promises to extend over a long period will inevitably increase that tendency.

Accidents in Metalliferous Mining

In his contribution published in this issue of the JOURNAL Mr. Hoffman has done a real public service. For a long series of years there was no summary of the accidents occurring in coal mining in the United States, except those prepared by Mr. Hoffman and published annually in the JOURNAL. In the recent direction of attention to this important subject, all investigators have been obliged to revert to Mr. Hoffman's work, for which proper credit has not been given to him.

The same kind of reports for metalliferous mining has heretofore been lacking. When a few months ago we requested Mr. Hoffman to take up this matter he responded with alacrity and the present paper is the result. The deficiencies of this report are frankly recognized by Mr. Hoffman. He has made the most out of the data available, but unfortunately, to the discredit of our mining industry, the available data are scanty. For only six States has it been possible to secure statistics extending over a long series of years. The other States do not report them. Consequently, the figure finally reached by Mr. Hoffman must be regarded as indicative rather than as absolute.

The probability is, however, that the actual ratio of fatal accidents in metal mining is larger than the figure reported by Mr. Hoffman, because his figure is based chiefly upon the States which have provided the best mining laws and the best systems of mine inspection. The good of these things is clearly shown by the statistics. Thus, in Colorado and Montana, which among the western States are conceded to have the best laws, the general tendency of the fatality ratio has been downward. We are led to believe that if those States and Territories like California, Nevada, Arizona, New Mexico and Utah, which have not had either adequate mining laws or systems of mine inspection, could be summarized in the same way, the general ratio of lives lost per 1000 men employed would be increased.

Anyway, Mr. Hoffman clearly estab-

lishes one thing, which formerly was not believed but lately has been strongly suspected, namely that the loss of life in metal mining in the United States is fully as great as in coal mining. Mr. Hoffman has arrived at the average of 3.09 per 1000 in metal mining, as compared with 3.13 in coal mining. Bearing in mind the condition that we have mentioned above and the fact that the statistics for coal mining are far more complete than for metal mining, we surmise that the loss of life in metal mining in the United States is actually larger, proportionally, than in coal mining. This emphasizes the importance of the work that is now being done by a committee appointed by the American Mining Congress in drafting a new and modern law governing metalliferous mining that will be recommended to the several States.

The Potash Salts Question

The regulation of the potash salts industry seems at last to be in a fair way to settlement, with due regard to the rights of holders of contracts in this country. It will be remembered that the old Kali-Syndikat was broken up last year, chiefly on account of the controversy arising from the purchase, through German representatives, of an important mine by an American company. Advantage was taken of the temporary cessation of the agreement by another American company, which made a contract for its supply at reduced prices, running over several years. The different mine operators finding it impossible to renew the old agreement, the Prussian government, which is itself a large owner and miner, intervened, and insisted on the formation of a new syndicate. After some discussion and many propositions—one being the imposition of an export tax on the products of the potash mines—it was agreed that the whole question should be submitted to Imperial control, and a bill for that purpose was introduced in the Reichsrath. The provisions of this bill included the abrogation of the American contracts either immediately, or at the end of two years. It may be noted that the mine above referred to as owned by an American company, has a nominal German ownership—which is required by the German law—coupled with a contract by which all its output is taken by the company at fixed prices, which are

understood to be lower than those of the old syndicate.

When matters had reached this point, the American companies appealed to the State Department at Washington, asking for some action to protect their contract rights. While little has been made public on this point, it is understood that the Washington authorities took the matter up, and that certain representations were made at Berlin, in connection with the negotiations pending on tariff matters. At any rate the proposed export tax was abandoned, and the latest despatches state that the bill now pending in the Reichsrath has been modified. While still providing that the new syndicate, under government control, shall have an absolute monopoly of the production and sale of potash salts, members holding contracts made prior to Dec. 19, 1909, will be allowed to fill those contracts for their full term; and will not be required to cancel them at the end of two years, as at first proposed. Mine operators, however, will be required to pay a *pro rata* assessment on any production in excess of the quantity allotted to them by the syndicate. This provision may possibly be used to make trouble for the so-called "American" mines.

This bill, as it now stands, may be taken as the final settlement on the part of the German government. While it apparently admits the contract rights of the American companies, it is evident that the monopoly of potash salts production which Germany now holds is to be most jealously guarded for German profit.

Rail Production in 1909

The production of rails in the United States in 1909—which is reported by the American Iron and Steel Association in advance of the make of steel—was rather larger than had been expected. It reached a total of 3,062,582 tons, which was 1,140,971 tons more than in 1908, but 601,043 tons less than in 1907. It was less by 915,315 tons than in 1906, when our maximum production of rails was reached.

The remarkable point in the rail production of 1909 was the great increase in the make of open-hearth steel rails. The long discussion, extending over two years, of the defects of bessemer-steel rails resulted in a general turning to the open-hearth furnace as a producer of rail metal. In 1909 the make of open-hearth steel rails was 1,255,961 tons, which was

two and one-half times that of 1908, and five times that of 1907. The proportion of bessemer-steel rails fell from 93 per cent. of the total in 1907 to 70.5 per cent. in 1908 and to 60 per cent. in 1909. It is not unlikely that it will be below 50 per cent. in the current year. The change has been helped by the opening of the steel works at Gary, by the substitution of open-hearth furnaces for bessemer converters at the Carnegie works and the larger use of open-hearth steel at the Bethlehem and the Maryland steel works. Up to last year the greater part of the open-hearth rails were made in Alabama, at the Ensley works of the Tennessee Coal, Iron and Railroad Company; in 1909 Indiana and Pennsylvania both exceeded Alabama in their production.

The statistics of output by sections show that in 1909 only 8.4 per cent. of the rails made were under 45 lb. per yard; 34 per cent. were between 45 and 85 lb.; while 57.6 per cent. were 85 lb. or over. Open-hearth steel went largely into the heavier sections; it was used in 52 per cent. of the rails over 85 lb.; in 29.4 per cent. of the medium sections, and in only 12.5 per cent. of the light rails.

An interesting statement—the first report of the kind ever made—is that 50,505 tons of alloyed-steel rails were made. In these titanium steel led, nickel-chrome coming next. There were only small quantities of nickel-steel and manganese steel.

The iron-rail industry has disappeared. In 1907 there were 925 tons of iron rails made; in 1908 only 71 tons, and in 1909 none at all. In recent years the only iron rails made were of very light section, for mine and industrial use.

Respecting Press Agents

Our attention was called a few days ago to a paragraph in a newspaper that there was great competition and wire-pulling in the environs of Wall Street for the position of press agent for the promoters of the copper combination which has as yet not been formed. So the world, and particularly that part of it which has money to invest, may shortly expect to be informed of the blessings to come through the agency of a certain great person and the shekels to be raked in by the shrewd. Thus is advertising elevated to the acme of the art.

But seriously we wonder to what extent the public is alive to the insidious insinuations of the press agent? All of the advertising brokerage houses that issue their so-called "market letters" maintain one, according to the financial resources of the concern. This furnishes a regular and lucrative field of employment to the "mining writer." Among the more trifling concerns that cannot afford one of these gentry, some of whom command high salaries, the head of the house (perhaps the whole house) may be his own writer. Their greatest ambition is to smuggle items into the columns of the regular press, but in this they have no great success, except with the prostitutes.

So we say to the guileless investor, shun the "market letters," beware of the items and stories in "financial" papers, and listen not to the tipster, for these things are all manifestations of the press agent, who serves persons that are anxious to sell something which is usually of little value. And if that thing be a mine, buy not unless it be vouched for by an engineer of recognized standing.

Just a Business Proposition

Two years ago a committee of Senators and Congressmen spent some months investigating the postal situation. They took nothing for granted but looked into every nook and cranny that was open.

This commission decided that no reliable data were available and that most of the figures given were "estimates."

They found that very few improvements in the business methods of the Post Office Department had been made in a hundred years.

They found the largest business in the world run with antiquated methods, that the responsible positions in this vast machine were in the hands of politicians, that red tape clogged the wheels of progress and that, unlike any other business concern, this one is trying to economize by cutting down the volume of its business rather than increasing it.

This committee offered a bill to Congress, known as the Overstreet bill—but Congress had other fish to fry and no action was taken.

This bill provided for the appointment by the President of a non-political Di-

rector of Posts, who shall not be removed except for cause, and for a reorganization of the Postal Department along modern business lines.

Senator Carter has reintroduced this bill, and it ought to pass. It makes no snap judgments on "estimates." It provides that the department be put on a business footing first and remedies applied after it is known what is the matter with it.

The increase of magazine postage is not needed—the deficit increased \$18,000,000 on a *decreasing* second-class mail.

There is something rotten in Denmark—we think it is just departmental dry rot.

There have been some 17 Postmasters General in the past 20 years. To change the head of any big private business concern so often would break it. Fortunately the Postmaster General just rattles around in his job and the clerks carry on the work and make out their reports—and his.

Then he proposes—but the people dispose.

And the people of this country want their newspapers and magazines just as cheap as they can get them and they are getting tired of some things in our antiquated post office.

For instance, they are wondering why our department can make arrangements to carry a parcel from Seattle via New York and on to London or Paris or Berlin for 12c. per lb. *and charge 16c. per lb. to carry the same package to Tacoma, or even across the street.*

They are tired of the trade our post office made with Canada, increasing the rates on second-class matter to our neighboring country to the detriment of our trade there. They are tired of such acts as the recent reduction of 80 per cent. on foreign-going letters—and a howl about a deficit in the same breath.

If parcels posts are good for the foreigner they are good for us.

If the postage on the letter that carries the money order back to Italy should be less, why should the postage on the paper that tries to make an American citizen of another Italian be more?

A respectful letter from any business man to his representative in Congress asking him to support the Carter Bill (Senate Bill 6287) will receive attention. We urge our readers to write such letters.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS
AND THE EXPERIENCES OF READERS

Bore Holes as Safeguards in Coal Mines

I have followed with the deepest interest the numerous articles and reports on "Rescue Work" and "Safeguards in Coal Mines." In the JOURNAL, Dec. 25, 1909, is a most useful suggestion of installing a system of boreholes. I feel sure if this suggestion of putting down drill holes in suitable positions is carried out, it will be the means of saving many lives.

Many years ago a serious fall of ground took place in a coal mine in the Newcastle district, New South Wales, and 20 or 25 men were entombed. The fall extended over such a large area that it was impossible to cut through in time to save the lives of the men. The coal seam was in shallow ground (only 80 or 90 ft. of horizontal covering of compact fine sandstone and shale). As perfect maps of the workings were available, and it was known where the men were working at the time of the fall, I at once strongly urged that four or five drill holes should be started, and working at top speed I estimated the holes could be put through in from 40 to 50 hours. My suggestion was not agreed to and work was carried on to drive through the broken ground. It was several weeks before this work reached the sound part of the mine, and of course all the men and horses were found dead. By means of the bore holes communication would have been established with the entombed men, and food could have been sent down. Medical instruction could also have been communicated in case any of the men were badly injured. It is more than probable, if this suggestion had been carried out, all the lives would have been saved.

Along the Main Reef, and on some of the coal mines, a system of "first aid" teaching is now being carried out, and steps are being taken to organize the men, so trained, into regular units of the St. John Ambulance Brigade, which will render their services more efficient, and the men will be the more readily available in any extreme emergency. Later we shall be able to add to the "first aid" teaching the important training of "rescue work" to which I notice much attention is being devoted in the coal-mining districts of Pennsylvania. It is in the coal-mining areas, and not on the mines of the Main Reef, that the sugges-

tion of bore holes might well be considered. I should be glad to be put into communication with one of the leaders of this work in Pennsylvania to whom I shall be pleased to forward particulars of our methods in the Transvaal.

T. S. PARROT.

Johannesburg, South Africa,
Jan. 28, 1910.

Sodium-Hyposulphite Method for Determination of Copper

I have just read the article in the JOURNAL of Feb. 5, by C. A. Heberlein, describing the use of sodium hyposulphite for the precipitation of copper. As I have used this process for a long time and have found it highly satisfactory, it seems possible that a more detailed description may be of value. I first used the method when working on a roasting and leaching process. Some of the amounts of copper to be determined were exceedingly small but I have found the method to be satisfactory when it is applied to the amounts of copper met with in ordinary practice.

The method as I commonly use it is as follows: Dissolve the ore or slag in $\text{HNO}_3 + \text{HCl}$. Evaporate nearly to dryness, or if dryness is reached take up with a few drops of HCl . Add H_2SO_4 and evaporate until white fumes are evolved. Cool, add about 25 c. c. water and about 1 gram sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$). Heat to boiling and add more thiosulphate in small quantities until a permanent white precipitate is formed. Boil until the precipitate becomes granular and the solution is clear. Filter, wash with hot water, allow to drain for a moment and pour a little alcohol over the paper and precipitate. Fold the paper, place in a crucible and burn. If the precipitate is well granulated it may be washed by decantation. Dissolve in HNO_3 , add a little water and then add Na_2CO_3 or NaOH in strong solution until a permanent precipitate is formed. More of the alkali may be added to dissolve the copper precipitate, but it is not necessary. Add 1 c.c. strong NH_4OH , or more than 1 c.c. but always the same amount. Cool and titrate.

This method is a little slower than the precipitation by aluminum, but I believe it to be appreciably more accurate, and it is more rapid than the electrolytic method unless the revolving cathode is used. The

solution to which the thiosulphate is added should be slightly acid. A small amount of the precipitant is added before boiling to avoid the dangerous foaming which will take place if the salt is added to a boiling acid solution. To insure complete precipitation the precipitant is added until a precipitate of free sulphur appears after the black copper precipitate has been thrown down. Boiling until the precipitate becomes granular prevents clogging of the filter and the clear filtrate runs through the paper almost as rapidly as clear water. The addition of the alcohol is an expedient to save time. It removes nearly all of the water and makes it possible to burn the paper without any further drying. I have sometimes used this rapid method of drying with other precipitates and find that it is often of considerable advantage. The ignition removes the paper and frees the copper from the sulphur in which it may be inclosed.

The use of Na_2CO_3 or NaOH avoids the necessity of neutralizing with NH_4OH . The success of the cyanide titration depends upon the presence of an equal amount of free ammonia in each portion titrated. It is difficult to secure this equality when the acid is neutralized with ammonia because, though the same amount of HNO_3 may be added in each case, the different amounts of copper present will consume different amounts of acid. The presence of an excess of the sodium salt does no harm. The addition of the ammonia gives the blue color of the copper-ammonia ion. The ammonia should be accurately measured. The addition of only 1 c.c. may not make the solution clear but this is not necessary as the first addition of cyanide clears it. The method is easy, rapid and accurate.

C. M. YOUNG.

Lawrence, Kan., Feb. 7, 1910.

The Yampa Coalfield, Colorado

As already indicated in the Colorado correspondence of the JOURNAL, the people of Routt county and those owners of patented coal tracts in the Yampa coalfield who live in various places in the United States are annoyed by the long-drawn-out endeavors of the Government agents to prove criminality and take their lands away from them. This effectually blocks the development of the seams and the production of the fuel. Now in the

light of the Glavis evidence they seem to have lost all hope, for should it be shown that the lawmakers are coal-land grabbers, what chance has the coal owner, without capital and without "pull," to prevail against their efforts to deprive him of his holdings. Most of these were patented long before a railroad was built, or even commenced building.

I know one sad case, where an old couple have been living on the coal land and working it in their small way for 20 years, waiting and hoping to hear the whistle of the locomotive. The locomotive is still 100 miles away, kept back by the pernicious activity of competitive railroads and their affiliated coal companies in order to retain their monopoly of the coal trade, and keep the 1200 square miles of Yampa anthracite and bituminous coal out of the market. And last, but not least, by the efforts of the Government, a cloud has been cast over the title of the whole field, and capital scared away. People who have hitherto looked on a United States patent as title absolute, like the British freehold, are beginning to feel like the Scotchman who said, "I hae me doots." And this is a more serious matter than can easily be grasped.

T. B. C.

Denver, Colo, Feb. 11, 1910.

California Gold Output

The daily press of San Francisco pays but scant attention to the gold-mining industry of California, mainly, perhaps, because there are no stock-dealing features connected with it. At the same time many columns are printed weekly relating to the petroleum industry, and this is given in great detail. Recently some of the papers have taken up the gold-dredging industry and its advantages to the State, but in doing so some wild statements are being made which are far from true and therefore do more harm than good. Among other things it is stated in bold headlines that the dredges are now producing more than half of all the gold being mined in the State. They are doing nothing of the kind and never have done it. According to the mine-production report of the U. S. Geological Survey for 1908, which furnishes the latest available statistics of gold production in detail, the deep or quartz mines of California yielded \$10,530,187 while the placers, including the dredges, yielded in the same period \$8,231,187. Of this placer gold, the yield from dredge mining was \$6,536,189, or 79 per cent. of placer-gold output, the other \$1,694,998 coming from hydraulic, drift and surface placers. This shows that while in 1908 the dredges produced gold valued at \$6,536,189, the other gold mines yielded \$12,225,370, or almost twice as much as the dredges. Therefore, on examination, it is seen that

the statement that dredges are producing more than half of California's gold output is wrong, and that they are really producing only about one-third. Moreover the deep mines produce \$873,057 silver at commercial value while the dredge yield of silver with the gold is only \$12,070. The dredges are doing well and are increasing their output in some fields, though in other fields no increase is expected. The quartz mines meanwhile are increasing their yield also and it will be some years, if ever, before the dredges catch up with the deep-mine gold yield in California.

M. F. H.

San Francisco, Cal., Feb. 23, 1910.

The Copper River Railroad

I wish to congratulate the JOURNAL on the issue of Jan. 8, 1910, and particularly for the quick publication of statistics which are practically correct for the few cases with which I am familiar. There is one instance, however, where I do not think just credit was given. In the article on Alaska, M. J. Heney, who is the contractor for the construction of the Copper River & Northwestern Railway, is given the entire credit for constructing that railroad. While it is true that a large portion of the construction work accomplished on the Copper River & Northwestern Railway is due to Mr. Heney's energetic operations, much credit is also due to the work of E. C. Hawkins, who is the chief engineer and general manager of Copper River & Northwestern Railway, and under whose direction Mr. Heney is working.

L. WERNECKE.

Cordova, Alaska, Feb. 6, 1910.

Canadian Iron Production

Figures collected by the American Iron and Steel Association give the production of pig iron in Canada for two years past as follows, in long tons:

	1908.	1909.	Changes.
Basic pig.....	335,410	357,965	I. 22,555
Bessemer pig.....	112,811	169,545	I. 56,734
Foundry and forge	115,451	149,580	I. 34,129
Total.....	563,672	677,090	I. 113,418

The make in 1909 was the largest ever reported. Of the total for the year 660,856 tons were made with coke and 16,234 tons with charcoal and electricity. In 1909 the Canadian furnaces consumed 1,311,796 tons of iron ore and 58,731 tons of mill cinder, scale, etc., in the manufacture of pig iron. In addition they consumed 470,080 tons of limestone for fluxing purposes. The raw material consumed averaged 2.02 tons ore and 0.69 ton flux to the ton of pig.

On Dec. 31, 1909, Canada had 16 completed furnaces, of which 11 were in blast and 5 were idle.

February Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during February, 1910, by a number of mining and industrial companies in the United States, Canada, and Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Alaska Mexican, g.	Alas.	\$0.40	\$72,000
Alaska Treadwell, g.	Alas.	0.75	150,000
Alaska United, g.	Alas.	0.15	27,300
Amalgamated Copper, Mont.	Mont.	0.50	769,439
Arizona Copper (com.)	Ariz.	0.30	455,969
Bunker Hill & Sul., I. Ida.	Ida.	0.20	60,000
Elkton Con., g.	Colo.	0.01½	37,499
International Nickel, pf.	U. S.	1.50	133,689
Mohawk, c.	Mich.	1.00	100,000

Foreign Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Buffalo, s.	Ont.	0.03	\$30,000
Dolores, g.	Mex.	0.22½	90,000
Dominion Coal, pf.	N. S.	3.30	175,000
Lucky Tiger, g.	Mex.	0.05	35,750
Mines Co. of Am.	Mex.	0.03	60,000

U. S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
Jeff. & Clearfield C. & I. com.	Penn.	\$2.50	\$37,500
U. S. Steel, pf.	U. S.	1.75	6,304,919

Chronology of Mining for February, 1910

Feb. 1—Explosion in Browder mine of Elk Valley Coal Company near Drakesboro, Ky.; 34 killed. Fire destroyed tipples and shaft buildings at Scholl Brothers' mine near Bartonville, Ill.

Feb. 2—Explosion at Palau mine, Las Esperanzas, Mex.; 68 killed.—Western coal miners' wage-scale conference met at Toledo and adjourned next day without agreement.

Feb. 5—Explosion at Ernest No. 2 mine of the Jefferson & Clearfield Coal and Iron Company at Indiana, Penn.; 11 killed.

Feb. 8—Explosion in the mine of the Stearns Coal Company, Stearns, Ky.

Feb. 17—Strike of the engineers' union at Butte, Mont., the mines resuming after a few days with engineers furnished by the Western Federation of Miners.

Feb. 19—Meeting of Utah branch of American Mining Congress at Salt Lake City.

Feb. 25—Arguments in the Trust suit against the anthracite-coal-carrying companies were closed in the U. S. Circuit Court in Philadelphia, and the court took the case under advisement.

Feb. 26—Indian tariff increase on silver from 5 per cent. to four annas per oz., (about 16 per cent.) announced.

Feb. 27-28—Avalanches at Mace and Burke, Ida., caused large loss of life.

DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Constructing a High Stock Pile

The accompanying photograph shows a high stock pile of red ore being accumulated by the Tennessee Coal, Iron and Railroad Company at its Muscoda ore-mines at Readers, Ala. An auxiliary hoist



ARRANGEMENT FOR BUILDING STOCK PILE IN BIRMINGHAM DISTRICT

and frame carrying sheaves are used in building this stock pile up to the required height; the hoist and frame, being set on timber bases, are moved along the stock pile as the face of that portion which is being built up advances. The use of an auxiliary hoist enables the pile to be built up to a greater height than could be done by ordinary tramming. The ore on being hoisted from the slope passes through pockets and down to the track leading to the ore heap. It is trammed to the base of the portion of the heap being built up, where the hoisting cable is connected to the car which is pulled up the incline and dumped at the end where the tracks are shown extending beyond the brow of the pile. The cars can, of course, be run back down the incline by gravity.

Compressed Air in Mines*

BY W. L. SAUNDERS†

In his review of the modern conditions in mining and metallurgy in the United States Mr. Brunton said: "The ventilation and cooling of metal mines have not yet received the attention which their importance demands. In this respect Western engineers could take profitable object lessons from their brethren in the coalfields."

The importance of this subject can scarcely be overestimated. It should surely be the province of the mining engineer not only to excavate material and treat it properly and economically, but in doing this he should study how to protect and conserve the lives of the

motives which have come into general use, and he makes the statement, which no one can dispute, that each has its own field. Following this, however, the claim is made that "where the openings are dry and the roof sufficiently high and firm to carry the trolley-wire insulators, there is no question as to the desirability of using electricity." This seems to be a rather slender hook on which to hang the interests of the compressed-air locomotive. The members of this institute recently visited the Anaconda smelteries, where we saw air locomotives doing useful service throughout the works. The superintendent, when asked why he used air in preference to electricity, answered, because it was better and cheaper. This is only one notable instance where air is preferred for traction purposes. There are many others, as, for instance, the Homestake, the largest and richest single gold mine in the world, where air locomotives do useful service not only in the yards but in the mines themselves. These installations, Anaconda and Homestake, are of the old type; that is, the simple compressed-air locomotive. Notwithstanding this, the results are satisfactory and economical.

There is a new type of locomotive, built by the H. K. Porter Company of Pittsburg, which should be able to add 50 per cent. to the saving in air economy. This new type uses the natural heat of the mine as a reheater to expand the air between the high- and the low-pressure cylinders. Under the old system of simple compressed-air locomotive it was frequently true that the fuel required to furnish the power for the air and the electric systems was almost exactly the same. With the new system it is claimed that under the same conditions the fuel requirements in air will be but two-thirds of that made necessary in an electrical installation. There are some conditions where the electrical installation might prove more economical even than the compound compressed-air locomotive. Much depends upon the load factor. With a good load factor of from 30 to 40 per cent. of the rated power of the engines and generators furnishing the current, and with mining conditions which permit operating locomotives at rated speed and power, it should be possible with electric locomotives to obtain efficiencies approximating those found in connection with the operation of large street railways; but in ordinary mining conditions there is much starting and

miners. John Mitchell's figures show that four times as many men are killed in mines in the United States, in proportion to the number of men employed, as in any other country in the world. Explosions are responsible for much of this, but where explosions occur human life might be saved, provided there is a complete system of ventilation in the mine, and provided certain safeguards are employed.

UNDERGROUND HAULAGE

Under section VI., "Underground Tramming," Mr. Brunton, in the same article, refers to the air and electric loco-

*Discussion of D. W. Brunton's paper, "Mining and Metallurgy in Western United States," read before the Spokane meeting of the American Institute of Mining Engineers; Bull. No. 37, A. I. M. E.
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stopping, tracks are crooked and curves frequent, and the poor load factor results in an efficiency in mines even below that of the simple compressed-air locomotive.

DISADVANTAGES OF TROLLEY WIRES

Trolley wires in mines are always more or less a source of danger, annoyance and expense. This is especially true in gold, silver and copper mines, where many of the levels are operated simultaneously, and where the output per level is comparatively small. In such cases it frequently requires the services of several men and large quantities of copper wire and insulators to keep the haulage locomotives in close touch with the various working places. Even in cases where the openings are dry and the roof high and firm, the trolley wire becomes a menace when there is a wreck on the road or any other accident resulting in a short circuit.

Wherever the wires are carried near ore chutes, or places which require occasional or frequent blasting, they are in danger of being ruptured or put out of service. Furthermore, the danger from

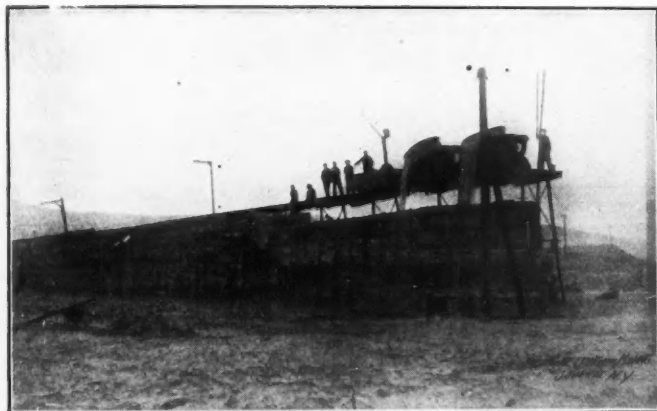
not by any means everything to be considered in looking for the best. Material and workmanship are of the greatest importance, and the skill which can only come of experience when applied in the construction of this important mining tool should surely be of value to the miner who is seeking a reliable machine for permanent service.



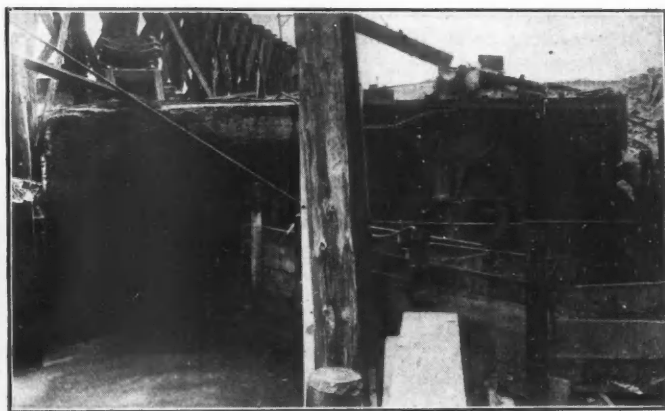
FORMS FOR SLAG CULVERT AT BUTTE REDUCTION WORKS

Slag-Wall and Culvert Construction

The accompanying engravings illustrate the building of slag walls and culverts at the Butte Reduction Works at Butte, Mont. The method of building up the walls, is shown in the photograph to the left. The plant is situated on flat land adjacent to Silver Bow creek. It is therefore necessary to exert precautions so that the concentrator tailings will not encroach upon the stream. Slag walls are built on either side of the creek to protect it. They are built up by dumping the molten slag between cast-iron plates as shown.



MAKING SLAG WALL AT BUTTE REDUCTION WORKS



SLAG CULVERTS AT BUTTE REDUCTION WORKS

fire cannot be overestimated, inflammable material being frequently in proximity to the wires.

The long entry to the mine obviously can be best equipped electrically, but in the various ramifications of the mine compressed air has been proved to be safest and best.

The argument that the air locomotive loses time in charging has some merit, but observation of the performance of the electric locomotive in mines proves that the time lost in handling the trolley pole under ordinary mining conditions is approximately as great as that due to charging the air locomotive. In narrow drifts it is sometimes found impossible to turn the trolley pole, and the locomotive has to be run a considerable distance with the trolley pole in advance of, instead of trailing behind, the support. Under such conditions slow speed and great caution are required in order not

to break the poles or tear down the wiring. Ordinarily charging a compressed-air locomotive means the loss of about a minute and a half for every 4000 ft. of travel.

It is to be regretted that Mr. Brunton dwelt so briefly upon rock drills, for surely this valuable adjunct to the miner deserves serious consideration. The rock drill has made the mining and smelting of low-grade ores profitable. Development work, tunnel construction, drifting and stoping are all pursued today to a greater extent than in olden times, because the rock drill has been perfected to that stage of simplicity where it may be used profitably and economically. It is difficult to find in the list of mechanical appliances a machine which has been subject to greater wear and tear, or in the building of which experience is of more importance, than the rock drill. The design of a rock drill is

The photograph at the right shows the end of the slag culverts built at this plant after the designs of James Doull. A reinforced-concrete culvert was first built, but cost about \$70 per lineal foot. Later the reinforced-slag culvert was substituted and proved cheaper and just as satisfactory. The illustration shows the molding forms used in connection with the construction of the culvert.

The 200-stamp mill for the City Deep is being shipped from England to South Africa. Every effort is being made to have the milling begin before Oct. 1, 1910. The extraordinary bonus of \$500 per day is to be paid to the Rand Mines Power Supply Company for every day of saving on the contracted time of delivery of power from its new plant now under construction.

Tailings Dam of the Cananea Consolidated Copper Company

By L. D. RICKETTS*

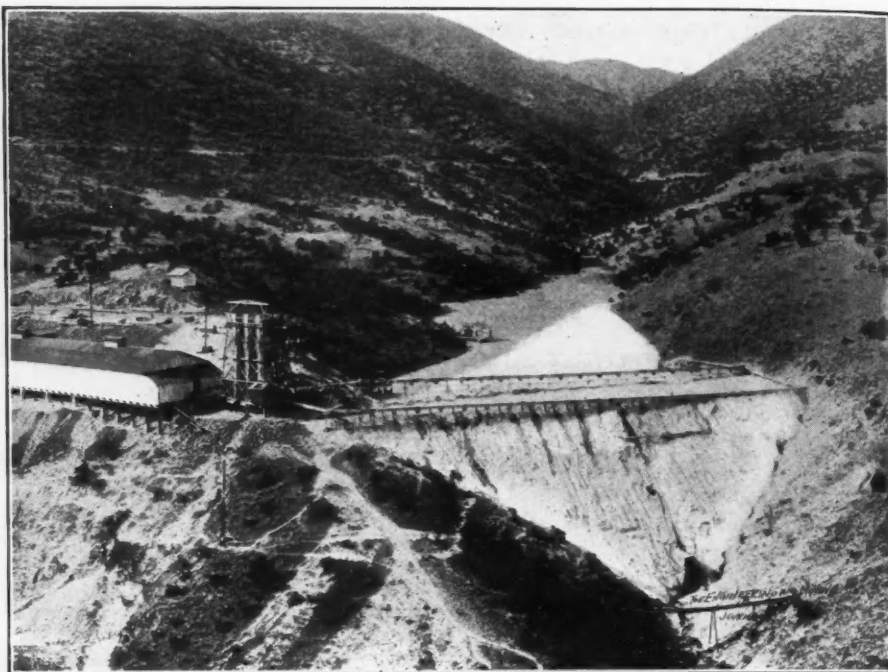
The accompanying views of the tailings dam of the Cananea Consolidated Copper Company show plainly the method of construction, which simply consists in separating the coarse sand from the general tailings, making a dam with the sand and allowing the slime and most of the water to flow into the upstream side of the dam. A tunnel through the hill, with an uptake, provides for diverting flood waters. The general plan of forming this dam was worked out by Samuel Storrow, consulting engineer, of Los Angeles, Cal. There is nothing particularly novel in building this kind of a dam, but it is useful in calling attention to the fact that this company is taking steps to impound tailings, which, while they cannot be further benefited at the present time, still contain nearly \$2 per ton gross value. The tailings are impounded partially to prevent pollution of the streams, but mainly because it is considered that some process will later develop by which they can be retreated as a profit.

At the time these photographs were taken the highest portion of the dam was 65 ft. above the lowest point of the cañon. The elevators to the left, Fig. 1,

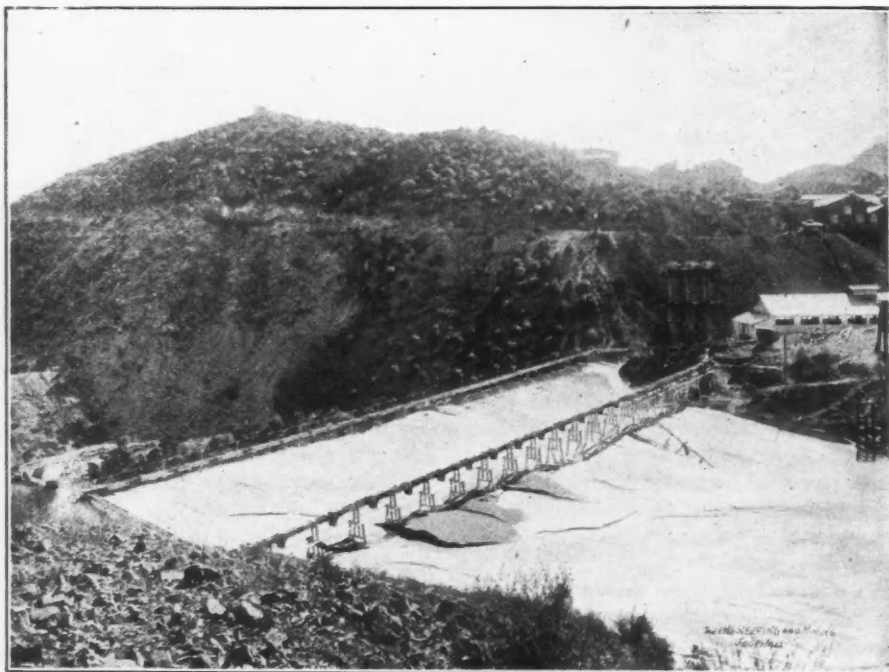
found the tailings of the Cananea Consolidated Copper Company for a year or longer.

Fig. 2 shows plainly the method of building up the dam. Two parallel launders have spitzkastens at intervals. The thick sands with a minimum quantity of

dam. By the use of two launders the foot of the dam can be kept quite steep, say 25 deg. from the horizontal. It would be useless to give the grade of the launders as a standard as this has to be determined empirically and will vary according to the conditions of the tailings.



TAILINGS DAM AT CANANEA. ELEVATORS AT THE LEFT



TAILINGS DAM, SHOWING LAUNDERS IN FOREGROUND

will continue to raise the dam, and when the dam is raised to a higher level the elevators will be extended. Ultimately this dam will be about 110 ft. high. It is estimated that this small basin will im-

*General manager, Cananea Consolidated Copper Company, Cananea, Sonora, Mex.

water, are drawn from these spitzkastens. To the right of the picture, back of the launder and next to the crest of the dam, one can see where a row of tailings is kept piled up on the crest of the dam so that any water coming in with the sands will drain into the basin in front of the

In this case but 3 per cent. is used for the reason that there is a large amount of slimes with the sands, and these form a lubricant which aids greatly in transporting same. The clarified water is pumped back to the mills for re-use, or allowed to flow through the waste tunnel as desired.

While there is nothing extraordinary in this method of building a dam, it is cheap and is of interest because I believe that every large establishment engaged in dressing ores should store its tailings. If this were done there would be a great deal of valuable material available as ore in the future.

A Face Protector

A screen used for the face in the Joplin district, is made of a piece of ordinary screen-door wire cloth. The piece of cloth is about 14x16 in. A string is fastened to two corners and tied back of the head so as to allow the wire to hang from the cap over the face. This screen is used by the men at the grizzlies when breaking large pieces of ore with hammers. The hard, cherty character of the ore causes pieces of rock to fly off when struck with the hammer, and unless the face is protected it causes more or less annoyance to the laborer and he is at the same time liable to have his eyes seriously injured.

Goldfield Consolidated Mines Company

The directors of the Goldfield Consolidated Mines Company at the regular quarterly meeting Feb. 24, declared in addition to the regular quarterly dividend of 30c. per share, an extra dividend of 20c. This payment will call for a distribution of about \$1,800,000.

The directors attending the meeting were: George Wingfield, J. H. McKenzie and A. H. Howe, of Goldfield; J. H. Carstairs, of Philadelphia, and W. C. Ralston, of San Francisco.

Mr. Howe said that there was no news of importance to give out concerning conditions at the 1000-ft. level from the Clermont shaft. He declared that while the drift that is being driven from the shaft toward the big oreshoot is in some good ore, it has probably 50 ft. yet to go before it reaches the point where the main orebody is expected to be found.

W. C. Ralston said: "There's nothing in that copper story. Neither is there anything in the report that we have lost the vein in the Mohawk. It is true that the dip of the oreshoot has changed, has flattened out slightly between the 900- and 1000-ft. levels. But the ore was picked up by a winze from the 900-ft. level and it is of the same character as above. This is not unusual in the Goldfield district, the dip of the Mohawk vein having changed on the upper levels."

WORK IN JANUARY

Manager J. R. Finlay submitted a preliminary report on operations for January.

JANUARY TONNAGE.

	Dry Tons.	Per Ton.	Approximate Production.
Combination.....	6,193	\$18.41	\$114,093
Mohawk.....	7,928	15.27	121,088
Red Top.....	6,243	36.36	227,122
Clermont.....	3,716	87.00	323,195
Total.....	24,080	\$32.62	\$785,498
Loss in tailings.....			55,898
Estimated recovery....			\$729,600

"The amount indicated as recovered was not all precipitated and turned into bullion at the end of the month. Owing to the increased tonnage treated in the mill there was a larger amount of concentrates in process at the end of the month than at the beginning. Mr. Hutchinson estimates that about 60 tons of concentrates, containing 1000 oz. of gold, belonging to January ore, had not been treated.

"The total cost has come down a little, principally in the item of general expense. The cost of mining and development is a few cents lower than for December, and the cost of milling a few cents higher. On the whole I think it is safe to say that the reduction in costs,

due to a production of 25,000 tons per month as against 20,000, will be almost entirely in the overhead charges. It is too early to figure on much reduction in other directions, but when our difficulties at the mill are fully overcome there should be some reduction there.

"As to the cost of mining, it is difficult to see much opportunity for lower costs; possibly we should anticipate somewhat higher costs on account of the

JANUARY EXPENSES.

	Amount.	Per Dry Ton.
General expense.....	\$28,200	\$1.18
Mining—		
Pay roll and salary..	\$53,256	
Power.....	4,416	
Supplies.....	35,400	
Departments.....	7,972	101,044 4.21
Railroad.....	2,000	0.08
Milling—		
Pay roll and salary...	\$14,838	
Power.....	7,848	
Supplies.....	32,500	
Departments.....	2,603	57,789 2.41
Marketing concentrates	23,000	0.96
Total cost.....	\$212,033	
Less miscellaneous earnings.....	1,713	
Net cost.....	\$210,320	8.73
Loss in tailings.....		2.32
Total costs and losses.		\$11.05
Profit per ton.....		21.57
Total value of ore...		\$32.62
Total profit for month.....		\$519,300

necessity of providing equipment for operating at greater depth than heretofore.

RESULTS OF DEVELOPMENT WORK

"The total advance made in development headings is, so far as I know, the largest on record, being as follows: Combination, 840 ft.; Mohawk, 1020; Red Top, 1328; Jumbo, 1375; total, 4563 feet.

"Of this development a total of 858 ft., or somewhat less than 20 per cent., was in ore. Most of this work, however, was simply following orebodies that were already presumed to exist and cannot be said to add anything to ore in sight. In the Combination and Mohawk I do not consider that any new ore was developed during the month. In the Clermont, on the 750-ft. level, developments were made in three new places exposing ore of a total area on that level of 1254 sq.ft. Of this amount 780 sq.ft. is due to the extension of the sill floor in the large stope No. 401. Since no equivalent developments were made on the levels above and below, I am forced to estimate that this ore should be considered only to extend half the distance to the 600-ft. level upward, and half the distance to the 900-ft. level downward. In other words, a reasonable estimate of ore put in sight by these developments should not be calcu-

lated on a vertical extent of more than 120 ft., but this will allow an estimate of approximately 12,000 tons put in sight at the Clermont as against 3700 tons extracted. The average grade of this ore I calculate roughly at \$70 per ton.

"In the Red Top, out of a total of 217 ft. in ore, only 96 ft. belongs to drifts on main levels putting new ore in sight. The total amount may be roughly calculated at 4000 tons of an average value of \$15. In round numbers I should say that the developments of the month have put in sight 16,000 tons, with a total value of \$900,000, as against 24,000 tons mined with a total value of \$785,000, showing a surplus of value put in sight for the month, but a shortage of tonnage.

THE SITUATION AT DEPTH

"On the 1000-ft. level of the Clermont, the main crosscut has reached the vein, but thus far no ore has been encountered. The silicified mass in which the ore is to be expected is found with its usual attitude and appearance. We are now drifting on a seam which we think will undoubtedly soon lead to an ore shoot. For the last few days we have been getting assays of from two to eight dollars per ton. We expect to find here a continuation of the large oreshoot already developed on the 750- and 900-ft. levels, but on studying the maps it is evident that this oreshoot should be further east in the direction in which we are now going.

"We are hampered in conducting the proper amount of development work in the lower levels of the Clermont by a shortage of hoisting capacity. Extensive development work that we cannot now attempt ought to be done on the 600-, 750-, 900- and 1000-ft. levels in the large tracts of unexplored ground both north and south of the territory we have at present opened. I look forward confidently to finding large amounts of ore on all of these levels. The difficulty in pushing work comes from the shortage of air. We are depending on our compressors to supply air not only for the machine drills but also for the Mohawk and Clermont hoists. The result is that the compressors are taxed to their utmost capacity and we cannot attempt further development work until we can replace one or both of the hoists with electric hoists. This will take several months.

"The explosion of an oil tank on Jan. 26 caused a loss of about \$5000. The machine shop and carpenter shop at the mill were consumed, together with a carload of oil and some lime. The incident was much exaggerated in the newspapers. We are taking additional precautions against fire throughout the property.

"In spite of difficulties caused by the weather and fire, the mill has a most gratifying record for the month. It has proved its capacity for treating up to 900 tons but we should count on 850 tons for normal. The increased output is obtained without any loss in metallurgical efficiency. The mine is in good condition to maintain its present output without any great effort. The principal limitation both on ore production and development is the capacity of the compressors, as above mentioned.

NOTE EXPLAINING COST STATEMENT

"Heretofore this company has published its complete costs only in the annual reports, but it has made a practice of publishing at intervals its operating costs, namely, mining, transportation and milling. In this statement, however, the effort is made to show the total deductions that must be made from the gross value of the ore, calculating gold at \$20.67 per oz., to arrive at net profits applicable to dividends. Few companies issue such statements.

"The items that are stated as costs now, that were not so stated formerly, are the general expenses, of which, at least half are bullion taxes and the cost of realization of bullion. Further, the cost of smelting residues from the concentrate plant is now included as an operating expense under the head of milling.

"The sum total of costs and losses will vary according to the grade of the ore. The bullion tax and tailings losses vary directly with the grade, and the cost of marketing concentrate residues varies also but not in direct proportion to the value contained.

"This explanation is intended to dispel the surprise caused by a statement showing the total costs and losses instead of the direct operating costs. The former are about \$11 per ton and the latter somewhat less than \$7. It is perhaps worth while to state that the sum total of costs and losses is apparently less than that of any other gold-mining company in the world that produces an ore of similar grade."

Explosion in the Pettebone Mine

Six men were so badly burned by an explosion of gas in the Pettebone shaft at Dorranceton, Penn., at 10 o'clock, Tuesday morning, Feb. 22, that five will probably die.

On account of the colliery being idle for Washington's birthday, the injured men had to walk nearly two miles underground to the foot of the shaft before they received assistance. The flesh was hanging in shreds from their faces and hands, and their pain was almost beyond endurance. Their travel from the point where the explosion occurred to the foot

of the shaft was most difficult. The explosion not only blew out their lights, but scattered their lamps in all directions, and they had to grope their way in the dark.

A pocket of gas was burning in the mine on Monday afternoon, and these six men went in on Tuesday to build brattices and doors to change the air current to drive out the accumulation of gas. They had finished the job and thought the place was safe when the explosion resulted. The Pettebone is a Delaware & Lackawanna colliery. The explosion occurred in the "Gem" slope.

The Anaconda Statement

In its application to have its stock transferred to the regular list of the New York Stock Exchange, the Anaconda Copper Mining Company submitted its profit and loss account for the six months ended June 30, 1909, and balance sheet at that date, both of which are given below:

PROFIT AND LOSS ACCOUNT.

SIX MONTHS ENDED JUNE 30, 1909.

Sales of copper, silver and gold.....	\$6,060,028
Royalties and precipitates sales.....	46,110
Dividends on investments.....	16,847
Rental of water rights.....	25,000
Miscellaneous receipts.....	4,478
Net profit of subsidiary departments, after depletion of coal and timber lands and depreciation of plants and equipment.....	95,063
Interest.....	62,814
*Copper, silver and gold on hand at end.....	5,931,690
Total.....	12,242,033
Deduct:	
*Copper, silver and gold on hand at beginning.....	6,169,244
Mining expenses, including development and depreciation.....	2,720,908
Ore and scrap copper purchases.....	104,162
Transportation of ore from mines to reduction works.....	77,955
Reduction expenses at Anaconda, including depreciation.....	1,362,113
Transportation of metals, refining and selling expenses.....	562,600
Administration expenses.....	23,138
Total.....	11,020,123
Profit for the six months ended June 30, 1909.....	1,221,910
*Copper at cost; silver and gold at net selling price.	

BALANCE SHEET, JUNE 30, 1909.

Assets:	
Mines, saw mills, townsite property and water right.....	\$20,443,350
Buildings and machinery.....	3,112,235
Investments.....	534,113
Insurance unexpired.....	44,207
Materials and supplies for future operations.....	2,158,502
Merchandise for sale.....	534,606
Copper, silver and gold on hand.....	5,931,690
Accounts receivable.....	1,278,032
Loans and advances to associated companies.....	2,147,557
Cash in banks and in hands of selling agents.....	907,556
Total.....	37,091,852
Liabilities:	
Capital stock.....	\$30,000,000
Taxes accrued.....	120,753
Accounts payable.....	857,373
Wages payable.....	539,631
Dividend warrants not presented.....	7,740
Dividends payable July 14, 1909.....	600,000
Balance December 31, 1908.....	4,944,442
Profit for six months ended June 30, 1909.....	1,221,910
Deduct dividends.....	1,200,000
Total liabilities.....	37,091,852

The output of the Anaconda Copper Mining Company for the year ended Dec. 31, 1909, as compared with three previous years is presented herewith, to-

gether with some of the principal items of costs and the dividends paid for the last four years:

	1909.	1908.	1907.	1906.
Copper, lb.	75,860,194	64,869,176	63,055,661	94,963,835
Silver, oz.	2,363,184	2,071,246	2,001,350	2,979,908
Gold, oz.	7,466	8,395	8,290	15,885
Min. exp. dev. dep.	\$2,720,908	\$4,505,529	\$5,241,704	\$5,870,439
Trans. ore to reduc.	77,955	136,593	153,140	234,150
Reduct. ex. at Anaconda...	1,362,113	2,940,175	3,640,295	4,424,278
Trans. ref. and sell.	562,600	989,562	997,939	1,721,965
Admin. ex.	23,138	59,529	53,649	57,672
Net min. profits...	1,159,696	945,963	3,147,773	8,584,169
Dividends.	1,200,000	2,400,000	6,300,000	6,900,000

Through its application to the Stock Exchange, many interesting facts are made public. The Anaconda company was incorporated June 15, 1895, since which time to Dec. 31, 1909, the company has paid in dividends \$45,900,000. The company owns in Cascade county, Montana, 2605 acres of coal land and in Ravalli county, Montana, 30,471 acres of timberland, together with various timber holdings in other counties throughout the State.

Its copper-mining properties approximate 1168 acres. Mines are operated by means of 11 shafts, all of which, except one, are deeper than 2200 ft. The operations all indicate extensive bodies of commercial ore. Crosscuts are now being driven from the lower levels, and the results thus far obtained are satisfactory. During the last two years large orebodies of an excellent grade have been discovered on the lower levels of some of the properties, the existence of which had never been indicated by developments above.

President B. B. Thayer says that it has never been considered a wise policy to endeavor to put in sight extraordinary measurable ore reserves on account of the cost of maintenance of development shafts and drifts when carried beyond the scope of regular stoping operations. It is the opinion of engineers, however, that there is as much ore blocked out as at any time in company's history.

The company, aside from mines and claims near Butte, also owns sawmills, timber lands, coal mines, townsites, water rights, electric railroads, electric lighting plant, hotel, foundry and brick yard, all in Montana, and it supplies the city of Anaconda with water.

The company owns 51 per cent. of the stock of the Butte, Anaconda & Pacific Railway. Coal properties at Belt, Mont., have been operated for about 20 years, a portion of the product going to both Anaconda and Great Falls.

The fact is made known that the lease under which the Anaconda company operates the Washoe smeltery, owned by Washoe Copper Company, will expire in 1912. The works have capacity for treating 10,000 tons daily.

Snowslides in the Coeur D'Alene District

Twenty-four persons are reported to have lost their lives in snowslides in the Coeur d'Alene district, Idaho, Feb. 27 and 28. The most disastrous slide occurred at the little town of Mace, which is situated in a narrow canon. Fourteen are reported dead, and eleven injured there. The slide demolished the houses in its path, and stopped a short distance beyond the wrecked home of Ira Pascoe, superintendent of the Standard-Mammoth mine. Mr. Pascoe and his son and daughter were killed. Mrs. Pascoe was rescued almost uninjured.

The town of Burke was the scene of another slide in which five bodies have been found, and the men who have been

Rail Production in the United States

The American Iron and Steel Association reports that the production of all kinds of rails in the United States in 1909 amounted to 3,062,582 tons, against 1,921,611 in 1908, an increase of 1,140,971 tons, or 59.3 per cent. The production in 1907 was 3,633,654 tons. Rails rolled from purchased blooms, crop ends, scrap and seconds, and rerolled and renewed rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. The maximum production of all kinds of rails was reached in 1906, when 3,977,887 tons were rolled.

The production for 1908 and 1909 is shown in the accompanying table.

tons; nickel-chrome rails, 12,287 tons; and nickel-steel and electric-steel rails, 1245 tons. The 50,505 tons of alloyed-steel rails produced in 1909 were rolled by eight works in six States. Of the total 36,809 tons were rolled from alloyed bessemer steel and 13,693 tons from alloyed open-hearth steel. The above are the first alloyed-rail statistics gathered by the association. Open-hearth rails were used chiefly for the heavier sections. For those of 85 lb. and over to the yard the make of open-hearth rails exceeded that of bessemer steel.

Transvaal Mines

The number of producing mines contributing to the January gold output was 71; there were 9625 stamps at work in



HELENA-FRISCO AND STANDARD MINES IN THE COEUR D'ALENE DISTRICT, IDAHO, WHERE SNOWSLIDES HAVE BEEN RUNNING

digging tunnels since Sunday morning expect to find more dead. Two slides occurred near Wallace and five persons are reported to have been killed by them. The snow in the Coeur d'Alene district is said to be deeper than at any time since 1888, when 60 people were killed by an avalanche at Burke. Old-timers in the district had been sounding warnings to Mace and other towns that slides were imminent because of the record depth of the snow, the Chinook winds and warm rains.

The Standard-Mammoth mine at Mace lies between precipitous mountain sides, as shown in the accompanying illustration. The Helena-Frisco mine is in the same cañon, a short distance below the Standard. The boarding house of the Standard mine was missed by 120 feet.

Irving K. Farrington & Co. inform us that their reference to J. Parke Channing in connection with Tularosa Copper Company, to which we referred recently, was a typographical error, which they corrected as soon as possible.

RAIL PRODUCTION IN UNITED STATES.			
	1908.	1909.	Changes.
Bessemer.....	1,354,236	1,806,421	I. 452,385
Open-hearth.....	567,304	1,255,961	I. 688,657
Iron.....	71		D. 71
Total.....	1,921,611	3,062,582	I. 1,140,971

Of the total make of bessemer-steel rails last year 1,723,964 tons were rolled by makers of domestic ingots and 82,657 tons by companies which did not operate bessemer converters. Included in the total by makers of domestic ingots are about 62,000 tons of rerolled rails. Almost all the open-hearth rails in 1909 were rolled from basic steel, and virtually all were rolled by producers of open-hearth ingots. The maximum production was reached in 1909. Indiana was the largest maker of open-hearth rails in 1909, followed by Pennsylvania, Colorado, Alabama, Ohio, New York, Illinois, Maryland and New Jersey in the order named. In previous years Alabama had always been the leading producer.

Included in the 3,062,582 tons of steel rails rolled in 1909 are 50,505 tons of alloyed-steel rails, as follows: Titanium rails, 35,945 tons; manganese rails, 1028

the various mills. The force of unskilled labor employed in January, 1909, was 173,585, of whom 162,540 were Kafirs and 10,045 Chinese. In January, 1910, the number reported was 179,393, all Kafirs. The Chinese force, which was gradually reduced during the last year to 1910 in December, practically disappeared in January.

American Institute of Mining Engineers

The American Institute of Mining Engineers held the opening session of its spring meeting in the Carnegie Library at Pittsburg, Tuesday, March 1. On Wednesday, a visit was made to the testing station of the Technologic Branch of the U. S. Geological Survey. Thursday is to be devoted to a visit to the steel works at Homestead. The meetings will be concluded on Friday. The headquarters of the Institute during this meeting are at the Hotel Schenley.

The Oliver Continuous Filter at Minas del Tajo

Cyanide Costs on Slime Reduced from \$1.21 to 91c. per Ton; Daily Capacity 400 lb. Slime per Sq.Ft.; Canvas Lasts Three to Five Months

BY G. A. TWEEDY AND R. L. BEALS*

The filter plant of the Minas del Tajo at Rosario, Sinaloa, has two Oliver continuous filters, each of 60 tons capacity. These filters consist of drums, 11 ft. 6 in. in diameter by 8 ft. wide, revolving on horizontal axes in boxes or tanks. The outer surface of the drums is divided into sections and covered with the filtering medium. The drums are partly submerged in the pulp to be filtered (kept from settling by air agitation) and, as they revolve, a vacuum applied to the sections builds up a cake of slime on the surface. As the sections leave the pulp they are dried by the vacuum and

supporting the drum to a plate at the end.

The plate has two circles of 24 holes each, to which the pipes are connected. Facing this plate is a second plate, having a groove or channel opposite the outer circle of holes. An adjustable bridge in this groove covers one hole, so that, the channel being connected to the vacuum pumps, a vacuum is applied to 23 of the sections. Air under pressure, passing through the pipe connected to the inner circle of holes in the plate, is admitted to the section that is cut off from the vacuum by the bridge. As the drum

upon leaving the pulp, this cake is dried by the vacuum. A water wash is then applied in the form of a drip, in much the same manner as clean water is added in cleaning the concentrate on a vanner. This water is drawn through the cake until the vacuum is cut off and the cake discharged. The discharge takes place just before the section enters the pulp for a repetition of the cycle. The drums revolve once every 4 minutes.

The air and solution from the sections go to a chamber that is connected to the wet- and dry-vacuum pumps. Here the solution and air are separated, the wet-

COST PER TON OF TREATMENT OF SLIME.

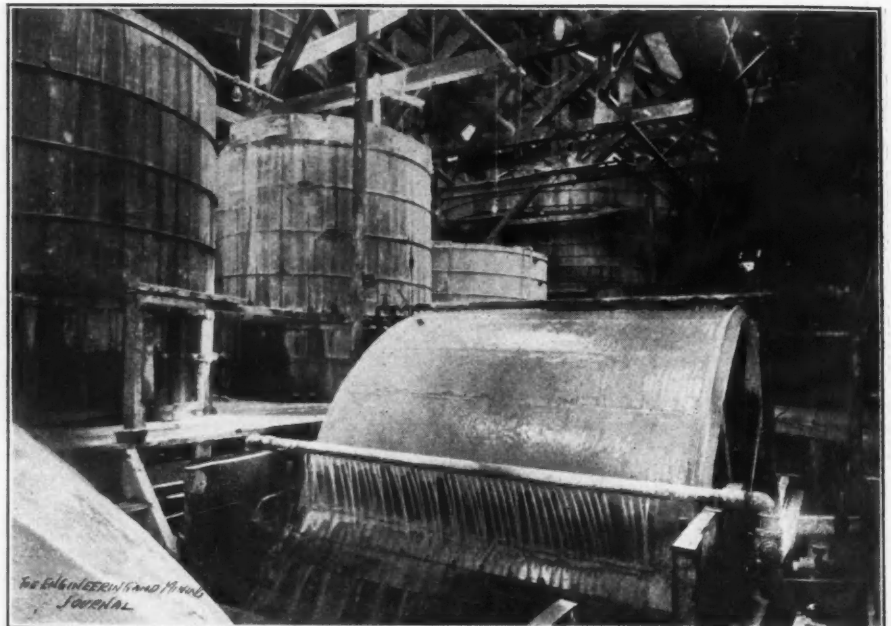
Item.	Before Installation of Filters.	After Installation of Filters.	
		Slime-Plant.	Filters.
Native labor	\$0.0803	\$0.0890	\$0.0372
Supervision	0.0513	0.0497	0.0215
Cyanide	0.6007	0.3434	.....
Lime	0.1710	0.1035	.....
Pumps, piping	0.0036	0.0013	0.0012
Belts, lacing	0.0085	0.0084	0.0067
Lubricant	0.0088	0.0022	0.0033
Miscellaneous	0.0364	0.0099	0.0066
Total	\$0.9606	\$0.6074	\$0.0765
Power	0.2534	0.1419	0.0835
		0.7493	0.1600
Total	\$1.2140	\$0.9093	
Tons treated	17,540	11,126	

then a water wash is applied and drawn through the slime. Just before the section enters the pulp again, air, under pressure, is admitted to the chamber and the cake is discharged. The cycle is then repeated, the whole work being continuous and automatic. A comparison of the cost of slime treatment before and after the installation of filters is given in the accompanying table.

CONSTRUCTION OF THE FILTER

The construction of the filters is shown in the accompanying drawings. The drum is built of 3.5-in. staves firmly bolted to the spiders. The perimeter of the drum is divided into 24 sections by 1-in. strips. Small strips 0.5x0.5 in., nailed 1 in. apart, form channels for the passage of solution in each section. Two 0.5-in. pipes are connected to each section, which pass through the hollow shaft

*Rosario, Sinaloa, Mexico.
NOTE—Excerpt from a paper, "Cyanide Plant and Practice at the Minas del Tajo, Rosario, Sinaloa, Mexico," Bull. No. 38, A. I. M. E., Feb., 1910.



OLIVER FILTER, SHOWING REMOVAL OF CAKED SLIME BY WATER JETS

revolves the vacuum is cut off from each section in turn and air is admitted.

A screen is placed on the strips forming channels in the sections. The strips dividing the drum into sections are planed level with the surface of the screens. A layer of burlap covers the screens and on this the canvas is placed. The canvas is drawn tight and calked into a groove around the edge of the drum. To bind the canvas firmly to the division strips, the drum is wound with steel wire.

OPERATION OF FILTER

The drums are submerged for three-fifths of a revolution. Every section as it enters the pulp is connected to the vacuum pumps. As the drum revolves the section picks up a cake of slime and

vacuum pump being connected to the base of the chamber, the dry-vacuum pumps to the top.

Two one-cylinder dry-vacuum pumps and one double-cylinder solution pump are used. (These wet- and dry-vacuum pumps have been displaced by a wet-vacuum pump which maintains a 26-in. vacuum and takes less power.) A small compressor furnishes air at from 5 to 10 lb. pressure to discharge the slime and agitate the pulp in the filter boxes. To operate the pump, compressor, and drums, 13 h.p. are required. With this equipment the capacity of the filters is 125 tons of dry slime per day.

The vacuum, maintained at 25 in., yields a cake of slime varying from 3/16 to 3/8 in. thick, depending on the character

of the slime filtered. Between the time a section leaves the pulp and the application of the water wash, the slime is dried to 35 per cent. of moisture. The amount of water drawn through the cake is practically equal to the moisture in the slime. As the pulp ordinarily filtered has a specific gravity of 1.24, the amount of solution passed through the filters is large, the ratio of solution to slime in the pulp being 2.3 to 1.

In treating oxidized ore, 33 per cent. of moisture is discharged in the residue, which is chiefly clay having the character

with dilute hydrochloric acid. The washing takes an hour, and 7 lb. of acid is used in treating one drum.

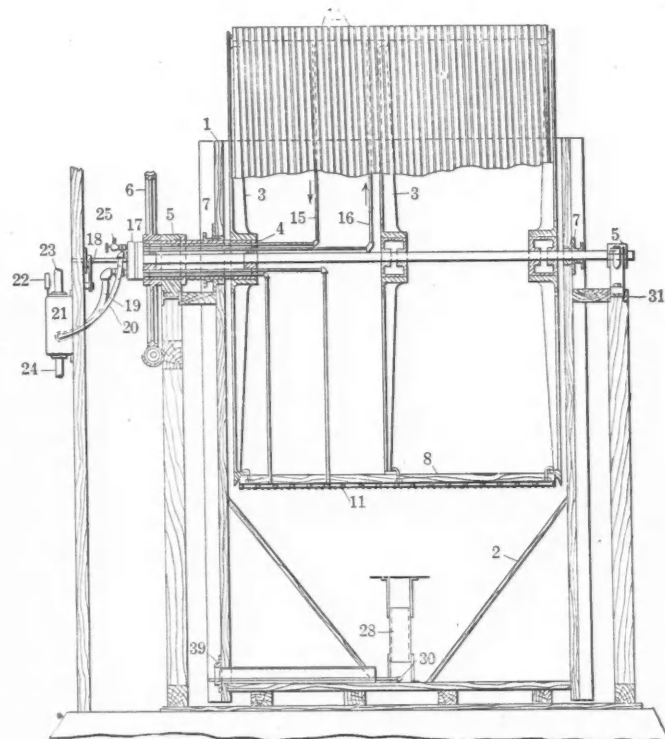
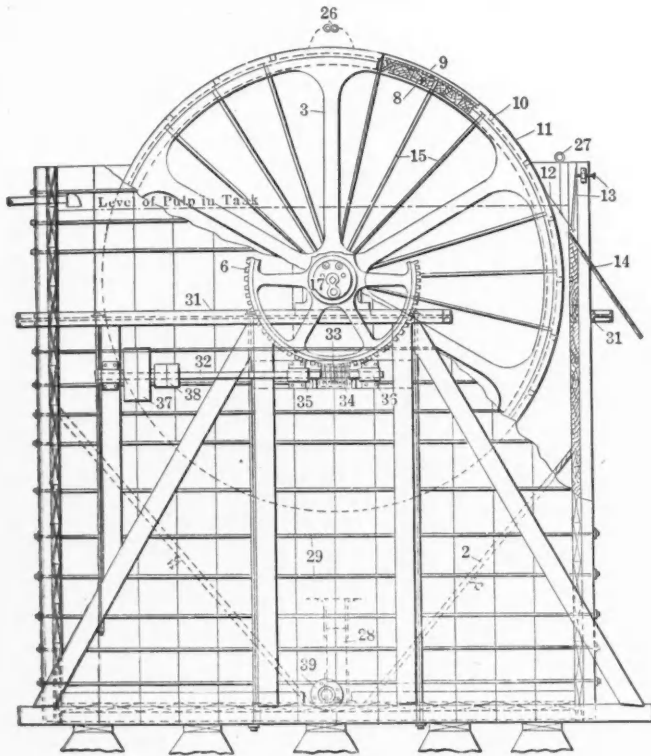
There are 290 sq.ft. of filter surface on each drum. Filtering 60 tons per day, per drum, each square foot handles 400 lb. of dry slime. The canvas lasts from three to five months. To re-cover and re-wire a drum takes from 12 to 18 hours.

The cost of re-covering a drum is \$33.83. The tons filtered by the cloth being approximately 4000, the recovering cost is \$0.0084 per ton filtered.

One peon attends the filters and ma-

Utah Copper Company

The report for the fourth quarter of the year 1909 states that during November and December none of the plants were operated at full capacity on account of inefficient railroad service. During the quarter the lowest grade of ore was treated that has ever been mined by the company, being slightly less than 1.5 per cent. copper. The character of the ore, however, was more favorable for concentration because of the lesser proportion



TRANSVERSE AND LONGITUDINAL SECTIONS OF THE OLIVER FILTER

The reference numbers represent: 1, Redwood tank; 2, false bottom; 3, cast iron spiders supporting filter drum; 4, hollow trunnion carrying spiders, piping, etc.; 5, main bearings; 6, worm drive gear; 7, stuffing boxes; 8, Redwood staves for filter drum; 9, filter medium; 10, division strips dividing filter into sections; 11, steel wire protection for filter medium; 12, steel scraper; 13, adjusting screw and lever for scraper; 14, tailings apron; 15, vacuum pipes from filter sections to automatic valve; 16, pressure pipes from filter sections to automatic valve; 17, automatic valve; 18, adjusting lever for valve; 19, flexible vacuum hose for working solution; 20, flexible vacuum hose for wash solution; 21, vacuum chamber containing float check valve; 22, vacuum gage; 23, pipe to dry vacuum pump; 24, pipe to solution pump; 25, pressure pipe for blowing filter sections; 26, wash spray pipe; 27, discharge spray pipe; 28, agitator pipe; 29, tie rods; 30, agitating air nozzle; 31, I-beam frame; 32, worm shaft; 33, worm; 34, oil well for worm; 35, thrust collars for worm; 36, post bearings for worm shaft; 37, driving pulleys; 38, high-speed pulleys for wiring; 39, flange for drain.

of a colloid. A certain quantity of tailings from the former pan-amalgamation plant has been retreated in the slime plant. These tailings contained a large amount of fine sand from the pans, and the filters reduced the moisture in this material to 25 per cent.

The water wash almost completely displaces the gold, silver and cyanide in the cake. The quantity of cyanide discharged is from 0.1 to 0.3 lb. per ton of dry slime. The undissolved content of the slime filtered is practically equal to the content of the discharged residue, the difference between the two being 0.1 oz. of silver.

The lime in the solutions gradually deposits in the cloth and cuts down the capacity of the filters. To rectify this, the cloth is washed once every two weeks

chinery, an expense which would not be necessary in the United States, where labor is efficient, since the greater part of the time no attention is needed, beyond the oiling of the machinery.

The cost of the operation of the filters given in connection with the slime plant includes a proportion of the charges for supervision of mill, shiftmen, timekeeper, watchmen and shop charges for mill. The direct cost of operation per ton of dry slime filtered is: Labor, \$0.0161; covering drum, material, \$0.0060; covering drum, labor, \$0.0022; repairs and supplies, \$0.0112; lubricant, \$0.0033; power, \$0.0835 (filters running under capacity); total, \$0.1233. This does not include cost of supervision or other overhead charges.

of oxidized material, resulting in a higher percentage of recovery.

The accompanying costs, the report states, include not only all direct operat-

COPPER PRODUCTION IN 1909.

	Copper Produced, Pounds.	Cost per Pound, Cents.	Profit.
1st quarter..	12,107,549	9.68	\$382,470
2d quarter..	13,774,412	9.19	482,748
3d quarter..	15,299,674	8.07	721,683
4th quarter..	13,291,210	8.48	596,317

ing expenses, but also the proportion of all fixed and general expenses, and the usual per-ton charge for the retirement of pre-paid stripping expense, and are based upon net product after smelter deductions and allowances. The sales of copper for the quarter were satisfactory, no copper

available for delivery remaining unsold at the end of the quarter.

The tonnage of underground ore mined during the quarter was only about 3 per cent. of the total, underground mining being practically discontinued. The ore delivered to the plants in January was of a better grade than that treated during the preceding quarter, due to more favor-

able mining conditions and a greater area of stripped ground on which to work. All the plants and equipment are in condition to accommodate full tonnage capacity without interruption.

Since the close of the fiscal year 1909, the company has acquired the ownership of the entire capital stock of the Boston Consolidated Mining Company, and its

property will be transferred as soon as legal formalities can be completed, and thereafter these two contiguous properties, constituting one enormous orebody, will be operated as a unit. The consolidated operation of these properties will permit economies and enlarged production at increased profit, which it is impossible to obtain when operating singly.

Quantitative versus Qualitative Thinking

BY R. W. RAYMOND

The wider significance of this gathering of alumni of the various schools of science is twofold. It illustrates, first, the specialization of the engineering professions, each requiring its own preparation. It was not so very long ago that the catalog of a certain college announced the Rev. ——— D. D. as president, and professor of ancient and modern languages and history; of mental, moral and natural philosophy and applied science! A small and in some respects, a ludicrous beginning—but it contained at least the aspiration, which was a prophecy, of the manifold and multiform training which our best universities are now equipped and competent to furnish.

In the second place, this gathering emphasizes the underlying unity of all these specialties: Mining, metallurgical, civil, mechanical, electrical, chemical engineers—you are all engineers. Even the architects are engineers or else they are not fully accomplished as architects. You must, methinks, all possess something in common which makes you engineers, and which, as engineers, you are bound to make effective for the benefit of your generation.

I am not going to excite your ridicule, or aid the somnolency of your digestion of such a feast as this, by offering you a complete, inclusive and exclusive definition of an engineer. Certainly, it means more than simply a man who runs an engine. Somewhere in the '70s of the last century, when the American Institute of Mining Engineers held its first meeting in Baltimore, a leading manufacturer of that city said to one of us, "If you have any influence with your brethren in that engineers' convention, I hope you will urge them not to order a strike. In these times, \$2.50 a day is really all that we can afford to pay our engineers." Of course, he was told that ours was not a labor union, but a union of laborers, who never struck for high wages, but simply earned them and got

them; and that our chief purpose was not to increase the wages but to improve the work.

QUANTITATIVE THINKING ESSENTIAL

While I do not propose to define the engineer, I beg to suggest one element which characterizes, I think, all true engineers. And I will use as a name for it a term borrowed from the laboratory. The engineer's thought and work are quantitative, not merely qualitative. Engineering lies at the base of the edifice of civilization; but the progress of civilization is often erroneously measured by mere inventions. Now inventions may sometimes be made and must always be perfected and utilized by engineers. But inventors who are nothing more fare badly, as they ought to.

How often we hear the accusation that the world has ill repaid the first proponent of an idea which in the hands of another has proved greatly profitable. But, in truth, it is not the happy thought about a thing, but the practical doing of the thing, that deserves reward. No doubt the first man, looking at the first bird, wanted to fly, and tried to fly, but the trouble was, he couldn't fly. Should we now hunt up his heirs, and pay them for the invention of their ancestor? His work was merely qualitative.

Once upon a time, a pale, inspired inventor climbed up to my office, and asked me to help him to go to Colorado. He had invented the idea of using electricity in mining and metallurgy; and he wanted to go to the Rocky mountains, because at their summits electricity was so abundant. His notion was a qualitative one. Yet, no doubt, if he is still alive, he cherishes the notion that he has been robbed of the glory justly due to him for his bright idea.

INEFFICIENCY OF THE MERELY QUALITATIVE THINKER

These qualitative enthusiasts grow more and more numerous every year, with the increase in half-educated practitioners of "applied science." And the old errors continuously crop out anew.

After every big snowstorm, we have a number of qualitative proposals to remove the snow from our streets by thawing it with steam jets, and letting it run away of itself. What is still more remarkable, the editors of our leading newspapers gravely publish such communications, under the impression that there may be something in the notion, and that they had better not disparage it lest haply they be found fighting against science.

After the great blizzard a storekeeper in Brooklyn undertook to apply quantitatively this qualitative proposition. Having a 16-ft. heap of snow opposite his store, and a cellar full of old boxes under it, he dug in the drift a chamber with a chimney, crammed this stove with the kindling wood from the cellar, lit the fire, and waited for the mountain to disappear in fervent heat. He, being a qualitative thinker, did not know the difference between temperature and heat units, or dream of the amount of work he was expecting his little fire to do. When he had burned all his wood, he abandoned his faith in science.

I could multiply such illustrations indefinitely. But I may be permitted, in conclusion, to say generally and inoffensively, that qualitative thinking is one of the dangers of our day. Great popular manias, fads of special reform, exposures of public evils or hardships, appeals for governmental interference, all are, or are likely to be, merely qualitative. I think it was Thomas Jefferson who said, in substance, "A free people never loses its liberties by surrender to force. It gives them away in moments of enthusiasm."

It is the duty of engineers, who have been trained to regard and handle things quantitatively, to contribute this needed element to the thought and action of their time.

Let them make no haste to conclusions; let them count the cost, measure the means, weigh the sacrifices, appraise the gains and the losses—in a word, hold fast to the distinction between heat units and mere degrees of temperature.

NOTE—Excerpts of an address given at the dinner of alumni of the Schools of Science and the School of Architecture of Columbia University, on Feb. 2, 1910, at the Hotel Astor, New York.

A Modern Mine at Auboné in French Lorraine

Blast Furnaces Situated at the Iron Mines; Shafts Lined with Cast Iron; Three Types of Pumps in the Mines; About 1600 Men Employed

B Y E . W A L C H

The exploitation of the oölitic iron-ore deposits of the French Lorraine by deep shafts is entirely in the hands of iron and steel producers, and in most instances the mines and furnaces are in close conjunction. A general description of the deposits was given in the JOURNAL, June 19, 1909, and a brief description of a modern surface plant as installed at Auboné in the Briey district will be of interest.

This installation includes an iron-ore hoisting plant and blast furnace. It belongs to the Société Anonyme des

steam hoisting engine using flat ropes and a Reumaux safety appliance. The No. 2 is equipped with an electric winch and steel-wire ropes. The No. 3 shaft is the most recent and is equipped with an electric hoisting engine of the Ilgner system using steel ropes. The headgear of this shaft is 40 m. high from the ground to the axis of the upper sheave, the sheaves being 5 m. in diameter. The single-floor cages used on this shaft offer room for two cars holding 1500 kg. of ore each. Every hoisting engine is fitted with a Karlik speed recorder.

surface, having a capacity of 10,000 l. per min.; (2) a first-class, underground, duplex, steam pump having a capacity of 13,000 l. per min.; and (3) a set of two Sultzner centrifugal pumps having each a capacity of 5000 l. per min. The whole capacity of the pumping plant is therefore 33,000 l. per min, against a head of 140 m. at which mining is done. Ventilation is effected by a Mortier aspiratory fan of 30 cu.m. per min. capacity.

POWER FROM FURNACE GASES

Steam for the mine is produced by



GENERAL VIEW OF THE MINE AND FURNACES AT AUBONÉ

Hauts-fourneaux et Fonderies de Pont à Mousson.

HOISTING AND RESCUE SHAFTS

Three shafts are sunk, two of which (Nos. 1 and 3) are used for hoisting and the third one (No. 2) for ventilating and rescuing. The No. 1 shaft was started in 1897 and sunk by freezing the ground; hoisting started in 1901. The two other shafts were started successively afterward, and the No. 3 is just completed. The plant is now equipped for an annual output of 2,400,000 metric tons.

The No. 1 shaft has a diameter of 5 m. and is lined with cast-iron panels. Steel guides made of rails are used. The No. 2 is only 3 m. in diameter and lined with slag bricks. The No. 3 is 4.25 m. in diameter, lined with cast-iron panels and fitted with steel guides as the No. 1 shaft.

The No. 1 shaft is equipped with a

Cages are hoisted to the upper platform of the headgear at 10 to 15 m. above ground, and cars are tipped into large ore bins, having an aggregate capacity of 10,000 tons. Tipping is done either by hand with special tipples or more often by mechanical appliances, such as tipping traveling bridges. The railway cars are run under the ore bins and loaded directly by gravity.

The gray seam, which is 2.5 to 5 m. thick, supplies 95 per cent. of the ore, the balance coming from the brown seam which constitutes a silicious flux for the blast furnaces. Drilling underground is done with electric drills, and haulage is by 40-60 h.p.-electric locomotives using a 250-300-volt continuous current.

The flow of water in the mine is 6500 l. per min. As usual in the district three types of pumps are installed: (1) A Cornish steam pump, worked from the

eight semitubular boilers having an aggregate heating surface of 1300 sq.m. The electric power is derived from a central power station which utilizes gas from the blast furnaces. This station contains gas engines furnishing a total of 2700 h.p. and one 500-h.p. steam engine, this latter driving the electric hoist of No. 3 shaft.

The output of the mine since 1901 is given in an accompanying table.

OUTPUT OF THE AUBONE MINES.

	Metric Tons.		Metric Tons.
1901.....	36,970	1906.....	912,210
1902.....	212,500	1907.....	1,034,075
1903.....	403,116	1908.....	854,825
1904.....	553,834	1909*.....	553,584
1905.....	605,154		

*First six months only.

One thousand men are employed in the mine alone, and they live in 386 lodgings erected by the company at a cost of over \$400,000. The smelting plant includes

two blast furnaces, each producing 120 tons of pig per day, and eight Cowper gas heaters, 7 m. in diameter and 30 m. high. The tapping hall has an area of 2120 sq.m. The number of workmen employed at the furnaces is 250, and 350 perform the services which are common to the mining and the smelting plants.

Blast is supplied to the furnaces by

naces, the production of which is almost entirely made into pipes. It also owns at Pont à Mousson a large brick plant producing over 100,000 bricks per day, and a cement works to utilize the slags of the blast furnaces. This company owns also a large smeltery at Foug, the product of which is used in the manufacture of pipes of small diameter and sundry cast-iron pieces.



HEADGEAR AT SHAFT NO. 3, AUBONÉ

three 300-h.p. blowing engines utilizing the furnace gas, one 300-h.p. Eberhardt compound steam blowing engine and a 1000-h.p. compound steam blowing engine. Gas cleaning is done first by means of centrifugal fans with water jets, and further by the Theisen process. Steam is produced by eight Babcock & Wilcox boilers having an aggregate heating surface of 1680 sq.m. Three 550-h.p. Poetter gas producers are kept in reserve.

The Société Anonyme des Hauts-fourneaux et Fonderies de Pont à Mousson owns its principal iron works at Pont à Mousson where it erected five blast fur-

Cobalt Lake

The annual report of the Cobalt Lake Mining Company showed a loss of \$41,906 on the operations of the last fiscal year; this with the balance on the debit side of profit and loss account, brings the total debit up to \$233,690. The report, however, was of an encouraging character as regards recent operations in the opening up of a vein from which rich shipments are anticipated. Total shipments from July 31 to Dec. 31 gave a profit of \$51,700.

The Mining Census

SPECIAL CORRESPONDENCE

In pursuance of an agreement arrived at between the Census Bureau and the Geological Survey, it has been arranged to have only one set of schedules sent this year to mine and quarry operators. The act authorizing the thirteenth census provides for a census of mines and quarries, and this would presumably result in some duplication of work were the Geological Survey to continue sending out its schedules as in former years.

Under the present plan, the supplementary schedules which have been prepared by the Census Bureau will be supplied to the special agents and enumerators of the census. These schedules will be filled out and will be returned to the Census office which will transfer them to the Survey. The Survey will then do the work of tabulation and will supply the completed figures to the census upon an agreed plan. These returns, as prepared by the Survey, will be accepted by the Census and will be published as census returns. None of the information will be collected by mail except in a few large cities where some of the concerns have general offices to which the schedules may safely be sent for intelligent filling out. In all other cases, a special agent will make a personal visit to the mining operation concerning which it is desired to get information. The complete list of such operations in the possession of the Survey has been turned over to the Census Bureau for use in the work of collecting data.

This is a decided innovation upon the methods which were employed at the time of the last census when the collection of these statistics was effected by mail, only the delinquents being visited by special agents. The improvement expected lies along the line of greater uniformity and harmony in the statistics as well as in obviating a good deal of the correspondence which would otherwise be necessary.

The supplementary schedules which have been prepared by the Census and are now ready to be placed in the hands of the special agents cover the following topics: Anthracite coal; bituminous coal; asphalt and bituminous rock; auriferous and argentiferous deep mines; bluestone; clay; copper smelters; copper refineries; granite; gypsum and gypsum products; iron mines; coke; copper mines; lead smelters and lead refineries; limestone; manganese and manganiferous iron mines; marble; mica; millstones and chasers; miscellaneous mining industries; natural gas; non-argentiferous lead and zinc mines; petroleum; phosphate rock; placer and surface mines; pyrites; quick-silver; the rare metals; reduction mills; sandstone; slate; talc and soapstone; trap rock; zinc smelteries.

Fatal Accidents in American Metal Mines

Need of Efficient Legislation. Fatalities 3.09 per Thousand as Compared with 3.13 for Coal Mines. Comparison of International Statistics

BY FREDERICK L. HOFFMAN*

The occurrence of fatal accidents in American metal mines has heretofore attracted less attention than the importance of the industry demands. It may be conservatively estimated that metal mining in the United States in 1910 employs approximately 150,000 persons, exclusive of salaried officials and clerks. The census report on mines and quarries for 1902 returned the number employed in metal mines at about 110,000, but it is doubtful whether the total number of wage earners was accurately enumerated for some of the mining States. The rapid progress of the industry during the intervening period makes it practically certain that the number employed at present is not much less than 150,000. The principal branches of metal mining in the United States, in the order of their quantitative importance, are iron, copper, gold and

metal-mining industry. The corresponding returns for the Canadian provinces are in greater detail, and they have therefore been included in the present discussion for the purpose of convenient comparison. While every effort has been made to make the returns complete, it has been impossible to secure the necessary data for South Dakota for 1904. No returns are available for the metal mines of California, Nevada, Utah, Arizona and a number of other States in which the industry is of sufficient importance to warrant official supervision of mining operations and the official publication of the essential facts regarding the industry.

Table 1 exhibits in detail for the several States and the Canadian provinces the number of fatal accidents in metal mines officially returned since 1894. For

ing the period covered by the table. In the Canadian provinces during the same period of time it is estimated that there have been about 500 deaths as the result of metal-mining casualties.

The incompleteness of the table, therefore, precludes an accurate summary account of mining fatalities for recent years. Upon the estimate that about 150,000 wage earners are employed in metal mining at the present time, and that the average fatality rate throughout the United States is not less than 3 per thousand, it is reasonable to assume that the total number of fatal accidents in American metal mines at the present time is not much less than 500 per annum.

Table 2 exhibits in detail the fatality rates for the various American States and Canadian provinces for the years for

TABLE 1. NUMBER OF PERSONS KILLED BY ACCIDENT IN THE METALLIFEROUS MINES OF NORTH AMERICA, 1894-1908.

	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total.
Colorado.....			97	110	108	103	107	121	82	67	101	109	82	77	64	1,228
Idaho.....										20	10	20	17	18	10	95
Michigan—Dickinson County.....		6	14	10	11	9	19	27	10	16	9	9	15	7	4	166
Houghton County.....	22	46	19	26	23	27	36	33	44	33	45	58	44	49	58	563
Marquette County.....				17	19	26	24	29	29	23	15	22	22	37	16	279
Missouri.....	17	23	13	16	29	27	52	41	14	17	30	49	58	42	46	474
Montana.....	27	41	64	52	48	49	47	35	47	39	41	48	52	42	21	653
South Dakota.....									13	8		8	7	6		48
Newfoundland—Copper.....							3		1	4	2		2			12
Iron and pyrites.....								1	5	2	1	6	1			16
Nova Scotia—Gold.....		1	2	1	4			1	1			1	6	2		19
Ontario—Silver and cobalt.....					1		1				1		2	15	24	44
Gold.....				2	1	11	10			2	6				3	37
Iron ore.....								3	3	3		1	2		3	15
Copper and nickel.....			1		2	3	7	9	7	2	1	6	3	4	15	60
British Columbia.....					6	16	13	14	12	15	14	14	17	20	21	162
United States.....	66	116	207	231	238	241	285	286	239	223	251	323	297	278	225	3,506
Canada.....		1	5	2	15	30	34	28	29	28	25	28	33	41	66	365
Grand total.....	66	117	212	233	253	271	319	314	268	251	276	351	330	319	291	3,871

silver, lead and zinc, and quicksilver. In 1902, before the copper industry had attained its present importance, the distribution of mine labor was as follows: 38,851 men employed in the iron mines, 36,142 in the gold and silver mines; 26,007 in the copper mines 7881 in the lead and zinc mines and about 1500 persons employed in the mining of quicksilver.

NEED OF EFFECTIVE LEGISLATION FOR METAL MINE INSPECTION

For most of these industries the present information regarding the occurrence of fatal accidents is very limited and of more or less doubtful value. Official returns are available for only a few of the more important metal-mining States, but even for these the data, as a rule, are presented in the aggregate and not with a due regard to the various branches of the

some of the States and provinces the information is available for only recent years, while for others the data are not available for the entire period. The lack of accurate information is not to the credit of the various States, which have been decidedly derelict in this matter. There are no satisfactory reasons why returns should be required to be made of the accidents occurring in the coal mines of Utah and not in the metal mines of that State, nor why there should be a complete absence of public interest in this matter on the part of such important mining States as California, Nevada and the Territory of Arizona. It is reasonable to suppose that the total of 3871 fatal accidents in metal mines reported as having occurred in the different States of the United States since 1894 is, therefore, a substantial understatement of the actual facts. In all probability not much less than 5000 deaths have occurred dur-

ing the period covered by the table. There are some reasons to believe, however, that the number of persons employed is overestimated for some of the States by the inclusion of men at work in ore milling, smelting and refining, without a corresponding inclusion of the fatalities occurring in this group of employees.

FATALITY RATE IN UNITED STATES

The table shows that between 1894 and 1908 the fatality rate in the United States has varied from 4.79 per thousand in 1895 to 2.37 per thousand in 1908.

The rate was as high as 8.28 per thousand in metal mining in Montana in 1896; 7.79 per thousand in iron mining in Dickinson county, Mich., in 1901, and 6.35 per thousand in copper mining in Houghton county, Mich., in 1895; while the rate was as low as 1.45 per thousand for the metal mines of Montana in 1908. The information at

*Statistician, Prudential Insurance Company, Newark, N. J.

present available is not sufficient for a precise differentiation of the accident liability according to the predominating metallic products of the different States. When the returns are combined for the different mining fields and assumed to represent the predominating branch of the mining industry, it would appear that the fatality rate in gold and silver mining as determined by the combined returns for Colorado, Idaho and South Dakota was 2.75 per thousand for the period considered, while the corresponding rate for lead and zinc mining in Missouri was 3 per thousand; for copper mining in Montana, 3.53; for copper mining in Houghton county, Mich., 2.94; and for the iron mines of the same State 4.17 per thousand. Averaging the data for all the States, and for all the years for which the information is available, the fatality rate in metal mining in the United States has been 3.09 per thousand, which compares with 3.13 per thousand for the coal mines of North America during about the corresponding period of time.

FATALITY RATE IN CANADA

The average fatality rate for the metal mines of Canada during the same period

warrant the conclusion that the average fatality rate in American metal mines, or 3.09 per thousand, is less by as much as 0.69 per thousand, than the corresponding rate for the metal mines of Canada, which is conservatively calculated at 3.78 per thousand.

METAL MINE VS. COAL MINE FATALITIES

It is made apparent by the preceding analysis that the fatal-accident liability in metal mining is certainly not much less than the corresponding accident liability in coal mining. It is quite probable that if the subject were thoroughly inquired into and if all doubtful data were eliminated, it would be shown that the fatal-accident liability is really greater in metal mining than the corresponding liability in coal mining. In this connection it has been pointed out by E. T. Corkill¹, Ontario inspector of mines, that:

"In metalliferous mining an accident seldom occurs in which a considerable number of men are killed, the fatalities usually being one or two at a time, though in the course of a year they may amount to a large total. Public opinion is, therefore, not aroused; the management of the mine is not so much impressed with the

useful purpose of bringing into contrast at least the apparent differences in conditions which may demand further inquiry and qualified research. Where the liability to error is as serious as in the case of mining-accident statistics, due to the absence of information, or varying methods of reporting casualties according to the degree of seriousness, an international comparison may be seriously misleading. But, subject to this caution, the following rates are included for the principal mining countries of the world. The rates, with few exceptions, are for the period 1899-1906 and they have been derived from the annual reports of the chief mine inspectors of the United Kingdom.

Algeria, chiefly iron mines, average rate 1.38 per thousand.

Austria-Hungary, iron mines, 1.48; other metal mines 3.11 per thousand.

Bohemia, iron mines, 1.67; other metal mines 0.81 per thousand.

Bosnia and Herzegovina, iron mines, 1.84; other metal mines 0.82 per thousand.

Belgium, metal mines, 0.75 per thousand.

France, metal mines, 2.02 (for men working underground the rate was 2.49

TABLE 2. FATAL ACCIDENTS IN METALLIFEROUS MINES OF NORTH AMERICA, 1894-1908.
RATIO OF PERSONS KILLED PER 1000 EMPLOYED.

	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total.
Colorado.....			3.80	3.77	3.57	2.63	2.67	3.25	2.33	2.08	2.86	3.18	2.36	2.33	1.96	2.80
Idaho.....										2.86	1.67	3.33	2.43	2.57	1.83	2.47
Michigan—Dickinson County.....		3.02	5.57	4.63	4.45	3.13	5.91	7.79	2.54	4.00	2.95	2.80	4.30	2.06	1.64	4.01
" Houghton County.....	2.99	6.35	2.33	2.98	2.20	2.07	2.58	2.44	3.11	2.42	3.14	3.78	2.67	2.79	3.37	2.94
" Marquette County.....				4.09	4.33	4.60	3.62	5.58	5.26	3.83	3.73	4.35	3.77	5.49	2.98	4.32
Missouri.....	3.36	3.70	2.65	2.51	3.81	2.46	4.49	3.73	1.23	1.37	2.20	3.93	4.38	2.79	2.88	3.00
Montana.....	3.81	4.68	8.28	5.29	4.33	3.98	3.36	2.90	3.41	2.75	2.83	3.27	3.47	2.71	1.45	3.53
South Dakota.....									3.71	2.39		2.26	1.88	1.71	1.69	2.25
Newfoundland—Copper.....							7.46		2.23	6.41	3.51		4.44			3.50
" Iron and pyrites.....								1.05	4.92	1.83	0.71	4.36	0.63			1.93
Nova Scotia—Gold.....		1.90	3.59	1.40	6.49			1.13	1.31			1.99	11.61	4.14		2.70
Ontario—Silver and cobalt.....					16.95		20.00				2.88		1.89	7.36	9.94	6.64
" Gold.....			10.58	2.33	3.45	18.00	13.33			3.87	26.09				8.38	6.54
" Iron ore.....							8.33	7.73	9.26			0.51	1.54		1.38	1.44
" Copper and nickel.....			2.06		3.14	3.58	4.85	3.94	4.04	1.39	0.94	5.11	1.84	2.19	8.71	3.57
British Columbia.....					3.96	4.57	3.48	3.24	3.25	5.45	4.04	3.77	4.27	5.07	5.68	4.23
United States.....	3.39	4.79	4.24	3.82	3.59	2.87	3.18	3.47	2.74	2.40	2.76	3.41	2.98	2.83	2.37	3.09
Canada.....		1.90	3.69	1.11	4.28	5.91	4.13	2.85	3.29	4.13	2.77	2.79	3.07	4.11	6.08	3.78
Grand total.....	3.39	4.73	4.22	3.74	3.63	3.04	3.26	3.40	2.79	2.52	2.76	3.35	2.99	2.85	2.69	3.14

was 3.78 per thousand. The average rate has been as high as 6.64 per thousand for the silver and cobalt mines of Ontario, and as high as 6.54 per thousand for the gold mines of that province. The average rate was lowest for the iron-ore mines of Ontario, or 1.44 per thousand, and as high as 3.57 for the copper and nickel mines of Ontario, and 3.50 per thousand for the copper mines of Newfoundland. The rate has been comparatively low for the iron and pyrites mines of Newfoundland, or 1.93 per thousand, while it has been above the average, or 4.23 per thousand, for the metal mines of British Columbia. Some of the extremely high rates for individual years, and particular mining fields, are due to the small number of men employed and do not indicate with accuracy the true occupation hazard of the industry. The information, however, apparently would seem to be sufficiently complete to war-

importance of careful supervision; the miners are awakened for a few days, and then forget, and the same conditions prevail as before. It is a common belief among most metal miners that the fatalities in coal mines far exceed those in metalliferous mines. This is a great mistake, and, while it is not proposed to argue that metal mining is as hazardous a calling as coal mining, still the writer desires to impress upon all metal miners that only care and close supervision of their work will lessen the number of accidents and place metalliferous mining on the list of the less hazardous occupations."

COMPARISONS OF INTERNATIONAL STATISTICS

International comparisons have their inherent limitations but they serve the

¹*Eighteenth Annual Report of the Bureau of Mines of Ontario.*

and for men working overground, 0.92 per thousand).

Germany, ore mines and smelting works, 1.07; Prussia considered separately, 1.08, and Saxony, 0.81 per thousand.

Italy, metal mines, including sulphur, 1.73. In Italy the fatal-accident liability in sulphur mines alone during the 10-year period ending with 1899 was 2.84 per thousand.

Japan, metal mines (1903-1906), 1.50 per thousand.

Portugal, metal mines, 0.95; but for underground workmen alone the rate was 2.15 per thousand.

Spain, chiefly metal mines, but including some coal mines, 2.65 per thousand.

Russia, gold mines (1901-1903), 0.55 per thousand.

United Kingdom, metalliferous mines, 1.14; but underground workmen alone, 1.67, and workmen overground 0.39 per thousand.

New South Wales, alluvial gold mines, 0.54; gold quartz mines, 0.87; silver and lead mines, 2.49; copper mines, 1.22; tin mines, 0.38; and other metal mines, 0.83 per thousand. (In the Broken Hill district the percentage of cases of lead poisoning averaged during the decade 1897-1906, 0.32, but the ratio was as high as 1.12 per cent. in 1902.)

Tasmania, metal mines (1901-1906), 1.19 per thousand.

Queensland, gold mines, 1.70 per thousand.

Victoria, gold mines, 1.08 per thousand.

Western Australia, gold mines, 2.15 per thousand.

British Guiana, gold mines, 0.28; alluvial placer gold mines in 1895, 8 per thousand.

Kimberley, diamond mines (white miners only), 1.36; underground workmen considered alone, 5.28; and workmen above ground, 0.47; (Colored miners, only), 3.60; workmen underground, only, 7.27, and above ground, 1.71 per thousand.

South African Republic (1895-1898), white miners, 5.41; colored miners, 4.44; total, 4.56 per thousand.

Ceylon, metalliferous mines, mostly plumbago, 0.37; underground, 1.01; overground, 0.07 per thousand.

Gold Coast, gold mines (1898, 1903-1906), 2.41; workmen underground, 6.03; overground, 0.54 per thousand.

India, gold mines, 2.24; underground, 3.23; overground, 0.70 per thousand.

India, mica mines, 0.75; underground, 1.18; overground, 0.13 per thousand.

India, manganese (1901-1906), 0.37 per thousand.

India-Mysore, gold mines, 2.51 per thousand.

New Zealand, alluvial gold mines 1.53; quartz gold mines, 1.32 per thousand.

Transvaal (1902-1906), gold mines, white labor, 4.15; colored native labor, 4.74; Chinese labor, 6.50 per thousand.

It requires no further discussion to emphasize the practical importance of a qualified inquiry into the whole subject of fatal accidents in metal mining corresponding to the amount of public attention which is being given to the occurrence of fatalities in coal-mining operations. The same neglect of metalliferous mines is characteristic of English mining legislation, which has never been as effective in the case of metal mines as in that of coal mines. There can be no question of doubt but that a qualified inquiry would bring to light many facts of great practical importance, and there can be no excuse for the derelict mining States of the far West, which at present give no publicity whatever to the facts of accident occurrence in the metal mines of their respective States.

Mount Lyell Mines, Tasmania

The report of the Mount Lyell Mining and Railway Company, Ltd., operating in Tasmania, for the half-year ended Sept. 30, 1909, gives the production of its Mount Lyell mine during the period at 132,656 tons of ore, and that of the North Mount Lyell at 65,746 tons. The Mount Lyell sent 6922 tons of its output to the company's superphosphate works for acid manufacture, the remainder being sent to the smeltery.

The interesting feature of this company's operations is its application of pyritic smelting to its ores. The ores won from the Mount Lyell mine, containing 0.98 per cent. copper, 2.25 oz. silver and 0.046 oz. gold per ton, do not pay the costs of mining and treatment, but are necessary to form a smelting mixture for the richer ores of the North mine which carried, during the half-year, 6.20 per cent. copper, 1.49 oz. silver and 0.0025 oz. gold per ton.

The reduction works treated 190,482 dry tons of the company's ores made up as follows: Mount Lyell mine ore, 124,843 tons; and North Mount Lyell mine ore (including Lyell-Tharsis), 65,554 tons; a total of 190,482 dry tons containing 2.81 per cent. copper, 1.98 oz. silver and 0.031 oz. gold per ton. Metal-bearing fluxes, precipitates from the mine water and purchased ores brought the tonnage treated to 191,137 tons. This yielded 9650 tons of matte, which in turn produced 4538 tons of blister copper. The costs per ton are given as follows: Mining, 6s. 6.5d. (\$1.59); smelting, 7s. 7.28d. (\$1.85); converting, 1s. 1.79d. (\$0.28); total, 15s. 3.60d. (\$3.62).

The ore reserves of the Mount Lyell mine are given at 3,101,455 tons containing 0.533 per cent. copper, 1.96 oz. silver and 0.028 oz. gold per ton; of the North Mount Lyell mine at 777,594 tons containing 6 per cent. copper, 1.33 oz. silver and 0.005 oz. gold. Underground mining has been commenced on the pyrites of the Mount Lyell mine, a little less than 6000 tons having been produced in this way. On the North Mount Lyell, a large amount of development was done, necessitated by the fact that the orebodies are isolated and the problem at each level becomes one of finding new ore, rather than driving to intersect downward continuations of the bodies discovered above. Diamond drilling was extensively resorted to, especially in the lower levels, and resulted in the finding of a new body of payable bornite ore at the 1100-ft. level. Some work was done on the company's outlying properties.

In the reduction works there are six blast furnaces, an average of $3\frac{1}{2}$ of which were in continuous operation during the half-year period. It is found that furnace No. 6, with a higher smelt-

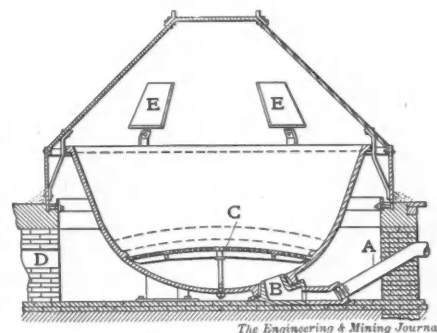
ing column than the other five, has continuously given better results, and it is proposed to similarly increase the height of the others.

In addition to the mines and smeltery, the company owns the Mount Lyell and the North Mount Lyell railways, chemical works for the manufacture of superphosphates and other fertilizers, and a coking plant.

The net profit for the half-year was £139,851 after deducting all charges. The total metal output is given at 100,244 tons of copper, 8,587,601 oz. silver and 280,443 oz. gold.

Ore Roasting Pot

Frank D. Baker, of Denver, Colo., has secured United States Pat. No. 942,810, on an ore-roasting pot in which the hood is without connecting flues at the top and provision is made for a seal around the



BAKER ROASTING POT

lower edge of the hood for preventing air from entering. As the hood is fitted with air-tight doors and its lower edge sealed, the gases, after escaping from the pot, may be forced by pressure from the blower, through flues *D* into the atmosphere without the aid of a stack or other means of supplying draft.

The accompanying figure is a sectional elevation of the improved ore-roasting pot. A blast of air is delivered from the conduit *A* and tuyere *B* to the hearth *C* and passes out with the gases through the flue *D*. When it is necessary to rabble or stir the ore, gate valves in *A* and *D* are closed, and the doors *E* opened giving access to the ore. As soon as the rabbling operation is completed the doors are closed, the valves in *A* and *D* are opened, and the roasting process continues. After the ore is roasted, the hood is lifted and the pot removed and dumped. Instead of a sand or other granular seal for the hood, a liquid may be adopted. By having a minimum number of close-fitting rabbling doors and a seal for the hood, it is aimed to reduce the volume of air to be handled by the flue and stack and thus reduce the size of these elements.

Ore Dressing in the Coeur d'Alene District—VI

Free-settling Classifiers Provide Jig Feed; V-Tanks Are Inefficient for Settling and Classifying; Vibration of Tanks Hinders Settlement

BY EDWARD S. WIARD*

I deem it best to treat the subject of classifiers and settling tanks together because some of the points discussed are applicable to all. In the Coeur d'Alene mills below the trommels there are free-settling classifiers for furnishing jig feed. Three plugs and an overflow is the common arrangement. At the Hercules mill none of the jigs was fed with classified products, the feeds to the jigs being all screen sized. For supplying the concentrating tables with feed, V-tanks were at first tried but a pocket launder was afterward substituted. In the Federal mills shallow classifiers are only employed in jig work. Of the forms of free-settling classifiers employed the Richards-

son of water. I am not prepared to admit, however, that much more might not be accomplished in dewatering before the sands and slimes reach the jig classifiers than is at present done. It has been my experience that in districts where water was scarce, dewatering operations were used in all parts of the mills. This was done not on account of any particular idea of a beneficial effect on the concentration, but to save pumping. The millman in these arid districts was always prepared for a classifying operation. If he had to use rising water to do this effectively it had no nightmares for him, for the moderately dilute pulp entering the classifier would either be little af-

to the ore reaching the classifiers would entail too great complications there is no reason why they should not be practised immediately before classification for the tables. That provisions to this end were not installed when the mills of the district were erected must have been due either to expediency or an idea that a rough classification was good enough for table work and even this totally unnecessary for the vanners. I find that the view still obtains that the evil of poor classification in table feeding can be overcome by gathering up the slimy water from the tables, thickening and retreating it on another machine. I am not prepared to say why the V-tank system has not been

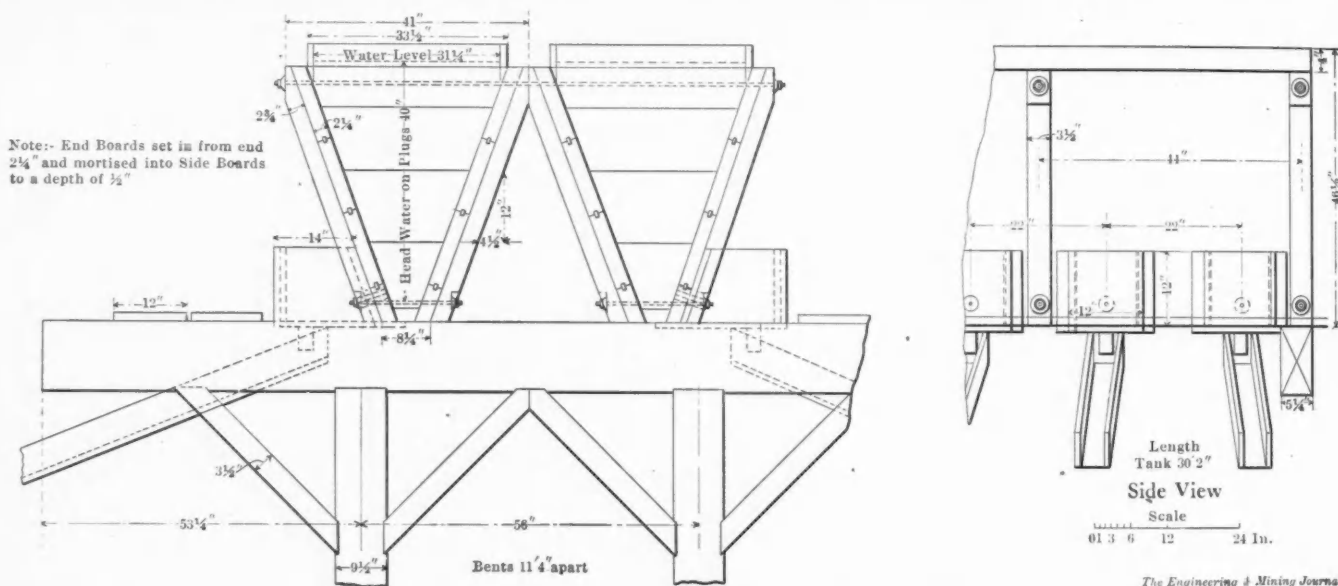


FIG. 1. DOUBLE CLASSIFYING TANKS AT MAMMOTH MILL

Coggins or Lake Superior type, or a modification of it, has given the most satisfaction. The Richards hindered settling classifier is being introduced into the district for retreatment table work and I understand is making closely classified products.

DILUTE PULP TREATED

The overflow from the jig classifiers passes into long, deep tanks of V-shaped cross-section which are poor settling and thickening devices and worse classifying ones. The volume of water arriving at these tanks is enormous. It must be admitted that with the jigging and screening starting at so high a limit as it does in this district the flow of pulp down the mill must frequently receive large acces-

sed by the increase of water, or a dewatering operation below the classifier would serve to remove any excess. He would have scorned to use a deep V-shaped tank because he could use a shallower and better classifying device, and settlement was readily obtained with the classification.

In the Coeur d'Alene the contributing factors to the extreme dilution of the pulp are the large volumes of water introduced by the jigging and screening operations and, as compared with most concentrating mills, the comparatively small percentage of sand and slime, the bulk of the ore receiving complete treatment on jigs. If dewatering operations are not practicable before the ore arrives at the jig classifiers they certainly are after the pulp leaves them. Even if we admit that dewatering operations prior

replaced by something better. It will suffice to point out its defects.

FEW SLIME-FORMING MINERALS IN COEUR D'ALENE ORES

Coeur d'Alene ores offer no great difficulty in settlement. The colloidal theory of slime cannot apply to them because they do not contain any of the substances usually assigned as forming colloids with the possible exception of small amounts of sericite which is found in the country quartzite. Carl Barus¹ as far back as 1884 made experiments with finely divided tri-poli powder, a highly silicious material, to determine its rate of settlement and the factors affecting its subsidence. He found that particles 0.00005 to 0.00007 cm. in diameter settled to the bottom of

*Mining engineer, Denver, Colo.

¹Bull. 36, U. S. Geol. Surv. The Subsidence of Fine Solid Particles in Liquids.

a tube, in both water and ether solutions, before the surface of settled material had fallen 0.05 cm. This is about the limit of vision with the most powerful microscope. A screen with wires of the diameter of particle given, and so spaced as to just pass such material, would contain about 20,000 meshes to the linear inch. Of the total lead and silver minerals fed into a Cœur d'Alene mill, the amount which by the comminuting operations would arrive at the sands and slime department in so fine a state of division as to pass a 200-mesh screen would be on an average 15 per cent. The amount of ore which would float away from properly settled and classified material would be negligible in

tank where the pulp enters is a baffle submerged 5 in. below the surface of the water. The function of this is to stop the high-grade material from floating away, but before the baffle is reached most of mineral has settled. Near the baffle there is to be found an accumulation of bits of wood, pine needles, etc. I believe the rising of this trash brings most of the high-grade mineral to the surface. At the Sweeny mill I encountered the same phenomenon. An examination of the floating material showed that it consisted largely of tiny bits of wood to which clung finely divided galena. On agitating some of the material in a beaker the galena separated readily from the wood and settled promptly.

tween the floats *d*, supporting the tank end of the tubes and the inverted mushrooms, is made of light strips of wood stiffened by four little angle irons in the corners. The inverted mushrooms or strainers are made of No. 24 copper plate.

With the form of strainer used, the pull due to the siphon action draws the top layer of water downward and in from the sides firmly and gently. With a simple tube in the water a current would be created from the bottom of the tank that would stir up the low-grade slime below the upper layers of water. The float tanks are prevented from moving from their position by strings, not shown in the drawing, fastened from their points to the nipple pipe *e*. The little strips of wood *f*, from the points of the floats to the sides of the tank, are in the nature of baffles to cause the floating material to converge toward the mushrooms and prevent its passage between the floats and the sides of the tank. A similar strip *g*

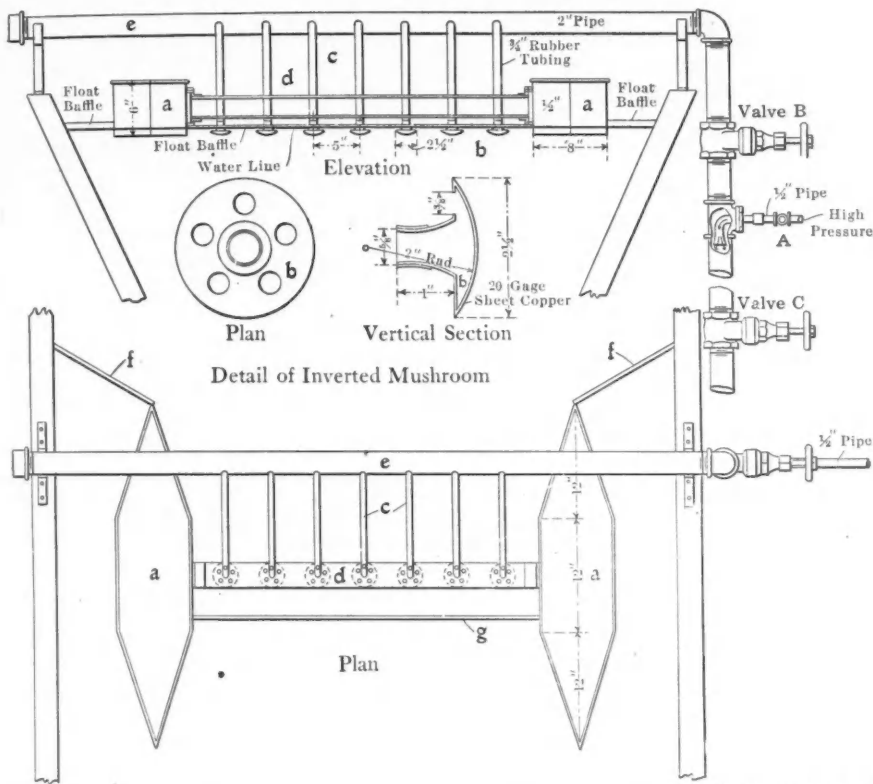


FIG. 2. SIPHON DEVICE FOR REMOVING SLIMES

the present state of the art of ore dressing.

In Fig. 1 are shown end and side views of the double tanks at the Mammoth mill. The overflow from the classifiers passes directly into the end of these tanks. At the point where the pulp discharges into the tanks, the launders are about a foot above the water surface in the tanks and vertical pieces of spouting are inserted in the bottom of the launders to deflect the pulp. One of the tanks receives the overflow from the main classifier and the other that from the middlings classifier. On the flow sheet of this mill the direct-tank system is indicated by a single figure. The dropping of the pulp vertically from a considerable height into the water of the tank causes boiling and a large amount of rich slime is constantly rising around the eddies formed by this action. About 13 ft. from the end of the

SIPHON DEVICE FOR REMOVING SCUM

The siphon device I used for removing this scum floated in the water about two-thirds the way from the feed end to the overflow end, but it would have been possible to have placed it much closer to the feed end of the tank and obtain water free from low-grade slime. For the purpose of merely removing comparatively clean water, a number of devices could have been used.

As shown in Fig. 2, two float tanks *a* serve to carry the intake end of the siphon, which consists of a number of copper mushrooms *b*, connected to the main siphon pipe by rubber tubes *c*. My floats were made of No. 30 sheet iron heavily coated with bitumen, but thin sheet aluminum would be better. The rubber tubing should be thin-walled, so as not to interfere with the free vertical movements of the floats. The bracket be-

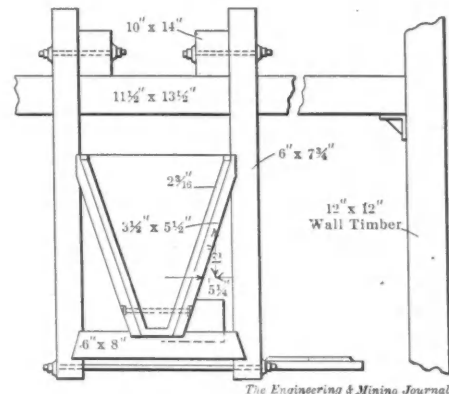


FIG. 3. SUSPENDED TANK

floats behind the mushrooms to prevent material from floating by them.

The siphon device is started by opening the valve *A* from the high-pressure supply; after it is started, the valve is closed and regulation is effected by the valve *B*. To avoid a climb to the tank, a second valve *C* for starting or stopping the siphon may be placed on the vanner floor. The coarser bits of trash are removed by a fine screen as the pulp enters the V-tank.

TANK ARRANGEMENT AT MAMMOTH MILL

At the end of the duplex tanks of the Mammoth mill the pulp of the south tank flows into the companion tank through a shallow slot cut in the top of the tanks. It then flows into a launder 12 in. wide, the launder being enlarged to a width of 23 in. at the slot cut in the side of the north tank. From the launder the pulp flows into the suspended tank illustrated in Fig. 3. The supports for this tank are 6 ft. apart, plugs 36 in. apart, height of tank 54 1/2 in., width of bottom 9 in., and width at top 45 in. From this tank the overflow passes by a launder into a third tank having about

the same dimensions as a single tank of the duplex series. Fig. 4 shows the number and diameter of the plugs in this tank system. The final overflow is about 150 gal. per min. The head of water on the plugs in the duplex tanks is 40 in. and that on the plugs of the suspended tank 46½ in. The diagram shows that the tanks are usually run with every other plug closed and the common spacing is thus 44 in. Most of the openings in the tanks are equipped with ordinary plugs of the types shown in Fig. 5. The one shown at the left is the more satisfactory. The curved opening is especially helpful where there is a notable amount of wood pulp in the slime. It is a good idea where plugs are used to keep a plentiful supply of the various sizes on hand and replace the old by new ones at periodical times. When the old plugs are removed they should be destroyed; otherwise they will be liable to be put back in the tanks. Fig. 6 shows a form

of slime hoppers between plugs causes a serious reduction in the cross-section of the tank; (3) plugs are continually stopped up or the material delivered contaminated from accumulations of slime between plugs sliding down into the discharge orifices.

Seldom if ever in Cœur d'Alene mills is care exercised to introduce the current of slime into the tank so as to get the

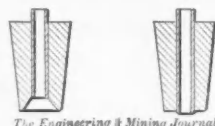


FIG. 5. DETAILS OF PLUG

a hyperbola, a portion of the sides of the tanks and the surface of the water. In a tank where $d = 40$ in. and $\alpha = 20$ deg. 3 min., the section varies

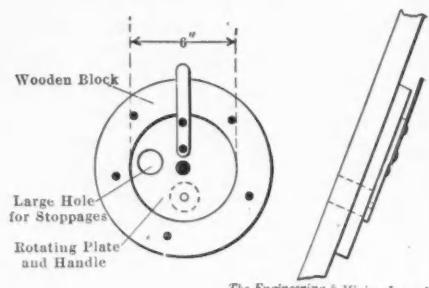


FIG. 6. GATE FOR PLUG OPENINGS ON TANKS

best results from surface current classification. The pulp is usually dumped into the tank. In these long tanks a surface current would not long persist but would break up into subcurrents heading to different parts of the tank and tending to

from 2.85 to 4.16 sq.ft. where $s = 44$ inches.

If the plugs were 22 in. apart the minimum cross-section would be increased to 3.83 sq.ft. I have assumed that the angle of repose is 45 deg., as I have found by measurement that the finest slime will settle to an angle of 38 deg. with the horizontal. The slime hoppers will build up highest at the feed end of the tank and lowest at the far end. The contractions and expansions of the flowing stream due to the slime hoppers create eddies which tend to send fine slimes to plugs to which it does not belong and to carry grains too far. If the flow in the tank is of a steady, uniform current the classification will be poorly defined because portions of the entering stream of pulp will descend as a whole to the bottom of the tank and pass out of the plugs in an unclassified condition. The creation of eddies by the changes in cross-section of the tank, tends further to confuse the definition of the classification.

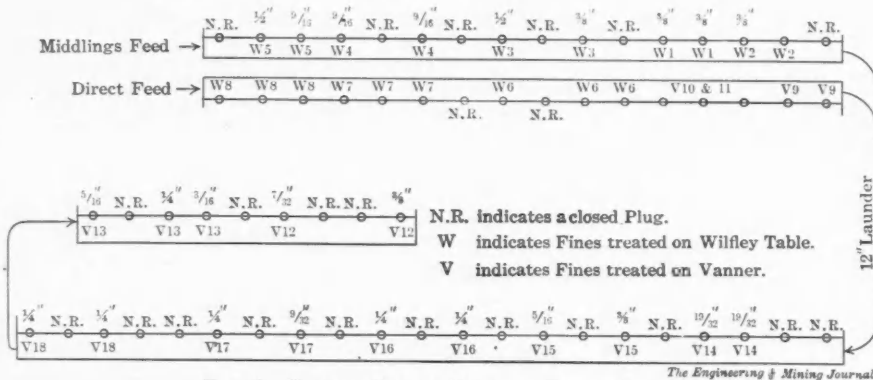


FIG. 4. KEY TO PLUGS USED IN TANK SYSTEM

of gate used on the Mammoth tanks at some of the tank openings as a substitute for the ordinary plug.

There is considerable vibration of the tanks, notably of the suspended one, and this motion hinders quick settlement and classification. In erecting a mill every effort should be made to give spitzkasten supports free from vibration, even to the extent of resting them on posts independent of the main vertical mill-members if these will be set in vibration by the motions of the Wilfley tables and vanners. I noted at one time that samples of pulp in barrels showed remarkable differences in the rate of settlement. With barrels set on a concrete floor laid on the solid rock, the addition of a little acid caused the pulp to settle completely in a few hours, while in those resting on the suspended portion of the same floor, after 24 hours of settlement the solutions were still turbid; and the vibration was far from being of as great amplitude as that of the Mammoth tanks.

DEFECTS OF CLASSIFYING SYSTEM

The faults of such a settling and classification system as that described are: (1) The tanks are too long to be good surface-current classifiers; (2) the forma-

tion of slime hoppers between plugs causes a serious reduction in the cross-section of the tank; To get the best settling result it is of course desirable to set the whole body of the water in motion but such a result spoils the classification.

SLIME HOPPERS BETWEEN PLUGS

The section of a V-tank varies from a minimum given by a hyperbolic expres-

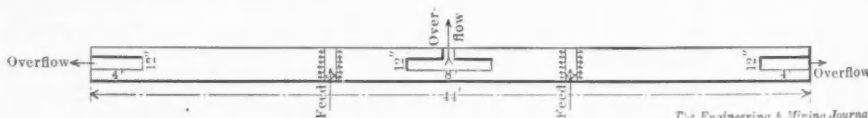


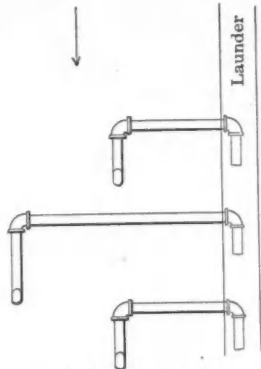
FIG. 7. PLAN OF HUNTER TANK

sion involving d , α , θ and s to a maximum given by the expression $d_2 \tan. \theta$ where θ is the angle of the sides of the tank from the vertical; α the angle of repose of the slime with the horizontal, d the depth of water in the tank and s the spacing of the plugs. The minimum cross-section diminishes as α , d and s increase. Between the plugs the slime builds up portions of conical hoppers of the tank. The intersections of the portions of the hoppers with one another form hyperbolas. The minimum cross-section is thus an area bounded by

the plugs be close together the reduction of section between them is small because the slime hoppers build up in the point or narrowest portion of the tank, but as the spacing is increased the reduction of area increases rapidly, for each successive increment of spacing carries the hopper up into wider portions of the tank. If the spacing were carried to an extreme the cones projected would meet at some point above the tank. In such a case there would be a depression over each plug and between solid masses of sand and slime flattened on

top, over which the pulp would flow with a current strong enough to carry all the grains forward. Goose necks are never employed on the Cœur d'Alene V-tanks for reducing the head of water on the plugs.

All the ores of the district as they reach the mills contain a large amount of wood. A portion of this reaches the sands and slimes departments in a pulp of shredded particles. It is claimed by the millmen that only a comparatively



The Engineering & Mining Journal

FIG. 8. INCLINED PIPES

great head of water or large plugs will prevent this material from lodging in the tank openings. There appears, however, a wide difference of opinion among the millmen as to how far they can go in reducing the head and diameter of the plugs.

It should not be overlooked also that if the vanner man is left to follow his own bent he will settle the matter of the right size of plug to use in the way most comfortable for himself. The use of screens for removing the bulk of the woody particles is not general in the district. I am not an advocate of putting feed on vanners as thick as can be obtained. The recent work of Doctor Gahl at the Detroit Copper Company's mill at Morenci, Ariz., shows the fallacy of that mode of feeding, but the watery feeds which come from these V-tanks are too thin for the best results.

The accumulations of sand and slime between the plugs are constantly sliding, tending to stop the plugs or carry down to them notable amounts of the finest slime. This effect is more harmful at that part of the tank where the coarsest sand settles.

On casual thought one would be disposed to think that the accumulation in the tank near the entry end of the feed would consist almost entirely of sand, but it is surprising how much fine slime adheres to the faces of ore between plugs and is carried down with the sand when an avalanche takes place.

CLASSIFICATION AT OTHER MILLS

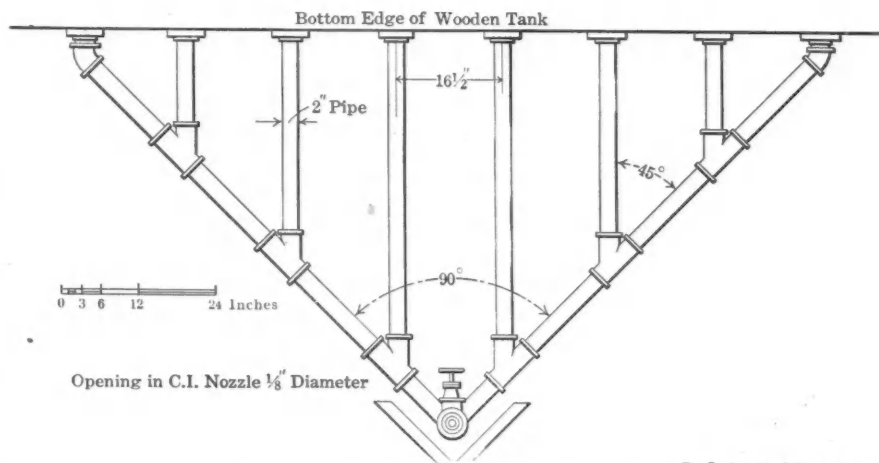
At the Hunter mill classification by shallow classifiers is employed for

furnishing feed for the jigs and to some extent for the tables. The overflow from the final classifiers flows into tanks placed along the walls of the mill building. The rear of these tanks is vertical. The front has an angle of slope with the horizontal of 54 deg. The spacing of the plugs is 48 in. and the head of water on the plugs, 51 3/4 in. The plugs are placed vertically in the bottom of the tanks and feed machines placed below. Fig. 7 shows how the feed is distributed in the tanks and the mode of overflow.

A similar overflow arrangement consisting of a launder submerged in the water of the tank and set parallel to and equidistant from the sides is used on one of the V-tanks at the Standard mill. This device works continuously. At tap-off times of the jigs, they are comparatively deeply submerged and the desired effect of skimming off the clean surface layer

V-tank system. The overflows from the classifiers on both sides of the mill discharge into the same V-tank. The east overflow enters the tank about 30 ft. from the east end; the west overflow about 20 ft. from that end. The flow of the pulp is to the east. At the extreme east end the tank discharges into a parallel tank of the same length. At the west end the second tank discharges into a third parallel one. These tanks are about 100 ft. long, the spacing of the plugs is 42 in. and the angle of the sides with the horizontal 62 1/2 deg. At the time of my visit to the mill it was shut down and the water had been drained from the tanks. I could not measure the depth of water on the plugs but I did note that the reduction of cross-section between the plugs due to the accumulation of slime was great.

In the lower part of the mill for feeding vanners and settling tailings for re-



The Engineering & Mining Journal

FIG. 9. DEVICE ON V-TANK, BUNKER HILL MILL

of water is not obtained. The ordinary variations in the flow also interfere with the skimming operation.

BUNKER HILL V-TANKS

The Bunker Hill tank is placed athwart the long axis of the East mill. The feed enters the side of the tank and the head of water on the plugs of the west portion, which is somewhat different in construction from the remainder, is 62 in. The spacing of the plugs is 36 in.; the diameters range from 5/16 to 9/16 in. In addition to the overflow produced by the great series of inclined pipes illustrated in Fig. 8 there was at the time of my visit a discharge of about 100 gal. per min. through a slot in the side of the end of the tank. It is stated, and I am inclined to believe, that the amount of solids which go to waste from this tank is very small. In a long tank of this kind with plugs and cross-section large enough, the amount of overflow can be reduced to any desired amount.

The Morning mill has an enormous

treatment, there are a large number of V-tanks equipped with the device shown in Fig. 9. At first sight this seems an excellent device for thickening the pulp and reducing the height of accumulations of material between openings.

The head of water on the 1/8-in. nozzle is about 98 in. As shown the contrivance has eight openings in the tank and covers a tank length of 132 in. With eight plugs of 1/8-in. diameter in the bottom of the tank the pulp would be discharged with about 4 1/2 times as much water as from the single 1/8-in. nozzle. On climbing to the top of the tanks I found stretches 8 to 10 ft. long filled solid with sand and slime. It may have been that this was due to neglect in the bustle of shutting down the mill. At the Hercules mill the device was tried and discarded because of frequent stoppages. Above each pipe was suspended a rod for the purpose of loosening accumulations.

SETTLING TANKS AT SWEENEY AND MAMMOTH MILLS

For settling the material from the floor drains, the overflow of elevators, concentrate tanks and bins, shallow tanks are provided at some point outside the mill buildings. The same style of tank is to be found at the Sweeney and Mammoth mills. At the latter mill the tank consists of four sections about 3 ft. deep, 10 ft. wide and 40 ft. long. The water enters the section nearest the mill, then at the lower end flows into the second section. At the head end of section two the water passes into section three and so on, zig-zagging through the tank until finally it goes to waste through a passage 22¾ in. wide. The head of water on the discharge is 2¼ in. or approximately 230 gal. per min.; the passageways at the end of the sections were 40 in. wide and cut in top of the partitions. Means are provided to divert the flow from the first section to the second when it is desired to clean up the former.

amount and an attempt was also made to distribute the water evenly across each compartment. At the discharge end I raised some of the settled material with a stick and found the grains still coarse enough to reflect the light from countless crystalline facets.

At the Hercules mill the overflow from the coarse-concentrates bin goes to waste. That from the slime tank is pumped back into the wash-water system. Some of the high-grade material so returned must go to waste with tailings. In my opinion it is far better to settle and ship high-grade material than to resubject it to the cycle of the mill.

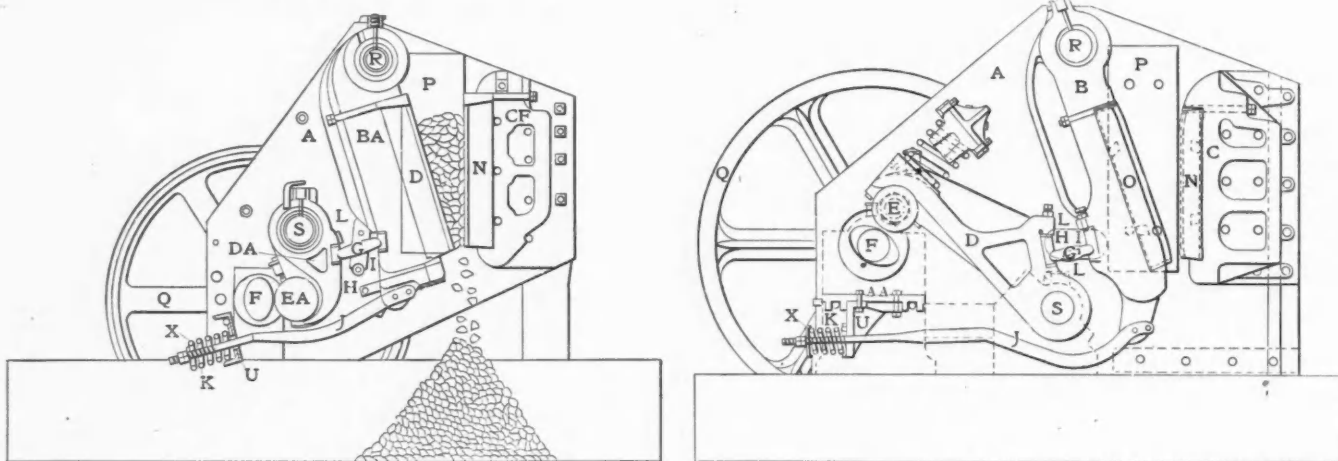
The Champion Rock Crusher

The main shaft of the Champion crusher, shown in the accompanying sections, is elliptical in shape so that each revolution produces two movements of the jaw. By this means the speed of operation is halved and much wear is

San Toy Mining Company

The San Toy Mining Company, operating a silver-lead mine in the Santa Eulalia district, Chihuahua, Mex., sold 29,509 tons of ore during the year ended Dec. 31, 1909, from which a gross income of \$655,465 was realized. After deducting all expenses, including heavy development and construction charges, net earnings to the amount of \$326,483 remained. The company closed the year free from debt and with \$137,783 in undivided profits in the treasury.

The ores of this company occur in lime or on the contact between lime and a porphyry capping, the deposits including both vertical fissures and flat chamber deposits. The production of the last year was almost entirely from the latter class. A new shaft was sunk for the purpose of opening the vertical fissure discovered in 1908. This shaft was sunk to the first level (474 ft.), equipped and placed in operation early in January,



TYPES OF CHAMPION ROCK BREAKERS

The Engineering & Mining Journal, N. Y.

At the Sweeney mill the outdoor tank consists of four sections 5 ft. wide, 30 ft. long and about 2 ft. deep; 1700 tons of water, containing 1.2 ton of slime averaging 30 per cent. lead, enter the tank in 24 hours. The final overflow is through a passage 24 in. wide. When it is considered that in this pattern of settling tank all the water at the end of each section must pass through narrow slots into the next it is difficult to conceive of any material settling in any compartment except the first.

NEW SETTLING TANKS AT BUNKER HILL MILL

At Bunker Hill mill there is an immense spread of outdoor settling tanks. Some tanks which had been constructed just previous to my visit were far better than the rest. They received water containing high-grade material and had compartments 3 ft. deep, 20 ft. wide and 20 ft. broad. The water was split up so as to give each compartment an equal

saved. The main frame A of the crusher, in order to stand the tensile strain to which it is subjected, is constructed of rolled steel. Cast iron is used for the stationary and swinging jaws, which must withstand compression strains.

The solidity and rigidity necessary for a crushing machine are obtained by having all bolts double nutted and the side plates planed with grooves into which tongues on either side of the stationary jaw fit. This makes the sides and front end of the machine practically one solid piece. Care is taken to provide against lost motion by slightly tapering the arbor R, from which the moving jaw is suspended so that when necessary to re-babbit the bearing arbor can be driven out easily. The arbor is tightly secured to the side plates of the crusher but can be taken out for repairs and quickly replaced. The Champion rock breakers are built by the American Road Machine Company, Kennett Square, Pennsylvania.

1910. Electric power is in use at the mine, furnished by a generator actuated by a Koerting-type gas engine.

The president says that new development will now proceed rapidly with special reference to the vertical fissure, that under the circumstances the production for the year was satisfactory, that though good ore is exposed the reserves cannot be measured on account of the irregularity of the deposits, and, finally, that a continuation of these bodies is fully anticipated.

The Chester County Historical Society in Pennsylvania will with appropriate exercises celebrate next summer the 100th anniversary of the starting of the first boiler-plate mill in America. This was the Brandywine mill, near Coatesville, which was built in 1810 by Dr. Charles Lukens. This was the foundation of the extensive works now owned by the Lukens Iron and Steel Company.

Sprague Process for Treating Furnace Gases

Used Successfully at Midvale, Utah; Sulphuric Acid Neutralized by Zinc Oxide, Lime or Magnesia; Fumes Removed by Filtration through Fabric

B Y C. B. S P R A G U E *

The Sprague process has for its object the removal of all fume, solid matter and sulphuric acid from furnace gases, by filtration through fabric, after a preliminary chemical treatment of the gases to make filtration possible. The necessity for the removal of these substances is two-fold:

(1) To prevent possible damage to vegetation.

(2) The recovery of valuable metals, otherwise lost as fume.

Until recently, practically all damage suffered from furnace emanations was ascribed to sulphur dioxide gas. A study of these emanations and of conditions surrounding smelteries has shown that such damage is due, if at all, only in minor degree to this gas, and that when sulphur dioxide is admitted into the atmosphere in a state of sufficient dilution, it is not injurious.

SMELTERY EMANATIONS

These are flue dust, fume, sulphuric acid and gases, including sulphur dioxide. The flue dust represents in general the composition of the finer material fed to furnaces, although it may have undergone more or less alteration. In general, flue dust is comparatively harmless to vegetation, and with a proper system of flues may be made to settle out of gases, so that no appreciable quantity escapes into the atmosphere.

The fume is solid matter in an infinitely fine state of division, and is for the most part the result of chemical action in the furnaces. It consists of various metallic compounds—arsenious oxide and sulphide, salts of lead, copper, iron, zinc, etc.; it usually contains silver and some gold. A greater or less proportion of the salts consists of the soluble sulphates of metals.

The quantity of sulphates depends on the amount of sulphur in the ores, and on the treatment to which they have been subjected. The fume from reverberatory roasting furnaces, treating sulphide ores or mattes, is always rich in sulphates. The proportion of sulphates produced in pot or converter roasting is much less. The fume from copper-blast furnaces and converters is also high in sulphates. The smelting loss in valuable metals carried away as fume, is great. The extent of this loss depends, of course, on the composition of the ore and the metallurgical treatment.

*Research chemist, United States Smelting, Refining and Mining Company, Midvale, Utah.

FILTRATION THE ONLY PRACTICABLE MEANS OF TREATING FUME

The fume cannot be made to settle out of gases by means of flues. Owing to the inability of water to effect contact with the fume, all methods depending on its action are practically useless for precipitating and removing the latter. The great difficulty and cost of thoroughly subjecting enormous volumes of gas to the action of water is also apparent.

The only practical means known at present for arresting and recovering the fume, is by the filtration of gases through fabrics. This has been practised to a limited extent heretofore, especially on gases from lead blast furnaces. It has not hitherto been possible to apply this method to roasting or blast furnace treatment of copper ore, owing to the destruction of the filtering medium, due in part to the corrosive salts mentioned but especially to sulphuric acid. Sulphuric acid is produced in greater or less quantity whenever sulphide ores or mattes are roasted. For the greater part this arises from the breaking up of sulphates produced in roasting. The sulphur trioxide so produced unites with the water vapor, always present in the gases, forming sulphuric acid.

CHARACTER OF OPERATIONS INFLUENCE PRODUCTION OF SULPHURIC ACID

The method of treatment influences the amount of sulphuric acid produced. In reverberatory roasting as much as 1.5 or 2 per cent. of the total sulphur in the charge may be converted into sulphuric acid, and carried away in the gases. In pot or converter roasting the proportion converted into sulphuric acid is much less, as is also the quantity of sulphates. In blast-furnace smelting of lead ore, where the amount of sulphur in the charge is small, and a reducing atmosphere is maintained, sulphuric acid is not produced. Varying quantities are formed in copper blast-furnace smelting, depending on the amount of sulphur in the charge, and other conditions.

Sulphuric acid (or sulphur trioxide) is also produced in the converting of matte, especially in the last stages of the blow; and small quantities are given off in reverberatory smelting. The quantity of sulphuric acid produced in the treatment of sulphurous ores is relatively small as compared with the sulphur dioxide. Although the sulphuric acid so produced must be in the liquid state at low temperatures, it is at many plants so rarefied

that it cannot be made to settle out in cooling chambers, nor can it be effectually precipitated by water sprays.

Where much sulphuric acid exists in gases, its amount can be determined by the chemical analysis of a measured quantity of gas, the total volume being known. If the quantity is small, the examination of a sample of manageable size, will often fail to show its presence. In such cases, large known volumes of the gas should be filtered through woolen or cotton bags. The acid is retained in the fume collected, and may be determined by analysis of the latter. Where sulphuric acid exists, even in traces, this experiment will result in a rapid deterioration of the bags.

SULPHUR DIOXIDE

The flue gases from smelting operations consist for the most part of air, more or less impoverished in oxygen, with lesser quantities of carbon dioxide and sulphur dioxide. The removal of the sulphur dioxide has no part in this process. The usually dilute condition of the sulphur dioxide in furnace gases renders its conversion into sulphuric acid impracticable, even though the product could be disposed of. Owing to its large quantity, any special chemical treatment for the removal of sulphur dioxide is not commercially practicable.

It cannot be removed by means of water, as has often been proposed, for aside from the low solubility of the gas when dilute, the enormous quantities of water and the disposition of solutions, it would be spontaneously given up from such solutions on exposure to the air. Whether or not the sulphur dioxide given off from furnaces is capable of doing damage to vegetation, any such possible damage is minimized by dilution. Gases rich in sulphur dioxide may be diluted by the admission of air into the flues before filtration. The air admitted also serves to cool gases.

NEUTRALIZATION OF GASES

The purpose of the Sprague process is therefore to neutralize the sulphuric acid in the gases, and remove, by filtration, the fume and the sulphates produced by neutralization. All the sulphur, including that combined as metallic sulphates and sulphuric acid, is eventually discharged into the air as sulphur dioxide, excepting the small amount going into the slag.

For neutralization zinc oxide, lime,

magnesia or other bases may be used. In addition to neutralizing the sulphuric acid these substances have the power of decomposing the soluble salts of iron and copper in presence of water. Zinc oxide has a discriminating action toward sulphuric acid, and does not unite with the sulphur dioxide under the conditions where it is used, the process being entirely dry. In absence of water, lime and magnesia unite with the sulphur dioxide so slowly as not to interfere with the neutralization of the sulphuric acid; so that no great excess over that quantity theoretically combining with the latter need be used.

The difficulty is in effecting a thorough mixture of the neutralizing agent with the rapidly moving gases, when fed into them mechanically. A successful method, however, has been worked out. Where the quantity of acid is not excessive, it is best neutralized by zinc oxide evolved in the state of fume from zinc ores treated in special furnaces. The furnace is connected with the flue conveying the furnace gases to be neutralized. The zinc oxide being itself in a condition of fume, is carried along with gases and effects intimate mixture with them. Where the quantity of sulphuric acid is large, powdered lime or magnesia is introduced into gases, by appropriate means, and its action supplemented by that of zinc oxide evolved from special furnaces. This last is necessary because complete neutralization, by agents mechanically fed into gases, cannot always be depended upon, owing to the difficulty of effecting perfect mixture.

This combination makes it possible commercially to neutralize and filter gases containing large amounts of acid. The neutralization must be absolutely complete, as even the escape of traces of the acid will in time destroy the filtering fabric. The zinc-oxide furnaces are provided with an air blast beneath grates. The zinc ore is mixed with coal. The action is one of reduction and oxidation. The ores may be either sulphides or oxidized, and when of favorable composition, as high as 75 per cent. of the zinc, may be driven off as oxide.

Theoretically 81 parts of zinc oxide, 56 parts of lime, or 40 parts of magnesia, are required to neutralize 98 parts of sulphuric acid. More is used as a factor of safety. The amount of zinc oxide used is never sufficient to have any effect on the metallurgy of the plant at large, and finally finds its way into the slag. Where lime is used, it is, of course, finally available for flux in the blast furnaces.

COOLING GAS BEFORE FILTRATION

Before entering the baghouse the gases should be cooled under 100 deg. C. To effect this, either air is admitted into the flues, which serves further to dilute the sulphur dioxide, or gases are conducted through steel cooling flues, or

both. Although the first cost is several times greater, woolen bags are preferable to those made of cotton or other vegetable fiber, for filtration, and must be used in any case where gases are at a high temperature or contain much sulphur dioxide. Above 110 deg. C. woolen bags undergo a slow deterioration; the same is true of cotton at lower temperatures. Such materials as wire gauze, asbestos or glass cloth, are physically unsuitable and cannot be used for gas filtration.

AMOUNT OF FILTERING SURFACE

The amount of filtering surface required is determined more by the quantity of fume to be recovered than on the volume of gases. The amount of fume produced varies with the composition of the ores and with the treatment given them; and may be 1 to 2 per cent. of the weight of charge. Ordinarily not less than 25,000 sq.ft. of filtering surface should be provided per ton of fume produced per day. The neutralized gases are drawn through flues and forced through the baghouse by means of fans. The gases escape, while the fume is retained on the inner surface of bags and falls into a chamber beneath. The accumulation of fume is removed from time to time and treated for the recovery of its valuable contents.

CAPACITY

This process has been in successful operation at the lead smeltery of the United States Smelting, Refining and Mining Company at Midvale (Bingham Junction), Utah, since August, 1908.

Five or six blast furnaces are operated, having a capacity of 1100 tons of charge; 18 pot roasters with a capacity of 300 tons; and 6 hand roasters treating 72 tons of matte; besides a small reverberatory furnace for smelting matte, and an arsenic refining plant.

About 3000 lb. of sulphuric acid is neutralized daily, and the recovery of fume is approximately 20 tons. The filtering surface in the baghouse is about 500,000 sq.ft., there being 3340 bags. Those taking gases from the roasting plant are of wool, the others of cotton. The amount of gas filtered is about 350,000 cu.ft. per min. measured at 0 deg. C. The hotter gases are passed through steel cooling flues before entrance into the flue leading to baghouse. Neutralization is effected by means of lime, and of zinc oxide evolved from furnaces, two of which are kept in constant operation. Normally, no "smoke" whatever is to be seen, only invisible gases being given off from the plant.

The process is equally adapted to copper smelting, and the United States court has recently granted permission to start the company's copper plant at Bingham Junction, on the showing made.

This, in common with the other smeltries in the Salt Lake valley, was shut down early in 1908 by the injunction obtained by the farmers from the Federal court.

Prices of Manganese Ore

The latest schedule of manganese-ore prices issued by the Carnegie Steel Company, which is the principal buyer, is based on a valuation of 26c. per unit of manganese and 5c. per unit of iron for an ore carrying 49 per cent. or over in metallic manganese. This base ore must contain not over 0.20 per cent. phosphorus and not over 8 per cent. silica. Prices are for deliveries at Bessemer, Penn., near Pittsburg, or at South Chicago, to the South works of the Illinois Steel Company. The price scale is as follows:

	Per Cent. Metallic Manganese.	Cents per Unit. Manganese.	Unit. Iron.
Ore containing	49 or over	26	5
Ore containing	46 to 49	25	5
Ore containing	43 to 46	24	5
Ore containing	40 to 43	23	5

For excess of phosphorus or silica over the base, deductions are made as follows: For each 1 per cent. in excess of 8 per cent. silica there shall be a deduction of 15c. per ton, fractions in proportion. For each 0.02 per cent. or fraction thereof in excess of 0.20 phosphorus there shall be a deduction of 2c. per unit of manganese per ton.

Ore containing less than 40 per cent. manganese, or more than 12 per cent. silica or 0.225 per cent. phosphorus is subject to acceptance or refusal at buyer's option. Settlements are based on analysis of sample dried at 212 deg. F. The percentage of moisture in the sample as taken is deducted from the weight.

Alternating-Current Drill

A new, portable, breast drill for use with alternating current is being manufactured by the General Electric Company. It will take a drill bit up to $\frac{3}{8}$ in. in diameter, or will also operate a $\frac{3}{4}$ -in. wood bit. The company claims this machine will drill a $\frac{3}{8}$ -in. hole 1 in. deep in cast iron in 27 sec.; or in machine steel in 95 sec. The weight of the drill is 21 lb., and the control switch can be operated without releasing the hold on the handle; thus ease and rapidity of handling and operation are assured.

In the contract between the provincial government of British Columbia and the Canadian Northern Railway Company for the extension of its line in that province, it is stipulated that no Asiatic labor shall be employed.

Stationary versus Moving Hoisting Plants

In Opencut Mining Locomotives Cease to Be Economical When the Operation Becomes Locomotive Hoisting; Hoist the Load, not the Engine

B Y J. F. J A C K S O N *

The attention of the mining world for some years has been turned toward open-pit mining as conducted on the Mesabi range in northern Minnesota, and lately in certain "porphyry" properties in the West producing large tonnages of copper ores. Overburden from 20 to 50 ft. or more in depth is stripped by steam shovel and train or other methods from areas often hundreds of acres in extent. The horizontal ore beds thus exposed are often 100 to 300 ft. in thickness.

MINING HAS DEVELOPED THE STEAM SHOVEL

The demands of this work have developed the steam shovel from the breakable, uncertain machine of 10 years ago, to the dependable 90-ton monster of today. In the early stages of steam-shovel mining, the obvious thing to do was to bring the ore trains directly into the mining pits by means of locomotives. Many interesting and complicated systems of inclined grades, curves and spirals have been worked out; and as the mines increase in depth it has required constant ingenuity on the part of mining engineers and operators to keep the railroad grades within limits and to hoist the large tonnages required out of the mine. Tonnages of from 6000 to 10,000 tons per day from a single pit are now reported.

I first observed these open pits five years ago, and came to the conclusion at that time that the limits of grades for economical hoisting by means of locomotives had even then been exceeded.

At about the time referred to, I had under consideration the problem of whether to build a half-mile trestle on a 2 per cent. grade to gain access to the top of stamp mills about 60 ft. above the general level of the railroad, or to use steel inclines with hoisting apparatus. It was decided to use inclines, and one mill was equipped with a 20 per cent. incline up which a single ore car of 40 tons capacity is hauled by a simple, second-motion, Nordberg hoisting engine. The other mill, near and beyond the first, was equipped with an 11 per cent. incline, up which two 40-ton cars are hauled at one time. These inclines have been in operation several years without accident, handling up to 4000 tons per day at low cost per ton. Without going into detailed figures at this time, I wish to assert that the capacity of a single-track incline on a 10 or 12 per cent. grade is much greater than that of a single-track

railroad line on any grade reaching to the same vertical depth, when that depth exceeds say 100 ft., or perhaps less.

HOIST THE LOAD, NOT THE ENGINE

In operating an underground mine having a vertical or steeply inclined shaft, it would hardly be seriously proposed to lower the winding engine into the shaft each time it was desired to hoist out a load, and to make the engine hoist itself out with the load every time. Or, let us suppose a covered or open shaft or incline on an 8 per cent. grade. Let us further suppose that an ordinary first- or second-motion hoist, such as is used around mines, and weighing say 30 or 40 tons, be mounted on a flat car, the flat car then loaded with fuel and water and the hoisting rope fastened to an anchorage above the collar of the shaft. The car and hoist are now ready to be lowered into the mine, coupled to two, three or four ore cars, and the movable hoisting plant with its train of ore can then be hoisted out of the mine.

All this sounds somewhat preposterous, but mechanically it is precisely what is done when ore is hoisted out of a mine on excessively heavy grades with a locomotive. A locomotive is capable of exerting a draw-bar pull or tractive effort of about 20 per cent. of that portion of its weight which rests on the drivers, due to the limits of the coefficient of friction of tires on rails.

A certain 10-wheel engine with tender weighs 140 tons, of which 70 tons is on the drivers. At 20 per cent. friction, it is just able to pull itself up a 10 per cent. grade. On a 5 per cent. grade it can pull itself and a load equal to itself. By the use of sand a slightly better friction coefficient can be obtained, against which a tractive or rolling resistance of 8 or 10 lbs. per ton for slow moving must be figured. Shay and saddle-tank locomotives have the advantage of having a greater portion of load on the drivers. For the sake of simplicity, I will assume 20 per cent. friction and neglect tractive resistance, curve resistance, etc.

The engine above mentioned can haul on a 5 per cent. grade: (1) The locomotive itself, 140 tons; (2) two cars, 40 tons; (3) two carloads of ore, 100 tons; or a total train of 280 tons. A 72-ton Shay locomotive with all the weight on drivers on an 8 per cent. grade will exert a total draw bar pull (20 per cent.) of 28,800 lb., and haul a total load of $12 \times 28,800$ lb., say 172 tons. Of this weight

the engine weighs 72 tons; two cars, 30 tons, and two loads of ore, 70 tons. The above figures may be bettered slightly, but they illustrate without any complications the principle involved, viz., that it is folly to make a hoisting engine expend a great part of its energy in hoisting itself.

CABLE HOISTING RECOMMENDED

Now, no one believes that any method can be found more economical than mining by steam shovel and tramping by locomotive and 50-ton cars. Can the advantages of steam-shovel mining and locomotive tramping be retained without the disadvantage of locomotive hoisting? Decidedly yes. A heavy-duty hoisting engine can be placed at the top of an incline having a grade of 9 to 12 per cent. and extending to the deepest part of the mine, with turnout at each level. These levels may be 15 to 25 ft. apart vertically, to suit convenience of stoping. Two or three loaded cars can be hoisted at one time and a corresponding number of empty cars lowered, practically all of the switching being done at top and bottom by gravity. There is no feature of the manipulation of these cars at the top or bottom of the incline which has not been successfully worked out and operated for years. The resulting economy and convenience in every phase of the work could not fail to be great. Levels would be kept nearly horizontal, sloping slightly toward the "shaft." Tramping would be by light locomotives handling but few cars at a time.

A hoisting engine with a cable having a safe working strength of 25,000 lb. will easily handle two 40-ton ore cars, weighing 60 tons each when loaded, up a 10 per cent. grade. Such a grade 1000 ft. long will reach a depth of 100 ft. When the mine is deep, grades up to 20 per cent., on which to handle single standard ore cars, may be used to attain the desired depth within a shorter distance. The necessary amount of switching at the shaft (all of which should be done by gravity) is slightly increased; otherwise the economy and daily capacity are but little affected.

In conclusion let me say that first cost, cost of operation and maintenance of a stationary winding engine will be much less than that of an auto-tractive hoisting plant, and that the continued use of the locomotive on heavy grades for mine hoisting is simply an example of a good idea carried beyond its proper limits.

*Milwaukee, Wis., and Houghton, Mich.

Filling Abandoned Workings with Culm or Sand

Detailed Description of the Flushing System Used in Germany to Prevent Surface Subsidence and to Create a Saving in Mine Timbers

BY HENRY M. PAYNE*

The flushing method, as it originated in this country, has been adopted by many European mines with great success, and in view of the movement toward conservation now in progress, directed at the preservation of the smaller overlying veins of coal, which in another generation we shall be working, the system could well be adopted in many more American mines than are now using it.

The German government was quick to see the value of the process, especially in localities where the mining is carried on under thickly populated areas, where the least subsidence of the surface would create a complex disturbance of gas, water and sewer mains, and the construction and operation of a "Spülver-

screened are shoveled into a crusher standing by, which breaks them up and feeds the crushed product back into the sluiceway. This company has over 90 miles of this large pipe in operation below ground, which costs from 5 to 12c. per ft. in place.

At the time of my visit, the plant had been in operation less than a year, and no available data on the cost of operation could be secured. It was said, however, that the cost of timbering was held down at least 33½ per cent. by the use of the process.

THE WATER IS USED AGAIN

The water from the sand flushing drains off on the lower side of the area filled, and is pumped out and used again

thick, cement 0.08 in. thick, and porcelain 0.60 in. thick, leaving the net inside diameter 4.32 inches.

The output of this mine requires at least 1000 tons of sand per day to replace the coal, and on a basis of 300 working days per year, it is found that the porcelain lining lasts for about 300,000 tons of sand, or just about one year.

All the timber originally set is left, and surrounded by the sand filling, making the robbed mine analogous to a railroad trestle around which the embankment fill has been made. The cost of the sand-flushing process is here about 50c. per ton of coal. The average cost of mining is \$3 per ton at the top of the pit, of which the miner receives \$1.75, and the balance is due to haulage, hoist-

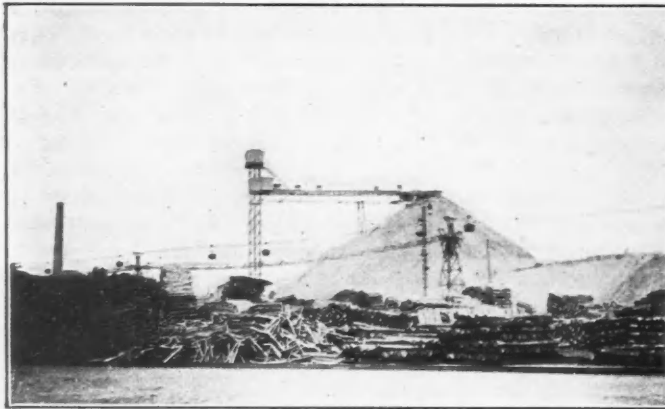


FIG. 1. SHOWING METHOD OF STORING THE GOB UNTIL IT CAN BE USED



FIG. 2. ONE OF THE TERMINALS OF THE AERIAL TRAMWAY AND CRANE HOUSE

satz" is a part of every German mining engineer's education.

One of the most extensive plants in Germany using this process, is the Grube Königin Luise, at Zabrtze, in upper Silesia. The company has built a railroad some 15 miles into the country to its supply of sand, which is brought to the mine in its own hopper-bottomed cars, and run upon a trestle, as shown in Fig. 1, where it is dumped into a large storage pit. The seam which is operated here is from 29 to 32 ft. thick, so that out of a total of 8000 employees, over 1000 men are required in connection with the sand-flushing process alone.

The sand is distributed through the mine in a 3 1/5-in. pipe by hydraulic power, passing from the storage pit shown in the cut, through a 2-in. screen. The coarse gravel and rocks thus

at the sand pit for flushing. The shaft at this mine is 975 ft. deep, the dip of the coal 6 per cent., and the pumps throw 1585 gal. per min. from the flushing process. The cost of securing and transporting the sand alone, to the storage pit, does not exceed 25c. per ton.

The Zabrtze mines are divided into the East and West fields with a total annual output of 2,750,000 tons. The accompanying sketches, Fig. 3, show the method of development and of refilling. This sand, after being washed into place and the water drained off, becomes so hard that it is necessary to use a pick to loosen or remove it. It is found in all cases fully equal to the load imposed.

At the Bergwerks Deutscher Kaiser Zweite, at Hamborn, Rheinland, the same process is used, but all the pipes are porcelain lined. The main supply pipe is 6 in. in diameter, made of iron 0.16 in.

ing and fixed charges. The shaft is 1788 ft. deep and the pumps throw the drainage water from the flushing process from this depth at the rate of 1320 gal. per minute.

The company employs at its various mines 22,000 men, of whom 10,000 are exclusively employed at the coke ovens. Their total yearly coal output is 3,000,000 tons, and by working eight-hour night shifts, they make 320 working days per year, the mines being closed only from 6 a.m. to 6 p.m. on Sunday. The various mines of this company have a casino and club house, with separate dining rooms for the officers, superintendents, foremen, engineers, etc., and every plant is elaborately equipped with bath rooms for the miners and all modern conveniences.

In some districts, where there are large quantities of gob or culm, notably

*Mining engineer, Morgantown, W. Va.

as at the Hibernia Bergwerks Gesellschaft Shamrock Erste und Zweite, at Herne, where the output exceeds 3000 tons per day, from six different levels, at depths varying from 650 to 2275 ft., a gob pile which accumulated for 35 years, was used in 15 years, for refilling the

abandoned workings, at a great saving in mine timbers and expense from subsidence of the surface.

Fig. 1 shows the method of storing the gob until it can be used. This picture and Fig. 2 were taken at the Rhein-Elbeminne of the Gelsenkirchen Bergwerks Actien Gesellschaft.

Fig. 2 shows one of the terminals of the aerial tramway and the traveling-crane house, surmounting the coal storage yard. The main tramway is 2600 ft. long, and supplies the coke ovens whose by-products I described in a preceding paper.

The total output of the four mines of this company is 7000 tons per day, and 7000 miners are employed, averaging one ton of coal per day per man. This company averages 200 working days per year, or 1800 coal-hours.

The company's equipment cost \$3,750,000, and in addition to the complete by-product plant referred to, includes an electric lighting, pumping and ventilating system, and two-stage air compressors giving 519,650 cu.ft. per hour, at six atmospheres, and a condenser for 15 tons of water from steam per hour. I am deeply indebted to Herr Bergassessor Ackermann, Freiherr von Tautphoeus, and Herr F. G. Tarrant for special courtesies and data, in my investigation of this subject.

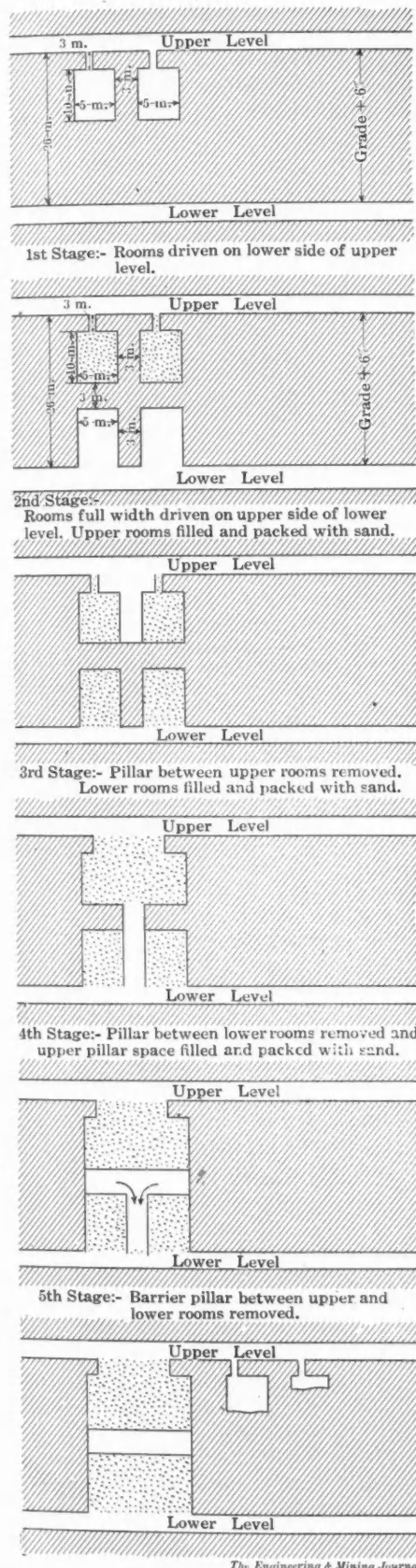


FIG. 3. SKETCHES SHOWING THE METHOD OF DEVELOPMENT AND OF REFILLING

the anthracite regions, but he thought that something might be done to educate him, although he admitted that the undertaking was a portentous one, and he was doubtful of its ultimate issue. Mr. Jennings then passed under review the social conditions of the foreign mining population. These were far from being what they could or should be, even accepting the domestic standard of the foreigner at home. It was unfortunately a fact that the foreigner was addicted to drink, and that there seemed to be no limit to the opportunities open to him for indulging in this appetite.

At this point Mr. Jennings made a remark with which those who heard him agreed fully, and that is, that a considerable number of the accidents in the mines are the result of the drinking habits of the miners whether native or foreign. Mr. Jennings did not say that miners were permitted to enter the mines under the influence of drink, but it was morally certain that a man who was drunk or under the influence of drink on the previous night was in no position to work in the mines. Apart from the physiological effects of the drink, his brain was liable to be muddled and he was inclined to be careless where he would realize, under ordinary circumstances, that danger surrounded him at every turn. Mr. Jennings also pointed out that where a large number of foreign miners congregate, there has sprung up a class of harpies, recruited from the foreign population, who never work and who never intend to work, and whose sole occupation is to act as jackals to the hordes of petty swarms and justices of the peace that swarm in the coal regions and live on illegal arrests and fines extorted from ignorant foreigners.

The Foreigner in Our Mines

SPECIAL CORRESPONDENCE

Recently before the Scranton Miners' Institute, Supt. Joseph P. Jennings, of the Pennsylvania Coal company, delivered an interesting address on "The Foreigner in the Mines." At the outset of his discourse, Mr. Jennings postulated the fact that we had the mines in the anthracite regions manned to a large extent by foreigners, and that being admitted, as it must be, the question that the community had to face was rather sociological than economical. The foreigner was here and here to stay, in the opinion of the speaker, and the problem to be solved was to bring the foreigner into something like harmonious relations with his immediate environment.

It is all very well to say, as many people claim, that we have a voracious capacity for assimilating the foreigner; however, people who speak in this way mean the children or the children's children of the foreigner, which is a different thing than the absorption of the foreigner as he lands on these shores, and as he arrives in the anthracite-coal regions, generally a middle-aged man, having all his habits for life irrevocably fixed.

Mr. Jennings despaired of assimilating the matured foreigner as he appeared in

The American Institute Excursion

In its present form, the proposed excursion of the American Institute of Mining Engineers to Japan, in the autumn of 1910, provides that the members of the institute party shall meet at San Francisco (where a couple of days may be spent in sessions, etc); that the excursion proper shall start from and return to San Francisco; that two or three weeks shall be spent in Japan, ending with attendance at the celebration of the Mikado's birthday in the first week of November. This plan would require the party to start from San Francisco about Oct. 5, reaching San Francisco on its return about Nov. 25. The cost of the trip from and to San Francisco is estimated as not exceeding \$500 per person. These figures are mere estimates, believed to represent a maximum, without allowance for such reductions as might be secured for the excursion.

Progress in Fuel Briquetting

BY ROBERT SCHORR*

Table No. 1 and diagrams Nos. 1 and 2 illustrate the conditions of mining and of briquetting coal and lignite between the years 1885-1909. During this period the world's fuel output has more than doubled and the production of briquets has risen from 4 3/4 to 26 million metric tons, or to a little over 28,650,000 short tons. The rapid growth of the German lignite-briquetting industry is

*Engineer, San Francisco, Cal.

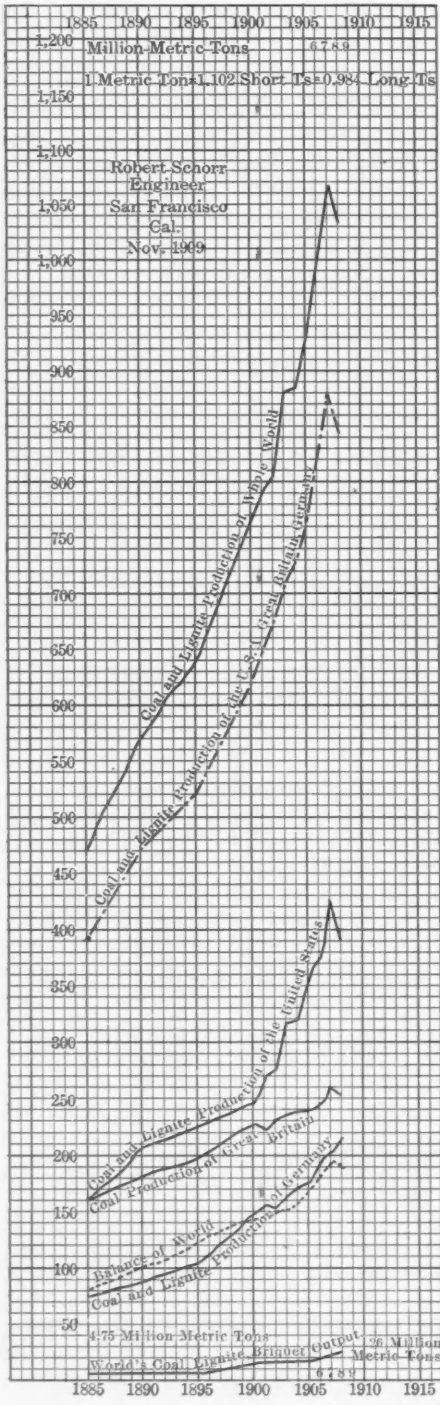
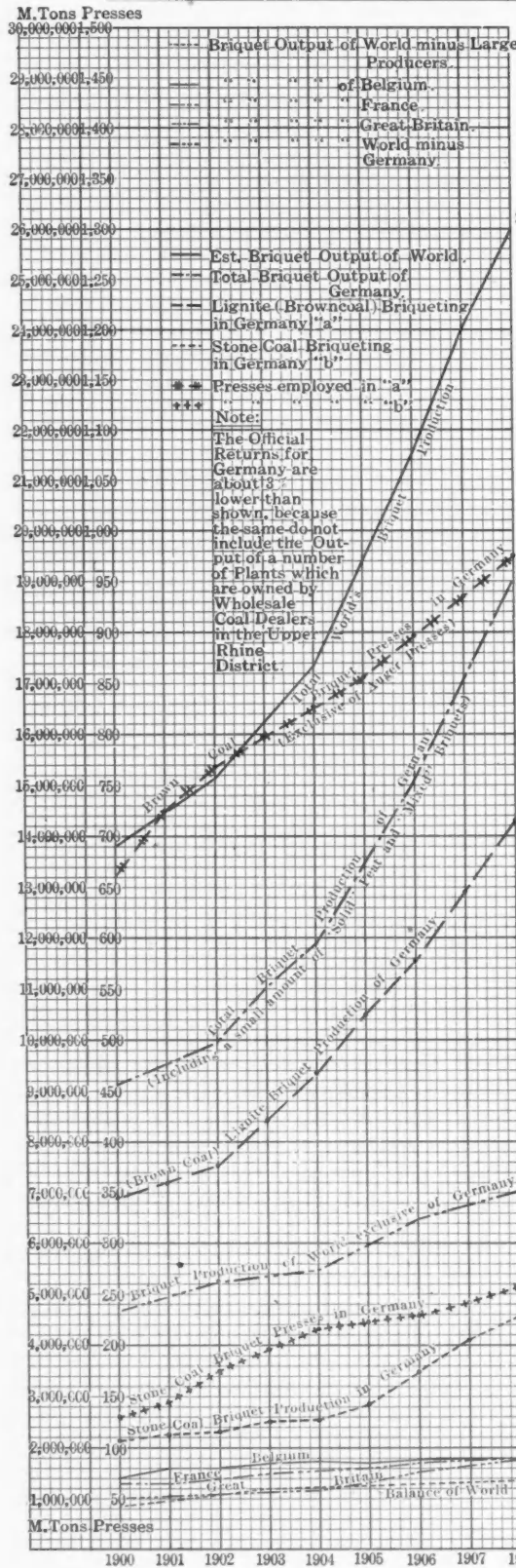


DIAGRAM NO. 1. SHOWING COAL AND LIGNITE OUTPUT OF WORLD

Robert Schorr, Engineer

World's Fuel Briquet Production in 1885: M.T's			Per Cent of World Coal & Lignite Prod'n	Briquet Prod'n of Germany	
(Brown Coal) Lignite	" "	4,075,000		1%	1885:	800,000 M. Tons, or = 1.1% of Coal & Lignite Mined there, or = 17% of World's Briquet Output.
Solid, Carbonized Peat	" "	650,000	1908:		19,070,000 M. Tons, or 8.84% of Coal and Lignite Mined there, or 73.3% of World's Briquet Output. Germany's Coal & Lignite Production of 215 Mill. M. T's = 26.0% of World's.
Other "Mixed" Fuels	" "	10,000			
		15,000			
Total in Met. Tons			4,750,000		
World's Fuel Briquet Production in 1908: M.T's			2 1/2%		
(Brown Coal) Lignite	" "	11,500,000			
Solid, Carbonized Peat	" "	14,338,000			
Other "Mixed" Fuels	" "	62,000			
		100,000			
Total in Met. Tons			26,000,000		
			= 28,652,000 Short Tons		
			1-Metric Ton = 1.102 Short Ton = 0.984 Long Ton		



26,000,000 M. T's Briquets = 2.5% of World's Coal & Lignite Production.

Manufactured in about 575 Works with near to 1,900 Presses, exclusive only of Auger Presses used for making Machine Peat. The Production of the same is not included in the Diagrams.

19,070,000 M. T's of Briquets = 8.84% of Germany's Coal & Lignite Production. = 73.3% of World's Briquet Output. Manufactured in about 450 Works with close to 1,400 Presses of every type, as above.

Diagram No. 2
Development of Fuel Briquetting in Recent Years.

(Machine Peat is not included)

mainly responsible for this. My contributions upon this subject have been published in the JOURNAL, the most complete being "Lignite Briquetting in Germany," which appeared in the issue of Feb. 29, 1908. The only other important producer of lignite briquets is Austria with 130,000 tons in 1908, next to Germany's 14,227,218 tons. All German brown-coal briquets are made without binder, as has been described in the aforementioned article and also in my paper on "Fuel and Mineral Briquetting," read before the American Institute of Mining Engineers in February, 1904. Only brown-coal varieties containing less than 4 per cent. and generally more than 6 per cent. of "bitumen" (extract, soluble in CS₂) are not used for briquetting, a large portion of the same being distilled for tar products, gas and Grude (brown coal) coke.

3 are in Germany, 1 in Russia and 1 in Holland. They employ all told 6 Exter-type presses and I have estimated their output at 62,000 for last year. There are also a number of such installations in Canada, but they are on a small scale and not in steady or commercial operation. Their production is insignificant.² The tabulations and diagrams do not include machine nor hand-cut peat. There are in the neighborhood of 10,000,000 tons of peat used in this form.³ Nothing definite can be secured regarding the manufacture of "mixed" briquets. There are a number of such works in the United States, in Germany and in Austria, using as raw material, mixtures of various description, consisting of coke breeze, brown coal, black lignites, bituminous coals, sawdust, etc. I have assumed that 100,000 tons of mixed briquets were made in 1908.

of the same are still in existence, but either idle or operated occasionally only. Not one of these installations is really a "plant" in the European sense of the word, and not one could be termed a commercial undertaking of importance. In 1885, the United States was credited with a production of 130,000 tons of briquets, but I do not think the output for 1908 was more than one-half of this. There are no statistics available upon the subject.

The Cherry Mine Disaster and Its Lessons

BY SIM REYNOLDS*

The one bright spot in the St. Paul Mine disaster was the courage and forti-

Table No. 1: Coal and Coal-Briquet Production of World. (See also Diagrams No. 1 and No. 2.)

1 Metric Ton = 1.102 Short Tons = 0.984 Long Tons.

Year	U.S. of America	% of Total	Great Britain	% of Total	Germany	% of Total	Total 3 Leading Producers	% of World's Total	Balance of World	% of Total	Coal and Lignite Production World	Coal and Lignite Briquet Prod'n. World	% of World's C. & L. Prod'n.	Coal & Lig.-Briquet Prod'n. Germany	% of World's Coal & Lig.-Briquet Prod'n.	% of Germany's C. & L. Prod'n.
1885	160 M.T's	33.8	159.35	33.5	73.67	15.4	393	82.7	82	17.3	475,000,000 M.T's	4,750,000 M.T's	1.0	800,000	17.0	1.1
1890	204	35.8	181.6	31.9	89.05	14.8	474	82.5	95	17.5	569,000,000 "	7,000,000 "	1.23	2,750,000	39.6	3.09
1895	220	35.25	200	32.05	100	16	520	83.3	104	16.7	624,000,000 "	10,000,000 "	1.60	4,400,000	44.0	4.4
1900	243.4	31.55	228.8	29.85	149.8	19.7	622	81.4	143	18.6	765,000,000 "	13,800,000 "	1.81	9,200,000	66.6	6.16
1901	266.1	33.67	222.6	28.19	153	19.36	642	81.2	148	18.8	790,000,000 "	14,400,000 "	1.82	9,400,000	65.3	6.15
1902	273.6	34.03	230.7	28.69	150.6	18.68	655	81.4	149	18.6	804,000,000 "	15,100,000 "	1.87	9,850,000	65.6	6.54
1903	273.6	35.55	233.4	26.43	162.46	18.32	713	80.7	170	19.3	883,000,000 "	16,600,000 "	1.89	10,950,000	66	6.74
1904	318.3	35.92	236.1	26.64	169.45	19.14	724	81.7	162	18.3	886,000,000 "	17,300,000 "	1.95	11,800,000	68	6.98
1905	352.7	37.9	239.9	25.8	173.6	18.7	736	82.4	164	17.6	930,000,000 "	18,250,000 "	2.01	13,500,000	72.0	7.83
1906	372.7	37.4	247	24.8	193.5	19.4	813	81.6	153	18.4	996,000,000 "	21,600,000 "	2.16	15,050,000	69.6	7.77
1907	427.1	39.5	261.9	24.2	205.54	18.7	894.5	82.4	195.5	17.6	1,080,000,000 "	24,000,000 "	2.22	17,000,000	70.8	8.29
1908	377.1	36.4	255.25	24.6	215.1	20.7	847.5	81.7	187.5	18.3	1,035,000,000 "	26,000,000 "	2.52	19,070,000	73.3	8.84

The Engineering & Mining Journal

Brown coal, similar to the German raw material for briquetting, occurs on the American continent—as far as I know—only in a few places; namely, in Dakota, Alabama, California, Texas and Panama. All other Tertiary lignites require binder material to yield a serviceable briquet.

About 11,500,000 metric tons of stone-coal briquets were made in 1908, and here also, Germany is far in the lead with a production of 4,700,000. This is about 700,000 tons more than stated in the official reports, due to their not including a number of briquetting plants which are owned by wholesale coal dealers. See note on diagram No. 2.

The manufacture of solid, carbonized peat briquets has made no noticeable headway until recently; two large plants are in the course of construction in Ireland and Germany, which will employ Dr. Eckenberg's new process. The same has been fully described¹ by E. Nystrom. At the present time there are only 5 peat briquetting establishments in operation;

¹"Peat and Lignite," by E. Nystrom, Department of Mines, Ottawa, Can., 1908.

LOCATION OF VARIOUS BRIQUETTING PLANTS

The first commercial briquetting plant was built:

- In France, 1842, at Béraud.
- In England, 1846, at Newcastle.
- In Belgium, 1852, at Montigny-sur-Sambre.
- In Austria, 1858, at Brandeis, near Prag.
- In Germany, 1861, at Muehlheim a.d. Ruhr.
- In United States, 1870, at Point Richmond, near Philadelphia.

The history and the present state of fuel briquetting in this country form a marked contrast to the development of most of our industries. About 40 briquetting plants have been built and 15 or 16

²Bulletin No. 1. Department of Mines, Ottawa, Can., 1908-09.

³"Commercial Aspects of Gasifying Peat," by R. Schorr; read before the American Peat Society, Toledo, Oct., 1908.

NOTE—For the compilation of the diagrams I have used the following references, viz.: "The Mineral Industry," ENG. AND MIN. JOURN.; "Jahrbuch der deutschen Steinkohlen Industrie," 1907; "Coal Briquetting in the United States," by E. W. Parker; also a number of bulletins of the U. S. Geol. Surv., prepared by Mr. Parker in his capacity of chief statistician; "Handbuch der Briquetbereitung," by G. Franke, 1909; "Briquetted Coal," by C. T. Malcolmson, read at the July, 1909, meeting of the International Railway Association, Chicago; "Technologie der Brennstoffe," by Dr. F. Fischer, 1901; "Braunkohlen-Teer-Destillation," by Dr. W. Scheffhauer, 1907.

tude shown by the survivors, courage under conditions enough to break the spirit of any man; facing death for what must have seemed ages, in a hideous form, and yet come out hopeful and cheery. This and the efforts of the men who offered and gave their lives in an effort to save, goes strongly to show that every day dangers of life for the miner breeds a fearlessness and contempt for danger quite uncommon.

Much comment has already been made on the judgment displayed by the rescuers in the methods used in handling the fire. But in this as in many other things, it is easier to criticize than to take charge of such a situation, and do it satisfactorily for the general public. Any error in judgment under such circumstances is pardonable. Precautionary measures against a similar occurrence is of more importance now.

Eternal vigilance is the price of safety about mines. We have in this case of the St. Paul mine an illustration of what a simple detail gone wrong can do.

*Mine superintendent, Stewartsville, Ohio.

THE IMPORTANCE OF STRICT DISCIPLINE

The foreign commission invited to inspect and report on our mining conditions by our Government, said, among other things: "We cannot too strongly emphasize the fact that thorough discipline about the mines is absolutely essential to safety." They undoubtedly pointed out our weak link right there, because as a rule discipline in our mines is woefully lacking.

In a conversation with a close observer of all things relating to mining, the laxity of methods and discipline was touched upon by my friend and myself. I cited numerous instances that had come under my observation to illustrate our haphazard "every man for himself" way of doing things. My friend replied that it was characteristic of the American workman to chafe under restraint, and object to being disciplined, and the miner is no exception to the rule, which may be true enough; however, where this failing affects the safety of human life and valuable property it is a failing that should be eradicated as speedily as possible. Lack of care in doing things; haphazard work of any kind is of little importance if it affects only the individual. But where the recklessness of one jeopardizes the lives of many it is time to call a halt.

The committee of foreign experts were speaking from experience when they urged discipline and methodical work, as the European miners evidently realize and appreciate the benefits derived from systematic work and rigid observance of rules and regulations.

COMPARISON OF EFFICIENCY AND FATALITIES

We can produce more coal per miner and cheaper coal per ton. We can invent and utilize labor-saving machinery, which fairly staggers our European brethren, but they have us beat to a standstill so far as the conservation of life is concerned. We will no doubt come down to this after awhile, but why not hasten the time?

At the present time, Federal supervision is being talked of by the law makers at Washington. It is to be hoped that they will hasten any legislation that will bring about better conditions than we have at present.

We have our State mine inspectors, able and efficient men, honorable and ardently desirous of doing their duty as they see it and the law interprets. They make periodical inspections of our mines, suggesting and advising, and at times insisting on certain changes in our methods—or, as is more often the case—the lack of it. But their power for good is very limited; they cannot change our characteristic traits.

Furthermore, conditions in a mine can change quickly. What the inspector sees today may be altogether different in three

months hence. The territory these men cover is altogether too large. Three or four, and sometimes as much as six months, is too long for any mine to be left without inspection.

TROUBLES OF THE INSPECTOR

I believe the lives of 500 miners is of sufficient value to any State to call for the constant service of a competent man, paid by the State. If necessary place a tax of one-half cent per ton on the coal mined to pay the expense. Under present conditions, this seems to be the only quick and practical way out of a bad mess. If lives and property on the surface are worth policing, why not lives and property underground?

The following dialogue is not unusual at one of our American mines: The State inspector (who happens to be making a visit along with the foreman) goes into a miner's working place. Inspector says to miner who is loading coal from under a bad piece of slate: "Say, John, that slate looks bad, better pull it down."

John stops shoveling for a moment, looks blankly at the inspector, and not understanding, resumes his work. This rather irritates the inspector. He walks up to the miner, touches him on the shoulder, and tells him again of his danger, at the same time pointing to the bad slate. John begins to comprehend, he stops for a moment, and bumps the slate with his shovel handle, then a pick, and says: "Oh, sure; me watch um; me loadun dis waggun, maybe fix um awright," and unless prevented forcibly goes on shoveling again.

Our yearly reports are filled with paragraphs reading as follows: "John Smith was killed by a fall of slate in Room 23, 3d Left, leaves a wife and six children." Fully 50 per cent. of our fatalities come in this quiet, unostentatious form, creating no commotion on the surface nor in the public prints, but doing its awful work just as perfectly as the worst explosion ever did, for it seems gas and dust are not our only enemies.

Of course it must be admitted someone was at fault with regard to the unfortunate position of the stables in the St. Paul mine, placed as they were in such position between the two workings, and where a fire therein shut off all egress of the workmen beyond.

And the use of a naked light in the stables looks like criminal negligence of someone. But who thinks of these things or the awful possibilities lying dormant in them until something happens? This simply shows that in our calling, at least, the most trifling details should not be overlooked.

How many of us are there who are schooled in the right action to take if a fire should occur in our mine tomorrow? I saw a mine foreman—and a pretty efficient one generally—very much embarrassed the other day when asked by the

general manager to detail the course he would pursue if such a thing happened in his mine; the manager outlined an imaginary fire. The result showed strongly how far we are from preparation.

EXAMPLES OF CARELESSNESS

Few men will risk the filling of a cartridge with a dangling light on their heads, yet I have seen miners who would. As an example, I will cite the following case which came under the notice of an inspector of one of the Ohio districts some time ago. A miner was changing the wick in his lamp, putting in a new one. A full keg of powder was at his side (every miner in Ohio can have 25 lb. of powder in his working place, which would permit 7500 lb. of powder for 300 miners). Needing the light of the old wick to put in the new one, he set the lamp in a convenient place, in this instance the top of the keg. By the time he had the new wick ready, he happened to notice that the paper cork in the lamp had ignited and was about ready to drop in the hole. He ran quickly around the corner of the "rib" and just got there when the powder exploded. The smoke nearly suffocated the men in that section of the mine.

A CARELESS OFFICIAL

This is an extreme case, I know, but not worse than the officials will do at times. I remember a certain morning in a large mine in Pennsylvania, and an underground mine office, in which were congregated the foreman and one or two of the firebosses, who had just covered their sections and brought in their reports to the foreman. Presently another came in and one of his companions happened to notice that his eyebrows and the front of his hair were burnt some, and when it was mentioned he replied that in lighting the gas stove that morning at home it had exploded in his face. It came out later through another fireboss that he had been making his tests with an open light, to cover his section more rapidly and more conveniently.

I speak from experience when I say that taking the mining fraternity generally, there are not in the wide world a class of men who take more chances with their lives. This trait of carelessness—existing from trapper-boy to general manager—is responsible for the larger part of our accidents. We will have gas explosions despite the most rigid discipline. We will also have an occasional mine fire, both bringing monetary loss and destruction of human life. Slate will continue to take its toll despite the most perfect policing of our underground industry, but so let it be. Fate has in store for us in the chosen work enough of death, enough of misery. Let us not add to the list by our "high pressure" methods of running all the time along the line of danger in order "to make it pay."

Mineral Production of Idaho for 1909

Lead, \$9,356,571; Silver, \$3,625,317. Activity in Mining Stimulated by Railroad Building. Snowstorm Mine Main Copper Producer

BY F. CUSHING MOORE*

The mineral production of Idaho for the year 1909, basing the figures upon the average New York metal prices, aggregates \$15,561,131, or \$45,730 greater than for 1908. The greatest source of revenue was from lead mining which produced \$9,356,571. The next metal in point of importance was silver, the production for the year aggregating \$3,625,317. Gold ranked third with a production of \$1,465,481; copper, fourth, with \$1,034,651; zinc, fifth, with \$104,841, and coal, sixth, with a value of approximately \$20,000.

A great deal of activity was displayed by the competing railroad systems and considerable actual construction is in progress. The railroad from Armstead, Mont., through Salmon City to Lewiston is completed as far as Junction on the Lemhi river. This road, which will be into Salmon City within a few months, is undoubtedly backed by the Hill interests and will connect with the Northern Pacific at either Lewiston or Grangeville. Numerous surveys for railways are being made in various parts of the mountainous sections of the State, which, if constructed, will materially aid the mining industry and increase the production. Idaho possesses many promising mining properties which at present are so remotely situated that it is impracticable to carry on operations. Many would become productive if brought within a reasonable distance of a railroad.

Since the depression of 1907, Idaho has suffered severely from lack of financial assistance in prospecting and developing the smaller properties. The larger properties which were on a producing basis prior to that time have been able to operate almost continuously, as the metal prices have been fairly good. There has been a lack of interest shown by the investing public, and it is only during the latter part of last year that renewed interest in the development of unproductive properties has manifested itself. The fact that the tendency toward the development of prospects is on the increase is an encouraging sign for a bright future.

LEAD

In 1909, Idaho produced 217,594,679 lb. of lead, having a value of \$9,356,571, of which 99 per cent. came from the Cœur d'Alene district in Shoshone county. Practically all of this lead was derived from argentiferous-galena ore.

*State mine inspector, Boise, Idaho.

The ore of the Cœur d'Alene district occurs in fissure veins and zones, in Pre-Cambrian quartzites. The veins have been filled largely by replacement. First-class galena is produced, varying from 45 to 70 per cent. lead. The bulk of the ore is concentrated, the ratio of concentration varying from 5 to 1 to 12 to 1; the concentrates shipped run from 45 to 60 per cent. The ratio of silver to lead varies from 4/10 to 1 oz. per unit of lead. The State of Idaho produces about 30 per cent. of the total lead of the United States and with the associated silver occupies a conspicuous place in the metal production of the world.

SILVER

Every mining county in the State produced more or less silver, the bulk of which was derived from the Cœur d'Alene galena ore which produced 88 per cent. of the total production of the State, 7,039,451 oz., with a market value of \$3,625,317.

The next district in importance in the production of silver was the Silver City district in Owyhee county which produced between 9 and 10 per cent. of the State's total production. There are many properties in several sections of the State with a large tonnage of dry silver ores in sight which are lying inactive owing to the lack of metallurgical processes and transportation facilities. With the advance in the price of silver and railway activity, the silver production of the future is likely to be greatly increased.

GOLD

Idaho produced 70,898 oz. or \$1,465,481 of gold during 1909. The Silver City district ranks first in production with \$404,983; Boise Basin second with \$241,277 and Elmore county third with \$209,105. The greater portion of the production of this county was derived from the quartz mining operations in the Atlanta district. Custer county ranks fourth in gold production with \$101,901 to its credit for 1909.

Dredging operations which are contemplated for the future will undoubtedly increase the gold production of the State in years to come.

The successful operation of a number of dredges, which have been working during the last few years, has increased interest in the opening up of large deposits of dredgeable ground in various sections of the State.

COPPER

Several of the copper properties which have been productive in the past, remained practically idle during last year. The State produced 7,759,887 lb. of copper, with a market value of \$1,034,651, 98 per cent. of which was from the Snowstorm mine in the Cœur d'Alene district. The other district of importance is the Seven Devils district, Custer and Lemhi counties. The Seven Devils district which has been worked in a desultory way for many years has during the last few months taken on the appearance of healthy development. The Salt Lake Copper Company, which is controlled by the Lewisohns, has taken options on some of the more important properties, with the expectation of developing them to the productive stage, and with the idea of ultimately installing a smeltery in the immediate vicinity of Homestead, the present terminus of the Huntington-Lewiston branch of the Oregon Short Line.

ZINC

The zinc production of Idaho which amounted to 1,906,200 lb. was derived mainly from the Cœur d'Alene and Wood River Districts. The Success mine of the Cœur d'Alene district produced 84 per cent. of the total production. This property was inactive during the early part of the year but made a creditable showing during the period of operation. The property has immense reserves of zinc which are associated, though not intimately mixed, with argentiferous-galena ore.

COAL

Idaho contributed but slightly to the coal production of the country, there being only two districts in which coal was mined during the year.

The only deposit of importance which contains a good grade of bituminous coal is found in Fremont county. The Brown Bear coal mine in this section produced about 1500 tons of high-grade bituminous coal during the year, which averaged approximately as follows: Fixed carbon, 55.65 per cent.; volatile carbon, 36.62; moisture, 3.13; ash, 4.10; sulphur, 0.50. Total, fuel contents, 92.00 per cent.

This property has 12 coal measures exposed upon it varying from one to ten ft. in thickness, but it is so remotely situated from transportation that its production has been confined to supplying local demand. There are no difficult engineer-

ing feats to be accomplished in the building of a railroad to this district as a water grade could be obtained with no heavy work.

The coal measures are in an unaltered sedimentary formation of Cretaceous age; are a continuation of the series mined farther southeast in Wyoming, and if properly opened and equipped could supply the total coal demands of the State for years to come.

The only other producing coal property in the State is at Salmon City, which sold during the year about 2000 tons of lignite coal, all of which was consumed locally. A large portion was used by the Pittsburgh & Gilmore Railway in the operation of steam shovels. Numerous showings of lignite coal are found at various portions of the State, but upon which little work has been expended.

PHOSPHATE DEPOSITS

The San Francisco Chemical Company of Montpelier, Bear Lake county, owns the only productive deposit of phosphate rock within the State. From this property 735 tons of rock were shipped in 1909, averaging from 60 to 70 per cent. calcium phosphate. The company contemplates extensive operations in the future. The rock occurs in flat-dipping beds in a sedimentary formation identified as belonging to the Upper Carboniferous series. The veins range from a few inches to 10 ft. in thickness.

OTHER MINERAL RESOURCES

Idaho possesses many surface manifestations of a number of the commercial yet rarer minerals, including antimony, nickel, cobalt and cinnabar. From the heavy sands obtained in the placer opera-

tions in the Boise basin, Warren's, and other placer camps, monazite and other valuable minerals have been discovered, which, with the proper process of separation will be commercially valuable. Wolframite, hübnerite and scheelite are found in several districts and with the increased demand for tungsten minerals, these present prospective value.

In Idaho county asbestos was mined on a small scale, during the year. The product was used for the manufacture of pipe coverings and boiler jackets. The asbestos is of the short-fiber amphibole variety, is extremely clean and free from injurious minerals and has been tested to 4000 deg. Fahrenheit.

Platinum is also found in connection with the fine gold of the Snake river. Opals and sapphires are also known to exist in various portions of the State.

Need of Complete Record of Prospect Drill Holes

BY H. C. GEORGE *

In the Wisconsin lead and zinc district, the orebodies being worked at the present time occur in "flats and pitches" at depths ranging from 50 to 175 ft. As the topography is comparatively regular, few outcrops occur so that orebodies are found by means of the churn drill.

During the years 1904 and 1905, the large dividends paid by the Empire and Enterprise mines at Platteville, Wis., produced considerable excitement. Prospecting became one of the chief occupations. Persons from all walks of life purchased drilling machines and began the search for mines. The prevailing opinion seemed to be that all that was necessary for the discovery of a mine was the securing of a lease on a piece of land, the purchase of a drill, and the sinking of a dozen prospect holes at random.

Most of the drillers were new at the business and were primarily interested in making money, irrespective of the results secured or the records kept. Most of the prospecting companies had no one in charge of operations, and the drilling was left almost entirely to the judgment of the drillman. Holes were sunk to depths ranging from 75 to 200 ft. with little or no record kept. Whenever any ore was found, the drillman washed the drillings to make a showing, and what was really only a trace was made to appear something of importance. Based on such salted discoveries (I say "salted" for washing drillings is just as much "salting" as adding ore from another source), shafts were sunk, concentrating plants built, and mining op-

erations begun, only to find that what was supposed to have been a good orebody was really nothing worth considering. Large numbers of these projects secured capital from many parts of the country, and the resulting failure of so large a percentage of them has not reflected credit on the district. Only since the panic of 1907, have mine operators been more careful and the prospecting reduced to a system with proper records kept. This improvement in method is producing its natural result. More mines are being found and fewer failures recorded and the mining industry is being placed on a stable basis.

In most cases all traces of the old prospect drill holes have been lost and ground that has been thoroughly drilled in the past will again be drilled because of the lack of evidence that it has already been prospected. Such conditions never should have existed. A number of State or Government inspectors should have been placed in the district to see that proper records of prospect drill holes were taken. By a proper record I mean the position of the drill hole, the elevation of the surface at that point, the thickness and position of the formations passed through, and the position and the amount of the ore passed through.

The Wisconsin State Geological Survey has furnished excellent record books for prospect-drill holes, free of charge to all mining companies or drillmen wishing them, but the persons taking advantage of this offer are usually those who would keep a good record even if no such offer had been made.

In my opinion there is no branch of the lead- and zinc-mining industry of the

upper Mississippi valley that needs Government regulation more than prospecting. The State survey has directed attention to the benefit of accurate drill-hole records. But the large number of mills, hoisting and concentrating plants that have stood idle during the last three years, built on false or meager evidence of the existence of an orebody, show what a large amount of capital has been wasted simply because of the lack of a complete and accurate record of the prospecting operations.

If the prospect drill holes show the existence of a good orebody, a complete and accurate record of the drill holes aids wonderfully in the development of the mine. I call to mind one instance in this district where the "drillings" showed the existence of a large orebody but no records were kept. The shaft was sunk and drifting was commenced on what was supposed to be the orebody. But the main orebody was not discovered until part of the roof caved, exposing it. If drill records had been kept, no such mistake would have been made.

Since most of the orebodies are found in the synclines of the folded strata, the depth at which certain formations occur and their dip as indicated by the drill records will greatly aid in mining developments.

The diamond drill has not been successfully used in this district on account of the large number of open fissures and crevices existing in the rocks. The churn drill will probably continue to be the principal prospecting machine and too much emphasis cannot be placed upon securing as complete and accurate records as possible.

*Director, Wisconsin State Mining Trade School, Platteville, Wis.

i PERSONAL i

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

S. H. Brockunier, of Wheeling, is in Kanawha county, W. Va., on professional business.

Francis A. Thomson, of the State College of Washington, was a recent visitor to Butte and Anaconda, Montana.

James MacNaughton, general manager of the Calumet & Hecla mines, is enjoying a short vacation in the South.

James Wilcox has tendered his resignation as superintendent of the Mass Copper Company in the Lake Superior region.

D. MacDougall has been appointed assistant general manager of the Dominion Iron and Steel Company, Sydney, Nova Scotia.

Morton Webber will leave New York in a few days for Mexico to examine a silver mine in Sinaloa for New York clients.

A. J. Beaudetto, recently at Dawson, Yukon Territory, will shortly open an office at Vancouver, B. C., as consulting engineer.

James M. Healey has resigned as superintendent of the Round Mountain Mining Company, of Nevada. F. J. Thorn has succeeded him.

R. P. Dunlap has resigned his position as vice-president and a director of the Montana Tonopah Mining Company, of Tonopah, Nevada.

W. P. Schuck, chemical engineer, has associated himself with J. H. Linton in the Pacific Coast Testing Laboratory, Seattle, Washington.

Frederick Hobart, associate editor of the *Engineering and Mining Journal*, is in Toronto this week, attending the meeting of the Canadian Mining Institute.

D. M. Munro has resigned his position as manager of El Favor Mining Company at Hostotipaquillo, Jalisco, Mexico, and has gone to Canada on private business.

H. F. Bovard, for some time past district superintendent at Irwin, Penn., has been appointed general superintendent of the mines of the Keystone Coal and Coke Company.

Dr. L. D. Ricketts, general manager of the Greene-Cananea Mining Company, and Harry E. Kirk, mine superintendent, have gone to the West Indies on a six weeks' pleasure trip.

W. S. Keith, consulting engineer for the Empire Smelting Company, has been making an examination of the Gold Park Consolidated Mining Company's holdings in Riverside and San Bernardino counties, California.

T. A. Harper has started on an inspection trip in Honduras, accompanied

by J. A. Fortesquieu. On the completion of this work, Mr. Harper will proceed to Alaska to take charge of work there for Pearse, Kingston & Browne, of London.

Fritz Cirkel, of Montreal, has been appointed consulting engineer and H. A. Ball, formerly superintendent of the Banner Hill mines, Nevada City, Cal., superintendent of the Imperial Gold-Fields, a new corporation operating alluvial ground in Beauce county, Quebec.

F. A. Glass, at present with the Duluth Diamond Drilling Company, formerly with the Rogers-Brown Ore Company at the Kennedy mine on the Cayuna range, will engage in general mining engineering, exploration, survey, estimates, etc., at Brainerd, Minn., very shortly.

R. H. Channing has resigned as president and general manager of the Cerro de Pasco Mining Company. He will be succeeded as general manager by A. B. W. Hodges, who has resigned from the Granby Consolidated. Mr. Hodges expects to go to Peru next month.

Robert H. Richards goes to the meeting of the American Institute of Mining Engineers to read a paper, March 1, on "Developments in Ore Dressing Machinery," and on March 3 to the meeting of the Canadian Mining Institute at Toronto to read a paper on the same subject.

John A. Farwell who has, for a number of years, been secretary-treasurer and sales manager of the J. Geo. Leyner Engineering Works Company, has retired from the company and returned to Chicago to attend to other interests there. His address will be Room 305, No. 115 Dearborn street.

H. K. Masters has resigned as general manager to the Central Chili Copper Company, Ltd., operating a custom smeltery and mines in the province of Coquimbo, Chili, and is leaving for New York by way of London. H. M. McLaughlin succeeds Mr. Masters as general manager.

+ OBITUARY +

F. M. Barrett died at Philadelphia, Feb. 20. He had been a partner in the large coal firm of Castner, Curran & Bullitt for three years, and had been connected with the firm for over 20 years.

Julian T. Alexander died at Baltimore, Feb. 20, aged 72 years. He was born in Baltimore and early became interested in coal mining. In 1867 he was chosen a director of the Georges Creek Coal and Iron Company, and since 1886 had been president of the company.

William P. Owens died at Pittsburg, Penn., Feb. 24, aged 82 years. Welsh by birth, he came to this country when a child, and started work as a coal miner

when still a boy. He worked his way up gradually, and was superintendent of the mines of the New York & Cleveland Gas Coal Company, at Turtle Creek, Penn., for over 30 years. He retired from active work 15 years ago.

John Crawford Porter died at Pittsburg, Feb. 17, aged 79 years. He was born at Pittsburg and engaged in the iron business nearly 50 years ago, first as a member of the firms of McKnight, Duncan & Co. and McKnight, Porter & Co. In 1880, he became a partner in the Spang Steel and Iron Company, of which he was secretary and treasurer until 10 years ago, when he retired from active business life.

Paul A. Fusz died at St. Louis, Feb. 16, aged 63 years. He was born and brought up in St. Louis; he began business with the iron firm of Chouteau, Harrison & Valle, as a boy, and rose to be general manager of the company in 1873. He became associated with the Laclede Rolling Mills in 1885, and continued with that company until it went out of business about 1893. He was interested in several mines in Montana, and was president of the Granite-Bimetallic Mining Company for 12 years.

SOCIETIES and TECHNICAL SCHOOLS

Canadian Mining Institute—The annual meeting began in Toronto, March 2. The first day was devoted chiefly to the business session and to the consideration of proposed amendments to the by-laws.

Engineers' Society of Western Pennsylvania—At the monthly meeting in Pittsburg, Feb. 15, Elmer K. Hiles was reelected secretary. J. C. Roberts, of the United States Geological Survey, read a long paper, illustrated by lantern slides, describing fully the work of the Government testing station at Pittsburg.

Scranton Miners' Institute—At the recent meeting in Scranton, Penn., John Hale, one of the oldest miners in the Lackawanna valley, told how in his youth, some 65 years ago, the firebosses in England endeavored to ascertain if there was gas in the workings with a lighted candle. The fireboss used only one of the strands of the wick and screened this with his hand. According to Mr. Hale, it was probably seeing a miner do this that suggested to Sir Horace Davey the idea of the safety lamp, for the miner's hand in a measure acted as the netting does in a safety lamp. At any rate, Mr. Hale remembers that when a miner in any English mine wished to use a safety lamp he had to purchase it himself, and as the lamps were then very dear, few miners of those days could afford the expense. Mr. Hale said that he had in his possession one of the first of these safety lamps that were manufactured for commercial purposes.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON
IMPORTANT EVENTS FROM MANY IMPORTANT
MINING CENTERS OF THE WORLD

San Francisco

Feb. 25—The details of the settlement of the smeltery-smoke question in Shasta county, so far as it concerns the Mammoth Copper Mining Company of Kennett, have been agreed to by representatives of the farmers and the smelting company. An amicable agreement was reached upon the matter to be incorporated in the complaint and answer in the friendly suit to be brought in the U. S. Circuit Court in San Francisco. The farmers will not waive any claim for damages already accrued or that may accrue before July 1, the date upon which the smelting company promises to have its bag house in operation.

Riley A. Boggess, whose name was at one time well known in connection with quicksilver mining in California, is taking steps to reopen and resume operations on the Abbott and Sulphur Bank quicksilver mines in Lake county. Both these mines were formerly productive, the Sulphur Banks notably so. The recent rise in price of mercury has caused renewed interest in mines of this metal and it is expected that several mines for some time idle will be started up in the summer.

There has been an abundant fall of snow in the higher mountains of California during this winter and most of it has packed quite hard. This insures an abundant water supply.

Alleghany and Forest in Sierra county continue to be the two places which are attracting the most attention from California miners and prospectors. Within a radius of five miles of Alleghany there are now 32 mines being actively developed and some are producing largely. A number of tunnels from 500 to 2000 ft. long are under way or planned. There have been thus far no wildcat companies, all those at work having promptly paid their bills. The lower crosscut in the famous Tightner at Alleghany has not cut the ledge as was expected by Feb. 1. It now seems apparent that the course and dip of the vein has changed and must be looked for further back in the ridge than was expected.

John F. Krause, of San Francisco, some time since organized the Mt. Hamilton Land and Oil Company on a non-assessment basis and sold a large amount of stock in the Eastern States to people who were assured that no assessments would or could be levied. However, whether a mining company is incorpor-

ated outside the State on that basis or not, the California laws provide for assessments to pay indebtedness by stockholders when the property is within the State. Perhaps contrary to the supposition of Krause, indications of oil were found on the lands of the company, and he then attempted to "freeze out" his stockholders by levying an assessment. In the course of his operations the Government officials concluded he had used the mails to defraud and he was arrested and convicted on such a charge. Before sentence was passed Krause got a lawyer who sought to mitigate the man's punishment by offering to make restitution to all who had been defrauded in the stock deals. The prosecution, however, called the court's attention to the fact that Krause had received over \$70,000 from the sale of stock, and when prosecution seemed imminent, transferred the coin. Then when there was a seeming lull in activity on the part of the Government, he brought suit to recover the money. Sentence will be passed at the end of February.

Butte

Feb. 25—After a week's cessation of activities in the majority of mines in the camp, it now looks as though operations would be in full swing again within a few days. The members of the International Engineers who walked out, are still firm in their determination to stay out, but the Western Federation of Miners have brought in hoisting engineers from Colorado and Dakota to fill their places and the mining companies are apparently ready to try out the imported men. General Superintendent John Gillie, of the Amalgamated company, has announced that operations will be resumed with the new engineers as fast as possible. Just how adequate the new men will be to fill the responsibilities attendant upon the operation of the complex hoisting engines is a question which only the future can determine. It is thought that all of the mines will at least attempt to resume operations during the present week. It is quite probable that with the slow operation necessary with the new engineers the companies' mining costs will be increased materially as will also the liability to accident.

Federal Judge Hunt has recently handed down his decision in the case of Hugh Magone vs. the Colorado Smelting and Mining Company, et.al. The action

was brought to obtain an injunction against several mining companies to prevent them from polluting the waters of the Deer Lodge river, which complainant alleged had destroyed the value of the water for the purpose of irrigating his ranch. The judge finds that the complainant's ranch has been damaged in the sum of \$572.50 which sum the mining companies are required to pay within 60 days, otherwise a permanent injunction will issue.

Construction work on the Montana Rapid Transit Company's trolley line between Butte and Helena will begin May 1, and the road should be completed by autumn. Fifty-two of the 72 miles of roadbed have already been constructed, and it is estimated that the total cost of the road will be \$3,500,000. It is planned to run cars on a three-hour schedule and to undercut the present rates of the Great Northern Railway.

The latest announcement of the Idaho Smelting and Refining Company is to the effect that the smeltery at Sandpoint, Ida., will resume operations March 1. President Anderson states that the company has a working capital of \$600,000 and contracts enabling it to receive 600 tons of ore daily, most of which will come from the Cœur d'Alene district.

It is probable that the Gilmore & Pittsburg railway will be continued from Armstead, Mont., to Dillon, in Beaverhead county. At a recent meeting of the citizens of Dillon, arrangements were made to subscribe a \$10,000 fund for the purpose of assisting the railway in obtaining a terminal in that city.

The Montana, Wyoming & Southern railway's request to have the rates on coal from Bear Creek to Bridger raised has been denied by the State Railway Commission. The commission states that while the present rate of 35c per ton may be unremunerative, yet this fact is caused by the lack of proper facilities for doing an increased business, and that were the motive power of the road sufficient, the present rate would bring good returns.

Denver

Feb. 27—In southwestern Colorado the promise of extensive railway building is acting as an impetus to the mining industry. The Denver & Rio Grande is to be broad-gaged from Alamosa to Durango, and connection is also to be made from the latter point to the Southern Pacific system, the chief object being apparently

to get the coal from the Durango field into the southern regions which are not at all well supplied with good fuel. In fact, nearly all the railways in the State are preparing to extend their lines and spend large sums in betterments. The Colorado & Southern is said to be going to spend \$2,000,000 for new equipment and \$3,000,000 for improvements of track and equipment now in use. The new equipment is to include 10 passenger engines, five Mallet compound engines and seven switching engines, 500 all-steel gondola cars of 100,000 lb. capacity each, to haul iron ore and coal, 300 box cars, 500 stock cars, etc. Another \$5,000,000 is to be spent by the Colorado & Southern and Denver & Rio Grande together in the Pueblo-Walsenburg division, where a new double track will be built. On the Moffat Road, since its completion into the Yampa coalfield, it has been found impossible to handle the business with existing equipment, and last month Mr. Moffat purchased 20 more engines, and 518 steel cars, the whole being necessary to handle existing freight traffic between Denver and Steamboat Springs.

At Ouray, four small smelters are projected, one of 200 tons capacity at the San Antonio mines in Red Mountain district, and one of 500 tons at the Mono-Baltic mines adjoining the San Antonio, both of these being of the pyritic type; a third is the Bright Diamond smeltery, which, with its mine in the quartzite belt below town, has just been reported sold to Eastern people and is preparing to mine and treat 200 tons of auriferous pyrite daily; the fourth of 200 tons capacity is to be of the Kuenzel type, similar to the plant at Buena Vista. Doubtless some of these will "die a' borning."

The Colonel Sellers mine at Leadville, purchased some years ago by the New Jersey Zinc Company, is now about to be worked again, and a new shaft is being sunk west of the Iron Silver Company's boundary. The Colonel Sellers was one of the largest and earliest producers of the Leadville sulphides in the days when zinc was highly penalized, and to eliminate the zinc from the lead ore a big concentration mill was erected and worked for many years. The A. Y. & Minnie adjoins to the west, and situated on the same oreshoot from which an immense tonnage was shipped to the smelters, and the largest dump of zinc-sulphide tailings in the district accumulated. This property was the first mining venture of Meyer Guggenheim, and the difficulties at this mine brought him to the West and gave the first insight into the charges then being exacted for smelting Leadville ores, which in a short time induced the old gentleman to take up the business. So the A. Y. & Minnie may be said to have laid the foundation of the Guggenheim fortunes.

Salt Lake City

Feb. 25—The preliminary report of the Utah Conservation Commission for 1909 has been issued. The report deals with the agricultural resources of Utah, irrigation and water power, the mineral resources of the State, manufactured food products, fish and game, forest and forest reserves. It contains interesting general information about the resources of the State. Copies can be obtained by addressing Col. B. B. Mann, chief of the Conservation Commission, Salt Lake City.

A suit was brought in the United States circuit court, Feb. 21, by the Utah Metal Mining Company against the New England Gold and Copper Company for \$300,000 in the first cause for action, and \$1,350,000 in the second cause, alleged to be the value of the ore illegally extracted from property belonging to the Utah Metal Company by the defendant.

The National Copper Bank, of Salt Lake City, has been granted a charter by the controller of currency. This bank was organized chiefly by Utah mining men. Over 50 per cent. of the capital stock of the bank is held by directors and officials. W. W. Armstrong is president and Eugene Giles, cashier.

The regular monthly meeting of the Utah Society of Engineers was held in the Newhouse building on the evening of Feb. 18. H. M. Sheley, of the State engineer's office, Richard P. Lyman, of the University of Utah, and A. F. Doremus, formerly State engineer, took part in a discussion of the water supply of Utah, its management, conservation and use.

Arrangements have been completed for the taking over of the Eureka City Mining Company by the Chief Consolidated, practically all the Eureka City stockholders concurring in the consolidation. The last outstanding stock of the Little Chief Mining Company has been secured by the Chief Consolidated. The company has also added to its territory by the recent purchase of the American Star, Blackbird and Triangle claims. Development work has been actively carried on during the last few weeks and the main shaft has reached the 1700-ft. level. Two cars of ore were shipped to the United States smeltery at Midvale, in the week ended Feb. 18.

In the case of the Silver King Consolidated vs. the Silver King Coalition, Thomas Kearns, vice-president and general manager of the Coalition company, was on the stand for the defendant. He acknowledged that prior to the beginning of the suit, he had never rendered an accounting for Solon Spiro, president and general manager of the Silver King Consolidated, for the ore removed from joint territory, nor had he told him that he was in his ground. When asked if he had ever intended to render an account to Mr. Spiro, Mr. Kearns refused to

answer, saying that he was unwilling to swear to what he intended to do, but that he did not do it. One reason he rendered no accounting, he said, was because the ore taken out had not paid for the expense of development. On cross examination he testified that at least it had no more than paid for this cost.

Goldfield

Feb. 24—Another alleged attempt to high-grade at the Consolidated mill has been unearthed according to Clarence Sage, chief detective for the company. A constable of Goldfield, a saloon man, an assayer and an amalgamator at the mill are implicated in a conspiracy to rob the amalgam plates. The detective claims to have plenty of evidence to convict the men, and coming as it does, so soon after similar attempts, which are still pending in the courts, the case is attracting considerable attention.

That a smeltery of sufficient capacity to handle the production of all the mines in the Yerington district will be constructed by the Mason Valley Mines Company, there seems to be no doubt, according to the announcement of George E. Gunn. The site will be within 1½ miles of the Southern Pacific Railroad near Wabuska. The company owns an ample tract of land and has plenty of water developed by boring wells in the immediate vicinity. The Nevada Copper Belt railroad connects the smeltery site with the mines at Yerington. The financing of the project is said to have been consummated and plans in the process of preparation, so that actual construction should soon be started.

Indianapolis

Feb. 28—Arrangements have been made to separate the management of the coal properties in Indiana of the Rock Island-Frisco system, which will result in each branch of the system handling the output from its own mines. The output of the Consolidated Indiana Coal Company, operating block-coal mines in Clay county, which is owned directly by the Rock Island, has been taken over by that branch of the system. The Consolidated company has been reorganized with H. U. Mudge, president of the Rock Island, as president.

It is said that the development of from three to six new mines will result from the separation of the interests. The Rock Island is now in control of about 11,000 acres of coal land in Indiana.

Whether a railroad company has a right to confiscate coal turned over to it for transportation in order to avoid a tieup in the event of a strike among the coal miners, is a question to be submitted to the Railroad Commission for settlement. Reports come to the commission in the form of a complaint from manufacturers, that railroads are confiscating coal con-

signed to them and paying no attention to protests made by the consignees. The complainants assert that the railroad companies are not seizing the coal for immediate purposes, but that on account of a probable strike and resultant shortage, the roads are preparing against such contingency by storing large quantities of coal. The Indiana Railroad Commissioners say there is no doubt of a railroad company's right to seize coal en route and to confiscate it for immediate purposes, as an indispensable public necessity. However, the commission doubts the right of the companies to seize coal for storage purposes.

Cobalt

Feb. 26—There is again talk of a merger between Nipissing, La Rose, Kerr Lake and Crown Reserve. In an interview, Mr. McGibbon, president of La Rose, admitted that he had talked the matter over with men closely identified with the different companies, who seemed to be in favor of such a scheme. Nothing definite, however, has been done as yet. The possibilities of arriving at an equitable basis for settlement are somewhat dubious.

Crown Reserve is capitalized at \$2,000,000 and has an area of 23 acres. The greater portion of this has been explored, and in the near future the company will have to go to greater depth to open up more ore. Kerr Lake is capitalized at \$3,000,000 and has an area of 52 acres. Like Crown Reserve the greater part of this territory has been explored, but the mine has a greater depth than any other in the camp, and is now working at 450 ft. The ore is good at that depth, but the vein is getting smaller and the silver content less. The area of La Rose is 345 acres and the capital is \$7,500,000, and although the main La Rose mine is holding up well, the outside properties have been rather disappointing. Nipissing has the largest area in the camp, 846 acres, and is capitalized at \$6,000,000. A large proportion of its holdings is as yet practically virgin ground and in many parts the surface has not even been scratched. The other mines mentioned are exceedingly rich, but Nipissing, on the score of its large acreage, the splendid physical condition of the different workings, and the large area as yet unexplored, has the greatest future.

Toronto

Feb. 26—Hon. W. S. Fielding, Canadian Minister of Finance, has announced in the House of Commons, Ottawa, that the government had no present intention of renewing the iron and steel bounties which expire this year. The iron and steel manufacturers will shortly make strong representations to the government to induce it to change its decision. They are hardly likely to prevail, however, in

view of the growing antagonism to the bounty system and high protection, especially among the western farmers.

The visit to Canada of Sir Edgar Speyer, of the banking house of Speyer & Co., London, who before his return will make an inspection of the Dominion Iron and Steel and Dominion Coal companies' properties at Sydney, is understood to be in connection with the merger of these two companies. Speyer & Co. are heavily interested, having taken \$6,000,000 in bonds of the steel company. It is stated that the coal company is badly in need of funds to satisfy its liabilities to the steel company, and that the flotation of a loan is probable.

The Ontario government is offering for sale by tender 571 lots in the townsite of Porcupine covering 80 acres. Tenders will be received until March 16.

Mexico

Feb. 20—In January, the Ferrocarril de Teziutlan á Nautla, S. A., was formed as a stock company with a capital of 5,000,000 pesos, to construct a railroad from Teziutlan through a rich farming country to the gulf at Nautla. This will shorten the haul of the smeltery at the former place by half. The route has been surveyed and plans accepted by the federal government, and some right of way secured. Already 1,000,000 pesos have been subscribed, and the balance will be bonded. An option for the purchase of the concession and all rights pertaining thereto has been granted to an English syndicate. The engineers of this company are expected to land here about Feb. 20, to report on the project. If the option is not taken off, construction work will be begun in 60 to 90 days. Shops will be built at Tlapacoyan when track laying shall have reached that point. To build the harbor at Nautla, a separate company will be formed and bonds floated—the same method of procedure as was employed in building the Tampico harbor.

The Mexicano del Sur railroad, controlled by the National line, is extending its line from Oaxaca to Taviche. The grade is completed and track is laid to Ocotlan. Work is progressing without difficulty other than a controversy with the Oaxaca á Ejutla railroad about a crossing, which will soon be settled. The road expects to be in operation by May and will greatly help the mines in the Oaxaca section. Rails are 50 lb. in the valley and 60 lb. in the mountainous districts.

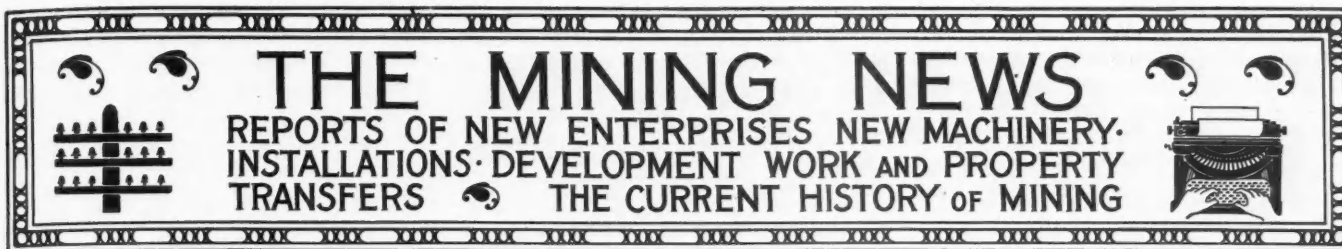
Report says that the American Smelters Securities Company has purchased the mines, smeltery and water system of the National Metallurgical Company of the Matehuala district in the state of San Luis Potosi. The price has not been made public. The National Metallurgical Company, incorporated in 1901, with a

capital of \$1,000,000, owns a number of copper and lead-silver mines, and has others under lease. The ore reserves of the various properties are large. The smeltery consists of three furnaces with an aggregate capacity of 550 tons daily. The company's water system, which supplies the town of Matehuala as well as the smeltery, draws its supply from the only available mountain stream in that section. It cost more than 350,000 pesos and is of the greatest importance, as in former years the scarcity of water often forced the inhabitants to desert the Matehuala camp.

London

Feb. 23—The Vancouver, B. C., mine of the Van Roi Mining Company, has been connected with the Mountain Boomer mine by a drive, 1300 ft. in length, which will facilitate the handling of ore at the proposed new mill at Granite creek. In the course of driving this level two new oreshoots were explored and a third has recently been entered. At the end of the year 100 tons per day were being put through the mill and preparations are being made to increase this capacity to 4000 tons per month. Since the company was incorporated in July, 1908, up to Sept. 30, 1909, operations have been conducted at a loss of £4000. The directors complain of the import duty into the United States of 1c. per lb. on zinc and 1½c. on lead, and are endeavoring to get the Canadian provincial government to assist in the establishment of a government smeltery for zinc ores in Canada. At present the zinc concentrates are shipped to Denver.

The Le Roi No. 2, Rossland, B. C., report records a year of prosperity, the profit for the year ended September having amounted in round figures to £50,000. The gross value of the ore shipped was \$703,317, or \$23.54 per ton, of which about \$19 was in gold and \$4 in copper. The consulting engineers say that the estimation of ore reserves in this mine is a difficult matter and that they are loth to give figures, but they think that the mine has enough ore down to the 900-ft. level to keep the present rate of production going for a year and a half. Below the 900-ft. level ore has been found by two diamond-drill holes and there is every reason to expect a considerable tonnage in depth. Mining costs were \$3.36 per ton, and smeltery charges \$5.70 per ton. The total cost of mining, smelting, development and depreciation was \$10.55 per ton, as against \$10.85 in 1908. The businesslike way in which both the technical and the financial positions are set out calls for special commendation. The affairs of the company are put before the shareholders in a clear and concise manner which many mining companies might imitate with advantage.



THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY.
INSTALLATIONS·DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

The Alaska-Treadwell reports 31,864 tons crushed during the month ended Jan. 15, yielding \$3.27 per ton; Alaska United Gold Mining Company, 32,896 tons yielding about \$1.95 per ton; Alaska-Mexican, 18,312 tons yielding \$4.58 per ton.

Seward—Residents of Seward favor the proposed plan to lease coal lands and pay a royalty of 50c. per ton on the tonnage mined. The coal question is important to this particular region because of its proximity to the Matanuska coalfields.

Juneau—The Pearl Harbor Mining Company is considering the erection of a stamp mill.

Arizona

COCHISE COUNTY

Santa Rosalia—This company has decided to discontinue shipments to the smeltery, but will concentrate the ore at the mines as soon as the reduction plant can be placed in operation. The shaft will be sunk to the 600-ft. level.

GILA COUNTY

Inspiration—The Inspiration orebody is being blocked out from the 400-ft. level of the Joe Bush shaft, where, by means of drifts, the ground is being broken at the rate of 600 ft. each month. One raise is being advanced from the northern part of this level. The crosscut south on the 275-ft. level of the Scorpion shaft is now 280 ft. long and for 150 ft. is in ore averaging nearly 3 per cent. copper. The 180-h.p. air compressor for use in driving the extraction adits from Keystone Gulch is in place and the air pipes are being connected with the Joe Bush shaft, 2500 ft. northward. Meanwhile, the first extraction adit has been advanced 100 ft. by hand drilling. One hundred and sixty men are employed.

Arizona-Commercial—Since operations were resumed at the smeltery, 200 tons daily have been supplied from the fifth and sixth levels, as usual. In addition the Superior & Boston also ships about 50 tons of 9 per cent. ore to this smeltery daily. Crosscutting is in progress on the seventh level of the Arizona-Commercial mine, to open the Black Hawk vein. Considerable water at this level is interfering somewhat with the work. About 350 men are employed.

Live Oak—All development work, with the exception of one raise, is being

done in drifts west from drift 306, which is a continuation of the sulphide adit. The raise which has been driven from the junctions of drifts Nos. 306 and 310, is 100 ft. high. All of the work is in ore averaging about 2.6 per cent. copper. A force of 40 men is employed.

Superior & Boston—This company has decided to adopt a combination of the caving and slicing systems in its mine. Extraction by the new system will first be carried on between the 600- and 400-ft. levels of the Great Eastern.

Warrior—The company is shipping about 75 tons of 10 per cent. copper ore to the El Paso smeltery daily. This ore is being stoped from the 250- and 300-ft. intermediate levels. The development work on the 300-ft. level westward is opening up ore of the same grade as that being shipped. A raise from this level is being put up about 500 ft. west of the shaft, and this is in ore also. One churn drill is prospecting the ground west of the mine workings and is in a schist carrying considerable pyrite at a depth of 639 ft. M. F. McCarthy is manager.

GRAHAM COUNTY

Arizona-Morenci Copper Company—This new incorporation will develop the properties hitherto owned by the Coppermines Company, of Arizona. The capitalization is 2,000,000 shares of a par value of \$5. The properties are practically undeveloped and adjoin the mines of the Shannon, Detroit and Arizona Copper companies. Two churn drills are in operation. Henry G. Catlin, of New York, is consulting engineer.

YAVAPAI COUNTY

Cababi—This company is pushing to completion its 100-ton concentrator and expects to build a smeltery.

Gould—A 100-ton smeltery is being erected at this mine 14 miles from Tucson.

Venezia—A 10-stamp mill will be erected immediately.

California

AMADOR COUNTY

Bunker Hill—This mine, E. H. Harrington, superintendent, yielded \$24,000 gross in January. The orebody on the 1750 level is 9 ft. wide.

South Eureka—The orebody in this Sutter Creek mine has been penetrated

from the 2000- to the 2700-ft. level, showing good ore the entire distance.

BUTTE COUNTY

Carlisle—At this mine, Forbestown, L. Garibaldi superintendent, the 10-stamp mill has been started.

CALAVERAS COUNTY

Boston—For this mine, San Andreas, a 100-stamp mill and new hoisting machinery are being planned. Electricity will be used for motive power.

Calaveras—This copper company now has its main shaft down 780 ft., and the Keystone shaft is being cleared out.

ELDORADO COUNTY

Landecker—This old gravel property near Placerville is being worked by the drifting system by a company of which Harold T. Power, of East Auburn, and John A. Britton, of San Francisco, are directors.

Mount Pleasant—This old mine which until last April had been abandoned for some years, is furnishing ore for 10 stamps and 10 more stamps will be added as soon as the state of the roads permits hauling. A. V. Judson is superintendent.

MARIPOSA COUNTY

Grant Mines—Six sets of leasers are working in the Pine Hill and Josephine mines on the Mariposa Grant.

MONO COUNTY

Parrett—This mine at Lundy, recently purchased by the Broken Hills Mining Company, is showing up several veins of high-grade ore.

Benton—This company, operating in Blind Springs district at Benton, is expending \$100,000 on proper equipment, and considerable machinery is being shipped in. C. E. Julihn is in charge.

NEVADA COUNTY

Metropolitan and Black Bear—For these mines near Moore's flat, controlled by A. L. Shinn of Sacramento and C. L. Wilson of Lincoln, a 25-stamp mill has been ordered. Moore's flat is the southern extension of the Alleghany district of Sierra county.

PLACER COUNTY

Hibbe—This copper mine near Sheridan is about to be reopened by an Oakland company recently formed.

Kenyon—On his ranch near Auburn, W. D. Kenyon has struck a 4-ft. vein of excellent ore.

PLUMAS COUNTY

Johnsville—South of this place, the Jamison mine, George S. Redstreak, superintendent, is working 50 men and keeping the 20-stamp mill steadily running. The Plumas-Eureka has 70 men at work and 20 stamps are dropping, while 20 more will soon be added. Fifty men are at work on the Four Hills mine.

SIERRA COUNTY

Rainbow—From this mine at Alleghany, L. P. Woodbury, manager, high-grade ore is being taken.

SISKIYOU COUNTY

Hawkins—This old claim on Greenhorn creek has been fitted up by Simas & Rose and giants are in operation.

Oom Paul—The new mill of this mine at Oro Fino has been completed and two shifts of men are taking out quartz.

Dredge—The gold dredge at Callahan is running steadily. The company will put on another dredge this summer.

TEHAMA COUNTY

Tom Head—The oreshoot in this copper mine, opened last year, has been cut 150 ft. deeper in tunnel No. 3. Machine drills are in use.

TUOLUMNE COUNTY

Black Oak—The mill at this mine, Soulsbyville, has been started up, and 30 men are taking ore from the mine.

Colorado

LAKE COUNTY—LEADVILLE

Humboldt—This mine in Adelaide park, under lease to Huckley & Co., is shipping about 200 tons per month of lead ore.

Printer Boy—A new plant of machinery has been erected by Andrew Hill, manager, and a good grade of ore is being hoisted.

Corona—Lessees on this mine are producing about 25 tons per day.

Gold Basin—It is stated that a small streak of ore has been found that carries as high as 9 oz. gold and 47 oz. silver. J. B. McDonald is manager.

ROUT COUNTY

Royal Flush—This mine is opened by two crosscut tunnels, 350 ft. apart, and several promising veins have been cut. The ore carries gold and silver. Machinery has been installed and both tunnels are being driven.

Farwell Mountain Copper Company—This company is working 15 men, developing its smelting ores by shafts and tunnels, and expects to make a trial shipment soon.

SAN JUAN COUNTY

Mineral Farm—It was Gustav A. Nielsgold who discovered this mine instead of Gus Begole as stated in the JOURNAL of Jan. 15.

TELLER COUNTY—CRIPPLE CREEK

The shipments from Bull and Beacon hills and Battle mountain during the last week have been heavy, and some of it of exceptionally high grade. The larger proportion of the tonnage went to the Standard plant at Colorado City.

Stratton Estate—The Deerhorn mine of the above estate is shipping from four to six cars per week of milling ore of good grade.

Mary Cashen—This mine, in the city of Victor, and the Surplus Fraction mine adjoining, will be now worked by the Mary Cashen Mining and Milling Company, lately incorporated, capitalized at \$50,000.

Findley—At the annual meeting of this company, the report of the general manager, A. E. Carlton, shows that 6818 tons of ore were shipped, of an average value of \$22 per ton. The company is free of debt, with a good cash reserve.

Idaho

COEUR D'ALENE DISTRICT

North Bunker Hill—This company has received a deed issued by the council of Wardner, for ground in the city limits, over which there has been controversy for several years. This action gives the company possession of all surface rights. Workmen are now extending a tunnel from the Wardner side of the gulch through Haystack peak to the company's ledge, to be cut at a depth of 1000 ft.

Jack Waite Claims—At a depth of 150 ft. a ledge 30 ft. wide has been opened showing solid ore, 9 ft. of which is said to be clean shipping, and the other 21 ft. of milling grade.

Hamilton-Coeur d'Alene—This group in the Carter district is preparing to ship some of the carbonate ore found in the upper tunnel. A trial shipment of 20 tons netted \$26.60 per ton.

Idaho Copper—The vein in which ore was recently found on the Reindeer strikes into Idaho Copper, and work on this property will be started at once.

Terrible Edith—The silver-lead ore recently uncovered is said to be among the richest ever taken from a mine in the district.

Reindeer—The crosscut of the ledge has gone through 10 ft. of shipping copper ore.

Bunker Hill & Sullivan—The amount of the dividend has been increased to \$60,000 for February.

Alameda—Sixty inches of high-grade galena and zinc ore is exposed in the crosscut of the ledge.

Silver King—A large body of high-grade lead-silver ore has been encountered.

Gold Hunter—The mill will be closed the latter part of February, to remain

shut for 60 days while the 1000-ft. winze from the No. 6 level is started. Shipments will be curtailed for two months.

Black Horse—Shipping ore and high-grade milling ore has been struck on the 1200-ft. level, the greatest depth in the mine.

CUSTER COUNTY

Sunbeam Consolidated—This gold mine, near Custer, C. E. Gable, manager, is working a large free-gold deposit, and is now installing the first 500-h.p. unit of a 2000-h.p. hydroelectric power plant.

WASHINGTON COUNTY

Arkansaw—Development work is being carried on with a force of 25 men, under the direction of Fred D. Smith, manager for the Seven Devils Copper Company. Work consists in blocking out the ore of the Decorah tunnel level and driving a drainage tunnel which will tap the ore-bodies at a depth of 350 feet.

Blue Jacket—Miller & Kleinschmidt have a 10-year lease and are driving a tunnel on the Queen claim, which will tap the ore-bodies at a depth of 200 ft. below the old workings.

Indiana

CLAY COUNTY

Michael White, superintendent of the five mines of the Vivian Collins Company, has been fined for violating the State mining laws for the protection of miners. The State mine inspector found that the men in those mines asked for props to prevent falls of slate and that Superintendent White refused to supply them.

In addition to mine No. 1, the Crafford mine No. 9, of the Brazil Block Coal Company, has been worked out, and the adjacent unworked fields will now be developed.

The Otter Creek Coal Company has discovered coal at a depth of 30 ft. north of Brazil. The vein is 4 ft. 10 in. thick and will be opened at once. Another good field is being opened by the German Coal Company on the Nance farm east of Brazil. This is a territory that is undeveloped.

GIBSON COUNTY

A fine 7-ft. vein of coal has been struck at a depth of 70 ft. by the Princeton Mining Company. The same quality of coal is being mined at a depth of 440 ft. It is said two or three additional mines will be added to this field. The vein recently found has a solid slate roof.

Kansas

United Zinc Company—This company is about to begin work on the Rogers forty at Galena where it has a deposit of shallow ore. The company has drilled the ground and determined the extent of

the ore, and will now install a steam shovel and work the ground by the open-pit method. This company will also drain a large part of the O'Neill land west of this tract and throw the land open to small leasers. The land has been worked in the upper levels and proved rich.

Elenita—This mine in the eastern part of the Empire camp has made its initial run and produced 70 tons of ore.

Michigan

COPPER

Oneco—No. 6 drill hole is well established in the ledge at a depth of about 150 ft. This hole is going down to cut the new amygdaloid formation at a depth of about 500 ft. No. 7 hole, in line with No. 6 at a point about 2000 ft. southwest, is still in the overburden.

Indiana—No. 5 drill hole, sinking about 800 ft. southwest of the No. 2 hole from which the rich core was taken, is down about 150 ft. and should soon be established in the ledge, when greater progress can be made. This hole is going down to determine the pitch of the formation, and from the data secured a shaft site will be decided upon and ground broken early in the spring for a shaft.

Franklin—The diamond drill operating to expose the Hancock lodes has encountered the conglomerate at a depth of about 500 ft. and it is expected that it will cut the No. 3 amygdaloid in the near future.

Superior—Under the management of the Calumet & Hecla this property is being opened in a systematic manner; the extensions of drifts from No. 1 shaft continue in good ground and No. 2 shaft is getting into a much improved grade of rock. Rock shipments averaging about 600 tons daily are being made to the Atlantic mill.

Hancock—No. 2 vertical shaft should encounter the No. 2 lode soon and results in a mineral way are being awaited with much interest.

Laurium—The third level has been reached in the shaft with a fine grade of rock in evidence throughout. The surface equipment has been completed and is of such capacity that it will take care of property through the opening stages.

Osceola—Nos. 5 and 6 shafts at the main mine have been closed down owing to the physical conditions of the shafts being such that they require extensive repairs to maintain the rock tonnage. Various improvements will be put into effect at the rock houses tending to lessen the cost of crushing and to handle a much increased tonnage. In all probability increased production will be made at other branches of this property, especially at No. 4 Kearsarge shaft, so that the total production may not be materially decreased.

Missouri

JOPLIN DISTRICT

"The Mining Club" has been formed in Joplin and the members pledged themselves to raise \$12,000 annually for the club. One of the missions of the club will be to investigate evasions of the new ore tariff law and to secure all kinds of statistical information which bears on the subject of zinc and lead-ore production and mining in general.

H. Gundling has let the contract for the erection of a 500-ton mill on his land at Stotts City. The cost will be about \$45,000.

Don McRuer—The company is working the large pile of tailings on the Alladin lease.

Herald—This mine at Cave Springs, west of Joplin, has shut down on account of low ore prices.

Hecma Land and Mining Company—This company has incorporated with a capital of \$200,000 to operate the Cameron mine which was recently purchased for \$45,000.

Muskingum—This company has been organized to operate a 26½-acre lease on the Taylor & Glover land west of Joplin. The lease is at 12½ per cent. royalty, and the company has 15 drill holes and a shaft in the sheet ground. All show a face of about 20 ft. of rich sheet ore. The company is planning the erection of a 300-ton, electrically driven mill similar to the Samson mill. J. C. Squires of Joplin is manager.

Montana

CASCADE COUNTY

United States Gypsum Company—Negotiations are now under way whereby the company will acquire the gypsum claims of Gust Siegling on Belt creek.

Johannesburg—The two-compartment shaft has been sunk 300 ft. and will be continued to 500 ft. Andrew Nelson is in charge, Neihart, Montana.

LEWIS AND CLARK COUNTY

Bessie—Arrangements are being made for a resumption of operations at this mine in the Greenhorn district. A 25-h.p. boiler, engine and pump have been leased from the Red Bird property.

Missouri River Power Company—Nine hundred men are now employed at Hauser lake rebuilding the old Hauser lake dam which was destroyed by floods. About 600 men are at work at Holter building the third dam at that place.

Nevada

CHURCHILL COUNTY

The power line from Fallon to Wonder is practically assured, bids having been made for the water power from the irrigation system at Fallon.

ESMERALDA COUNTY

Montgomery-Shoshone—The report for 1909 shows the proceeds of bullion and concentrates to have been \$446,224. The profit for the year was \$86,703.

ESMERALDA COUNTY—GOLDFIELD

Goldfield-Annex—Compressor and drills will be installed and laterals driven from the 800-ft. level where the ore was discovered recently. The shaft will also be sunk to the 1000-ft. point.

Booth—Three shifts have been put to work, and a crosscut will be run to open the Red Top vein at the 260-ft. level.

Atlanta—A discovery of a quartz vein is reported from the Precious Metals lease at the 730-ft. level.

Black Butte—Work on company account has been started, sufficient funds having been raised by the recent assessment of one cent per share.

Yellow Tiger—A fund has been placed in the treasury and work started on company account to prospect the company's territory.

LYON COUNTY

Mason Valley—A stockholders' meeting will be held, March 14, to vote upon increasing the capitalization of the company to 500,000 shares at \$5 par, and also upon a \$1,000,000 bond issue. It has been decided to erect a smeltery at once, its capacity to be 500 to 800 tons per day. The bond issue is for this construction.

NYE COUNTY

Johnnie—The result of a six days' partial clean up was an 85-oz. gold brick. The new Lane slow-speed mill was started on Feb. 13, and the mill capacity is now about 100 tons daily. The 700-ft. shaft is to be sunk to the 1000 level.

NYE COUNTY—TONOPAH

Shipments for the week ended Feb. 19 were as follows: Tonopah, 3150 tons; Belmont, 650; Montana-Tonopah, 964; MacNamara, 325; West End, 120; Tonopah Extension, 840; Midway, 80; total, 6129 tons. The estimated value was \$153,225.

Tonopah Mining—In the week ended Feb. 14, 3225 tons averaging \$21 were crushed. Bullion valued at \$47,850, and 30 tons of concentrates worth \$12,750, were produced. The extraction was reported as 91 per cent.

Montana Tonopah—Extensive development work on each of the seven levels continues to reveal good ore and keeps the reserves well up to the weekly output of 1000 tons. The mill report shows an extraction of 91.6 per cent.

Tonopah-Belmont—The big orebody recently opened on the 1100-ft. level has now been followed for weeks without showing any signs of diminishing either in width or value. Much of the ore is being shipped. It is almost certain that

operations at the 60-stamp cyanide plant will soon be resumed.

WHITE PINE COUNTY—ELY

Nevada Consolidated—The output is now normal at 6000 tons per day. The report of the company for the quarter ended Dec. 31 shows net earnings of \$736,634 and a deficit after charges and dividends of \$33,601. This deficit is accounted for by the fact that severe weather lowered the tonnage treated and increased the working costs.

Ohio

The Youghiogheny & Ohio Coal Company, of which F. M. Osborne, of Cleveland, is president, has added to its holdings by the purchase of all the interests of the Highlands Coal Company in Belmont county. There are two mines in operation upon the property, which has an area of 5500 acres. About 400 men are employed.

Oklahoma

Dudley H. Norris has bought the fee of 60 acres of the Crawfish allotment in the Quapaw camp for \$8500. The Oklah mine is on the south forty of the tract.

Omaha-Petersburg—This company has shut down its mill, the old M. K. & T., and will build a modern plant of 500 tons capacity.

Edna Ray—The mine at Miami has changed hands and will now be operated by the New Hope company.

Utah

JUAB COUNTY

Utah Mine—The 265-ft. level is being extended into property which was bought during the last year. This level will pass under old workings from which shipments were formerly made. Shipping ore has been opened on all the levels. It is expected that the property will soon be on a dividend basis again. The last dividend was paid in February, 1909.

Sioux Consolidated—The annual report shows receipts during the last year were \$686,482; cash on hand Jan. 1, 1909, \$63,457; disbursements, \$741,834; balance, Jan. 1, 1910, \$8105. The company has been doing active development work on the 450-ft. level west of the present orebodies.

Bullock—Preparations are being made to sink the shaft from the 210- to the 310-ft. level.

Tintic Combination—Work has been started on this East Tintic property which has been idle for some time. A drift is being run from the shaft on the 220-ft. level to cut the Aspinwall vein. B. H. Bullock is manager.

East Tintic Development Company—Preparations are being made for stoping

between the 230- and the 330-ft. levels. A winze has been sunk on ore 65 ft. below the 230-ft. level, and will be continued to the 330. Ore has been followed 110 ft. on the upper level and is said to have averaged about 6 ft. in width. A carload of ore was mined in doing development work.

Provo—This property, which is under lease to D. Roberts and associates, made its initial shipment of ore this week (Feb. 19). The ore came from a winze sunk from the 300-ft. level. Another carload of ore from development work is expected to be ready in about ten days.

North Colorado—A double-compartment shaft is being sunk and is now down over 50 feet.

Tintic Humboldt—This property, situated in North Tintic, has sunk its shaft 80 ft. with a windlass. A whim is being installed and sinking will be continued. It is expected to drift when the 100-ft. level is reached. W. F. Giles is manager.

Tintic Central—A contract for sinking the shaft to the 600-ft. level has been given. The shaft is now about 555 ft. deep.

Iron Blossom—A station has been cut at the 500-ft. level of the No. 3 or North shaft and drifting started for the orebody opened on the 400 level. About 75 tons of ore are being mined daily. The south shaft is down 134 ft., and will be sunk to the 1500 level. Frank Birch is superintendent.

SUMMIT COUNTY

Scott Hill Mining Company—At a meeting of the directors, it was decided to levy a quarter of a cent assessment for the purpose of continuing development.

TOOELE COUNTY

Buffalo Consolidated—The recent strike is reported to have widened to 5 ft. of shipping ore.

Silver Island Coalition—The last shipment sent out by this company near Wendover amounted to between 33 and 34 tons. Payment was made by the smeltery at the rate of \$119.48 per ton. The ore carries lead and silver with some copper and a small amount of gold. M. E. King is manager.

Washington

FERRY COUNTY

Valley Dew—A contract has been let for 500 ft. of development work on this property two miles east of Orient.

KITTITAS COUNTY

A consolidation has been made of the Busy Bee and the Golden Gate Mining companies at Cle Elum. Both companies own valuable coal and mineral claims. As soon as sufficient work has been done to insure a daily average of 50 tons of ore a reduction plant will be installed. J.

D. Medill is president of the new company.

SKAGIT COUNTY

North Coast Copper—This company will install a large amount of machinery in the near future. Edward Fredlund of Mt. Vernon is representative of the company.

STEVENS COUNTY

Liberty Copper—Preparations are being made to erect a concentrator next spring. T. H. Wilson, Chewelah, is president.

Trojan—This property on the west slope of First Thought mountain will be extensively worked in the spring.

Wisconsin

ZINC-LEAD DISTRICT

Platteville—A big strike of zinc ore was made on the John Seitz land, east of the Klar-Piquette, by a prospecting company newly organized; 15 ft. of sheet ground was penetrated in two holes by churn drill.

St. Rose—In driving a raise an 8-ft. body of heavy disseminated blende was exposed just above the cap, giving the mine a total working face 16 ft. high; the raw concentrates assay 57 to 59 per cent. metallic zinc.

Wisconsin Zinc Company—A 90-day option has been taken on the Winskill mine, at Benton, purchase price \$100,000; separate option was also obtained to the fee of the land, comprising 480 acres; the property lies 4½ miles southwest of Shullsburg.

United—Edward T. Goldthorpe has taken a two-year lease on this property, at Montfort, with option to buy at \$22,500.

Robart-Kickapoo—Hinkel Brothers, at Linden, have completed a new 50-ton mill and reopened the mine.

Wallace—This company will build a concentrator upon its property at Highland.

Canada

BRITISH COLUMBIA

The old smeltery at Van Anda, Texada island, which has been closed down for many years, is being reconstructed by an American syndicate. The treatment of custom ores by a new oil-burning process is planned.

Granby—These mines at Phoenix shipped 112,458 tons of ore to the Granby smeltery during the month of January, the largest output of the mines in any single month. This tonnage forced the ore receipts at the Granby smeltery up to the highwater mark of 115,084 tons.

ONTARIO

Frontenac—This lead mine in Frontenac county has been secured by the

Canadian Smelting Company, capitalized at \$500,000, in which American capital is largely interested. It will start mining operations and install a smeltery.

ONTARIO-COBALT

The shipments from Cobalt for the week end Feb. 18 were as follows: Nipissing, 264,311 lb.; La Rose, 333,343; Crown Reserve, 189,721; Kerr Lake, 291,640; Buffalo, 62,440; McKinley-Darragh, 64,400; Coniagas, 63,415; Trethewey, 62,000; Right-of-Way, 62,830; King Edward, 43,177; Cobalt Central, 2000; Total, 1,439,277 pounds.

Waldman—An oreshoot was struck on the bottom level. A diamond drill is working on the bottom of the shaft to explore the surrounding country.

Chambers-Ferland—A new high-grade vein has been cut.

Trethewey—At the annual meeting held Feb. 23 a financial statement was presented showing receipts for 1909 amounting to \$350,257, and disbursements \$150,449, leaving a net revenue of \$199,807.

Hargrave—No. 1 vein, which was cut 40 ft. from the Kerr Lake boundary at the 375-ft. level, has been followed up to the line and found to carry rich ore all the way. It is now being cut at the 175-ft. level to open up a stoping area. A shaft is being put down on No. 3 vein and has reached a depth of 95 ft. At 125 ft. a crosscut will be run to strike No. 2 and No. 4 vein.

Nipissing—The shaft on the Meyer vein is down about 200 ft., and the lower level will be driven at 185 ft., where the vein shows 6 to 8 in. of high-grade ore. On vein No. 64, a depth of 300 ft. has been attained and high-grade ore found on this level. The two lower levels are being connected with upraises preparatory to stoping.

ONTARIO-GOWGANDA

Welch—These claims adjoin the Bartlett and Reeves-Dobie. Camp buildings have been completed and a tunnel will be run into the side of the mountain, to tap continuations of the Reeves-Dobie veins.

La Brick—On this location between the Mann mine and Gowganda lake two 60-h.p. boilers and a 6-drill compression are being installed.

Transcontinental—A 50-h.p. boiler and five steam drills have been installed.

QUEBEC

The Robertson Asbestos Company is enlarging its asbestos refining plant, four more cyclone units being added to the two units already installed. The Berlin Asbestos Company is installing heavy crushing machinery in its new four-cyclone mill, 3 miles from Robertson. Operations are expected to begin in June. The Amalgamated Asbestos Corporation contemplates many improvements with a view to concentration of the plants at

Black Lake and Thetford; work on these will begin as soon as the snow is off the ground. The Chrysotile Asbestos Company, a new corporation, has taken over the Belmina mines and those of the Asbestos Mining and Manufacturing Company near Coleraine.

Mexico

CHIHUAHUA

Escondido Mining Company—This company has made the initial payment on the Escondido mine in the Santa Eulalia camp.

Arizona-Parral Mining Company—This company succeeds the American Zinc Extraction Company as operator of El Tajo mine in the Parral camp. The management remains with A. E. Swain.

La Republica—Production in three months ended Dec. 31 was 198,409 pesos from 3067 tons of ore. New electric pumps are being installed.

DURANGO

San Juan—The Compañía Minera San Juan is to increase its production to 200 tons daily. Aerial trams and improved hoisting plants are being installed.

GUANAJUATO

Aldana—This group has been fully paid for and turned over to the Proprietary Mines Company of America.

JALISCO

Amparo—The 1909 production was 1,445,000 pesos and a dividend of 10 per cent. was paid on a capitalization of over \$2,500,000. The company recently won a lawsuit involving title to over 500,000 shares of its stock, and this stock has been retired, reducing the capital to \$2,000,000. Twelve per cent. will be paid on this capital this year. The mill capacity will be increased over 1000 tons per month by installation of 2 tube mills, 2 Dorr classifiers, 1 Dorr thickener, 3 Wilfleys and 3 Pachuca tanks. The mill is now handling 5500 tons monthly. The present ore reserves are estimated at 365,000 tons, and dump ore at 45,000 tons.

Autlan Mines—The copper-gold mines formerly held and worked by the Cacoma Mining and Smelting Company, of St. Louis, are under option to Swain & Baldwin, of Mexico City, for 47,000 pesos.

Lupita—Ore, rich in silver, has been encountered in this mine in the Mascota district. The Lupita mill, idle for the last 3 years, will be placed in commission immediately. A cyanide plant has been added.

Tula Iron Mines—A fourth payment of 100,000 pesos on the purchase price of the Tula iron mines and foundry, timber and lands in the Tapalpa district has been made by the Mexico Iron and Steel Company, of Boston. The price is 1,000,000 pesos. As a result of the pay-

ment just made the Boston company is now in control of the properties, and will proceed with their exploitation. French capitalists will join with the Boston interests. Smelting furnaces, a steel plant and a tool and implement factory will be erected.

MEXICO

Mexico Mines—In January there were 11,430 tons of ore crushed for \$112,740 in bullion, netting \$55,790 profit. In addition to this 42 tons of ore worth \$7000 net were shipped.

El Oro—Crushed 25,201 tons of ore in January, returning \$229,910 in bullion. Total profit from mines and railway was \$94,290, and \$13,000 was spent on permanent improvements.

Esperanza—The consulting engineer estimates ore reserves, Dec. 31, 1909, at 227,578 dry metric tons which is expected to yield a profit of \$2,005,215. There is additional partly developed and indicated ore. It is estimated that over \$600,000 in profits will be derived from the re-treatment of the tailings dump.

SONORA

Greene-Cananea—Work has started on the new reverberatory furnace. It will be of similar type and the same capacity as the old one. A sintering plant for mixing slag and flue dust is in process of erection. The section of the concentrator which was closed down for repairs several weeks ago has resumed.

Duluth-Sonora Mining Company—An experimental shipment of gold-silver ore was made from this company's property, near Nacozari, to the Copper Queen smeltery at Douglas.

Santa Fe Mining Company—A force of men has been put to work on the ground owned by this company in the Arizpe district.

Africa

WEST AFRICA

Gold production in January is reported at 22,817 oz. bullion in 1908, and 17,357 in 1909; a decrease of 5460 oz. The bullion reported this year was equal to \$344,068, or 16,646 oz. fine gold.

Asia

CHINA

A consular report from Germany reports that deposits of potash salts have been discovered in China. The discovery is said to have been made by agents of the German Kali-Syndikat, and the exact situation is kept secret.

INDIA—MYSORE

Kolar Goldfield—Gold production in January is reported at 45,347 oz. bullion, an increase of 33 oz. over January, 1909. The bullion reported this year was equal to \$843,584, or 40,812 oz. fine gold.



Coal Trade Review

New York, March 2—The bituminous coal trade in the East shows little change. It is still disturbed by car shortage and railroad delays, which made deliveries slow and irregular. Steam coal demand is fair, but buyers insist on low prices.

The anthracite trade is steady as usual, but is beginning to feel the approach of spring weather.

In the West there has been some complaint of car shortage, but much less than in the East, though there has been some stormy weather. The rush to store coal in anticipation of a stoppage of mining in April still continues and is increasing trade to a marked extent. There is no change as to the wage scale discussion in the three competitive States; but there is now a fair prospect of a settlement in Illinois, which may clear up the situation. At a few distributing points, where coal has been temporarily scarce, premium prices have been paid for immediate supplies, but this condition will not last. The situation has been worst in the St. Louis district. Until some definite action is taken on the wage scales, the coal market will continue unsettled. The demand for steam coal is generally reported good.

COAL TRAFFIC NOTES

Coal tonnage of Norfolk & Western railway in January by districts, short tons:

Field:	Com- mercial.	Rail- road.	Total.
Pocahontas.....	826,996	106,104	933,100
Tug River.....	124,270	20,805	145,075
Thacker.....	114,393	45,464	159,857
Kenova.....	61,059	16,516	77,575
Clinch Valley.....	67,879	5,453	73,332
Total.....	1,194,597	194,342	1,388,939

The total shows an increase over January, 1909, of 443,314 tons, or 46.9 per cent.

New York

ANTHRACITE

March 2—There is nothing new to report in the hard-coal market locally. Business is steady, but March opens with a warm spell, which gives a foretaste of the falling off in domestic trade which is coming with spring. However, there is coming with spring. However, there is coming with spring. However, there is coming with spring.

Schedule prices for large sizes are \$4.75 for lump and \$5 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are, f.o.b. New

York harbor points, according to grade: Pea, \$3@3.25; buckwheat, \$2.35@2.50; No. 2 buckwheat or rice, \$1.85@2; barley, \$1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Car shortage and poor transportation are still the chief factors in the seaboard bituminous trade. Deliveries are slow. Mines can get only a part of the cars they need, the proportion depending on the road. The weather has been bad and has delayed shipments in transit to some extent. Added to this, two or three days of heavy fog have broken up harbor deliveries, so that conditions are difficult.

Orders continue to come from New York harbor and the Sound. As for some weeks past the call is mainly for the lower-priced coals. Prices are unchanged. Fair grades of steam coal bring \$2.60 per ton, f.o.b. New York harbor, while up to \$3 is asked for better coals.

Talk over contracts is more general, but buyers and sellers are still pretty far apart on prices, and very few have come to terms yet.

The coastwise-vessel market has been disturbed by the weather and boats are cautious about going out. Rates are nominally unchanged, but are a little uncertain.

Birmingham

March 1—The coal mines in Alabama are being operated on full time and the output is large. There is a continued demand for all the coal that can be mined here, no small amount going to the Gulf States. Labor is still being sought by the coal operators, indicating that a better output is desired. Contracts in hand and in sight, it is announced, will warrant a heavy production for some time to come. Coal prices are a little firmer than they were. The output in February was good. The coke production is holding up and there appears to be a need for all that is turned out. The furnace operations, of course, regulate the demand for coke. The consumption right now is equal to the make.

Chicago

March 1—Under the stimulus of the coldest weather of the winter, the coal market in the last week stiffened considerably, only to fall back nearly to its condition of previous weeks with the coming in of March. Not only domestic

coals were in brisk demand, but steam coals became the subject of sudden inquiry and large sales. However, the indications now are for quiet conditions, following the coming of mild weather and the general transition conditions of March. It is certain, however, that steam coals will continue to have a large sale, for the demand is great, and domestic coals have at least another week or two of good prospects in the fact that cold weather still exists in many parts of Chicago territory. The steam coal market, indeed, may be considered active enough to hold up prices, possibly advance the prices of run-of-mine and screenings. At present the demand for these sizes is strong, and they lead the market for Western coals.

Illinois and Indiana lump and egg sell for \$2.50@3; run-of-mine for \$2.25@2.50 and screenings for \$2.25@2.50. Eastern coals have been in better demand as a result of weather conditions, smokeless bringing \$3.80 for lump and \$3.30 for run-of-mine and Hocking \$3.15. With the sudden demand thus boosting prices, a large amount of coal, both Western and Eastern, has been diverted to this market, and prospects are not good for a firm holding up of prices. Anthracite has been in sudden demand because of the weather, but is practically back now to its condition of scattered, light sales and with a good supply of all sizes.

The Illinois Wage Scale—After a stormy session the convention of Illinois miners agreed to meet the operators in conference without waiting for the joint conference of the competitive States; thus accepting the proposal of the operators to settle the Illinois scales independently. The conference accordingly met late last week, but no agreement was reached, and an adjournment for two weeks was voted.

Cleveland

Feb. 28—Car shortage and irregular transportation have been responsible for slow deliveries, and coal has been hard to get. The situation is improving, however, with the weather, and in a few days matters will be running smoothly again. The desire to store coal has been quite a factor.

The greatest scarcity is in slack, and in some cases, where need was urgent, premiums running from 15 to 40c. per

ton have been paid. This condition was only temporary.

Quotations for Middle district coal, f.o.b. Cleveland, are \$2 for 1¼-in., \$1.85 for ¾-in., \$1.75 for run-of-mine and \$1.70 for slack; No. 8 district, \$2.25 for 1¼-in., \$2 for ¾-in., \$1.90 for run-of-mine and \$1.85 for slack.

Indianapolis

March 1—The situation is unchanged as far as the demand goes. Consumers are storing all the coal they can get, especially the railroads. The weather has delayed transportation, and the mines have hard work to get the cars they want. All mines in this district are working hard and have plenty to do. Nothing has been settled yet about the wage-scale conference.

Pittsburg

March 1—The coal market is stronger and there is a strong demand from some quarters, presumably for stocking purposes against a suspension of mining, April 1, which in some quarters appears to be taken more and more for granted. Coal movement has been poor, the railroads suffering more from a lack of motive power than lack of cars. Some industrial establishments, even in the Pittsburg district, have been on the verge of closing at times on account of lack of fuel. One large plant within the city limits of Pittsburg had to haul coal by wagon from a retail dealer last week in order to maintain operations. Prices are nominally unchanged, but firmer, on mine-run and nut at \$1.15, on ¾-in. at \$1.25 and on domestic 1¼-in. lump at \$1.40. Slack has become scarce and has advanced fully 10c., to 95c. @ \$1.

Connellsville Coke—A little inquiry has appeared for furnace coke in the last few days, but negotiations continue and not enough has been done to fix a market. Standard furnace coke is roundly quotable at \$2 per net ton at ovens, but this figure could doubtless be shaded a trifle. Foundry coke is nominal at about \$2.75. A large tonnage of coke is being stocked at ovens every week, and the pace cannot continue long. The situation in a nutshell is that during the fourth quarter of last year, Connellsville coke output averaged 440,000 tons per week, while the country was making pig iron at the rate of about 31,500,000 tons per year, whereas in the last few weeks coke production has averaged 470,000 tons per week and pig-iron production is no greater and may be a trifle less; yet at the first of the year some furnaces which had been using Connellsville coke changed to other cokes. With production increased 30,000 tons per week and consumption decreased, there is obviously a large surplus. The operators continue to work on the idea of a central selling agency, but have not

developed anything definite. Thus far the talk has probably done more harm than good, by making some operators feel that they are relieved from the necessity of adjusting their production to the actual requirements.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Feb. 19 at 463,123 tons, a decrease of 3000 tons from the previous week, and shipments at 4872 cars to Pittsburg, 8303 cars to points west of Pittsburg and 875 cars to points east of Connellsville, a total of 14,050 cars, or 69 cars less than in the preceding week.

St. Louis

Feb. 28—The coal market has been such in the past three months that even the worst grumblers in the trade have been hushed. Business has been in the best shape and prices are better than at any time in years. A great deal of money has been made in the coal business in the last three months and even operators who lost heavily during the dull period have their balances again on the right side of the ledger. Some jobbers in this part of the country have cleaned up almost 100 per cent. of the capital stock in the past 90 days.

High-grade coal is in strong demand from dealers though it is scarce and exceedingly high.

Current prices are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump.....	\$2.00	\$2.52
2-in. lump.....	2.00	2.52
Mine-run.....	1.60	2.12
2-in. nut.....	1.50	2.02
Screenings.....	0.85	1.37
Staunton, Mt. Olive & Springfield:		
6-in. lump.....	2.00	2.52
3-in. lump.....	1.75	2.27
Mine-run.....	1.25	1.77
2-in. nut.....	1.10	1.62
Cartersville:		
6 in. lump or egg.....	2.10	2.77
3-in. nut.....	1.80	2.47
Mine-run.....	1.50	2.17
1 ½-in. screenings.....	1.10	1.77
Franklin County:		
6-in. lump or egg.....	2.20	2.87
3-in. nut.....	2.00	2.67
2-in. nut.....	1.50	2.17

We have just passed through another cold week in which the domestic demand has been enormous. The price on coal reached a new high-water mark this week when Standard lump readily brought \$2 @ 2.25 f.o.b. mines. A number of plants situated on railroads came within an ace of running out of coal and a number of buildings, hotels, etc., were completely out of coal for a time this week. Retail dealers have been straining every effort to meet the demand in spite of the disadvantageous hauling conditions. The thermometer has hovered around zero all week. While the weather has now broken, prices remain firmer than ever with indications that they will advance next week. Stocks of coal in all parts of the State are extremely low. Manufacturers are unable to accumulate any surplus and

have been lucky to be able to keep their plants running.

The car shortage seems to be getting worse. This is doubtless due to the fact that a number of railroads that are taking a large quantity of storage coal are not unloading their equipment promptly or at all. This ties up thousands of cars. The Illinois Central, Baltimore & Ohio, Wabash, Iron Mountain, Chicago & Alton and Southern are all very short of equipment. The Louisville & Nashville and Belleville Electric seem to be the only ones that have a fair supply of cars.

While it is getting late for the movement of anthracite, yet weather conditions have been such as to keep the market active. All sizes are being absorbed readily and full circular is being strictly adhered to.

FOREIGN COAL TRADE

Austrian Coal Production—The production of coal in Austria for the full year is reported as below, in metric tons:

	1908.	1909.	Changes.
Coal.....	13,875,382	13,922,780	I. 47,398
Brown coal.....	26,728,926	25,919,969	D. 808,957
Total mined....	40,604,308	39,842,749	D. 761,559
Coke made.....	1,902,674	2,028,990	I. 126,316
Briquets made....	336,880	364,610	I. 27,730

Of the briquets reported in 1909 there were 182,803 tons made from brown coal or lignite.

Belgian Coal Production—The total output of coal in Belgium for the full year was 23,678,157 metric tons in 1908, and 23,561,125 in 1909; a decrease of 127,032 tons. Stocks at collieries, however, decreased from 917,330 tons Dec. 31, 1908, to 328,918 tons in Dec. 31, 1909, a reduction of 588,412 tons indicating an increase in consumption in 1909 of 461,380 tons.

Imports and exports of fuel for the year ended Dec. 31, were in metric tons:

	Imports.	Exports.	Excess.
Coal.....	5,866,070	5,080,353	Imp. 785,717
Coke.....	316,049	1,014,964	Exp. 698,915
Briquets.....	158,805	559,459	Exp. 400,654
Total.....	6,340,924	6,654,776	Exp. 313,852
Total, 1908.....	5,876,246	6,161,421	Exp. 285,175

The exports are largely to France; the imports from Germany. Exports and imports nearly balance.

Spanish Fuel Imports—Imports of coal into Spain, 11 months ended Nov. 30 were 1,796,682 metric tons, an increase of 35,713 tons over 1908; imports of coke, 271,087 tons, an increase of 16,064 tons.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Feb. 12; Best Welsh steam, \$3.96; seconds, \$3.90; thirds, \$3.78; dry coals, \$3.84; best Monmouthshire, \$3.60; seconds, \$3.42; best small steam, \$1.92; seconds, \$1.68. The market is easier. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

IRON TRADE REVIEW

New York, March 2—The iron market is still a waiting one, but with signs here and there that the long spell of inactivity may be broken soon. The consumption of iron and steel is large, and the demand for building material, which was checked by the severe winter, is beginning to revive as spring comes on. Manufacturers who bought too heavily around the close of last year are gradually working off their stocks and will soon be in the market again.

In pig iron there have been more inquiries for foundry, especially in eastern territory. Basic is neglected for the time, but there is some call for forge. Furnaces are, apparently, inclined to readjust prices, though no one likes to lead the way; but it is evident that some concessions will have to be made. The eastern market is still disturbed by offers of resale and speculative Alabama iron at low prices. The quantity of this iron seems to have been underestimated.

In finished material more business is offered. The railroads are the most active buyers just now, with orders for bridges and cars. Rail orders have also been liberal, and a large tonnage is now placed. A number of small orders for trolley rails are also coming in. In structural steel contracts are under discussion for spring building requirements, and some will be placed soon.

Export business is reported good, and a considerable quantity of material has been placed abroad, including several contracts for rails.

Rail Production—The production of steel rails for the year is reported by the American Iron and Steel Association as below, in long tons:

	Bes- semer.	Open- hearth.	Total.
Under 45-lb.....	223,568	32,290	255,858
45 to 85-lb.....	735,500	305,864	1,041,364
85-lb. and over.....	847,553	917,987	1,765,540
Total.....	1,806,621	1,255,961	3,062,582
Total, 1908.....	1,354,236	567,304	1,921,540

There were 71 tons of iron rails made in 1908; but none were rolled last year.

Lake Iron Ore—Shipments from the two Minnesota ranges for two seasons past are reported as follows, in long tons:

Range.	1908.	1909.	Changes.
Vermillion.....	841,544	1,108,215	I. 266,671
Mesabi.....	17,257,350	28,174,129	I. 10,916,779
Total.....	18,098,894	29,282,344	I. 11,183,450

The total shipments from the opening of the two ranges to the end of 1909 were 29,125,385 tons from the Vermillion, and 195,701,272 from the Mesabi. The largest shipper from the Vermillion in 1909 was the Pioneer, with 477,226 tons. The Mesabi mines shipping over 1,000,000 tons each were: Hull, 2,877,563; Fayal, 1,879,357; Virginia group, 1,843,440; Morris, 1,831,857; Adams, 1,829,372; Mahoning, 1,561,893; Burt,

1,238,133; Stevenson, 1,030,742 tons. Five mines were worked on the Vermillion and 84 on the Mesabi.

Baltimore

March 1—Exports for the week included 7801 tons rails and 608 tons rail joints to Mexico. Imports included 1000 tons spiegeleisen from Rotterdam; 6300 tons manganese ore from India; 22,100 tons iron ore from Cuba.

Birmingham

March 1—The Southern pig-iron market starts into the third month of the year with a better feeling than prevailed among the manufacturers during the previous month. The lull in the market and the waiting game brought about a reduction of quotations until considerable resale or warrant iron has been sold in the \$13 column, No. 2 foundry. The furnace companies have been holding for \$14. In the last few days a little spurt in inquiries for iron started in and the request was for quotations on iron to be delivered during the third quarter and last half of year. A few sales were made, though the manufacturers did not express a willingness to go beyond the third quarter. There is not a great amount of iron being accumulated here, in fact very little, while the warrant yards are diminishing and resale iron becoming scarce. Basic iron and charcoal iron are both in good favor and hold the prices that have prevailed for some time. Foundry-iron quotations have been reduced and there is no denying that considerable iron has been sold under \$14.

The steel plant of the Southern Iron and Steel Company, at Alabama City, 50 miles from Birmingham, is being started up right along and by the middle of March will be making steel on a large scale. The steel plant of the Tennessee company, at Ensley, is in steady operation and there is a good demand for the various products.

Chicago

March 1—Little change is perceptible in the iron market, particularly the pig-iron market. The demand this week is better for most iron and steel products; it has not increased notably for pig iron. Melters are still buying cautiously in small lots, while furnace agents are undoubtedly in an anxious mood. Southern production, especially, must be disposed of and some sales are said to have been made at or near \$13 Birmingham, though the greater part of the iron disposed of brings more. This means \$17.35 Chicago, against \$18.50@19 for Northern, which holds steady. The sales that are made are for second and third quarters, with some extending into fourth quarter. Inquiries indicate a large tonnage to be contracted for soon, and certainly the foundry output in this, chiefly a foundry

market, is not now small nor does it seem about to become small. With a decided upward turn of the market there will no doubt be eager buying, for the average melter is waiting to see what his fellow melters are going to do. Northern charcoal iron shares something of the light demand, at \$19, though steadier than coke iron. The finished-goods market shows better buying by the railroads and good conditions generally. Coke is in rather light demand at \$5.50 for the best Connellsville.

Cleveland

March 1—There have been no sales of iron ore worth noting. Furnaces that were expected to buy have not come forward yet.

Pig Iron—Rumors of basic iron sales at low prices are heard, but cannot be confirmed. There has been hardly business enough to test the market. Current quotations are, f.o.b. Cleveland, \$18.90 for bessemer; \$17.25@17.50 for No. 2 foundry; \$16.75@17 for gray forge; \$19.50@19.75 for Lake Superior charcoal.

Finished Material—Some business is coming forward for structural steel and for bars. Otherwise everything is quiet, and specifications are coming in more slowly. Jobbers, however, report a good trade doing.

Pittsburg

March 1—Sentimentally, there is clearly an improvement in the iron and steel market. The tone is better all along the line. As to actual orders there is little change, but it seems certain that there has been a definite, though slight, increase in business placed in the last week or 10 days. This, of course, is not observed equally in all lines, and the effect is offset to an extent by the fact that some lines here and there are running out of orders. This is particularly true of shapes. The Eastern mills for several weeks have been willing to sell on the basis of 1.50c. Pittsburg, since they have had scarcely any business on their books, while in the last two or three weeks the Pittsburg mills have pretty well caught up on deliveries and are more ready to sell. The Pittsburg and Western markets remain on the basis of 1.55c. Pittsburg. Plates have been in somewhat the same condition as shapes, but are a little stronger than shapes. Shading of \$1 per ton has appeared in corrugated sheets, both painted and galvanized. This is due to the extremely hard winter having greatly curtailed the consumption.

Prospects in the trade are that there will be a decided improvement as spring weather is entered upon. Actual production has not suffered to any extent, being substantially as great as in December or January, but in some lines stocks have been accumulated, particu-

larly in wire and pipe. These may be heard from later, it being questionable whether they can be absorbed readily even with good weather.

Pig Iron—There has been much better buying of foundry iron. The International Steam Pump Company has taken 10,000 tons for second-half delivery to Buffalo, and is in the market for 2000 tons more. The American Radiator Company has taken about 10,000 tons for delivery at the same point, while another radiator company at Johnstown has taken 4000 tons. The Westinghouse Electric and Manufacturing Company is inquiring for 15,000 tons of foundry iron for second-half delivery, 10,000 tons being for its Cleveland plant and 5000 tons for its Allegheny plant. Prices are to be submitted by Friday, March 4. The trade is on the *qui vive*, as all the prominent sellers have the inquiry, and the local market, having been dull for a long time, stands in need of some competition like this to develop what it really will do. Meanwhile foundry iron is quotable at \$16.25@16.50, Valley, for nearby delivery, with malleable 25c. higher and forge \$1 lower. Basic iron remains in a curious position. The only sales known to have occurred in February were at \$15.50, Valley, except that one of them may have been at a slightly higher price, although still under \$16. This was all speculative iron, sold by weak-kneed middlemen. The furnaces, on the other hand, have not openly quoted below \$16.25. In the circumstances \$16, Valley, may be regarded as a fair market quotation, although it is really nominal. It is understood that the United States Steel Corporation has been negotiating during the week for a round block of bessemer iron, 25,000 to 50,000 tons, and there are hints that an announcement of purchase may be made in a day or two. If made, it will doubtless be at \$18, Valley. The bessemer average for February is announced today at \$18.06, Valley, against \$19, Valley, in each of the three preceding months. The basic average is announced at \$16.31, Valley, against \$16.87½ in January.

Steel—The market appears to be entirely bare of new transactions, consumers being provided on old contracts. Prices are nominal and unchanged at \$27 @27.50 for bessemer billets, \$27.50@28 for open-hearth billets, \$28.50@29 for sheet bars and \$33 for rods, all f.o.b. maker's mill, Pittsburg or Youngstown.

Ferromanganese—The market is quiet, although showing a slightly better tone in that there is inquiry for second half. Prompt lots are quotable at \$43.50, Baltimore, although occasionally this figure might be shaded about 25c. Second quarter is quotable at about \$44 and second half at \$44@44.50, all at Baltimore, the freight to Pittsburg being \$2.30.

Sheets—Demand for specialties con-

tinues fairly good, but demand is extremely light for all grades of sheets involved in outdoor work, like eave trough and conductor pipe, corrugated material, etc. Corrugated sheets, as noted, are being shaded \$1 per ton, and that pretty generally. Regular prices, subject to the shading noted in corrugated, are: black sheets, 28 gage, 2.40c.; galvanized, 3.50c.; corrugated, \$1.70 per square for painted, \$3 for galvanized, 28 gage. The regular market on blue annealed sheets is 1.75c., but for early delivery 1.85@1.90c. is obtained, depending on the urgency.

Philadelphia

March 2—A number of eastern Pennsylvania mills, foundries and other consumers of pig iron rather suddenly ordered supplies for delivery during the second quarter and in a few cases extending well into the third quarter of the year. The furnace managers today report additional inquiries from some outside markets, mostly for foundry iron.

Steel Billets—The outside figure for billets has been shaded on small orders taken this week and makers have had the opportunity presented to them of doing a big business at still lower prices. Nearly all the concerns using forging billets are still running full time and the aggregate of their orders makes a fair showing.

Pipes and Tubes—The rush of locomotive work and the great activity in boiler shops and engine plants is helping the tube mills to new business and within a week old contracts have been renewed for enough stock to run about 60 days.

Plates—Heavy orders for plates have been placed in Pennsylvania mills, some of the orders coming from ship yards. Prices have been shaded in some eastern mills a trifle but this is claimed to be only temporary and due to certain conditions. The plate manufacturers claim to be in a certain condition to maintain steel-plate quotations without trouble. Both car and ship builders have in sight all the work they can handle.

Scrap—A good many mills have made inquiries for scrap and will probably become buyers, but up to today no sales have taken place. The dealers are anticipating the usual March and April demand for steel scrap and railroad scrap and feel they are in shape to take care of the usual demand and at stiff prices.

St. Louis

Feb. 28—The market for pig iron has been fair during the week. Some small contracts have been closed. Business at present is not up to normal and does not come up to expectations. Prices remain about the same, \$14.75@15.00 per ton Birmingham or \$18.50@18.75 St. Louis for No. 2 foundry. However, buy-

ers of considerable quantities would not have much trouble in getting these figures shaded.

Foreign Iron Trade

Swedish Production—The production of iron and steel in Sweden for the nine months ended Sept. 30 was, in metric tons:

	1908.	1909.	Changes.
Pig iron.....	427,200	444,500	I. 17,300
Puddled iron.....	113,500	83,600	D. 29,900
Converter steel			
ingots.....	59,700	48,300	D. 11,400
Open-hearth ingots.	263,000	190,000	D. 73,000

The decrease in production in 1909 was due to the general strike in all the Swedish industries.

German Iron Production—The German Iron and Steel Union reports the make of pig iron in Germany in December at 1,164,624 tons, an increase of 45,573 tons over November. For the year ended Dec. 31 the production was, in metric tons:

	1908.	1909.	Changes.
Foundry iron....	2,254,644	2,491,919	I. 237,275
Forge iron.....	635,228	652,306	I. 17,078
Steel pig.....	934,940	1,099,772	I. 164,832
Bessemer pig.....	361,472	412,118	I. 50,646
Thomas(basic)pig	7,627,227	8,261,538	I. 634,311
Total.....	11,813,511	12,917,653	I. 1,104,1

The total increase in 1909 was 9.3 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

German Steel Syndicate—The Stahlwerks Verband reports sales for the year ended Dec. 31 as follows: Billets, blooms and other half-finished material, 1,503,352; railroad material, 1,847,440; other rolled steel, 1,614,702; total, 4,965,494 metric tons, an increase of 201,580 tons, or 4.2 per cent., over the 1908 report.

German Trade—Exports and imports of Germany, 11 months ended Nov. 30, metric tons:

	Exports.	Imports.	Excess.
Iron and steel..	3,616,616	418,757	Exp. 3,197,859
Machinery.....	297,381	61,958	Exp. 235,423
Total.....	3,913,997	480,715	Exp. 3,433,282
Total, 1908.....	3,742,558	590,390	Exp. 3,152,228

Imports of iron ore in 1909 were 7,531,338 tons; exports, 2,578,341 tons. Imports of manganese ore, 357,056 tons; exports, 4069 tons.

Russian Iron Production—Russian production for the six months ended June 30, is reported as below, in metric tons:

	1908.	1909.	Changes
Pig iron.....	1,431,000	1,412,000	D. 19,000
Blooms, billets, ingots, etc.....	1,425,000	1,488,000	I. 63,000
Finished iron and steel.....	1,214,000	1,264,000	I. 50,000

Larger items of finished iron and steel in 1909 were 338,000 tons bar and merchant iron; 223,000 tons rails; 87,000 tons beams and shapes; 85,000 tons sheets; 79,000 tons plates; 65,000 tons wire.

METAL MARKETS

New York, March 2—The metal markets have continued rather uninteresting, through a large business has been done in some lines. The chief incident has been the sharp drop in silver.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1910..	\$ 6,163,132	\$ 2,131,357	Exp. \$ 4,031,775
" 1909..	7,865,356	3,420,183	" 4,545,173
Year 1910..	6,163,132	2,131,357	" 4,031,775
" 1909..	7,865,356	3,420,183	" 4,445,173
Silver:			
Jan. 1910..	4,498,304	4,248,354	Exp. 249,950
" 1909..	4,542,094	3,664,752	" 877,342
Year 1910..	4,498,304	4,248,354	" 249,950
" 1909..	4,542,094	3,664,752	" 877,342

Exports from the port of New York, week ended Feb. 26: Gold, \$1,075,000 chiefly to Argentina; silver, \$674,673, chiefly to London. Imports: Gold, \$161,250; silver, \$78,879, from Central and South America.

Gold—Prices on the open market in London were 77s. 9d. per oz. for bars, and 76s. 5d. for American coin, the premium of 1/8d. on bars reported last week having dropped. Gold arriving was divided between the Bank of England and Continental banks. In New York some more gold was taken for Argentina.

Platinum—The market remains quiet, but steady. Dealers continue to quote \$28.50@29 per oz. for refined platinum, and \$34.50 per oz. for hard metal.

Silver—The market, closing firm at 24d. on Feb. 24, opened weak the next day at 23 7/16 on the unexpected announcement of an extra 11 per cent. duty on silver imports by the Indian Government. The market has sold down to 23 3/16 and closes firm at 23 5/16 on China buying, with tendency uncertain.

SILVER AND STERLING EXCHANGE

Feb.-Mar.	24	25	26	28	1	2
New York....	52	50 3/4	50 3/4	50 1/2	50 1/4	50 1/2
London	24	23 7/8	23 3/4	23 3/4	23 3/4	23 3/4
Sterling Ex..	4.8675	4.8680	4.8700	4.8700	4.8715	4.8720

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper—In the week beginning Feb. 24, there has been more activity in the copper market than for a long time, the sales effected, particularly in the first half of the week, having been probably in the neighborhood of 40,000,000 lb., covering deliveries as far ahead as June. Transactions were made, especially with domestic manufacturers, many of the more important having come into the market, but some sales were also made for foreign delivery. The business followed the reduction by the United Metals Selling Company of its asking price to 13 1/2c., delivered, 30 days, which is equivalent to about 13.35c. cash, New

York, which price was promptly shaded by competitors, considerable business having been done as low as 13.20c, net, New York, with average at about 13.25c. The highest prices were realized on contracts for the more distant deliveries. Some considerable sales of Lake copper were made, fancy brands realizing 13 3/4c. and others 13 1/2c. It is coming to be more generally recognized that fundamental conditions are now improving. Consumption, both here and abroad, is very good

withstanding that the deliveries into American consumption during February were the largest on record for that month. The market closed at £149 3/8 for spot, and £151 for three months.

In the domestic market, the owners of spot material, who have held for premiums, became freer sellers when the market declined in London at the beginning of this week. Business done was mainly among dealers, and at the close tin can be purchased at 32 3/4c.

Lead—The market continues dull and unchanged at last prices, viz.: 4.40@4.42 1/2 St. Louis, and 4.55@4.60 New York.

Spanish lead at London is quoted at £13 3s. 9d, and English lead at £13 6s. 3d.

Spelter—There was a better demand for this metal, which the smelters did not meet freely, and in consequence the market has advanced and closes at 5.55@5.60c. St. Louis, and 5.70@5.75c. New York.

New York quotations for spelter Feb. 24, were 5.45@5.50c.; Feb. 25, 5.50@5.55c.; Feb. 26, 5.55@5.60c.; Feb. 28, 5.60@5.65 cents.

The London market is slightly lower and closes at £23 for good ordinaries, and £23.5 for specials.

Base price of sheet zinc is \$7.50 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

A judgment of \$2,464,660 has been entered against the Lanyon Zinc Company, at Iola, and an order of foreclosure granted to the Trust Company of America, the trustee for the bondholders.

Other Metals

Aluminum—The market is active and improving. Quotations are strong, at 22 1/2@23 1/2c. for No. 1 ingots. Abroad prices are strong and the upward tendency has not been lost.

Antimony—The market is rather dull and business light. Prices are easier than than they have been, Cookson's selling at 8 1/4@8 1/2c., and U. S. at 7 3/8@8c.; while 7 1/4@7 3/8c. is asked for outside brands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland.

Quicksilver—Business is fair and the market is steady and unchanged. New York quotations are \$50 per flask of 75 lb. for large lots. Jobbers ask 70c. per lb. for small quantities. San Francisco,

Copper, Tin, Lead and Zinc

Feb.-Mar.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.		Cts. per lb.	New York, Cts. per lb.		St. Louis, Cts. per lb.
24	13 1/2	13 3/4	59 3/4	33 1/2	4.52 1/2	4.37 1/2	5.30
	@13 3/4	@13 3/4			@4.60	@4.40	@5.35
25	13 1/2	13 3/4	59 3/4	33 1/2	4.55	4.40	5.35
	@13 3/4	@13 3/4			@4.60	@4.42 1/2	@5.40
26	13 1/2	13 3/4	...	33 1/2	4.55	4.40	5.40
	@13 3/4	@13 3/4			@4.60	@4.42 1/2	@5.45
28	13 1/2	13 3/4	59 1/2	32 1/2	4.55	4.40	5.45
	@13 3/4	@13 3/4			@4.60	@4.42 1/2	@5.50
1	13 1/2	13 3/4	59 1/2	32 1/2	4.55	4.40	5.50
	@13 3/4	@13 3/4			@4.60	@4.42 1/2	@5.55
2	13 1/2	13 3/4	60	32 1/2	4.55	4.40	5.55
	@13 3/4	@13 3/4			@4.60	@4.42 1/2	@5.60

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

and stocks are decreasing. At the end of the week an improvement in the London standard market was quickly followed by a larger inquiry from abroad and a consequent stiffening of prices. The market closes at 13 1/2@13 3/4 for Lake, and 13 1/4@13 3/8 for electrolytic in cakes, ingots and wire bars. Casting copper is quoted nominally at 13@13 1/4 for the week.

Copper sheets have been advanced 1c., and are now 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15 1/4c. base, carload lots at mill.

There has been more business done in the London market, which opened on Feb. 24 at £59 3/8, advanced 5 shillings on that day and closes firm at £60 for spot and £61 for three months.

Refined and manufactured sorts we quote: English tough, £63 1/2; best selected, £63 1/2@64; strong sheets, £73 1/2@74 1/2.

Copper exports from New York and Philadelphia for the week were 2007 long tons. Our special correspondent gives the exports from Baltimore at 130 tons copper.

Tin—The London market remained steady until the beginning of this week, when it suddenly declined about £2 net-

\$49@50 for domestic and \$2 less for export orders. The London price is £9 10s., with second hands selling at £9 7s. 6d. per flask.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, month of January, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	14,927	5,515 Imp.	9,413
Copper, 1909....	12,842	6,089 Imp.	6,753
Tin, long tons....	4,177	3,794 Imp.	383
Tin, 1909.....	3,564	3,060 Imp.	504
Iron, long tons..	19,012	3,912 Imp.	15,100
Lead, 1909.....	18,613	2,765 Imp.	15,848
Spelter, 1/2 tons..	11,055	813 Imp.	10,242
Spelter, 1909....	9,359	490 Imp.	8,869
Quicksilver, lb... 455,662	54,743 Imp.	400,919	
Quicksilver, '09	9,992	60,746 Exp.	50,754
Ores:			
Tin ore and con.	1,817	..... Imp.	1,817
Tin ore, 1909...	1,305	..... Imp.	1,305
Pyrites.....	63,617	..... Imp.	63,617
Pyrites, 1909...	64,636	..... Imp.	64,636

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished in all 4582 tons fine copper and 1942 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Feb. 26—The base price paid this week for 60 per cent. zinc ore was \$40@41 per ton; only two cars of high-grade ore were sold in the open market; producers are holding off for higher prices. The week's shipment is the lightest reported for a year. For 80 per cent. lead ore \$53 per ton was paid.

SHIPMENTS, WEEK ENDED FEB. 26.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	405,300	.....	.....
Benton.....	163,900	.....	.....
Cuba City.....	86,250	.....	.....
Platteville.....	80,000	66,220	63,000
Shullsburg.....	70,000	.....	.....
Total.....	805,450	66,220	63,000
Year to Feb. 26.....	11,916,040	972,389	1,995,050

In addition to the above there was shipped to the separating plants, 1,922,305 lb. during the week.

Joplin, Mo., Feb. 26—The highest price offering for zinc-sulphide ore was \$43. The base offerings were \$40@42.50 per ton of 60 per cent. zinc. The base price paid for zinc silicate ore was \$19@23 per ton of 40 per cent. zinc. The higher grades of zinc ore sold early in the week on a base of \$40@41, and later in the week an increasing demand for medium grades and ores carrying an iron penalty forced the base of these ores as high as \$42.50 for settlements and refusals of \$43 base for delivery the coming week. Even with the large increase in the demand the shipment was only 866 tons larger than last week. Average price, all grades, \$38.88. Lead ore was dull, sellers holding ore on bids of \$53. Buyers were in the market for all purchasable

ore, but the enforced curtailment occasioned by the severity of the weather reduced the output. Average price, all grades, \$52.72 per ton.

The week's production and shipment indicated a reduction in stock of 540 tons.

SHIPMENTS, WEEK ENDED FEB. 26.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,096,270	598,230	\$ 97,777
Joplin.....	1,770,210	120,310	38,476
Duenweg.....	620,620	.....	12,006
Alba-Neck.....	456,000	9,250	9,816
Carthage.....	426,330	.....	8,952
Oronogo.....	434,190	.....	8,652
Galena.....	323,610	39,560	7,520
Badger.....	319,940	.....	6,718
Spurgeon.....	196,310	105,320	5,757
Aurora.....	223,680	55,160	5,067
Jackson.....	207,840	.....	4,156
Sarcosite.....	191,250	.....	3,323
Quapaw.....	126,140	19,260	3,022
Granby.....	274,180	3,420	2,975
Miami.....	154,760	48,960	2,974
Carl Junction.....	65,830	.....	1,382
Totals.....	9,887,160	999,470	\$218,573

2 months..... 89,002,950 15,277,430 \$2,331,275
Zinc value, the week, \$192,217; 2 mos., \$1,903,798
Lead value, the week, 26,356; 2 mos., 427,477

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January.....	\$41.25	\$47.31	\$38.46	\$45.16	\$52.17	\$56.99
February.....	36.94	40.69	34.37	39.47	50.50	53.64
March.....	37.49	.....	34.71	.....	50.82	.....
April.....	38.63	.....	37.01	.....	55.63	.....
May.....	40.06	.....	37.42	.....	56.59	.....
June.....	44.15	.....	40.35	.....	57.52	.....
July.....	43.06	.....	41.11	.....	53.74	.....
August.....	48.25	.....	44.54	.....	57.60	.....
September.....	47.70	.....	44.87	.....	56.11	.....
October.....	49.50	.....	45.75	.....	55.02	.....
November.....	51.31	.....	48.29	.....	53.94	.....
December.....	49.45	.....	47.57	.....	55.26	.....
Year.....	\$43.98	.....	\$41.20	.....	\$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, March 2—The general market is steady and firm, with improvement in some lines.

Copper Sulphate—The market is steady, with a fair business doing. Prices are unchanged at \$4.10 per 100 lb. for car-load lots and \$4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—A much larger business is reported in this article than for some time past. Prices are unchanged at 2.10c. per lb. for spot nitrate and 2.07½c. per lb. for futures.

Arsenic—There are no buyers for the moment, and offers of lower prices do not tempt them into the market. Quotations are nominal, and easier, \$2.25@2.50 per 100 lb. being asked for white arsenic.

Sulphur—Messrs. Parson & Petit, New York, report the arrival of 700 tons Sicilian sulphur by steamer from Girgenti; 150 tons consigned to New York and 550 tons to Baltimore.

MINING STOCKS

New York, March 2—While the active liquidation of the previous week in the general stock market was over, there was a degree of weakness and irregularity not encouraging to operators. Slight rallies were not enough to check the general depressed condition of the market, which remains in rather an unpromising condition.

Horn Silver made its appearance during the week—the first for a long time—with a sale of 175 shares at 75c. per share. One sale of Homestake, of South Dakota, was reported at \$82.50 per share.

On the Curb copper stocks were rather irregular, prices fluctuating within small limits. At the close a little more strength was manifest, and there were fractional gains in some of the more prominent stocks. Other mining stocks were rather neglected.

One thousand shares of Big Vein Copper Company were sold at auction, Feb. 23, at \$25 for the lot. This is the stock that was recently ruled off the Curb market, previous to which it had been run up to \$11 per share.

Boston, March 1—With the exceptions of Lake Copper and one or two others of the new flotations, prices are above those of a week ago. The market has been dull and uninteresting but shows a gradually hardening tendency.

The reduction of the North Butte company's quarterly dividend from \$1 to 50c. did not have any unfavorable effect on the stock as this action had been thoroughly discounted. The turn seems to have come in the company's stock and a \$3.75 advance occurred during the week to \$39, although it was not all retained.

Lake Copper variations are wide and swift at times. It broke from \$84.50 to \$75 in one day's session of the Stock Exchange last week, but when it looked as if the bottom had dropped out of the stock it recovered to \$80. After that it followed another downward course to \$70.50, from which it again recovered to above \$75.

On the Curb prices in the main have followed the course of the big market.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.....	Mar. 12	Apr. 7	\$0.05
Bader, Cal.....	Feb. 24	Mar. 14	0.10
Belcher, Nev.....	Mar. 9	Mar. 29	0.10
Caledonia, Nev.....	Feb. 16	Mar. 9	0.10
Central Eureka, Nev.....	Mar. 13	Apr. 23	0.02½
Challenge Con., Nev.....	Feb. 17	Mar. 10	0.10
Chollar, Nev.....	Mar. 8	Mar. 31	0.10
Crown Point, Nev.....	Mar. 8	Mar. 28	0.10
Gould & Curry, Nev.....	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev.....	Mar. 9	Mar. 31	0.10
Julia Con., Nev.....	Feb. 17	Mar. 10	0.03
King Philip Copper, Mich..	Mar. 10	.....	1.00
Mexican, Nev.....	Feb. 21	Mar. 17	0.15
New Arcadian, Mich.....	Mar. 10	.....	1.00
Ojibway, Mich.....	Mr. Oct.	.....	2.00
Oneco, Mich.....	Feb. 15	.....	1.00
Rexall S. & C., Utah.....	Feb. 13	Mar. 15	0.01
Savage, Nev.....	Feb. 10	Mar. 8	0.10
Seg. Belcher, Nev.....	Mar. 8	Mar. 28	0.10
Union, Nev.....	Mar. 7	Mar. 31	0.10
Wabash, Utah.....	Feb. 21	Mar. 15	0.05
Yellow Jacket, Nev.....	Mar. 7	Apr. 11	0.10

Chino had a sharp \$1.75 advance to \$15.25; Bohemia has lost its activity and buoyancy; First National and Davis-Daly are heavy. Active features have been Boston-Ely, Cactus and Humboldt Smelters, the latter more than doubling in price.

STATISTICS OF COPPER.

Month.	United States Product n.	Deliveries, Domestic.	Deliveries for Export.
II, 1909.....	103,700,817	43,578,118	30,968,496
III.....	117,059,661	48,871,964	59,191,043
IV.....	113,574,292	47,546,010	65,110,111
V.....	118,356,146	61,163,325	70,542,753
VI.....	116,567,493	60,591,116	70,966,457
VII.....	118,277,603	75,520,083	75,018,974
VIII.....	120,597,234	59,614,207	48,382,704
IX.....	118,023,139	52,105,955	50,077,777
X.....	124,657,709	66,359,617	56,261,238
XI.....	121,618,369	66,857,873	55,266,595
XII.....	117,828,655	69,519,501	59,546,570
Year.....	1,405,403,056	705,051,591	680,942,620
I, 1910.....	116,547,287	78,158,387	81,691,672

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1909.....	173,284,248	117,140,800	290,425,048
IV.....	182,279,902	115,024,000	297,303,902
V.....	183,198,073	114,050,320	297,248,393
VI.....	169,848,141	127,352,960	297,201,101
VII.....	154,858,061	150,928,960	305,787,021
VIII.....	122,596,607	171,492,160	294,088,767
IX.....	135,196,930	197,993,600	333,190,530
X.....	151,472,772	210,224,000	361,696,772
XI.....	153,509,626	222,566,400	376,076,026
XII.....	153,003,527	236,857,600	389,861,127
I, 1910.....	141,766,111	244,204,800	385,970,911
II.....	98,463,339	248,236,800	346,700,139
III.....			

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January.....	51.750	52.375	23.843	24.154
February.....	51.472	51.534	23.706	23.794
March.....	50.468		23.227	
April.....	51.428		23.708	
May.....	52.905		24.343	
June.....	52.388		24.166	
July.....	51.043		23.519	
August.....	51.125		23.588	
September.....	51.440		23.743	
October.....	50.923		23.502	
November.....	50.703		23.351	
December.....	52.226		24.030	
Total.....	51.502		23.726	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake.		1909.	1910.
	1909.	1910.	1909.	1910.		
January.....	13.893	13.620	14.280	13.870	61.198	60.923
February.....	12.949	13.332	13.295	13.719	57.688	
March.....	12.387		12.826		56.231	
April.....	12.561		12.931		57.363	
May.....	12.893		13.238		59.338	
June.....	13.214		13.548		59.627	
July.....	12.880		13.363		58.556	
August.....	13.007		13.296		59.393	
September.....	12.870		13.210		59.021	
October.....	12.700		13.030		57.551	
November.....	13.125		13.354		58.917	
December.....	13.298		13.647		59.906	
Year.....	12.982		13.335		58.732	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January.....	27.380	32.700	July.....	23.207	
February.....	28.978		August.....	29.942	
March.....	30.577		September.....	28.815	
April.....	31.702		October.....	23.444	
May.....	30.015		November.....	30.348	
June.....	28.024		December.....	29.154	
			Average.....	29.465	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
JANUARY.....	4.175	4.700	4.025	4.582	13.113	13.650
February.....	4.018	4.613	3.868	4.445	13.313	
March.....	3.986		3.835		13.438	
April.....	4.168		4.051		13.297	
May.....	4.287		4.214		13.225	
June.....	4.350		4.291		13.031	
July.....	4.321		4.188		12.563	
August.....	4.363		4.227		12.475	
September.....	4.342		4.215		12.781	
October.....	4.341		4.215		13.175	
November.....	4.370		4.252		13.047	
December.....	4.500		4.459		13.125	
Year.....	4.273		4.153		13.049	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January.....	5.141	6.001	4.991	5.951	21.425	23.350
February.....	4.889	5.569	4.739	5.419	21.563	
March.....	4.757		4.607		21.438	
April.....	4.965		4.815		21.531	
May.....	5.124		4.974		21.975	
June.....	5.402		5.252		22.000	
July.....	5.402		5.252		21.969	
August.....	5.729		5.579		22.125	
September.....	5.796		5.646		22.906	
October.....	6.199		6.043		23.200	
November.....	6.381		6.231		23.188	
December.....	6.249		6.099		23.094	
Year.....	5.503		5.352		22.201	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
	January.....	\$17.18	\$19.90	\$16.40	\$17.98	\$16.26	$17.94
February.....	16.73		16.09		15.90	
March.....	16.40		15.84		15.62	
April.....	15.79		15.05		15.06	
May.....	15.77		15.02		15.08	
June.....	16.13		15.84		15.63	
July.....	16.40		15.90		15.96	
August.....	17.16		16.17		16.20	
September.....	18.44		16.80		17.03	
October.....	19.75		17.84		18.02	
November.....	19.90		18.37		18.09	
December.....	19.90		18.15		17.90	
Year.....	\$17.46		\$16.46		\$16.40	

STOCK QUOTATIONS

COLO. SPRINGS Mar. 1			SALT LAKE Mar. 1		
Name of Comp.	Bid.		Name of Comp.	Cig.	
Listed:			Carisa.....	.56	
Acacia.....	±.057		Colorado Mining.....	.83	
Cripple Cr'k Con.....	±.021		Columbus Con.....	.72	
C. K. & N.....	±.10		Daly Judge.....	4.00	
Doctor Jack Pot.....	.07		Grand Central.....	1.80	
Elkton Con.....	.68		Iron Blossom.....	.90	
El Paso.....	.66		Little Bell.....	1.65	
Fannie Rawlins.....	±.06		Little Chief.....	.45	
Findlay.....	.10		Lower Mammoth.....	.50	
Gold Dollar.....	.09		Mason Valley.....	1.87	
Gold Sovereign.....	±.03		Maj. Mines.....	2.32	
Isabella.....	.16		May Day.....	.19	
Mary McKinney.....	.46		Nevada Hills.....	.52	
Pharmacist.....	±.03		New York.....	.11	
Portland.....	1.05		Prince Con.....	.75	
Vindicator.....	.79		Red Warrior.....	6.00	
Work.....	±.06		Silver King Coal'n	2.50	
Unlisted:			Sioux Con.....	.38	
Golden Cycle.....	±1.50		Uncle Sam.....	.39	
United Gold Mines	±.08		Victoria.....	1.10	

SAN FRANCISCO.

Mar. 1.

Name of Comp.	Cig.	Name of Comp.	Cig.
COMSTOCK STOCKS			
Atlanta.....	.16	MISC. NEVADA	
Belcher.....	1.25	Belmont.....	1.57
Best & Belcher.....	1.75	Daisy.....	.07
Caledonia.....	.87	Jim Butler.....	.11
Challenge Con.....	.48	MacNamara.....	.26
Chollar.....	.31	Midway.....	.25
Confidence.....	1.40	North Star.....	.03
Con. Cal. & Va.....	2.05	West End Con.....	.36
Crown Point.....	1.37	Atlanta.....	.16
Eschequer.....	.27	Booth.....	.16
Gould & Curry.....	.37	C.O.D. Con.....	.10
Hale & Norcross.....	.62	Columbia Mt.....	.06
Mexican.....	2.07	Comb. Frac.....	.31
Ophir.....	2.35	Great Bend.....	.03
Overman.....	1.47	Jumbo Extension	.37
Potosi.....	.73	Oro.....	.06
Savage.....	.64	Red Hill.....	.04
Sierra Nevada.....	.85	Sandstorm.....	.03
Union.....	.95	Silver Pick.....	.09
Yellow Jacket.....	1.30	St. Ives.....	.20
		Tramps Con.....	.05

N. Y. EXCH. Mar. 1		BOSTON EXCH. Mar. 1	
Name of Comp.	Cig.	Name of Comp.	Cig.
Amalgamated.....	77%	Adventure.....	7 1/2
Am. Agri. Chem.....	146 1/2	Allouez.....	56
Am. Sm. & Ref. com	83 3/4	Am. Zinc.....	30
Am. Sm. & Ref. pf	107 1/4	Arcadian.....	7
Anaconda.....	50 1/4	Arizona Con.....	40
Bethlehem Steel.....	31	Boston Con.....	19 1/2
Col. & Hoek. C. & I.	120 1/2	Calumet & Ariz.....	73
Colo. Fuel & Iron.....	39 1/2	Calumet & Hecla.....	632
Du Pont P'd'r, pf.....	185	Centennial.....	26
Federal M. & S.....	181	Con. Mercur.....	10
Great Nor., orctf.....	70 1/4	Copper Range.....	77
Nat'l Lead, com.....	82 1/2	Daly-West.....	8 1/2
National Lead, pf.....	108	East Butte.....	10
Pittsburg Coal.....	22 1/4	Franklin.....	19 1/2
Republic I & S, com	39 1/2	Greene-Can.....	10 3/4
Republic I & S, pf.....	101 1/2	Hancock.....	27
Sloss Sheffield, com.....	176	Isle Royal.....	23 1/2
Sloss Sheffield, pf.....	117 1/2	Keweenaw.....	4 1/2
Tennessee Copper.....	132 1/2	La Salle.....	17 1/4
Utah Copper.....	50	Mass.....	6 1/2
U. S. Steel, com.....	83	Michigan.....	6 1/4
U. S. Steel, pf.....	120 1/2	Mohawk.....	64
Va. Car. Chem.....	55 1/2	Nevada.....	22 1/2
		North Butte.....	37 1/4

N. Y. CURB Mar. 1		BOSTON CURB Mar. 1	
Name of Comp.	Cig.	Name of Comp.	Cig.
Bonanza Creek.....	3	Parrot.....	20
Boston Copper.....	19 1/2	Quincy.....	87
Braden Copper.....	4 1/2	Shannon.....	14 1/2
B. C. Copper.....	7	Superior.....	57
Buffalo Mines.....	3 1/2	Superior & Bost.....	12 1/2
Butte Coalition.....	24 1/2	Superior & Pitts.....	13 1/2
Chino Copper.....	14 1/2	Tamarack.....	73
Cobalt Central.....	17 1/2	Trinity.....	8 1/2
Combination Fra.....	31	U. S. Smg. & Ref.....	45 1/2
Con. Ariz. Sm.....	2 1/2	U. S. Sm. & Re., pd.	50 1/2
Cumberland Ely.....	19	Utah Con.....	32
Davis-Daly.....	3 1/2	Victoria.....	4 1/2
Dominion Cop.....	7	Winona.....	10
Ely Con.....	7 1/2	Wolverine.....	142
El Rayo.....	2 1/2	Wyandotte.....	2 1/2
Florence.....	3 1/2		

LONDON Mar. 2			ST. LOUIS Feb. 26		
Name of Com.	Cig.		N. of Com.	High.	Low.
Dolores.....	£1 10s 0d		Adams.....	.40	.30
Stratton's Ind.....	0 3 3		Am. Nettie.....	.07	.06
Camp Bird.....	1 7 0		Cent. Cr'k.....	1.75	1.50
Esperanza.....	2 18 0		C.C. & C. pf.....	82.00	81.00
Tomboy.....	0 17 6		Cent. Oil.....	110.00	100.00
El Oro.....	1 8 6		Con. Coal.....	20.00	19.00
Oroville.....	0 10 0		Doe Run.....	110.00	100.00
			Gra. Bimet.....	.32	.28
			St. Joe.....	14.00	12.50

±Last quotation.

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MINING AND METALLURGICAL MACHINERY

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SAMPLING AND ASSAYING

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CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—

Carbons, good drill quality, carat	\$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd.	.08
Grains	.10@.17
Corundum	.07@.10
Crushed Steel, f.o.b. Pittsburgh, in kegs; Turkish flour	.05½@.06
Emery, in kegs; Turkish flour	.01½@.02
Grains	.03½@.04
Naxos flour	.01½@.02
Grains	.03½@.04
Chester flour	.01½@.02
Grains	.03½@.04
Peekskill flour, f.o.b. Easton, Pa.	.01½@.01¾
Grains, in kegs	.02½@.03
Gamet, per quality, sh. ton	25.00@35.00
Pumice Stone, Am. Powd., 100 lb.	1.60@2.00
Italian, powdered, per lb.	.01½@.01¾
Lump, per quality	.03½@.30
Rotenstone, ground	.02@.04
Lump, per quality	.04@.20
Rogue, per quality	.05@.30
Steel Emery, f.o.b. Pittsburgh	.07½@.07¾

ACIDS—

Acetic 28%	.02½
Boric	.07
Hydrofluoric, 30%	.02½@.03½
" 48%	.05½
" 52%	.06
" 60%	.09@.10
Hydrochloric acid, 20° per 100 lb.	1.15@1.50
Nitric acid, 38° per lb.	.03½@.04½
Sulphuric acid, 50°, bulk per ton	\$12 up
60°, 100 lb. in carboys	.85@1.12½
60°, bulk, ton	16.00@18.00
66°, 100 lb. in carboys	1.00@1.10
66°, bulk, ton	18.00
Oxalic, per lb.	.07½@.07¾

ALCOHOL—

Grain 95%	gal. 2.60
Denatured	.42
Refined wood, 95@97%	.52@.57

ALUM—

Lump	100 lb. \$1.75
Ground	1.85
Chrome Alum	.04½@.04¾

ALUMINUM—

Sulphate, com'l, lb.	1.50@1.75
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AMMONIA—

24 deg. lb.	.04½@.05½
26 deg. lb.	.04½@.05½

AMMONIUM—

Bromide	lb. .28
Carbonate	.08@.08½
Muriate grain	.05½@.06½
Lump	.09½@.09¾
Sulphate, 100 lb.	2.65@2.75
Sulpho-cyanide com.	.25
chem. pure	.35

ANTIMONY—

needle, lump, lb.	.04½@.04¾
Oxide	.07½@.08

ARSENIC—

white	.02½@.02¾
Red, Outside brands	.07
Saxony	.07½@.08

ASPHALTUM—

Barbadoes	per ton. 50.00@80.00
West Indies	" 20.00@60.00
Egyptian	lb. 11@.16
Gilsonite, Utah ordinary per ton	32.00@40.00
Trinidad	20.00@25.00
California	per ton. 25.00@30.00

BARIUM—

Carb. Lump, 80@90% lg. ton	26.00@35.00
Precipitated, 96@98%	34.00@36.00
Powdered, natural	lb. .02@.02½
Chloride com'l	ton. 35.00@38.00
Nitrate powdered, in casks	lb. .05@.06½
Blanc Fixe, dry, bbl.	per lb. .02½@.03½

BARYTES—

Am. Ground	sh. ton. 12.00@15.00
Floated	17.00@19.00
Foreign floated	20.00@23.00

BLEACHING POWDER—

35% 100 lb.	1.25@1.50
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BLUE VITRIOL—

(copper sulphate), carload, per 100 lb.	4.10@4.35
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BONE ASH—

lb.	.02½@.04
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BORAX, sacks

	.03½@.05
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CALCIUM—

Acetate, gray, 100 lb.	1.90@2.05
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Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton. 65.00
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Chloride, f.o.b. N. Y.	11.00@14.10
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CEMENT—

Slag cement	bbl. .75@1.25
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Portland, Am. 500 lb.	1.50@1.60
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Foreign	2.25@2.90
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"Rosendale," 300 lb. (in sacks)	.85
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CHROME ORE—

New Caledonia 50% ex. ship	
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N. Y. per lg. ton	14.00@16.00
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Bricks, f.o.b. Pittsburgh, per M.	175.00
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CLAY, CHINA—

Am. common ex-dock, N. Y.	ton. 7.00@10.00
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Foreign	10.00@20.00
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COBALT—

Oxide	lb. .80@.85
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COPPERAS—

Bulk	100 lb. \$0.55
In bbls.	.65@.80
In bags	.60@.75

CRYOLITE (carload)

lb.	.06½@.07
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FELDSPAR—

Ground	sh. ton. 6.00@14.00
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FIRE BRICK—

American	per M. 30.00@40.00
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Imported	30.00@45.00
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St. Louis	16.00
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Extra	20.00@23.00
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Special extra	30.00@35.00
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FIRE CLAY—

F.o.b. St. Louis	
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St. Louis, extra quality per ton	5.00
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ordinary	2.50
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FLUORSPAR—

Domestic f.o.b. Pittsburgh	
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Lump	ton. 8.00@10.00
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Ground	12.00@14.00
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Foreign crude ex. dock	8.50
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FULLER'S EARTH—

Lump, 100 lb.	.80@.85
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Powdered	.80@.85
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GRAPHITE—

Ceylon	
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Flying dust, finest to best	lb. .02@.04
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Dust	.02½@.05
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Chip	.04@.08
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Lump	.05½@.12
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Large lump	.08½@.10½
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GYPSUM—

Fertilizer	sh. ton. 5.00
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Ground	4.00@7.00
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INFUSORIAL EARTH—

Ground Am. Best	lb. .01½@.02½
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German	.02½@.02¾
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LEAD—

Acetate (sugar of) brown	
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lb.	.07½@.08
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Nitrate, com'l	.08@.08½
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MAGNESITE—

Greece	
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Crude (95%)	lg. ton. 7.50@8.50
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Calcined, powdered	sh. ton. 26.00@37.00
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Brick, domes, per qual. f.o.b. Pittsburgh	M. 160@200
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MAGNESIUM—

Chloride, com'l	100 lb. .90@1.25
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Sulphate (Epsom salt)	100 lb. .90@1.00
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MANGANESE—

Foreign, crude, powdered:	
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70@75% binioxide	lb. .01@.01½
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75@85% binioxide	.01½@.01¾
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85@90% binioxide	.01½@.04
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90@95% binioxide	.06½
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Ore, 80%-85%	sh. ton. 16.00@32.50
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Marble—Flour	sh. ton. 7.00@9.00
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MINERAL WOOL—

Slag, ordinary	sh. ton. 19.00
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Selected	25.00
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Rock, ordinary	32.00
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MONAZITE SAND—

Guar. 97%, with 5% Thorium oxide, normal	lb. .08 and up
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NICKEL—

Oxide, crude, lb. (77% for fine metal contained)	.47
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Sulphate, single	lb. .10½@.11
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Sulphate, double	.05½@.08
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NITRATE OF SODA—

100 lb. 95%	2.07½@2.10
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95% for 1910	2.07½@2.10
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96% is 2½¢ higher per 100 lb.	
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OZOKERITE—

best	lb. .14@.17
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PAINTS AND COLORS—

Litharge, Am. powdered	lb. .06½@.06¾
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English glassmakers'	.08½@.09½
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Lithopone	.03½@.07
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Metallic, brown	sh. ton. 16.50@22.00
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Red	14.00@18.00
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Ocher, Am. common	8.50.9.00
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Best	12.00@15.00
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Dutch, washed	lb. .02½@.03
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French, washed	.01½@.02
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Paris green, pure, bulk	.17½@.20½
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Red lead, American	.06½@.07
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Foreign	.08½@.09½
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Turpentine, spirits bbl., per gal.	.62@.63½
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White lead, Am., dry	lb. .05½@.06
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American, in oil	.07@.07½
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Foreign, in oil	.09@.09½
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Zinc white, Am. extra dry	.05½@.05¾
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French, proc's, red seal, dry	.06½@.07½
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French, process, green seal, dry	.07½@.07¾
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PHOSPHATES—

Acid	55@60c. per unit
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*Fla., hard rock 77%	7.00@7.50
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land pebble 68%	3.75@4.00
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†Tenn., 78@80%	5.00@5.50
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75%	4.75@5.00
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68@72%	4.25@4.50
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‡So. Car. land rock 60%	3.50@4.00
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*F.o.b. Florida or Georgia ports.	†F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.
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POTASSIUM—

Bicarbonate crystal	lb. \$.07½
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Powdered or granulated	.08
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Bichromate, Am.	.07½@.08
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Scotch	.10½
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Bromide	.20
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Carbonate (80@85%)	.03½@.03¾
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Caustic, ordinary	.05½
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Elect. (90% KOH)	.06@.06½
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Chloride (muriate), 100 lb.	1.90
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Chlorate, powdered	.09@.09½
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Crystals	.08½@.09½
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Cyanide (98@99%)	
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Carloads (30,000 lb.)	18c.
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5-ton lots	18½c.
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Less than 5 tons	.19
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Kainite, long ton, bulk, 8.50; bags	8.50
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Permanganate	lb. .09½@.10½
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Prussiate, yellow	.13@.13½
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Red
