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The Elmore Vacuum Process at Dolcoath

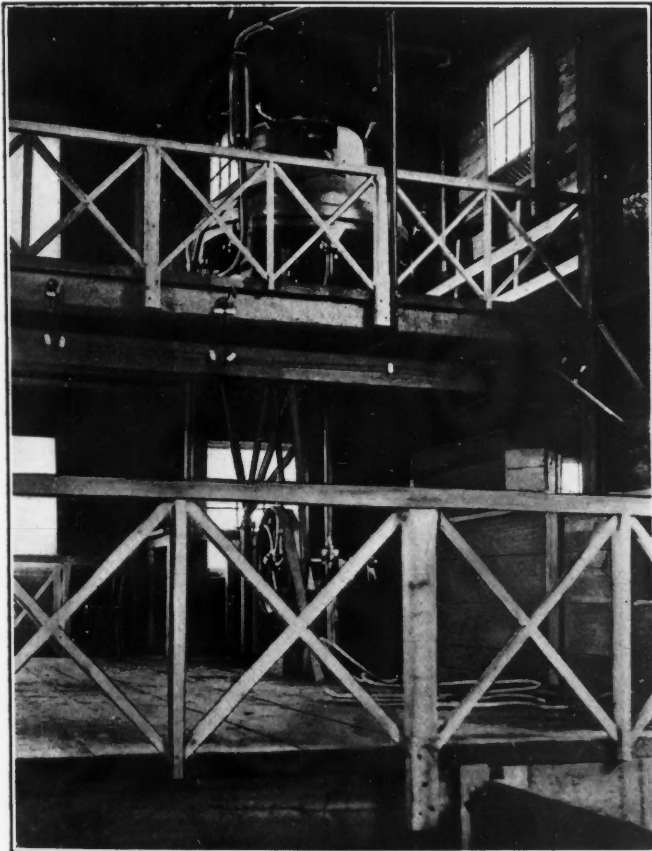
The Complex Tin-Copper-Tungsten Ores of Cornwall, Heretofore Treated With Difficulty, Are now Successfully Separated

BY EDWARD WALKER

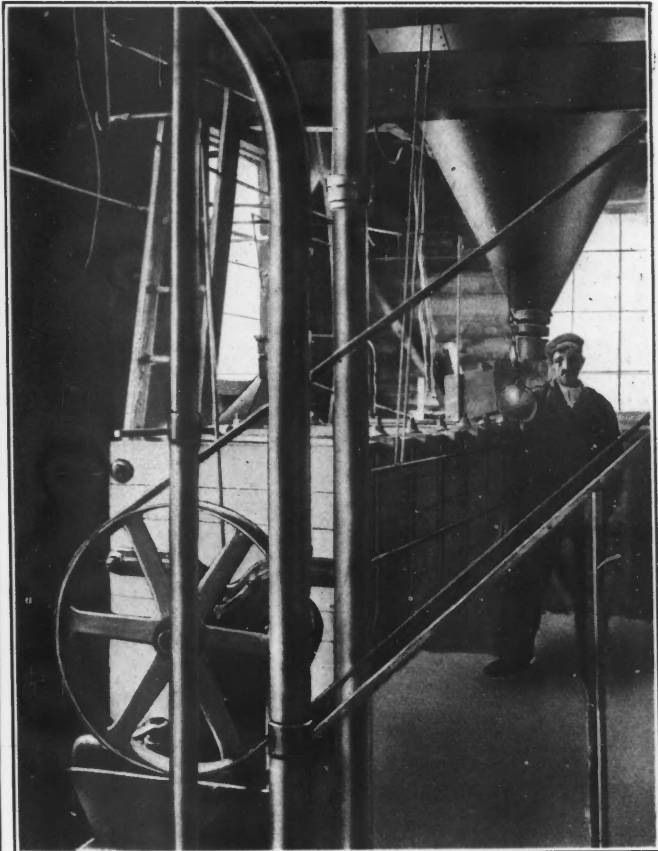
During the current year several references have been made in the pages of the JOURNAL to the concentration process invented by Frank Elmore and known as the "vacuum" process. Stanley Elmore described the process in the issue of May 11, 1907 and I gave some account of the installation at Tywarnhaile in the issue of June 1. Since that time the process has

mining engineers and metallurgists is to give the results obtained in practice. One of the most interesting of all the installations is that at the Dolcoath tin mine in Cornwall. In the accompanying illustrations are shown photographs and sectional drawings of the plant. The problem of ore dressing in Cornwall is a complicated one and until recent years a comparatively

the mines the option of saying whether the ores were to be considered as tin ores or copper ores. If the pyrite content was not great, the mines would burn the concentrates and re-buddle them. In this way the copper would be lost. The advent of modern plant and processes made it possible to deal with complex ores more profitably. For instance, the Wilfley table



VACUUM APPARATUS, WITH AIR-PUMP BELOW



MIXER AND SETTLING TANK

gone ahead rapidly and several plants are already in active operation in various parts of the world. There is a large installation at Sulitelma, Norway, where low-grade copper ores are treated, and there is a plant at Traag in the south of Norway, treating zinc ores. A plant is now being shipped to Broken Hill, New South Wales, for the use of the Zinc Corporation.

CORNISH ORES

After all the main point of interest to

small proportion of the metallic contents of the veins could be utilized. At only a few localities is tin oxide found by itself. As a rule varying quantities of iron, copper and arsenical pyrites occur with the tin and in some cases wolfram, gray copper, etc., are found with it as well. In the old days tin and copper ores could only be separated by hand. The mines never obtained payment from the smelters for both tin and copper values in their concentrates, and the smelters would give

separates arsenical and copper pyrites from the tin, and the Wetherill magnetic concentrator separates wolfram from tin, though at the present time the separation and recovery by these two machines are not by any means complete. The Wilfley table gets the pyrites out of the tin and makes a good tin concentrate, but, owing to the friable nature of the pyrites, the actual recovery of copper is not high. Then again, the magnetic concentrator makes a very clean tin concentrate, but a

great deal of tin goes over with the wolfram. It is said that the tin is made magnetic by the presence of iron particles and the metallurgists are engaged in devising some means of preventing this action.

APPLICATION OF THE VACUUM PROCESS

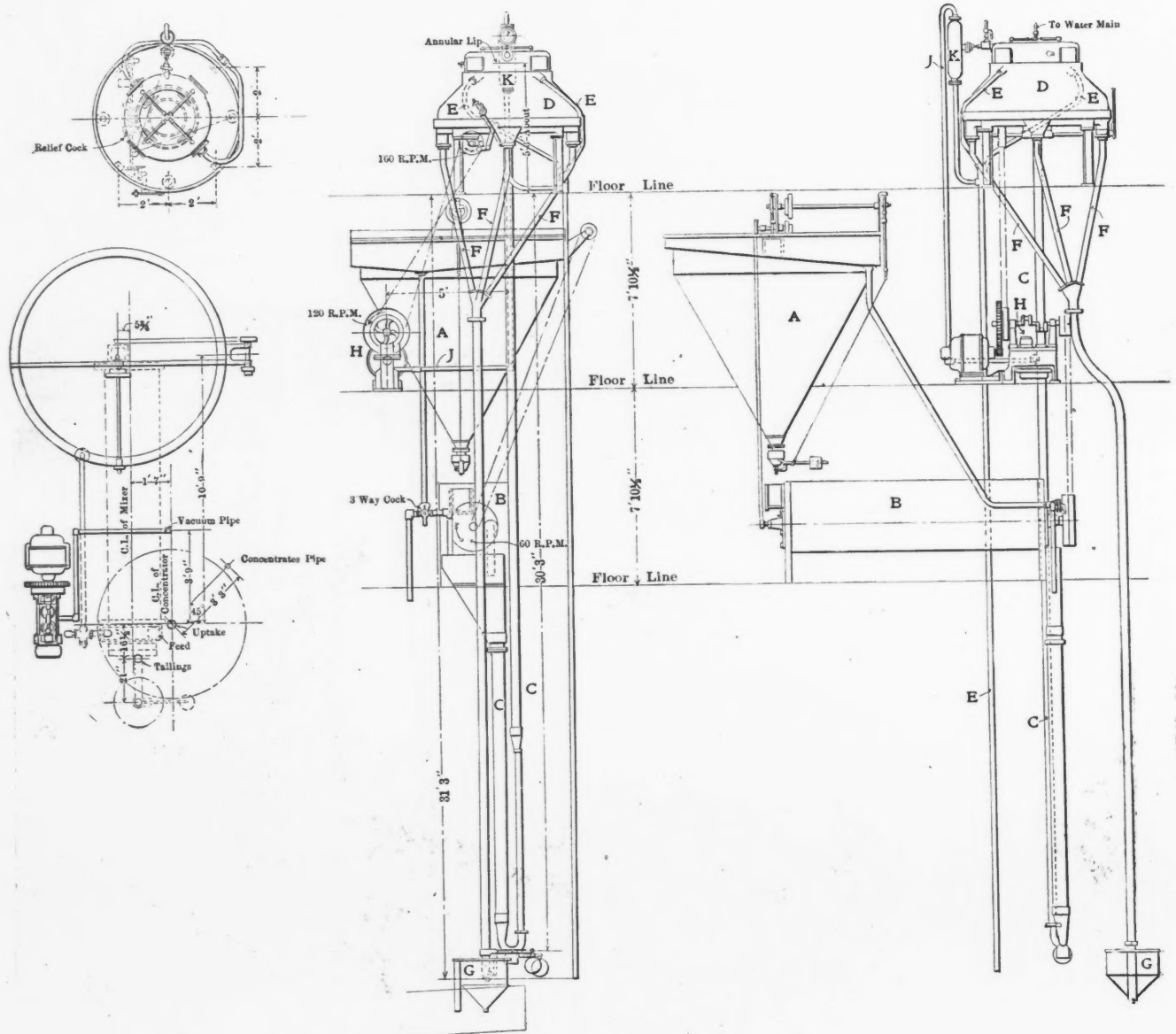
It seems to me that the vacuum process is just what is required in Cornwall to put the finishing touches on the system of ore treatment. It makes a very high extrac-

the vacuum plant, to remove the pyrite and other sulphides, such as blende, which occurs occasionally. The arsenic would be removed from the pyrites by roasting and the residue treated for copper. The tin and wolfram would be dressed out on tables or buddles in the usual way, and the concentrates passed through the magnetic separator. By this system the recovery of all the metals would be satisfactory commercially.

because the ores could not be treated profitably. The vacuum plant that has been put up deals with these ores in a satisfactory manner, and Dolcoath should before long become a producer of copper and arsenic.

THE DOLCOATH PLANT

Referring now to the illustrations, it will be seen that the ore is delivered to a rock breaker, from which it passes to a



ELMORE VACUUM CONCENTRATION PLANT, DOLCOATH MINE

tion of the pyrite, so that the recovery of copper from tin-copper ores is on a business-like basis. In the second place, the removal of pyrite is so efficient that the concentrates of tin and wolfram to be treated in the magnetic separator will be practically free from iron, so that the magnetic removal of iron and the possibility of iron making some of the tin magnetic will not have to be considered. The general method of dealing with these complex ores would be to pass them first through

THE DOLCOATH ORES

We always associate Dolcoath with high-grade tin ores, but there is plenty of copper and complex ores in the veins as well, and in the early days copper ores were worked profitably. There is hardly any wolfram found, though the same lodes in the adjoining mines—South Crofty and East Pool—are full of it. There are several veins in Dolcoath containing copper, arsenic and tin, with here and there some zinc. These veins have not been worked

ball mill. The pulp is pumped up to a thickening tank or settler A, from which it is delivered in regular quantities through an automatic double valve into the mixer B. Acid and oil are also fed into the mixer, and by means of rotating beaters are brought into thorough contact with the pulp. From the mixer it passes into a vessel from whence it is drawn up a pipe C to the vacuum machine D. The concentrates containing the pyrites bubble over as a scum and pass down the two

pipes *E*, and are collected in a tank on the ground, while the tailings containing the tin come down the four pipes *F*, through the tailings valve *G*, and out to the tin-dressing floors. The vacuum pump is shown at *H*. It is connected with the separator by means of the pipe *J*. A vessel *K* is provided to catch any concentrates which may happen to bubble over, and prevent them from getting into the air pump.

The whole of the apparatus is driven by electric current. A 25-h.p. motor drives the rock breaker, ball mill, mixer, and air pump.

TESTS OF THE PROCESS

As regards the results obtained by this plant, it is interesting to find that the very first continuous run gave a satisfactory extraction, although the crushing plant was not doing full duty. The figures for the oil consumption and the amount of ore put through the plant were adversely affected, owing to the ball mill not working up to its expected capacity. Whether this was because the men were not sufficiently acquainted with ball mills, or whether it was due to a defect in the machine I am unable to say. I understand, however, that for other reasons it is intended to replace the mill with stamps. The mill could not keep up with the work of the vacuum plant, and consequently the oil consumption was too great and the work done by the plant too small.

In this first test the machine ran for 43¼ hours and treated 31 tons of ore.

runs at Dolcoath reduced the amount of oil used to 13 lb. per ton, and I have no doubt that the figures will be still further reduced. The figures for the work of the plant are low, as I say, owing to the ball mill not crushing fast enough. The plant only treated three-quarters of a ton an hour. In subsequent runs when the

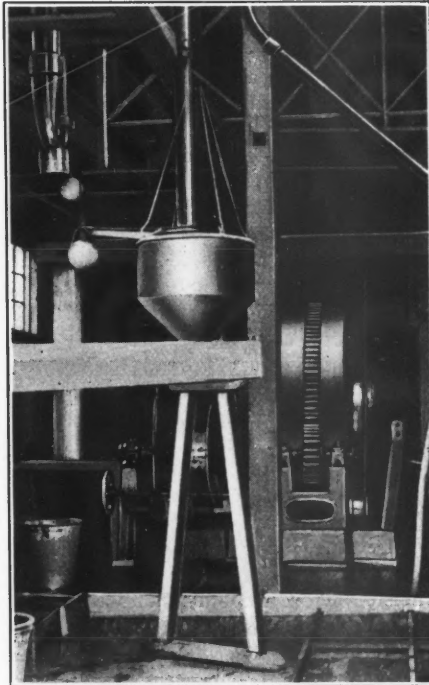
ing of iron and sulphur. Less than 0.5 per cent. of gangue went over with the concentrates. The tailings contained 14 lb. of black tin per ton by the vaning assay, and 0.23 per cent. of copper. The extraction of copper values was 92 per cent. These figures for a first run, and under adverse circumstances, were so promising that R. Arthur Thomas, manager of the Dolcoath, immediately ordered additional plant. Subsequent runs have given slightly better extractions. As much as 96 per cent. was extracted in one case. The ore treated in this plant is heavy in mineral, chiefly iron pyrites. The arsenic and copper occur largely as gray copper and there does not appear to be much arsenical pyrite present.

The question of fine grinding does not require discussion, for with the present results any further grinding would only add to the cost without any appreciable additional extraction. In fact, it is considered unnecessary to produce so much fine product.

The water passing over the settler or thickening tank is not allowed to run to waste, but is returned to the ball mill, so that slime that will not settle is not lost. Eventually everything that comes from the ball mill goes through the separator. When the water in the ball mill becomes charged with slime, the whole of it is sent to the separator without being thickened in the settler.

TREATING THE TAILINGS

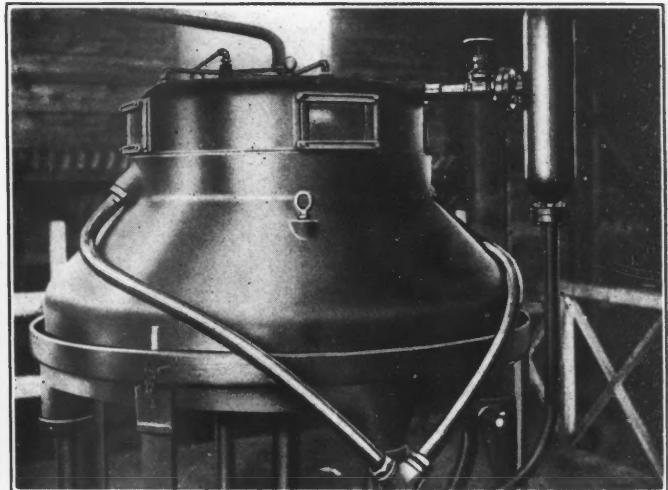
The best method of treating the tailings is now being discussed. As already men-



TAILINGS VALVE AND BALL MILL



CONCENTRATOR HOUSE, DOLCOATH



VACUUM CONCENTRATOR

The pulp was reduced to a size corresponding to a mesh of 20 holes per linear inch. The amount of acid used was 115.9 lb. of sulphuric acid, specific gravity 1.5, and the oil used was 686 lb. of fuel oil, or Texas residuum. These figures work out at 3.7 lb. of acid and 22 lb. of oil per ton of ore. At Tywarnhaile, as I mentioned in my article of June 1 last, the amount of oil used was only 5 lb. per ton of ore, while no acid was used, owing to the acidity of the mine water. Subsequent

plant had a full and continuous supply of ore the duty of the plant rose to 1½ tons per hour, and it is possible that this figure may be increased. With these preliminary remarks I will give the figures of the result.

RESULTS OF THE TEST

The ore fed in assayed 2.41 per cent. copper. The concentrates contained 17.4 per cent. of copper, 8 per cent. of arsenic, 6 per cent. of zinc, the remainder consist-

tioned, the tailings contain tin oxide and some remaining sulphides. It will probably be best to deal with these in the way already in vogue at tin-dressing works. This is to dress the roughs on tables and the slimes on buddles, then roast the concentrates to reduce the sulphides to oxides, and dress again to remove the oxides of iron, etc.

Some engineers propose to use a preliminary dressing of the ore by water concentration before sending it to the vacuum

plant. Personally, I do not see the need for this duplication of plant, for the action of the vacuum plant is rapid and effective, and it will treat roughs as efficiently as fines. There is no physical reason for limiting the application of the plant in this way.

The Zinc Industry of Great Britain During 1906

By EDWARD WALKER

The output of zinc ores in Great Britain during 1906 amounted to 22,824 long tons of dressed ore, almost entirely blende, as compared with 23,909 tons during 1905. The largest individual producers were the Nenthead mine, in Cumberland, with 3975 tons; the Carshfield, in Northumberland, with 3143 tons; the Minera, in Denbigh, with 2568 tons; the Trelogan, in Flint, with 1831 tons; the Cwnytwyth, in Cardiganshire, with 1198 tons; and the Great Laxey, on the Isle of Man, with 2017 tons. There were altogether 35 producing mines, chiefly in Cumberland and Northumberland, North and South Wales and the Isle of Man.

The metallic contents of the dressed ore varied from 40 to 59 per cent. The highest figures were obtained by the Minera, which returned 59 per cent. zinc contents. The average contents were between 46 and 47 per cent. It is estimated that the extraction by smelting is only from 76 to 85 per cent. of the metallic contents of the dressed ore, and the official return of the zinc obtainable from the 22,824 tons of ore is 8539 tons, thus making the average available metallic contents only 37½ per cent. of the ore. As an example, the Minera, mentioned above as having 59 per cent. metal, is returned as extracting only 78 per cent. of the metallic contents. This ore is smelted by the Vivians and Dillwyns, at Swansea.

The amount of dressed ore exported during 1906 was 12,942 tons, being chiefly Northumberland and Cumberland ores going to Belgium. The total quantity of zinc ores imported during the year was 58,902 tons, all of which went to Swansea. These consisted of various grades of blende and calamine, and no exact estimate of their contents is given.

The Trelogan mine in Flint is worked by Brunner, Mond & Co., and the zinc ores obtained are used for the extraction of zinc by the Hoepfner electrolytic process at Northwich.

In the Government report the list of zinc smelters in the United Kingdom includes the Minera, which it says is "not in use." This smelter was only used for a short time and has not been in operation for a number of years. There is not the smallest prospect that it will ever be re-started, so mention of it might as well be dropped out of the reports.

Cost of Shaft Sinking at Goldfield

By PERCY E. BARBOUR*

Very few data on mining costs in Goldfield have ever been published, probably for two reasons: Costs of work by leasers were not kept systematically and would have been of little value, as time and not economy was of first importance; systematic work by owners has but just begun, and it is almost too early to expect costs to be given away.

The shaft, respecting which data are here given, is located on the Daisy property in the Diamondfield district of Goldfield. It was started by a leaser and sunk to a depth of 102 ft., at a cost, as stated by him, of \$80 per foot. The next 100 ft., sunk under my supervision, was accomplished in 31½ days of three 8-hour shifts each. The first 50 ft. were comparatively easy ground to work, 33 ft. being accomplished the first week. Then a new formation, a hard black andesite, was encountered, and 19 ft. was a good week's work. The last week only 16 ft. were made. It was necessary to increase the round from 7 to 14 holes and even then, to accomplish results, the cut holes were fired and the muck hoisted before the other holes were shot.

The shaft was 4x8 ft. in the clear, timbered with square shaft sets of 6x8-in. timbers, 5 ft. 6 in. centers. Dividers and posts were of 6x6 in. and guides of 4x4 in. material. The shaft was lagged throughout with 2-in. plank. Each set required the following timber:

Pieces.	Size. Inches.	Length. Feet. Inches.
2 wall-plates.....	6 x 8	9 0
2 end-plates.....	6 x 8	5 0
1 divider.....	6 x 6	4 2
6 posts.....	6 x 6	5 1
27 lagging plank.....	2 x 12	5 6
Guides.....	4 x 4	11 0
Ladders.....	1 x 4	6 0
	2 x 4	11 0

This made a total of 539 ft. per set, plus waste in cutting, which was used for blocking, and was about 61 ft., making 600 ft. per set. In all 18 sets were required for the 100 ft. of shaft, so that 10,800 ft. of lumber and timber were required; say for computation 11,000 ft. The total cost of the shaft then figures as follows:

	Total Cost.	Cost per Ft.
11 M feet timber @ \$55.....	\$ 605.00	\$ 6.050
50 wedges per set, say 1000 in all @ 2½¢.....	25.00	0.250
1989 ft. "Bear" fuse = 1¼ case @ \$10.50.....	13.13	0.131
356 lb. 40 per ct. dynamite @ 15¢ 403 caps = 4 box, 4x, caps @ 80¢ 628 candles, 14 oz. 6's, 2.6 boxes @ \$6.....	15.60	0.156
100 ft. 6 in. galvanized air pipe @ 30¢.....	30.00	0.300
Miners @ \$5 and topmen @ \$4.50.....	1,586.65	15.867
Holsting engineers.....	475.00	4.750
One-half time of 1 man sharp- ening and framing @ \$6.....	93.00	0.930
One-third time of foreman @ \$7 Electric power 30 h. p. hoist @ \$9 per h. p. per month.....	72.50	0.725
Oil, waste and grease (est.).....	270.00	2.700
	2.00	0.020
Total.....	\$3,244.48	\$32.445

*Mining engineer, Goldfield, Nevada.

The excessively high price of everything required—supplies, labor and power—will be noted. This is the reason that ore under \$50 per ton cannot be profitably handled in Goldfield at present.

Chinese Metal Trade

In a recent consular report Consul Thornwell Haynes, of Nankin, says that in 1906 trade in the Chinese Empire was carried on under many adverse conditions. Severe floods and droughts accompanied by extensive internal disturbances produced general impoverishment and in some cases severe famine, especially in south central China. Changes in the currency have reacted to the detriment of the poorer classes of the population. The old cash has been replaced by the new copper cent with a face value 10 times as great with consequent increase in prices and restriction of petty trade. The metal trades were adversely affected by these conditions, as the following statistics of imports show:

	1904. (tons.)	1905. (tons.)	1906. (tons.)
Copper.....	15,401	64,400	4,171
Lead.....	11,094	9,552	9,945
Nickel.....	184	162	111
Quicksilver.....	87	78	70
Spelter.....	955	2,164	529
Zinc (sheets and plates).....	439	304	731
Tin.....	4,263	3,611	2,419
Tin plates.....	9,263	11,643	15,789
Brass and yellow metals.....	2,142	1,834	1,704

The extraordinary drop in the copper imports is due to the satisfaction of the requirements of new coinage. It will generally be realized that China cannot be an increasing consumer of copper until her requirements of iron and steel reach a much higher figure than prevails at present. The tin imports show a marked decrease, probably on account of the higher market price.

The following exports are reported in tons:

	1904.	1905.	1906.
Antimony, regulus and refined.....	(a) 3,696	4,221	4,221
Antimony ore.....	775	2,552	3,994
Lead.....	.....	.....	6
Lead ore.....	.....	1,546	2,728
Quicksilver.....	.....	25	18
Tin.....	3,355	5,020	4,637
Zinc.....	.....	45	81
Zinc ore.....	.....	7,753	8,462

(a) Included in antimony ore.

In the matter of exports less tin was shipped out of the country in 1906 than in the previous year. Antimony, on the other hand, benefited by the high prices and its production was increased though not to such an extent as to suggest any marked recuperative power in the Chinese workings.

In operating injectors it must be remembered that at certain points on high steam pressures the condensing powers of hot water are not sufficient to cause a flow of steam in the injector. Consequently when it is attempted to feed a high-pressure boiler with water much over 120 deg. F. trouble is usually experienced and a specially designed injector must be used.

The Sulphur Mines of Louisiana

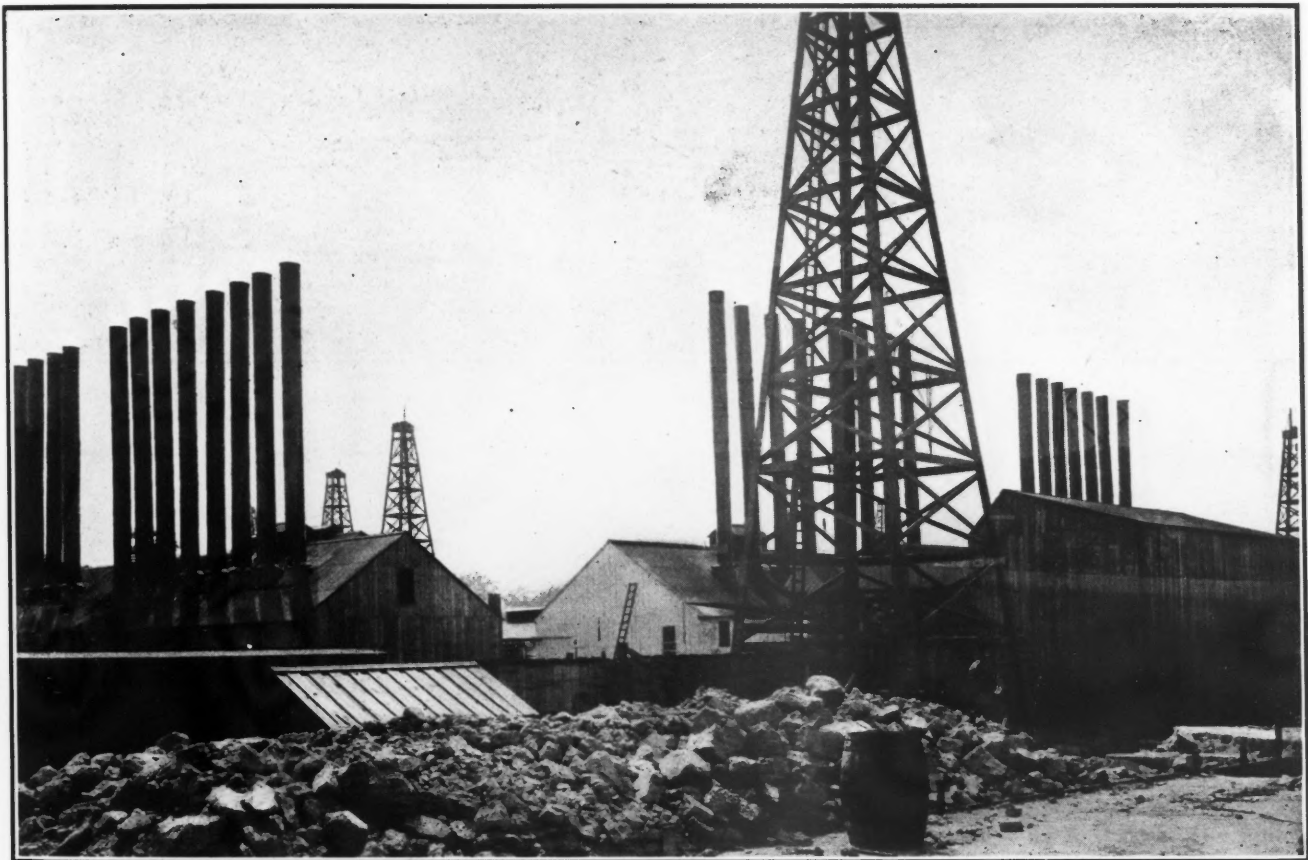
DAY ALLEN WILLEY*

The existence of sulphur in Louisiana in remarkably large deposits has been known for over 30 years; borings made before 1880 in the parish of Calcasieu for the purpose of discovering petroleum penetrated beds containing this material. The deposits are covered with strata of clay, sand and gravel resting upon a foundation of limestone. The sulphur is generally believed to occur as an impregnation in the limestone, but no reliable means of determining the actual percentage of

the surface. The hot water flows down between the 10- and 6-in. pipes, passes out into the limestone and supplies the heat which melts the sulphur. The amount of sulphur melted and the range of action of the water depend solely on its temperature and the pressure at which it is supplied, which in turn, is a function of the depth of the well. It is obvious that the hot water can penetrate through the cracks, pores and crevices of the limestone until its temperature has fallen to that of the melting point of sulphur. The melted sulphur, being heavier than water, runs back to the sump around the well pipe and enters it through holes provided for this purpose. Hot compressed air is

rectangular vats are constructed on the ground out of rough planking. The vats are sometimes arranged so as to have two standard railroad tracks between them, the track level being so low that the floor of the cars will be flush with the bottom of the vat. This arrangement is not universal, for the location of the vats is not permanent, but depends on the location of the wells, the rate at which they flow and convenience in handling the solid sulphur. The dimensions of the vats are likewise varied. A vat 250 ft. wide, 350 ft. long and 40 ft. high is usually served by three wells.

The vats are not filled as one would fill a water tank; the successive sulphur



GENERAL VIEW OF WORKS AT SULPHUR MINE, SHOWING PILES OF SULPHUR IN FOREGROUND READY FOR SHIPMENT

sulphur that the limestone contains is at hand. The method of winning the sulphur is very ingenious and has been described several times. In brief it consists in drilling a well through the various strata to the sulphur-impregnated limestone, melting the sulphur in place by heat and raising the liquid element to the surface through pipes.

The well is driven in practically the same manner as in the case of petroleum prospecting. In each well four lines of pipe are placed concentrically, 10, 6, 3 and 1 in. in diameter respectively. The spaces intervening between the pipes are used to carry hot water and compressed air into the strata and to conduct the sulphur to

forced down through the 1-in. pipe; at the bottom of the pipe it mixes with the melted sulphur, and forms an areated mass which is sufficiently low in specific gravity to allow the water pressure to elevate the melted sulphur to the surface where it is discharged into vats.

HANDLING AND STORING

The quality of material secured by this method of extraction must necessarily be superior since the process of extraction also partakes of the nature of a refining operation. Analyses of material ready to ship frequently show more than 99 per cent. sulphur. In preparing the material for shipment the only problems to be overcome are of a mechanical nature. Large

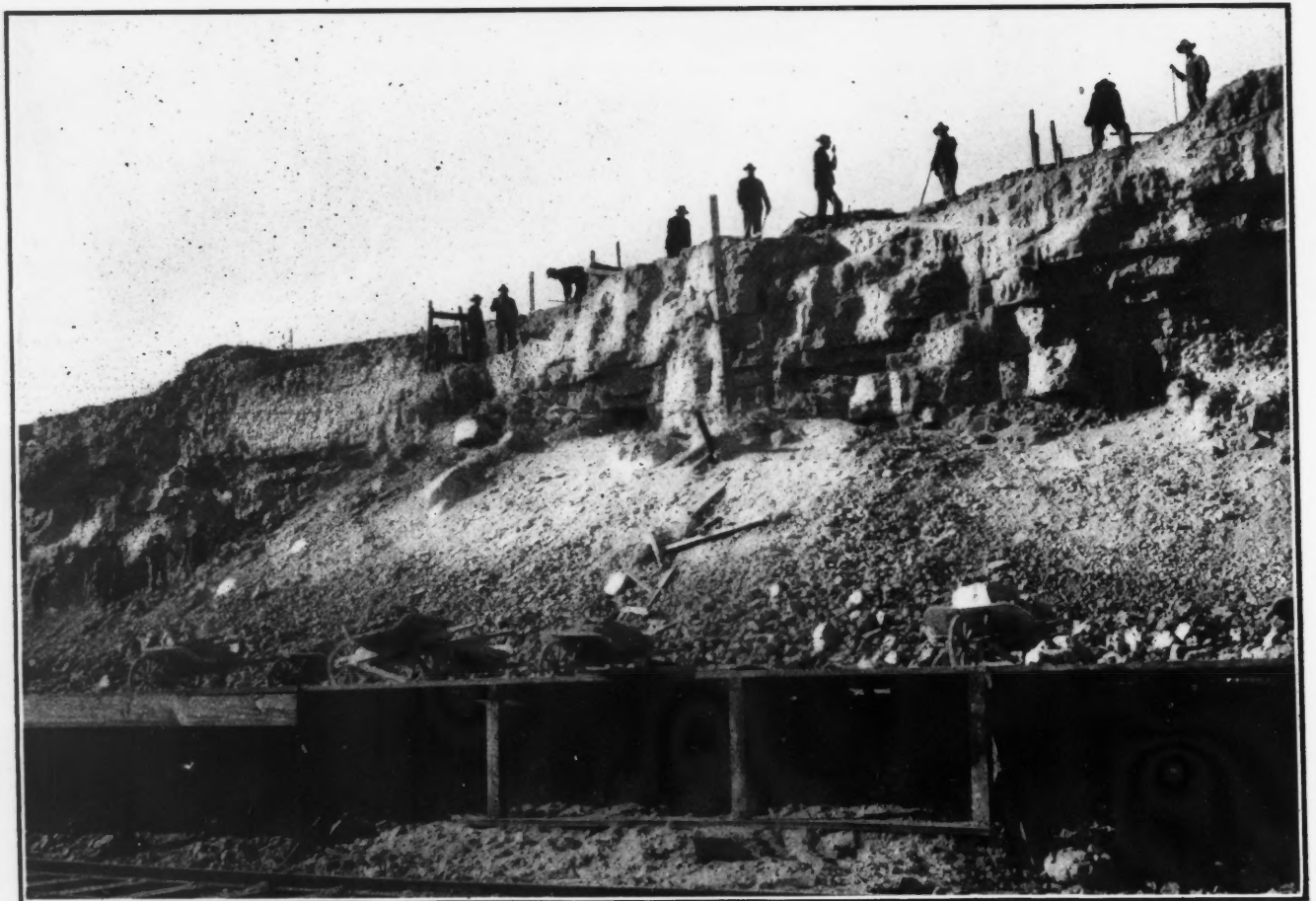
layers are only approximately parallel to the vat bottom. This is because the streams are directed to one part of the vat until the sulphur is relatively steep there, its viscosity preventing it from reaching a level at once. The stream of molten sulphur then turns itself to another part of the vat while the first section cools. In this manner evaporation and cooling go on simultaneously with filling. Sometimes, however, pockets and lenses of sulphur remain liquid in the center of the vat until long after the greater bulk of the material has solidified. This molten material runs out during the process of demolishing the sulphur block when it solidifies rapidly.

The solidified sulphur is brittle and

*Porter building, Baltimore, Md.



SULPHUR BIN STRIPPED OF ITS COVERING AFTER THE SULPHUR HAS SOLIDIFIED



BREAKING UP SULPHUR

easily broken up by picks, crowbars and shovels, which is, indeed, the method used. Laborers break the lump sulphur and tram it to cars in wheel-barrows. As the working face of the sulphur block recedes from the car track, blasting is used in order to break up the material more quickly and thoroughly. The company is said to be contemplating the installation of steam shovels in order to handle its product more cheaply and more expeditiously. At the ocean shipping port where the freight cars are discharged into steamers, various mechanical devices are in use such as bucket and belt conveyers, stackers and orange-peel buckets so that steamers may be loaded in a comparatively short time. Six hours is said to be the average time at present required to fill a steamer's hold.

Antimony Ore Smelting in Australia

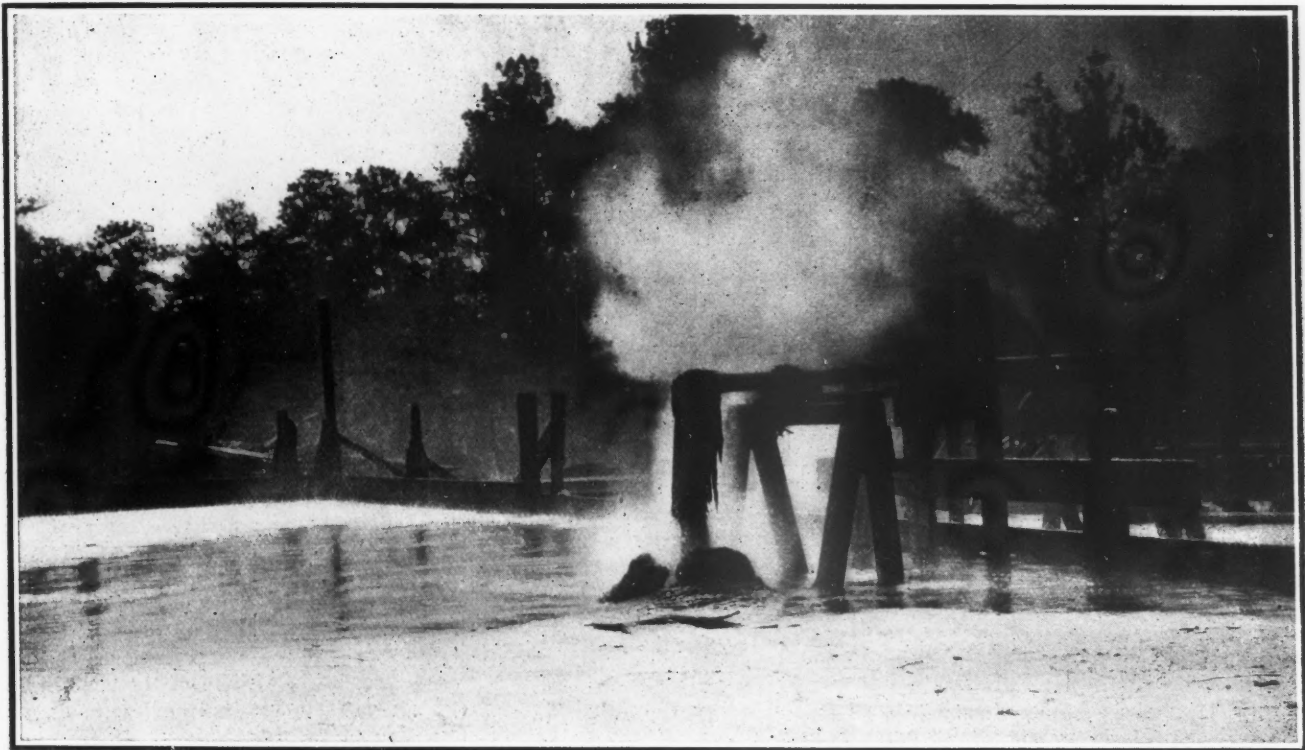
A brief description of the first smelting establishment for the reduction of antimony ores in Australia is given in the *Queensland Government Mining Journal* (August, 1907). The works are erected in Balmain, Sydney, and are owned by the Metals Smelting Company. A reverberatory furnace and the necessary supplementary plant were erected, and smelting was started during February, 1907. The company is now turning out about 24 tons of star antimony regulus per month, and shows an extraction of about 91 per cent. of the ore content. The refined regulus is produced in one operation,

New South Wales, which is a district producing a considerable amount of antimony ore. Moreover, producers of ore in New Zealand and Queensland now find it advantageous to dispose of their product at Sydney.

Abandoned Claims in the Yukon Territory

SPECIAL CORRESPONDENCE

Gold Commissioner F. X. Gosselin, in interpreting the abandonment amendment of the Yukon placer mining act, enacted at the last session of parliament of the interior, said that aban-



LIQUID SULPHUR PUMPED FROM DEPOSITS INTO VATS FOR SOLIDIFICATION

At present about 30 wells are in operation, the scene resembling the oil fields in Pennsylvania or Texas, the well rigs being similar in shape and proportions. An extensive system of boilers, rated at 24,000 h.p. supplies the superheated water used in the extraction process and delivers the water at the wells at 335 deg. F. By far the greater portion of the product is shipped to consumers direct, the part which is refined being relatively insignificant in quantity.

According to the *Chem.-Zeit.* (Oct. 23, 1907) borax occurs in Tibet in large quantities on the banks of lakes and rivers. Large exports were formerly made to Europe, but they have now dropped to scarcely 100,000 kg. per year.

and the starting of the metal is done subsequently in a separate furnace reserved for that purpose.

The works are very little affected by variations in price of antimony, as the smelter's margin remains the same whatever market prices may be. Moreover, the establishment of a smelter of this character is of very great importance to the producers of antimony ore, as now they can sell large stocks of ore ranging from 20 to 30 per cent. antimony, which previously had been thrown aside in the process of picking ore which was done in order to bring its antimony content up to 50 per cent., the minimum grade that could be exported to Germany and England with any profit. The company has stationed a purchasing agent at Hillgrove,

and the ground cannot be relocated until the new law is compiled with, which provides that the ground cannot be staked within 10 days. Every one will have an equal chance at the relocation. A notice of seven days must also be given by posting in the office of the recorder, so that, in order to make the relocation legal to anyone, the notice as well as the abandonment certificate must be in evidence the required time. Should a claim be given up now, and notice duly posted, the former owner cannot have a confederate stake the ground without taking the risk of many others going and participating in the division of the claim by staking simultaneously at the moment the ground comes open for staking.

Lake Superior Iron-ore Prices

SPECIAL CORRESPONDENCE

There is some discussion of Lake ore prices for next year, though nothing will be done for some time in fixing a rate. There is little doubt of a reduction in price, but this will be small, on account of the scarcity of merchant sellers, especially of bessemer ores. The talk now is for a cut of 25c. a ton in Mesabi bessemer and of 50c. in Mesabi non-bessemer, bringing these ores to \$4.50 and \$3.50, respectively. The prices of this year, made last winter, were as follows: Old Range bessemer, \$5; Mesabi bessemer, \$4.75; Old Range non-bessemer, \$4.20; Mesabi non-bessemer, \$4. There is also talk of a further reduction of the bessemer guarantee, this time to 50 per cent. While there is no doubt that guarantees of iron and phosphorus have not been very closely held to this year, even after the drop in the standard from 56.70 per cent. to 55 per cent. a year ago, it is scarcely possible that any such drastic change as now referred to will be made at this time. Of course such a change in price and base would put bessemer ores of the Mesabi really higher than now, the expected 25c. reduction in price being more than offset by the change in grades.

It is true, of course, that standards have not been well kept up to this year by shippers, and that penalties for lower grades shipped than contracted have been general. But it may be doubted if this is so much due to any diminution of iron content in the bessemer mines as to excessive and urgent demands upon them. These demands have prevented as careful mining as usual, and have caused them to put into shipments ores from any place they could be got, regardless of the fact that these mixtures brought down grades severely. Slightly more careful sorting of ores would have maintained grades better. It is probable, from this view of the situation, that next year's shipments can be held closer to guarantees. There will not only be a smaller tonnage, but more openings from which it can be taken. There is no famine in bessemer ores, as some of the consumers who have been trying to get it this year, and have failed, seem to believe, and most of the bessemer mines are holding their bessemer tonnage fairly well, but they have been forced to mine from non-bessemer parts of their mines, in order to get out requirements, and in this way higher phosphorus, lower iron, excesses of silica, etc., have crept in to such an extent that it has seriously discommoded the consumers in many cases.

It must be remembered that the number of bessemer merchant mines is constantly diminishing, while the greater number of new finds are not of bessemer character. Very little bessemer iron ore is mined on

either the Marquette or Menominee ranges—practically none on the latter; the bulk of the Gogebic production is Steel Corporation ore, and a good deal of what is left is owned by other steel-makers who are no more anxious to sell than is the corporation; the Vermillion is owned entirely by the corporation. Nothing is left but the Mesabi, and all the steel-makers are entrenched there. A few of them have an excess of bessemer which they are willing to trade for ores more adapted to their individual needs, some of them being fortunate enough to have plants that will make steel out of high-phosphorus ores. Aside from these the merchant-ore firms are quite reduced in number, and can be counted on the fingers. New finds on the Menominee, and that seems to be the most favored exploration district now, are of non-bessemer ores. There is only a mine or two on that range that produces bessemer ore, and future discoveries there are more than likely to add little or nothing to reserves of that nature. Whatever ores, available in the present generation, the new Cuyuna district will produce will probably be excessively high phosphorus.

Ore prices since 1900 have been as follows:

Year.	Old Range bessemer.	Mesabi bessemer.	Old Range Non-bessemer.	Mesabi Non-bessemer.
1900..	\$5.50	\$4.50	\$4.25	\$4.00
1901..	4.25	3.25	3.00	2.75
1902..	4.25	3.25	3.25	2.75
1903..	4.50	4.00	3.60	3.20
1904..	3.25	3.00	2.75	2.50
1905..	3.75	3.50	3.20	3.00
1906..	4.25	4.00	3.70	3.50
1907..	5.00	4.75	4.20	4.00

For all years to 1907 the standard on bessemer ores was: Iron, 56.70 (dry, 63 per cent.); moisture, 10; phosphorus, 0.045; but for the last year this was reduced to 55 per cent. natural iron.

The price of standard Old Range lake ore delivered at Lake Erie, has averaged \$4.59 per ton, for the past 25 years.

Landslide at Crow's Nest Pass

SPECIAL CORRESPONDENCE

Miners employed at the Crow's Nest Pass Coal Company's Coal Creek mines, distant about four miles from Fernie, British Columbia, fearing a fall of the mountain above the entries to the coal mines and the neighboring town in which they and their families live, telegraphed to the provincial department of mines requesting that official examination into the condition of the mountain be at once made. The local Government inspector of mines was at once instructed to report by telegraph and the provincial mineralogist was sent up from Victoria to make an examination, so as to satisfy the Government that the fears of the miners were groundless. There has not yet been time for the provincial mineralogist, W. F. Robertson, to ascertain the

conditions, as he has only just commenced his examination, but in the meantime the fissure in the mountain has been carefully examined, under instructions from G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, by James D. Hurd, of Illinois, and the following officials of the company: R. G. Drinnan, general superintendent; James McEvoy, chief engineer and geologist, and Andrew Colville, mine superintendent. All concurred in making the following report:

"Acting on instructions we have examined the fissure in the mountain north of Coal Creek. It is simply a widening out of the old natural jointage planes in the rocks. From its position, should any fragments ever be loosened they would fall into the valleys or draws behind or to the west of the colliery, and not in the direction of Coal Creek town or plant, but in any case would not come a quarter of the way down the mountain side on account of the slope at this point. But we do not anticipate that even small fragments will so break away.

"The rocks are almost horizontal in the mountain and even if the crack should at some remote time extend to the bottom, which is not likely, the cut off portion of the mountain would be just as stable as the rest, as the slope of the mountain is less than the angle of rest.

"In the Rocky mountains, owing to the wear of nature, small fragments of rock break off occasionally, but never reach the bottom where the slope is as it is in this case.

"In our opinion there is absolutely no danger whatever to life or property at either the mines or the town of Coal Creek from the existing conditions or from any result of these conditions which in our opinion could happen."

In order to allay apprehension among the miners and others employed about or living in the vicinity of the mines, many of whom remember the fearful destruction of property and loss of life caused by the big rock-slide that occurred in April, 1903, at Frank, Alberta, distant about 50 miles from the Coal Creek colliery, this report has been printed and distributed among all immediately concerned and has also been published in the local newspapers.

In a paper read recently before the American Iron and Steel Institute, upon the results of an investigation of the influence of varying percentages of carbon in the presence of a constant content of tungsten, says the *Engineer*, it was stated that 3 per cent. of tungsten raises the tenacity of the steels without materially lessening the ductility, while the elastic ratio is much higher than for carbon steels. The tenacity is at a maximum when the carbon content is 0.9 per cent., but above this percentage brittleness occurs.

A-B-C of Steam Percussion Drill Practice

Practical Suggestions for Unloading, Moving and Setting up
Keystone Drills Used in Testing Placer Ground in California

BY JOHN POWER HUTCHINS*

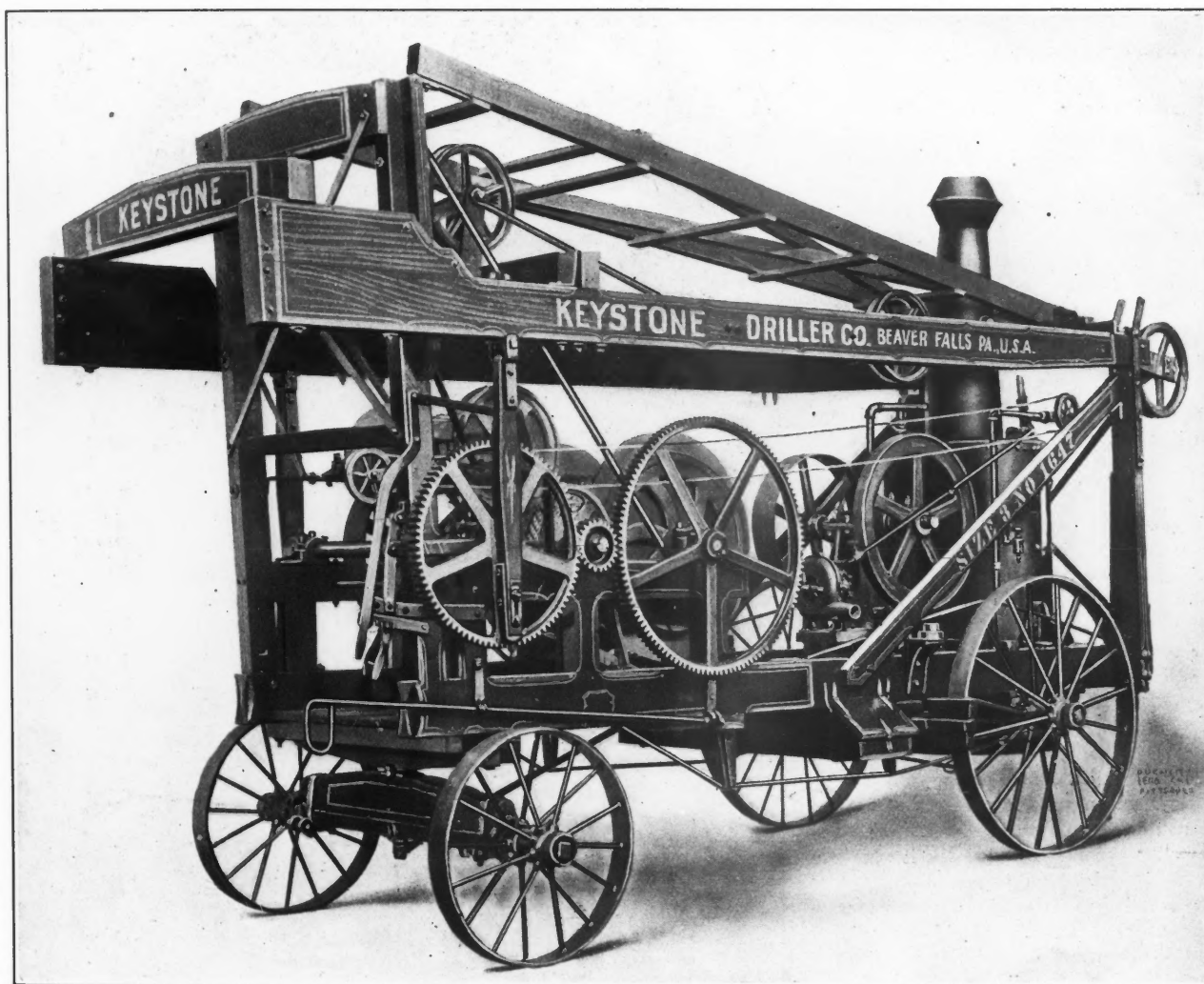
During the last 15 years gold dredging has become a most successful operation in the United States. Some of the factors that have favored this development are the improved methods for testing ground which have been evolved during that time. Of course, success has been largely mutual; methods of prospecting have been proved reliable by the

this information in such a way that the results of the operations of machinery installed can be predicted with remarkable accuracy, is a most important one. It is due largely to the use of steam percussion drilling machines that this fortunate condition exists.

It is usually a slow, difficult, costly and uncertain procedure to investigate with

tion of the metallic content. This is made unreliable when large volumes of water flow through loose gravel, even through lagging. It is also difficult to get all the metallic particles from the bottom of a shaft where it may be necessary to shovel the material from a sticky bottom under water.

The steam percussion drill is capable



KEYSTONE NO. 3 NON-TRACTION DRILL, COG HOIST, USUALLY SUPPLIED WITH FRICTION HOIST FOR PLACER INVESTIGATIONS

subsequent operation of the dredge, and that has given confidence in the testing operations. Prospecting as now carried on constitutes a new branch of placer mining. The fact, now generally recognized, that it is possible to get accurate knowledge of the numerous characteristics of subaqueous alluvion, and to use

*Consulting mining engineer, 52 Broadway, New York.

shafts the generally low-lying areas now being successfully dredged. This is due to several factors. Dredging gravel is generally so loose as to require close timbering and lagging, and the large flow of water usually encountered makes large pumping capacity necessary; all of these make for slow, difficult and costly progress. But the most important consideration is, of course, the definite determina-

of working in material of this kind, is not hampered by an excess of water in loose gravel in the slightest degree and, therefore, presents many advantages for testing placer ground. It may also be used for sampling river, lake or sea bottoms where caissons, diving bells or other mechanisms requiring compressed air would be necessary to allow men to work under water. Its cheapness and mobility,

its high rate of speed and low cost of operation are additional advantages. Its use is not limited to sampling alluvial deposits, for it can be employed with equal success in formations of other kinds.

It is not the object of this article to go into the advantages and disadvantages of the drill and the shaft method of investigating placer deposits. My purpose is to describe and illustrate in detail the steam percussion drill, its equipment, its crew and its manipulation. The ordinary difficulties will be noted and it will be attempted to make this paper what it aims to be, the A-B-C of steam percussion drill operating in testing alluvion. Many detailed descriptions of seemingly simple procedures must therefore be given, and it will be assumed that these are necessary for a full understanding of the subject.

The machine generally used is the Keystone No. 3 traction drill. Its design and construction are so suitable for placer investigations that its use is general. Its spudding arrangements have been largely responsible for its adoption, for they lend themselves particularly to processes which give accurate results in auriferous placer prospecting. Its powerful and reliable traction device also renders it suitable for testing shallow ground where many moves must be made, usually over rough, rocky, sandy or muddy surfaces. The following description will serve as an example of a typical Keystone drill operation in California:

UNLOADING

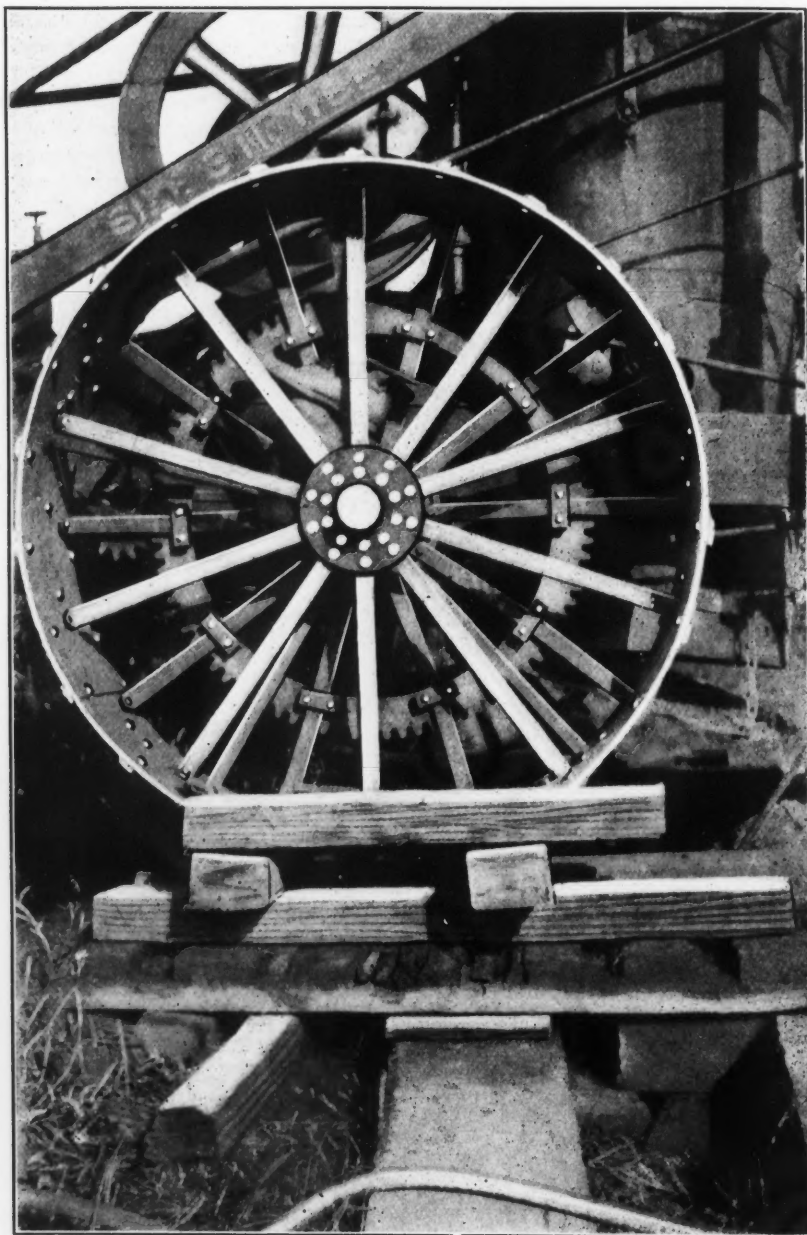
Suppose the drill to have arrived at the railway station mounted on a flat car. There are two common ways of unloading, depending partly on the existence or non-existence of a station platform. In case there is a platform it is sometimes convenient to run the drill from the flat car over the planks or steel sheets, which are commonly used in unloading heavy machinery of various kinds. The drill may then be run over the platform on 3x12-in. planks down the incline to the ground, if the position of the incline permits; otherwise it is necessary to improvise an incline, using two 3 or 4x12-in. 16-ft. planks with cribbing every 4 or 5 ft. The planks must be staked or otherwise firmly fastened to prevent movement while the drill is descending. All supports of the platforms, bridges and culverts should be carefully examined before the drill is taken over them; the loss of much time may be avoided if this precaution is taken. The No. 3 Keystone traction drill weighs with its load more than six tons, and it is therefore rather heavy for most bridges. In addition to this weight several hundred pounds of equipment are usually carried in the bed of the drill.

In unloading it is usually preferable to

take the drill directly from the flat car to the ground. The drill can be taken off either forward or backward, although it is usually taken forward because turns can be begun to better advantage as soon as the front wheels strike the ground; they are the steering wheels, and the greater width of the rear tires aids this procedure. Another reason for taking

power or with blocks and tackle and four horses. When blocks are used the tackle removes the danger of turning over backward. Blocks and tackle are not ordinarily used, for more time is consumed in this way, though there is less danger of accident when an experienced drill man is not in charge.

The end of the flat car opposite to that



METHOD OF BLOCKING UP DRIVE WHEEL.

the machine off head first is the danger of "turning over backward" when the drill is backed off a car by reason of the concentrated weight on the rear wheels. This is particularly likely to happen when short planks are used, the incline to be negotiated then being steep. Since the derrick is down during moving operations the danger of a backward turn is to that extent greater.

Drills may be unloaded with their own

from which the drill is to be taken must be securely and tightly chained to the rail to prevent tipping or moving and disarranging the planks when the weight of the drill begins to bear on the incline. This is superfluous when the car is a heavy one. The car wheels must be blocked on both sides of one wheel to prevent movement; this is easily done with the 1½-in. or 2-in. drive-clamp bolt nuts. The drill is taken straight off the car and

straddles one rail over which it later passes on planks. The degree of inclination which may be safely used is about 4 in 16; the floor of a flat car is about 4 ft. above the rails. Care must of course be taken while the drill is on any steep inclines under its own power to prevent its running away. Keeping the reverse lever "on center" will hold the machine on any ordinary incline.

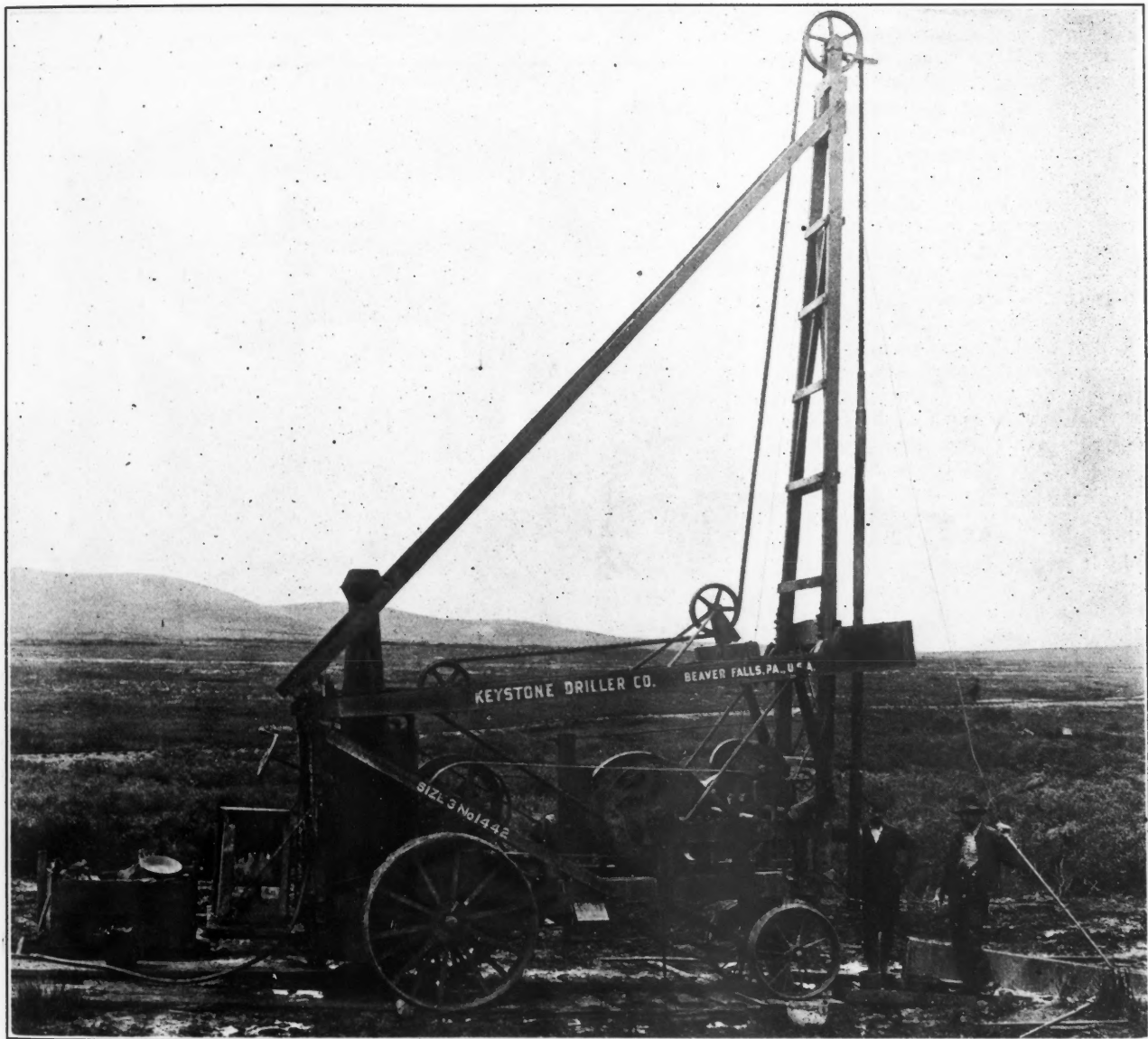
The time of actually running off a drill may be less than ten minutes, although several hours may be needed to complete

sprocket chain, the pinion of the traction device, the bearings on the intermediate shaft or other parts of the engine. It may also cause damage by producing leaky flues, in wear of brasses and other bearings. These parts are exposed to considerable dust, and usually loosened nuts, etc., will need attention. The engine always requires adjustment after driving the drill on long trips.

It is generally considered cheaper, often as much as 100 per cent., to move over rough roads by horse-power, and al-

which may take five or more minutes. Waiting for steam is also a common cause of delay; good wood, oil or coal is necessary to keep going on rough or hilly roads, and on long hills extra steam is required.

Rocks 4 in. in diameter and ruts 4 to 6 in. deep are crossed easily by letting down carefully with the brake when using horses and with the reverse lever when under steam. Considerable time is often consumed on rough roads in filling ruts; but as a general rule a Keystone



DRILL OPERATING ON TIDAL WAVE FRACTION, NEAR NOME, SHOWING CLEATED BOARDS USED INSTEAD OF CORDUROY

the operation. In loading a drill upon a flat car the operation is reversed, the precautions to be observed being the same.

MOVING ON ROADS

On rough roads it is generally good practice to haul the drill with six to ten horses weighing about 1200 to 1400 lb. each. This method may save the cost of frequent repairs, for moving the drill with its own power may result in breaking the

though the drill driven by the power of its engine may at times make as much as four or five miles per hour under exceptionally favorable circumstances, in general it can be moved more rapidly with horses. Moving the machine by means of its engine is subject to delays not encountered in the other method. Bad wood leads to loss of time; also waiting for water, for the machine must be watered about every half hour in operation,

traction drill can go wherever a loaded wagon can be hauled. The cleated wheels and the powerful brake of the drill will safely take it down steep inclines where a heavy wagon could not pass. It travels over rough cobble stones, brushy creek beds and other places where it is extremely difficult to haul a wagon. There is always danger in crossing brushy areas of tearing off the pet-cocks and pipes which discharge from the cylinder and

steam chest under the body of the machine. The drill will break down and run over two-inch saplings when under its own power, but this always involves danger to the fittings beneath the engine.

CORDUROYING

Corduoying is necessary on muddy, soft and sandy surfaces. Brush is good, often better than poles, when thrown in loosely, for poles may be kicked back while brush is not displaced by the wheels. When poles are used they should be long enough to be caught by both driving wheels. Straw, unless used very freely, is not good corduroy material for a Keystone drill under its own traction. Gravel and rocks or short pieces of wood may be used at times. On sidling roads, on account of the top-heaviness of the machine it may be necessary to build up the lower edge of the bed. This is done either by laying planks longitudinally and leveling transversely to prevent skidding on steep ascents, or by laying large poles 6 to 8 in. in diameter longitudinally and then putting in cross poles about 3 to 4 in. in diameter or plank of 3- to 4-in. stuff, with other longitudinal poles under the lines where the wheels will run, thus permitting the use of lighter corduroy. The cross poles or plank should be long enough to have a good bearing without lying horizontal; that is, the cross poles must incline toward the high side of the road to prevent any tendency of the longitudinal poles to roll down hill across the road. It must be borne in mind that the Keystone drill is so heavy that it may break down the lower part of a side-hill road. Where there is any danger of this kind, corduroying entirely across the road should be used if the road is transversely level enough to permit it. Greater bearing for the outside wheels is thus also secured.

A common difficulty is the sinking of a wheel into a hole or soft ground. After getting one driving wheel stuck in sand, mud or soft dirt, it is necessary to lift the tire nearly to the surface level with a jack or a lever so that cribbing may be built in and a plank may be placed in a nearly horizontal position for the wheel to run upon. Unless this precaution is observed the wheel will not climb out, but will "kick back" the planks or corduroy placed beneath it. It is often possible in a cut when it is not too narrow, to back up on a moderately inclined short piece of wood and hold the engine on center and then run ahead after another piece has been thrown into the hole. This is of course possible only when the drill will move itself or has not sunk so deep that the ash pan touches the ground.

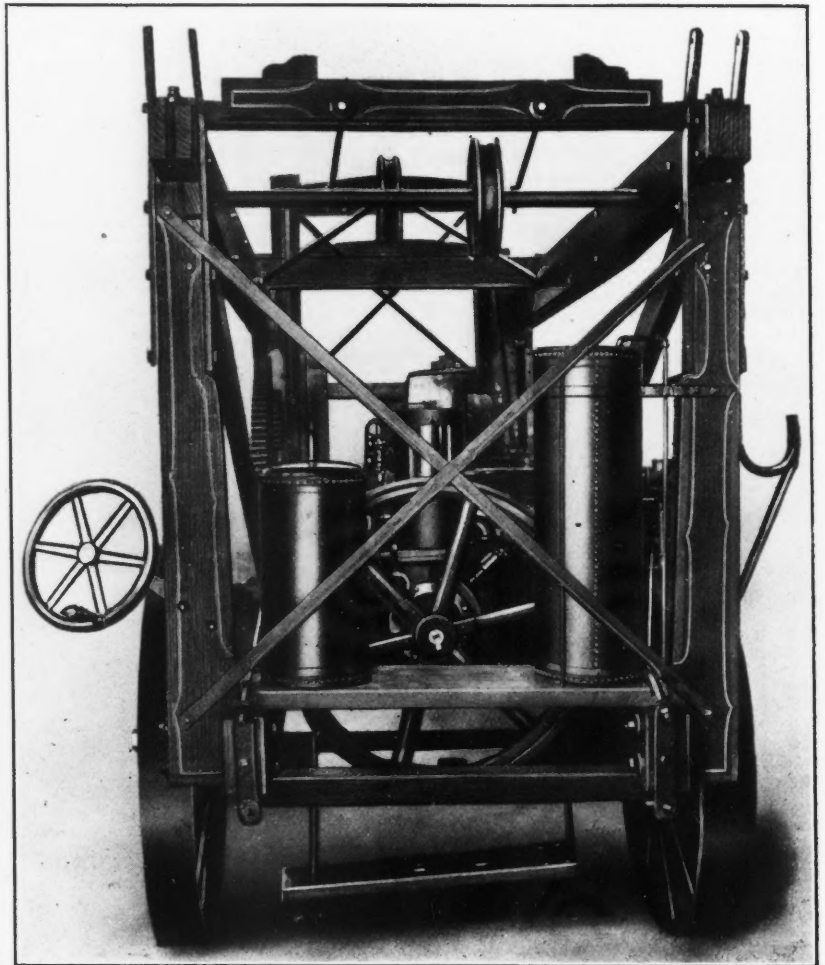
In moving over soft or sandy ground the team belonging to the water-wagon equipment may be extremely helpful; for when part of the traction effort is supplied by animals there is less tendency

for the driving wheels to dig into the ground. By using the team to furnish part of the power in difficult places, it is often possible to move over areas that could be crossed only on corduroy were the steam traction used alone. Narrow streams may be crossed even if so deep as to extinguish the fire under the boiler, which, however, endangers the grate bars, the sudden cooling having a tendency to crack them.

On good roads, under traction on the high speed, about four to five miles per hour is possible for a time; on the slow speed about two miles per hour is the

wheel may come in contact with the frame and bind. Sharp turns are difficult on soft surfaces, for the front wheels may skid. In rough or soft ground the turn may be shortened by using horses to pull short in the direction in which the turn is to be made. There is danger of breaking the kingbolt if the front wheels strike obstructions too high to be mounted readily. Such obstructions must be passed with care and at slow speed.

The actual drilling of the hole is often the easiest and simplest part of the operation, and the greatest difficulties encountered in prospecting are those of



DRILLING MACHINE EQUIPPED WITH GASOLENE ENGINE

rate of progress. Two double blocks with one-inch rope are sometimes needed in getting out of difficult places. The drill cable can be used for the same purpose. When two or more Keystone traction drills are being used in the same investigation, they are often of great mutual help in extricating each other from holes and in rendering assistance in other ways. To the experienced these remarks may seem superfluous, but since drills are often taken over very rough and soft ground, any suggestion may be of value.

Care must be taken not to make sharp turns in soft or rough ground, for a

moving the drill from place to place and from hole to hole. Extremely rough, rocky, soft, muddy, sandy and brushy surfaces are often found on placer ground.

SETTING UP

After the location of the survey pegs is ascertained the drill is moved exactly over one of them and the derrick is raised. This may be accomplished by footing the braces in the ground and backing up the drill. Particular pains should be taken to bring the hole in the exact spot indicated by the survey peg.

The machine is leveled up with jacks and blocking, a carpenter's level generally being used. Proper leveling is important for a departure from the horizontal may cause trouble with the sand line friction, which if not properly adjusted may take hold when not expected to do so and otherwise misbehave. Sometimes after hard usage, drill frames and derricks become so seriously twisted that the different parts will not operate properly if set up with level frames. In that case a departure from the horizontal in the direction required is necessary.

Although transverse leveling is more important the frame should be approximately level in the longitudinal direction as well; if the driving wheels are low the tool will swing too near the frame, the drive clamps striking the derrick, and cause other inconvenience. If the drive wheels are too high a set of severe strains is introduced in the derrick, particu-

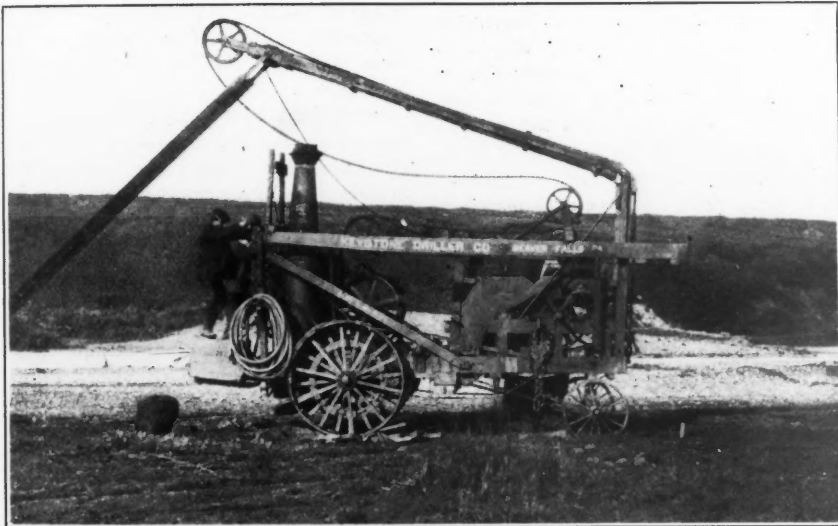
fairly level. The jacks are then footed over the two planks, a piece of blocking being placed between the jack heads and the frame, and the jacks are then screwed up until they take all the weight. A device is provided on this drill for locking the frame to the front axle on each side to prevent rocking on the king bolt. As drilling goes on, blocks are inserted on each side of the king bolt between axle and bolster to take the strain off the king bolt. Since it is often necessary to use the drill on uneven ground and therefore to raise one or both front wheels off the ground, this device is frequently inoperative. A drill may be used as a hoist in shaft sinking; in that case it becomes necessary to use this device, for the jacks would be in the way.

CREW

Three men are needed actually to operate a drill, a drill man, a fireman and a

He records the constituents, color and characteristics of the material and judges whether gravel is loose or otherwise, or whether it is fine, medium or coarse. To determine the size of gravel the pumpings are examined. If it is safe to assume that the boulders composing the gravel bed vary in character, the following line of reasoning will give a fair idea as to the size of the gravel. If but one or two kinds of fragments are found it is assumed that but one or two boulders were included in the core drilled and that the gravel is coarse. If the kinds of rock represented by the fragments are more numerous there must have been several boulders of medium size in the casing. Still more different kinds of fragments and small pebbles indicate fine gravel. While the drill man measures and marks the cable, thus keeping track of the core, it is the panners' duty to watch it also. The cable is measured frequently, always when a hole is started, also each time a section is added to the drive-pipe, and sometimes more frequently when a deep, wet hole is being drilled.

The water-wagon man, the "water buck," hauls fuel and water to the drill and helps whenever necessary. His team must often assist in moving the drill, particularly over soft ground, and he hauls the pipe, tools, etc., from a finished hole to the new place of setting up. He generally owns the team and the wagons for water and wood. His pay is \$4 to \$5 per day. The team must be a good one, for the work of hauling over rough, soft areas is severe for both the animals and equipment. When two drills are operating in the same immediate vicinity, one "water buck" sometimes supplies both. If frequent moves must be made this is not good practice, for under these circumstances one man and a team cannot properly attend to two drills.



RAISING DERRICK BY BACKING MACHINE TOWARD BRACES

larly when pulling drive-pipe. It is customary to get adjustment in a transverse direction by placing a level on a shaft or on a wooden cross piece between the engine and the boiler. Longitudinally the machine is leveled by using the drill cable as a plumb line.

In leveling, the lower of the two driving wheels is raised, as described for getting a wheel out of a hole, except that two firm blocks are used. Cribbing is sometimes needed; this must be firm enough to resist the vibration due to the operation of the machine. The other driving wheel should be securely blocked to insure against movement, for each of the wheels rotates independently of the other on the No. 3 traction drill.

Two 16-in. screw-jacks are used at the derrick end. Two pieces of plank about 2x10x14 in. are placed on solid ground under each corner of the frame and a plank about 2x10 in. by 5 ft. is placed with one end on each piece. This should be

panner. In addition a man is needed to haul fuel and water, and assist in moving, and to help generally. The drill man is in charge of the actual operation of the drill; he operates the levers and has the care of the machinery and tools; his pay is about \$3.50 for nine hours' work. The fireman fires and tends the boiler, and in addition assists in keeping the drive-pipe tools, etc., in good order; he also helps in manipulating the sand pump before and after it is hoisted out of the hole and while it is being dumped; he also pours water into the pipe as the tool is being hoisted to wash it and to thin the drillings; he cleans pipe threads and makes himself generally useful. He is the hardest worked man on the job, doing work that is not enough for two and more than enough for one, and is generally the poorest paid, getting about \$2.50 per day.

The panner receives, handles and pans the material as it comes from the hole.

TOOLS AND EQUIPMENT

The following list of tools and equipment shipped with a Keystone drilling outfit to California is given in full; it shows what is needed in actual practice:

One drill stem; one rope socket; one drill cable; one sand pump; one sand-pump line; three drill bits; one pair of driving clamps; six driving-clamp bolts; two jack-screws; one jack-screw bar; two 10-lb. sledges; one shop hammer; one claw hammer; two adjustable wrenches, 6 and 10 in.; two alligator wrenches, 4 and 10 in.; two monkey wrenches, 16 and 18 in.; one Stilson wrench, 18 in.; three cold chisels; one belt punch; one punch; two hot-eye chisels; one belt; two driving-block wrenches; one oil can; two No. 13½ Vulcan chain wrenches; two No. 15 Vulcan chain wrenches; one canvas fly; one umbrella tent complete; one hand ax; two axes; one hand saw; one extra lubricator; one square; one brace and four

bits; one blower belt; two extra foot-valves for the sand pump; one canvas blower hose; four iron stakes for canvas fly; one 1½-in. gas pipe, 12 ft. long; one galvanized-iron bucket; one sled; one oil sled for hauling fuel oil; one spirit level; one tool chest; one piece of lumber, 3x4 in. by 14 ft.; one piece ¾-in. chain, 8 ft. long; one crow-bar; one rocker outfit, including one complete rocker, one galvanized-iron tub, one galvanized-iron panning tub, three mining pans, one box 2x2x1 ft., one box 2x2x1 ft. with a drawer, used also as a seat for the panner, and one large dipper; one scroll for marking posts; one sluice box; one galvanized-iron 3-gal. bucket; one scraper for cleaning up; one chalk line; two shovels; assorted nails; three half-round files; one water can and one anvil.

The operation of the drill will be described in a future article.

California Mineral Production

SPECIAL CORRESPONDENCE

The California State Mining Bureau, under direction of Lewis E. Aubury, State mineralogist, has completed a report on the output of mineral substances in the State for 1906, and it is now in the hands of the printer. The report is late because the records of so many companies were destroyed in the great fire. An abstract of the report in an advance sheet shows the following yield and values for the year. The figures are in short tons, except as noted:

Substance.	Amount.	Value.
Asbestos	70	\$ 3,500
Asphalt	77,756	777,560
Bituminous Rock	16,077	45,204
Borax (crude)	58,173	1,182,410
Cement (bbl.)	1,286,000	1,941,250
Chrome	317	2,859
Clays (brick, M.)	277,762	2,538,848
Clays (pottery)	167,267	162,283
Coal	24,850	61,630
Copper (lb.)	28,726,448	5,522,712
Fuller's Earth	440	10,600
Gems .....	.....	497,090
Glass Sand	9,750	13,375
Gold .....	.....	18,732,452
Granite (cu. ft.)	329,810	344,083
Infusorial Earth	2,430	14,400
Gypsum	21,000	69,000
Lead (lb.)	338,718	19,307
Lime (bbl.)	689,268	763,060
Limestone	80,262	162,827
Macadam	1,066,164	870,887
Manganese	1	30
Magnesite (crude)	4,032	40,320
Marble (cu. ft.)	31,400	75,800
Mineral Paint	250	1,720
Mineral Water (gal.)	1,585,690	478,186
Natural Gas (M cu. ft.)	168,175	109,489
Paving Blocks (M)	4,203	173,432
Petroleum (bbl.)	32,624,000	9,238,020
Platinum (troy oz.)	91.46	1,647
Pyrites	46,689	145,895
Quicksilver (flasks, 75 lb.)	19,516	712,334
Rubble	489,208	547,519
Salt	101,650	213,228
Sandstone (cu. ft.)	182,076	164,068
Serpentine (cu. ft.)	847	1,694
Soda	12,000	18,000
Silver .....	.....	817,830
Slate (squares)	10,000	100,000
Tungsten .....	.....	189,100
Zinc (lb.)	20,600	12,566
		\$46,776,085

In the previous year the total product was valued at \$43,069,227, so that the increase for 1906 is \$3,706,858. The most notable increase in values are in copper, gems, tungsten and asphalt. For the

first time zinc appears among the mineral products of the State.

The total value of the metallic substances (including precious metals) for 1906 was \$26,156,702, which includes gold, silver, pyrites, quicksilver, copper, lead, tungsten, zinc, platinum and chrome. The silver is given in commercial value. Metallic substances show an increase for the year of \$2,632,718, most of which is due to the great increase in amounts and value of copper.

The total value of non-metallic substances was \$2,589,984, an increase of \$444,054 over 1905. These substances include borax, coal, mineral waters, salt, infusorial earth, gypsum, magnesite, manganese, mineral paint, fullers earth, soda, tourmaline, chrysochryse and others gems.

The total value of the hydrocarbons and gases was \$10,170,273, an increase of \$714,248. The hydrocarbons and gases include asphalt, bituminous rock, natural gas and petroleum. The petroleum price is the average f.o.b. at wells or stations in each county. The number of barrels of oil produced was 32,624,000, valued at \$9,238,020 as against 34,275,701 bbl. in 1905, valued at \$9,007,820. The increase in asphalt is very large for the year, it now being made in the process of refining the California heavy oils.

The total value of structural materials was \$7,859,126, a decrease of \$84,162 from the previous year. These materials include brick and pottery clays, portland cement, lime and limestone, macadam, rubble and concrete rock, paving blocks, marble, granite, sandstone, serpentine, slate and glass sand.

The relative value of the principal minerals of the State is as follows: First, gold; second, petroleum; third, copper; fourth, clays and their products; fifth, cement; sixth, borax; seventh, silver.

The Mining Bureau has field assistants at work on the matter for a new edition of the "Copper Resources of California." They have finished the investigation in the counties of Del Norte, Siskiyou, Trinity, Humboldt, Plumas, Nevada, Placer, El Dorado, Madera, Inyo and San Bernardino, and are now working up their field notes. A field assistant is also completing a new mineral map of Madera county, showing the location of mines, mineral deposits, etc. In connection with the bureau it may be stated that the three resident members of the board of trustees have sent their resignations to the governor. These are Curtis Lindley, Fred W. Bradley and E. A. Stent. The other trustees are Louis Janin, of Gaviota, Santa Barbara county, and Harold T. Power, of Bullion, Placer county. The trustees who have resigned are supposed to be dissatisfied with the working of the organizing act relating to the bureau, as its provisions make them merely an auditing board, with no voice in the choice of the State mineralogist, assistants or employees, and no power to direct the operations carried on by the bureau. The act

leaves all such matters to the discretion of the State mineralogist, who is appointed by the governor for a term of four years. The board, before these resignations occurred, consisted of four scientific and practical mining men and one mining lawyer, all of high standing, and was probably the best board the Mining Bureau ever had. It is to be regretted that these gentlemen have seen fit to resign. The position of trustees is an honorary one only, no salary being paid.

Titanium

Titanium, although generally spoken of as one of the rare elements, is really one of the more common ones. According to F. W. Clarke, chemist of the U. S. Geological Survey, it forms 0.43 per cent. of the surface rocks of the globe, and is much more plentiful than lead, zinc, copper, and other metals classed as "common." The Geological Survey reports that a great many schists and gneisses carry titanium, and it is found in appreciable quantities in clays—not only surface clays but also those that have been dredged from the sea bottom.

Many iron ores contain titanium, and ores containing 1 per cent. or more have generally been avoided by miners, owing to difficulties experienced in smelting, due to thick, pasty slags; but it is claimed that when properly handled titaniferous ores give no more trouble than other iron ores. The addition of titanium to cast iron greatly increases its strength, and an alloy called ferro-titanium is now manufactured at a number of places in this country and Europe for use as an agent by which to introduce the titanium into the iron. It is believed that titanium is used by various firms to increase the tensile strength and elastic limit of steel, and although much secrecy is maintained concerning the matter, it seems probable that some steels that are imported as vanadium steels are in reality titanium steels. As titanium, unlike other metals used for the same purpose, such as vanadium, molybdenum and tungsten, is plentiful and cheap, its successful use in steel hardening should establish a market for it.

Several firms are now experimenting with titanium filaments in incandescent electric lamps, but the reduction of titanium to a metal is so difficult that the lamps have not yet been extensively placed on the market.

Titaniferous magnetite and titanium carbide, the titanium of which is derived from rutile, are used as electrodes in arc lamps. When one electrode is made of these substances a block of carbon is used for the other. The best known rutile deposit in this country, the one which produced the greater part of the titanium output in 1906, is at Roseland, Nelson county, Va. A few pounds were produced in Chester county, Penn., where the product is said to occur in comparatively large crystals and to be very pure.

Mining Sheet Ground in the Joplin District

By DOSS BRITAIN*

The sheet-ground territory around Webb City is mined at a depth of 150 to 200 ft. and mills an average of 3½ to 4 per cent. mineral. Mining in this formation is conducted on a more extensive scale than any other form of hard-ground mining in the Joplin district.

The shaft is sunk in the usual way but is larger than the regulation 4x6 ft. size. From each active shaft in sheet ore must be handled an average of 200 tons of ore per eight-hour shift: hence the neces-

lars for the support of the roof. Figs. 1 and 2 show the pillars and drifts of a representative sheet ground mine.

The pillars are from 15 to 25 ft. in diameter and as far as possible represent the poorest ground in the mine. If they contain ore their final removal completes the exhaustion of the mine, those most remote from the shaft being first blasted down.

Both the floor and roof of the mine are kept approximately level, water draining through ditches to the sump. The roof of limestone requires but little attention. The ore cleaves readily leaving the roof clean and ringing solid. When the roof is other than limestone it often is loose, and great care must be used in its handling, as one inspection may show it per-

BREAKING THE ORE

The mineralized ground is composed of very hard flint, compactly bedded. A wide range of notions prevails as to methods of ground-breaking, but the conventional position of the holes and their number are represented in Fig. 3. Each set of four holes, considered a round, should break an average of 30 tons of dirt, 9 to 10 ft. laterally and from the roof to the floor. The top hole, No. 2, on the vertical median line of the area to be broken and very near the roof, is so directed as to break the roof level. Holes No. 1 and No. 3, equidistant from the median line, are 3 ft. from each other and the roof. The stope hole, No. 4, as near the floor as the drill will allow, slants so the shot will lift clean to the floor. The lateral direction of these holes varies with the individual taste of the machine man. All are uniformly 9 ft. deep, started with a 1½-in. bit, and finished with a 1¼ to 1 in. steel.

After squibbing to enlarge the bound end of the hole for powder, the holes are

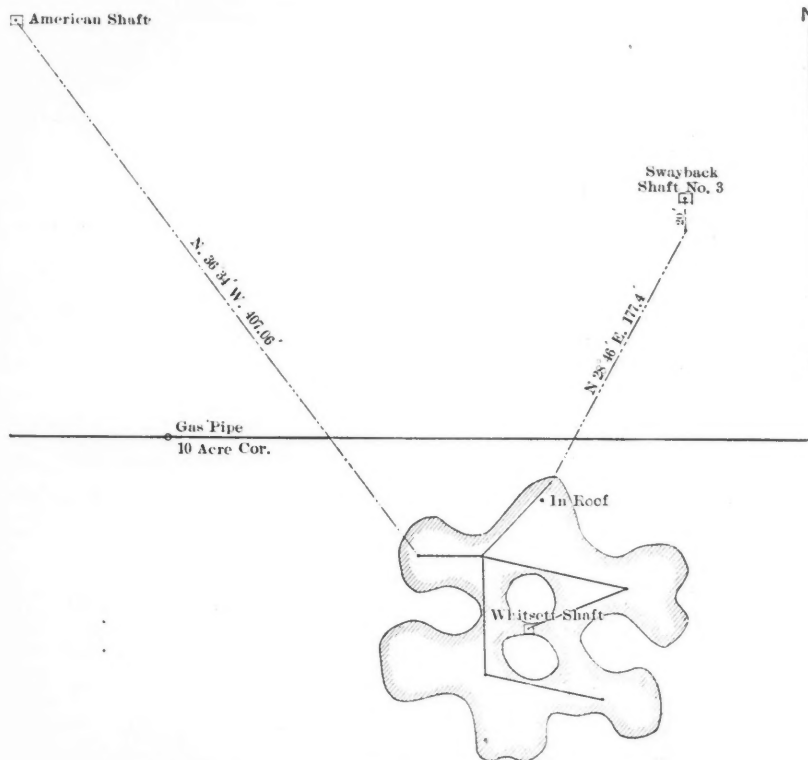


FIG. 1. PLAN OF THE WHITSETT MINE, PORTO RICO DISTRICT

sity for shafts 5x7 ft. and 6x8 ft., and frequently 6x9 ft. shafts. From the collar of the shaft to the solid limestone cap, 20 to 40 ft. deep, the shaft is cribbed, wedged, and cemented water-tight. The completed shaft usually extends into the orebody to be developed, having with few exceptions been sunk on a prospect drill hole indicating ore of sufficient richness to warrant a shaft and mill.

DRIFTING AND STOPING

A drift 6 ft. wide and 8 ft. high is driven horizontally into the orebody. Upon reaching a safe distance from the shaft it is widened to 50 ft. and carried on as a stope. Similar drifts start in other directions from the shaft, so as to take all of the orebody, leaving only pil-

lars for the support of the roof. Figs. 1 and 2 show the pillars and drifts of a representative sheet ground mine. These must be constantly pried loose or blown down. Soft places are also encountered and require timbering, a crib of logs being usually sufficient. The average thickness of ore is 6 to 9 ft., though it is sometimes followed as thin as 2 ft. and has occurred 25 ft. thick.

Two layers of mineral separated by a thin layer of rock are removed simultaneously with the dividing seam. Mineral rarely occurs here in layers so far apart as to prohibit working in this manner. When widely separated they are sometimes worked simultaneously but more often the upper stratum is exhausted before the lower is touched, except for developing purposes.

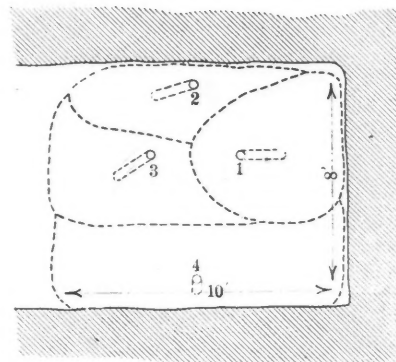


FIG. 3.

loaded with 50 lb. of powder, Nos. 1, 2 and 3, receiving half, and No. 4 the remainder. The blasts are fired as numbered in the figure.

HANDLING THE ORE

Generally the ore breaks small, but there are some pieces which require bulldozing or sledging. Pole picks are used to loosen the broken ground for the No. 2 shovel which finds universal use in the district. The tub used for hoisting is usually of 1000-lb. capacity but it carries only about 850 lb. of ore because it is only loaded to within 4 in. of the top. Such tubs are 30 in. deep, 28 in. diameter with sides of No. 10 standard-gage steel and bottoms of 3/16 in. steel; the bales are of 1¼-in. Norway iron. Tubs of 1250 and 1500 lb. capacity, of heavier material, are common and the installation of 2000-lb. cages at some of the Center Creek mines is contemplated.

No platform, common in other forms of mining at Joplin, is used for the shovellers because the face of the ore is so thin that it travels rapidly and keeping a platform up with it is too much of a task. The tubs are hooked to 5/8- to 7/8-in. steel

*Joplin, Mo.

cables by means of either a spiral or pig-tail hook or a snap hook. These hooks are equally favored. A tub starting from the mine with the bail merely resting on the depression between the upward curve of the spiral hook and the stem may be knocked off by a slight turn or contact with the side of the shaft. Properly fastened it is almost impossible for the spiral hook to be loosened accidentally.

both the axles and wheels are loose, so that there can be no binding, and the wheels adjust themselves to the irregularities of the track. The tracks spread in Y's to the face of the ore, and are constructed of rails weighing 8 lb. to the yard, spiked to timbers laid in the mine floor. The common gage for tracks is 14 inches.

Steam hoists and a few electric hoists

the bottom of the shaft. The code includes the following signals: 1 ring, tub up; 2 rings, lower tub; 3 rings, man up; 4 rings, speed pump; 5 rings, slow pump. By arbitrary arrangement four and five rings may also relate to steam, air, etc. As the mines are comparatively shallow, signals are employed to indicate only the most frequent functions about the shaft. For others a messenger is despatched who

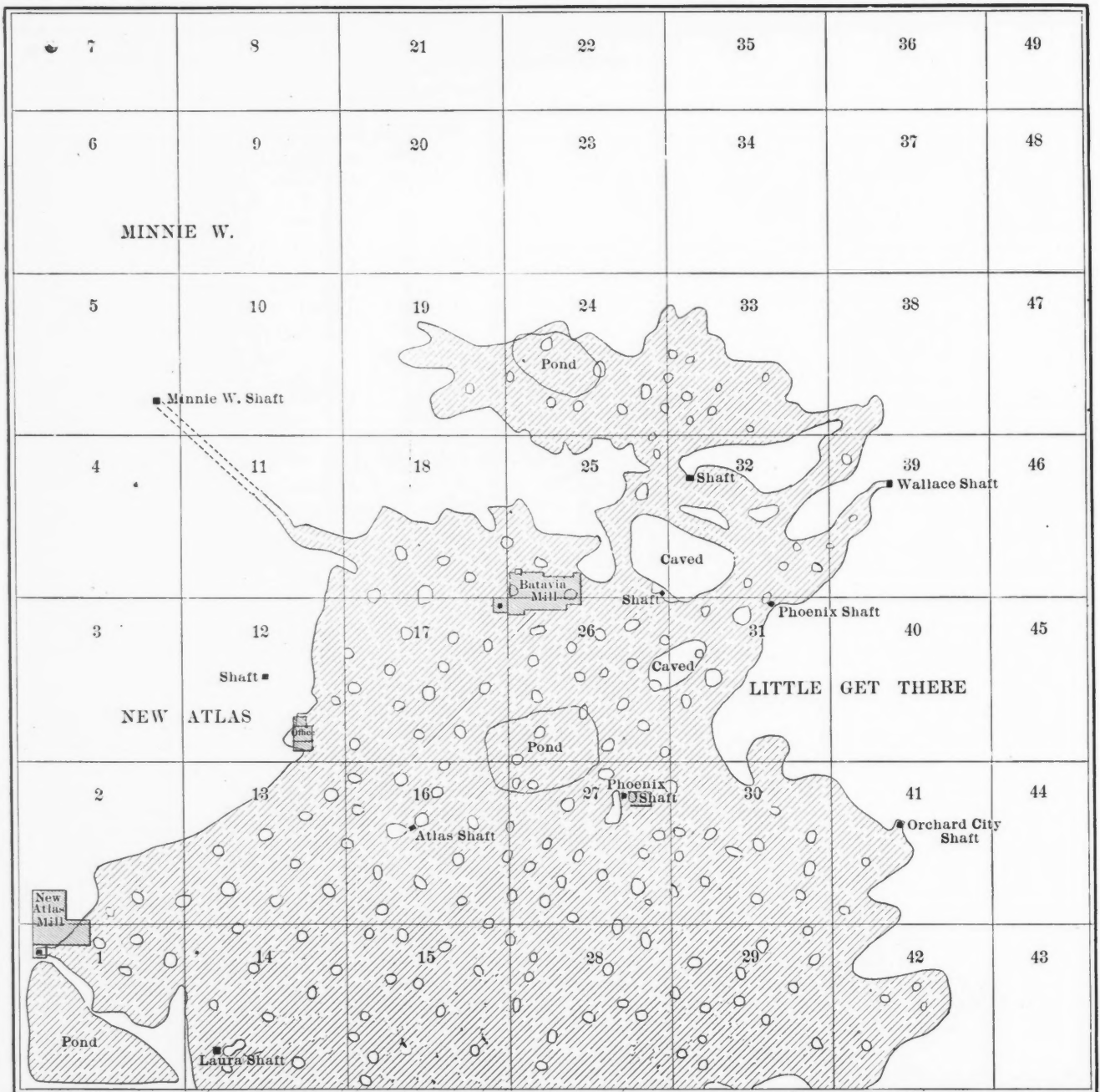


FIG. 2. PLAN OF THE MINE, BOSTON GET THERE ZINC COMPANY

With the snap hook the tub will not start unless properly hooked, but may be un-snapped by the arm of an ascending miner and with the momentum acquired bounce off the hook.

The cars holding the tubs while being loaded and carrying them in the mine consist of 2x2-ft. platform of oak boards not less than 2 in. thick, on four 6-in. wheels mounted on 1-in. axles. In the best type

are used. Of the former the Freeman double engine, 7¼x8 in. geared, and the single engine 8x8 in. geared are representative. The hoist operates in a tower over the shaft, which, if remote from the mill, necessitates the installation of tramways, either track or cable operated.

Throughout the Joplin district the signal apparatus consists of a gong or triangle in the hoisting tower rung by a wire from

can ride 200 ft. in less time than necessary to interpret some ambiguous and infrequently used signal.

Ventilation is accomplished during sinking and before the workings are of such magnitude as to allow connection between two remotely separated shafts, or shaft and drill hole, by means of a blower operated by a 5-h.p. engine or electric motor. Mines with inclined shafts are

capricious as to their atmosphere, which is exemplified in the Yellow Dog mine with two inclines facing each other north and south. With the wind from the north the air in the south shaft is pure, in the north below normal. With the wind in the opposite direction the reverse is the case to such an extent that the men have sometimes been driven from the mine.

LABOR AND WAGES

The scale of wages in the sheet-ground mines is as follows: A ground boss at \$30 per week; machine men, \$2.75 per day; helpers, \$2.25 per day; powder men, \$3.50 per day; shovelers, 6c. per tub of ore shoveled (\$4 to \$5 per day); tub runner, \$2.25 per day; tub hooker, \$3 per day; hoisterman, \$2.50 per day; pump man, \$2.75 per day; track man, \$2.50 per day. Under prevailing conditions sheet ore can be placed in the mill hopper for \$0.60 to \$0.70 per ton.

The ground boss takes the responsibility of the underground workings. Without a pump man he attends to his duties also. A few get more than the price given. The duties of the others are briefly as follows: The machine men and helpers work the air drills. A round of holes is a day's work. The drilling is done in the morning and early afternoon. The powder man squibs and fires the holes at the end of the shift. The shovelers load the tubs and in the absence of tub runners, who are employed only in the larger mines, push the cars between the shaft and drift face. The tub hooker connects and disconnects the tubs, timbers, etc. The trackman keeps the tracks in order and extends them to the faces. Pump men look after the pumps, repairs, etc. They are employed in the sheet mines only in Center Creek valley, where the most serious water conditions in the entire district have been successfully met. A 1½- to 3-in. pump is ample for the average sheet mine.

California Black Sands

SPECIAL CORRESPONDENCE

The auriferous black-sand deposits in the Pajaro valley, in the southern end of Santa Cruz county, near the sea-coast, are being experimented with to test their gold values, as well as the quantity of magnetic iron. Of the latter the sands are supposed to contain 66 per cent. There are millions of tons of this sand. The parties interested have established a testing plant at Watsonville, and are satisfied as to the iron. The gold value is expected to be as high as \$1.50 per ton, and they are experimenting as to best methods of saving this. It is understood that some hitherto untried process is being tried. These sands have before this been worked in a small way with a magnetic separator, but the experiment was not a financial

success, as they could not save gold enough to pay, and there was no way of utilizing the iron. Up in the northwestern part of the State also, some developments in black sand mining are under way.

The black-sand deposits near Gold Bluff, in Humboldt county, owned by the Gold Bluff Mining and Lumber Company, have been leased by Leighton & Capps, of Eureka, together with the dredge and plant. Another dredge is to be built and a magnetic separating plant and concentrating tables are to be installed. Preparations are being made to increase largely the capacity of the present plant. There are nearly 200 acres of the gold-bearing sands, and work has thus far been carried on in an artificial lagoon near the ocean beach.

Mining in the Transvaal

SPECIAL CORRESPONDENCE

Arguments in favor of Chinese labor are of no avail now, for the coolies are being sent away every month. The mines are beginning to realize what it means to lose these laborers. Two Chinese mines lost a large proportion of their coolies in September and in consequence their profits for the month show large decreases. Sufficient Kafirs have come forward to replace the Chinese, but they are raw, and until they learn their duties will be of little use. The mines with the green labor will have a hard time of it for a few months.

Much interest is being taken along the Rand over the question of Indians and other Asiatics trading in the Transvaal. The legislature has passed an Asiatic ordinance, requiring all persons affected to go through the formality of registration. Every Asiatic who fails to register will be deprived of his trading license on Dec. 31 next. So far they have refused to obey the ordinance, and trouble is expected.

The results for September have been published, and on the whole are satisfactory. The total output of gold for the Transvaal amounts to 538,034 oz. valued at £2,285,424, of which the Rand's contribution is 517,746 oz. valued at £2,199,247. Compared with August (a 31-day month) there is a decrease of 16,993 oz. in the Transvaal output. The total number of stamps at work in the Transvaal comes out at 8700, and of this number 8345 were crushing on the Rand. As regards labor, nearly 3000 coolies left the Rand for China during September. There are now 46,260 Chinese at work on the mines of the Rand. Fortunately the Kafirs show a net gain for September of 3398, which balances the loss of the coolies.

During the month the shaft of the Brakpan mines, a large deep-level concern in the Eastern Rand struck the reef.

The results are very disappointing, being far below the pay line. Had the assays gone high, it would have cheered people up, for there is a vast stretch of deep-level country in the neighborhood to develop. But there is no reason why there should not be an improvement as they develop on the reefs. The gold in this section is very patchy, and it is possible that the shaft struck a poor zone. At the Geduld mines, in the same district, the reef was very poor when first encountered, and for months the development results were disheartening, but the management persevered and has at last come across stretches of payable rock. It is to be hoped that the experience of the Brakpan mines will be similar.

Some of the base-metal propositions are publishing monthly reports. So far the copper properties have not turned out over well. One lead mine is having fair success. Little is heard from the government tin-mine scheme, but some work is being done there by a group of prospectors. So far the tin mines have not done much for the unemployed.

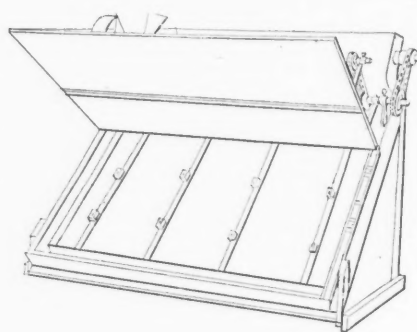
A Large Hydraulic Plant

SPECIAL CORRESPONDENCE

A number of years ago Dr. Pierce, of Buffalo, N. Y., organized the Big Bend Mining Company, which was to mine a large section of the bed of the Feather river at Big Bend, Butte county, California. A tunnel 11,000 ft. long was cut through a point and was designed to carry the water of the river, leaving the old bed bare for seven miles, and this bed was to be mined. The enterprise was not successful, principally because the river bed did not carry sufficient gold, and also because it was found costly to mine the gravel by the systems adopted at that time. Moreover the tunnel was too small in cross-section to carry all the water. This old tunnel is now being utilized by the Great Western Power Company, which is to enlarge it to 18 ft. and lengthen it 3800 ft., or to 14,800 ft. in all. This is to be lined with concrete for its entire length. It expects then to have 70,000 miners' inches of water with a fall of 400 ft., for generating electric power. The company is now employing some 1500 men in construction work. A trolley road five miles long is being built to carry men and material from one point to another. Dams are being built and concrete foundations laid for the power-houses. It is expected that from these power-houses, 52,000 h.p. can be delivered in San Francisco. The power plants and pole lines are now being built. Possibly with all the water flowing through the tunnel and the river bed again laid bare, mining may again be carried on in the river bed on a better system than that tried years ago.

The Newago Screen

A screen particularly adapted to use with fine material has been used by W. J. Bell with satisfactory results in the mill of the Newago Cement Company, at Newago, Mich. The screen is essentially an inclined rigid steel frame, at the bottom of which a steel cloth is kept at a strong uniform tension. The novel feature of the device, which is an invention of Mr. Bell, lies in the fact that the screen cloth is kept from blinding by vibrations of the screen mesh produced by the constant tapping of small hammers on its surface. The vibrations cannot be dead-



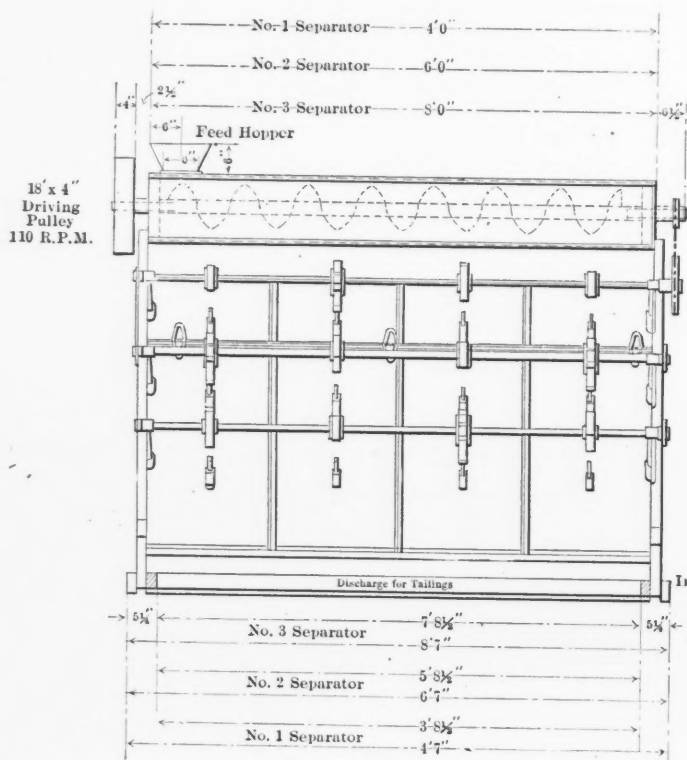
NEWAGO SEPARATOR FRONT VIEW, WITH APRON RAISED

down the surface or to leap far, and the possibility of fine screening. Screen meshes of 0.5 in. to 200 mesh may be used. Capacities vary from 20 tons to 0.5 ton per hour, according to the material and the fineness of the screen cloth. These screens are made by the Sturtevant Mill Company, of Boston, Mass.

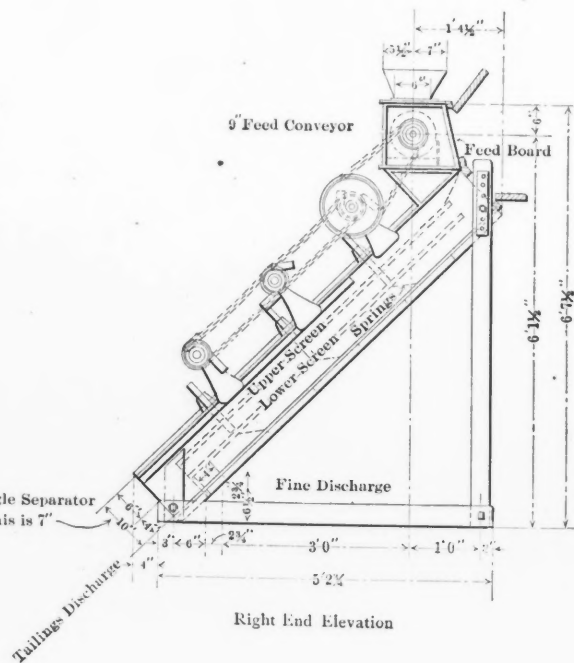
Sodalite in Canada

BY J. J. BELL*

About three miles from Bancroft, Hastings county, Ont., a station on the Cen-



Front View

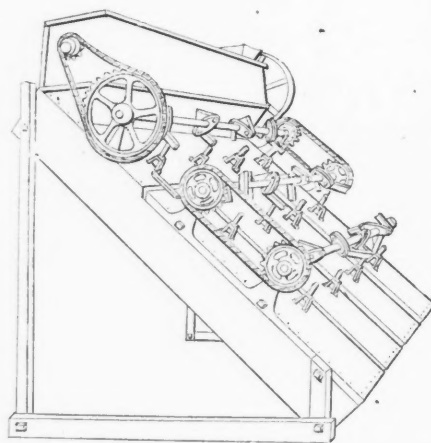


Right End Elevation

THE NEWAGO SEPARATOR

ened because the initial tension of the screen is automatically maintained. This simple scheme secures a remarkable rapidity of vibrations whose amplitude is small and yet sufficient to allow material innumerable opportunities to pass through the meshes before the material is discharged from the front of the screen. No foundation other than an ordinary floor is required. Ease and rapidity in making adjustment and changing screens is obtained by an arrangement of the front of the machine which is hinged and so may be opened to take out the screen; also if desired the screens may be removed through a narrow door at the rear of the machine.

The advantages of this screen are claimed to be—absence of the excessive wear and tear of an ordinary shaking screen, the utilization of all of the screening surface, inability of the feed to race



NEWAGO SEPARATOR PERSPECTIVE VIEW

tral Ontario Railway, occurs a mass of nepheline syenite, which extends across the townships of Faraday and Dungan-non. It is a rare rock, never discovered previous to 1892 in the Laurentian system of Canada. In this syenite, forming veins and irregular masses, as explained by Mr. Adams in the report of the Geological Survey of Canada for 1892-3, the beautiful blue mineral sodalite is found. On lot 25, range 14, Dungan-non, these veins and masses attain considerable size and are somewhat numerous. In 1901 the deposit was located, and purchased by Mr. Allom and associates. It is intended to organize a company and work the deposits.

A miner seldom runs into more than one missed hole in his lifetime.

*29 Prince Arthur avenue, Toronto, Ont.

Disaster at Monongah Coal Mines Nos. 6 and 8

Explosion Probably Caused by Loaded Trip of Cars Breaking Away and Severing a Trolley Wire at Foot of Slope

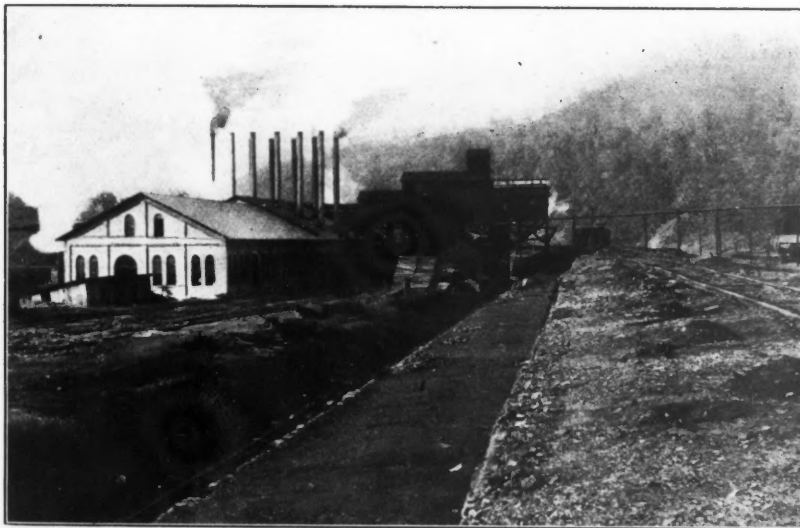
BY FLOYD W. PARSONS

The explosion at the Monongah Nos. 6 and 8 mines has come upon the operators of coal mines in northern West Virginia as a thunderbolt from a clear sky. There is not one experienced operator in this field who would heretofore have believed that a disaster of such magnitude could occur in the Fairmont district. The reason for having such confidence in the security of the Fairmont mines was based on three facts: (1) The dust occurring in the mines has not been considered as likely to quickly lend itself to an explosion; (2) the mines are not particularly gaseous; (3) the methods of ventilation and operation as carried on by the Fairmont Coal Company are care-

rooms on one entry without extending throughout the entire mine. Bitter was the disappointment of all concerned when it was learned that the present disaster had literally torn the workings of both properties asunder.

LOSS OF LIFE

The closest possible estimates place the number of men entombed at 305. About 55 of the victims have been removed, and the most hopeful do not believe that life still exists in any of the unfortunates who are underground. About 81 per cent. of those employed were foreigners, the predominating nationalities being Hungarians, Italians, Slavs, Austrians, and Poles.



GENERAL POWER HOUSE AT MONONGAH NO. 6 MINE TIPPLE

fully planned and based on a system that in many particulars is unequaled by the mines of many regions.

Of all the mines operated by the Fairmont Coal Company none were considered more nearly ideal than the No. 6 and the No. 8 Monongah plants. Immense fans were here installed, concrete overcasts and stoppings were used, and in Monongah No. 8 the main system of ventilation was carried on by seven parallel entries. Not one room or heading was ever allowed to drive off centers, the panel system of working was carefully carried out, and under no circumstances were rooms permitted to encroach on the barrier pillars.

Those in authority had supposed that if an explosion were to visit one of these mines the worst that could happen would be the destruction of one panel or the

The scenes at the mines on the day of the explosion and the night following are beyond description. It required all the persuasive powers of priests and friends of the bereaved to preserve reasonable quiet among the stricken wives and relatives of the entombed miners.

CONFLICTING OPINIONS

As is usually the case in such disasters, many opinions and statements as to the cause and course of the explosion are heard. It is difficult to determine the true nature of any such mine disaster even after the bodies have been removed and the workings opened. For this reason I do not attempt to attribute confidently the definite cause of the accident, but rather to state facts, which at this early date seem to lead to a probable explanation.

Shortly after 10 a.m., Friday, Dec. 6,

a trip of cars was being hoisted up the No. 6 slope and had reached the knuckle when a coupling connecting one of the cars broke, and the heavily loaded trip rushed back down the slope. After an interval of less than one minute the mouth of the mine into which the cars had disappeared belched forth a volume of dense smoke, unaccompanied by any flame, nor was there sufficient force behind the explosion at this point to demolish the mouth of the No. 6 mine or the fan and surface plant adjacent. It is only fair to state that many observers claim to have heard the explosion in No. 8 mine first, and that in No. 6 afterward; but the eye witness who gave me the facts concerning the breaking of the trip and the later appearance of the smoke from the mouth of the mine, is an engineer of such experience and ability that I do not hesitate to place absolute confidence in his exact statement.

IMPORTANT FACTS

Until further observations compel a contrary belief I feel that the following facts corroborate the belief that the runaway trip was the initial cause of the explosion:

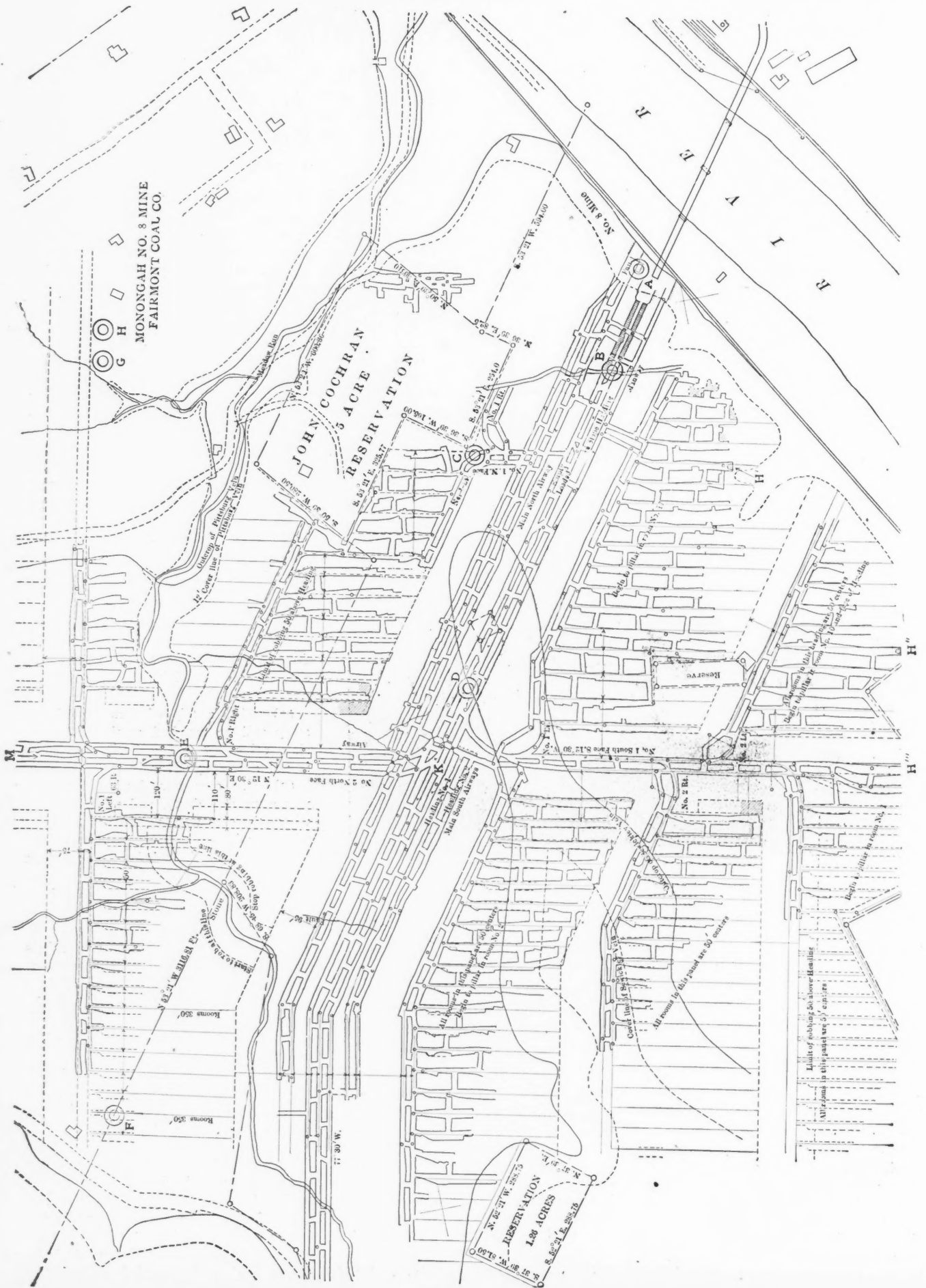
(1) That a trip of cars should run away and be wrecked at the foot of a slope coincident with a terrible explosion is not a matter of ordinary occurrence.

(2) The cars were loaded, the slope was somewhat dusty, and at the bottom where the cars were piled up, the trolley wire carrying 280 volts was torn and disarranged so that it probably threw a sheet of flame into the great quantity of dry dust that must necessarily have been raised.

(3) The explosion gathered force as it traveled through the No. 6 workings into the No. 8 mine and worked its greatest destruction at the very mouth of No. 8 mine, which is the farthest point from the origin. This coincides with the general action of most explosions, especially when due to dust.

(4) The mines were gaseous, but I believe that an explosion due to gas alone would in this mine have confined itself locally to one panel or section.

(5) The explosion originating near the mouth of No. 6 did not have far enough to travel in that direction to demolish the mine opening as it did at No. 8. If the explosion had occurred in the deeper workings of No. 6 or in some part of No. 8 mine, the explosion would have gained force as it traveled toward the



No. 6 and the No. 8 openings and would have been equally destructive at both points.

(6) Examination seems to indicate that the explosion traveled from No. 6 mine through the No. 2 north-face entry into the No. 8 mine. (This entry is the only underground connection between the two properties.)

(7) All the men so far found in No. 8 mine face away from No. 6 and toward the No. 8 opening.

(8) As for precedent that favors the truth of the runaway trip theory, I point to the fatal explosion caused by a runaway trip at the Rock Springs mine of the Union Pacific Coal Company in southern Wyoming.

(9) Flour and many other substances when finely powdered and subjected to a sheet of flame will readily explode. This coal dust, while probably not lending itself to an explosion so readily as the dust found in the New River and Pocahontas coal mines, would certainly have been capable of aiding and sustaining an explosion of this kind.

(10) The dust was several inches deep along the main entries leading out of No. 8 mine and appeared on some of the props in a partially coked form.

THE COSTLY LESSON

The Fairmont Coal Company is one of the most carefully organized coal corporations in America, and has one of the most effective engineering systems that present knowledge can devise. No expenditure has been considered too great when the management could be shown that even the smallest of benefits might result. Fans of the most modern type have been installed at nearly all of the mines, while the management's policy has been to carefully observe the State laws regulating the mining industry. Many improvements might, however, be adopted and result in providing greater safety. No matter how patriotic we desire to be, it must be acknowledged that we are far behind the coal operators on the continent. There is no careful system of watering the mines or removing the dust in this district. The company has no carefully organized rescue corps. One or two safety helmets which enable the wearer to penetrate gaseous workings and often spend an hour beyond the limits of fresh air, are owned by the Fairmont company, but no one drilled in their use is immediately available.

Safety helmets of this sort have proved their worth both in this country and Europe, but American operators have been loath to experiment and become familiar with their use. An apparatus of this kind is not effective in opening the mine, but is most necessary in penetrating

dangerous workings to rescue entombed men.

DEATH INSTANTANEOUS

There is little evidence to show that the entombed miners lived long after the explosion. The postures of the majority indicate that they had barely time to do more than throw themselves forward in an instinctive effort to preserve life. A large number of the men were horribly mutilated; a number having their heads, some their arms, and others their legs blown off. In one or two instances it seems probable that the victim had tried to crawl a short distance before being overcome, in other cases the miner's countenances show that hardly a muscle had twitched before death ensued.

BAROMETER HIGH

Barometric pressure did not play an important part in this explosion. On Dec. 3 the barometer was 30.06; Dec. 4, 30.24; Dec. 5, 30.46; Dec. 6, 30.44.

In referring to the accompanying map of the Monongah No. 8 mine, it will be seen that the general system of working is nearly ideal so far as a carefully worked out plan is concerned. The No. 6 mine is just below the No. 8 mine and is located on the same side of the river. At the point *M* is shown the No. 2 north-face entry which connects the two mines and through which the explosion was carried from No. 6 to the No. 8 workings.

After the terrible disasters that have occurred as the result of permitting coal companies to connect the underground workings of adjacent properties, it seems strange that the laws of West Virginia and many other States still countenance this practice. In the case of the Monongah mine the entry was driven for the sake of ventilation so that in case of any derangement to one fan the ventilator at the other property could furnish air for both mines. The No. 8 fan shown at *A* on the map was almost entirely wrecked, a large part being hurled across the river. At the point *B* the body of a coupler was found. At *D, E, G, H* and *F* other bodies were discovered. At the point *K* stood one of the best concrete overcasts in this State, the entire structure being completely destroyed by the explosion. At *C* a serious mine fire was discovered and necessitated the laying of pipe into the mine to furnish water for extinguishing the flames. In the rooms and entries to the left of the main entries it is expected that a great many of the bodies will be found. At the points *H', H''* and *H'''* the rooms have been broken through to the surface and it was through one of these openings that two of the men escaped.

Coke Production in Great Britain

The report of the mine inspectors for the year 1906 gives the number of coke works in the United Kingdom at 257; in 51 of these by-products were saved. The number and description of coke ovens in use at the close of the year for two years past was as follows:

	1905.	1906.	Changes.
Simon-Carves.....	726	808	I. 82
Semet-Solvay.....	470	670	I. 200
Coppee.....	2,233	2,308	I. 75
Bauer.....	52	52	.....
Koppe.....	72	108	I. 36
Otto-Hilgenstock.....	503	768	I. 265
Simplex.....	78	78	.....
Other kinds.....	1,412	1,482	I. 70
Total by-product ovens.....	5,546	6,274	I. 728
Bee-hive ovens.....	25,514	23,454	D. 2,060
Total.....	31,060	29,728	D. 1,332

The changes were in the direction of replacing the old bee-hive ovens by different types of retort ovens. The production of coke for two years is reported as follows, in long tons:

	1905.	1906.	Changes.
Coke made.....	18,037,985	19,296,526	I. 1,258,541
Coal used.....	33,452,943	35,402,677	I. 1,949,734
Coal per ton of coke.....	1.85	1.83	D. 0.02

The larger producing districts were Durham, which made nearly one-third of the total; Yorkshire, Lancashire and Wales.

The briquets made are reported as follows, in long tons:

	1905.	1906.	Changes.
Briquets made.....	1,219,586	1,513,220	I. 293,634
Coal used.....	1,109,797	1,399,542	I. 289,745
Coal and per ton of briquets.....	0.91	0.92	I. 0.01

Over 80 per cent. of the briquets were made in the South Wales district.

Phosphate Mining in Tunisia

According to Consul-General R. P. Skinner, of Marseilles, some of the Tunisian phosphate companies are said to have contracted for much of their production up to 1915. Tunisians are exulting over the prosperity of the phosphate business, which reflects itself in the earnings of the Gafsa company, whose shares, nominally worth \$100, are quoted at \$787, and yielded \$15.44 per share in dividends in 1906. This company began with an output of 73,000 tons of phosphate rock in 1899 and sold 590,000 tons in 1906.

The Société Anonyme La Floridienne has now entered the Tunisian field, promising to do a large business in Africa as well as in Florida. This is a Belgian corporation, with headquarters at Rue de la Loi, Brussels. The Florida company in its report of 1907, states that important quantities for delivery in 1909 had been disposed of at prices higher than those obtained for the output of 1907 and 1908. The Florida company own the Djebil Sal Salah deposit, one-half of royalties on the Ain Moularies mine, and an interest in the Ain Krimah mine.

An Emergency Water Supply for a Coal Breaker

BY JOHN H. HAERTTER*

Almost every summer the anthracite coal industry passes through a dry season, and the amount of water collected from every available source during such period is entirely too small to supply the modern mining plants. The dry season of the summer just passed was an unusual one and caused the operators much anxiety and expense; particularly so in the Lehigh and Schuylkill regions, where several operations experienced a period of idleness on account of the continued drought.

The amount of water used at a present-day coal plant is considerable, the preparation of the coal in the breaker itself requiring large quantities. Anthracite coal, as it comes from the mines, is not marketable, and the "run-of-mine" as it is called, cannot, as was done in the earlier days of mining, be so readily sold to consumers. Before the coal can be placed on the market it must undergo a preparation by which rock, slate, dirt and all foreign matter are removed, and the coal broken, screened, and assembled in grades of nearly uniform size. The method of preparation is not the same throughout the anthracite field, due to the different ways the coal beds were deposited; to the varying nature of the strata, whether hard or friable and whether wet or dry; and in many localities to faulty composition of the veins, as for example the overlying veins of the Pottsville basin. In the Lackawanna and Wyoming regions, the coal seams are, generally speaking, in an almost horizontal position, and the coal is partly prepared, as it were, by the miner and his laborer in their working place, the rock and refuse being picked out during the loading of the car, and later piling or gobbing it into the extra space made in excess of that needed for cars and passing room while the place is being driven.

In great contrast to this, the beds of the Lehigh and Schuylkill regions are highly inclined and the contents of the seam are loaded into the mine car, the miner being unable to clean and store the refuse, save where the working places are located in a seam approaching an anticlinal or synclinal; or on a gangway road where it is possible for the miner to blow out the seam in benches. The coal of the lower fields is frequently wet as compared with the upper field, and the contents of the cars going to the breaker for preparation are covered with a black, muddy mixture presenting an appearance of anything but marketable fuel.

*Engineer with Lehigh Valley Coal Company, Wilkes-Barre, Penn.

METHODS OF PREPARATION

For these reasons different methods of preparation are necessary. In some cases the coal is prepared dry, while at other times it is prepared wet, which gives rise to the terms "dry breaker" and "wet breaker." In the case of the wet, the coal during preparation, is thoroughly washed to remove the mud which adheres to it and an abundant supply of water must at all times be available. The amount needed for generating steam and for coal washing purposes cannot always be obtained, and where it can be obtained the expense will not warrant it.

At many of the collieries, a dam located somewhere above the general elevation of the plant to obtain sufficient head and fed by mountain streams, constitutes the

water pumped from the mine discharging directly into a storage reservoir or into wooden tanks; or is conveyed from the point of discharge through pipes or flumes to the storage dam. The storage reservoir or tank is located high enough above the level of the mechanical devices to which the water is conducted for washing the coal while it is being prepared. At some collieries the water which the mine makes furnishes an abundant supply at all times, dependent on the area of the openings and the wet nature of the strata, while at many the supply can only be relied on so long as wet weather prevails, being entirely cut off during dry season, sometimes of only short duration. Many little schemes have been tried to pull through a dry spell and avoid a suspen-

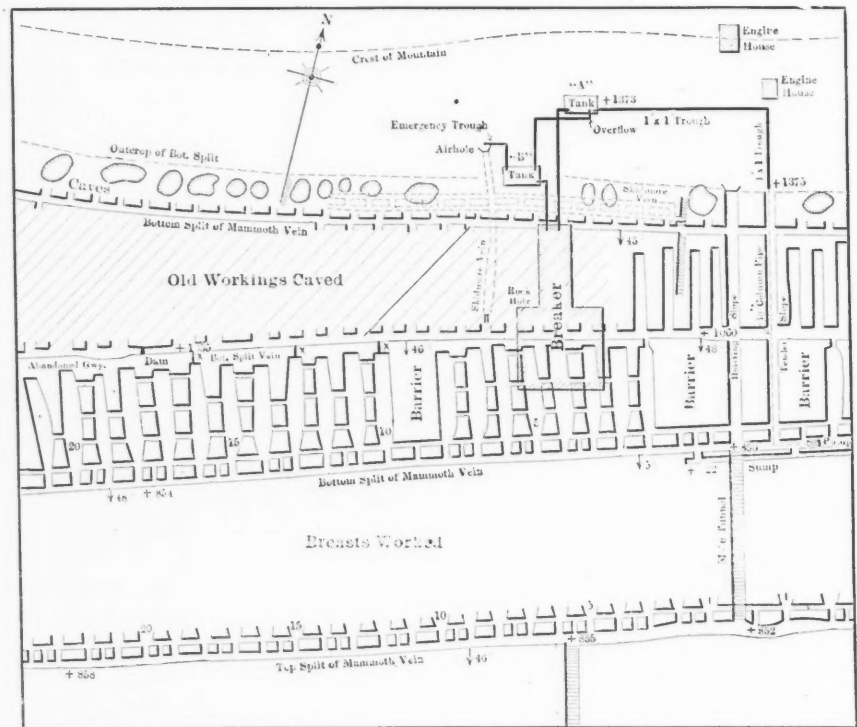


FIG. 1. SHOWING ARRANGEMENT OF TANKS AND LOCATION OF DAM AND DRILL HOLES

water supply; or the water is frequently conveyed through large pipes for a considerable distance from a stream or reservoir just outside the coal-producing area; while in some instances it has been convenient to connect with the pipes of water companies operating in the vicinity, some of the companies so operating not infrequently being an ally of the coal company. The water obtained from mountain streams, unless they be of good size and continuous in supply, is not to be relied on, and has, during dry seasons, always failed. To obtain a supply from water companies is too expensive, aside from that needed for the boiler plant.

MINE WATER IS USED

For these reasons, mine water is used at most collieries for coal washing, the

sion or having coal condemned on account of the dirt adhering to it. At some places the water, after going through the breaker, is conveyed to a pool or settling tank, where the dirt gathered during the washing of the coal is allowed to deposit itself, and the water repumped again and again from the pool or sump. While it becomes necessary in many cases to do this, it should be avoided if at all possible, for the water, charged with sulphur from the mine in the beginning and that gathered during the washing of the coal, is most destructive to the breaker machinery with which it comes in contact, as well as the pump lifting it.

During the summer of 1905 a continued dry spell, almost equal in length to that of this year, placed many operations in trying circumstances. Some of them were compelled to shut down, there being no

possible source from which to obtain the supply.

A SUCCESSFUL EXPERIMENT

The plan to be described here, Fig. 1, was adopted hurriedly after all others failed and at the moment when a suspension seemed compulsory. The colliery is located in the Southern Anthracite field and the veins worked, four in number, top and bottom splits of the Mammoth, Skidmore and Buck Mountain, with the exception of the bottom split are extremely wet, the Buck Mountain in addition containing, as is usual in that field, much refuse, slate and rock. A large amount of water was needed to thoroughly wash the coal. The supply for washing purposes was one entirely of mine water pumped from the foot of the hoisting slope to the surface and conveyed by a trough to a tank located on the hillside and at some height above the level of the breaker tip. This tank supplied the upper decks of shakers in the breaker and a regulating device at the tank fed another tank somewhat lower in elevation which supplied the lower shakers and jigs. During the ordinary weather the mine made water enough to keep a 16-in. and 30x10x18-in. compound duplex pump going at moderate speed and discharging a steady stream through a 10-in. pipe, which furnished for the breaker an ample supply. The two tanks were always full on starting up in the morning and remained so unless it became necessary to stop the pump during the day for repairs, when the amount in the tanks was sufficient to permit of such repairs being made. Of course the pump was running all night and after the tanks were filled the water pumped after that found its way through an overflow notch and flowed away over the surface into a coal-dirt stream some distance away.

After several weeks of dry weather even this supply soon failed, the water from the mine being but very little. After several experiments an attempt to carry the water after going through the breaker back into the mines again by way of old mine breaches failed. The water penetrating the old workings carried with it to the pump much clay, sand, and coal dirt with the result that the suction pipe and valves of the pump furnished more trouble than was expected and the plan was abandoned. When, finally, a suspension seemed inevitable, the following idea presented itself, namely to provide some sort of storage for the water coming from the tanks through the overflow notch. A hurried consideration resulted in the selection of a site for a dam inside the mine on an abandoned road, as shown in Fig. 1. The dam was hurriedly built, and consisted of 2-in. planks spiked to props, the breast formed of clay and manure. While the dam was being built, a force of carpenters were also at work preparing a conveyance for the water from the tanks.

The conveyance was a trough, beginning at a notch of 3-in. depth in the tank "B" in the figure, and extending to the mouth of the airhole in the Skidmore vein which had been worked up under the caved workings of the overlying vein from a rock hole, the strata between the two veins being only from 6 to 8 ft. thick.

The scheme was this: Every day, after the breaker had quit, the tank "A" was filled and the overflow was conducted by trough to the tank "B" which was allowed to fill. The overflow from the tank "B" flowed through the emergency trough to the airhole and thence down the same, finding its way through the old workings into the dam. Drill holes 4 in. in diameter from the faces of the breasts below were plugged at night, and were opened the next day at a time when the supply demanded it. The holes are marked "X" in the figure. The dam held, when full, about 20,000 gal., which, added to that contained in the tanks, furnished an adequate supply and also the desired relief during the dry spell while it lasted. The water during its course down the airhole gathered much dirt, etc., but this had the opportunity to deposit itself. One precaution was necessary and that was to prevent the water from backing up and going down the hoisting slope. For this reason the breast of the dam was carried to an elevation of 1060 ft., or level with a point 200 ft. west of the slope.

Coal Mining in Wales

Vice-Consul A. S. Phillips, of Cardiff, reports that the coal shipped from Welsh ports, foreign and coastwise, in the first six months of 1907 reached the total of 14,823,530 tons, being an increase of 1,005,147 tons over the corresponding period of 1906. It is worthy to notice that while the foreign trade is greatly on the increase the coastwise trade is considerably less, which is attributed to high prices. Many consumers of lower-class steam and house coal, when prices are so high as at present, go to other coalfields for a portion of their requirements. France is the most important purchaser of Welsh coal, buying in the first six months of this year over 3,000,000 tons.

The value of large coal is nearly 61c. per ton more than at the beginning of January. In the early part of February as much as \$4.86 per ton was paid, while \$4.98 per ton is now being asked for forward shipment. Small coals are now about 12c. above January prices. In June all miners working in the bituminous coalfields received an increase in their wages of 11¼ per cent.

The high cost and poor fuel value of the peat bricks made by the Swedish Government have caused this industry to be abandoned, says the *Iron and Coal Trades Review*.

Respiratory Apparatus for Use in Mines

In response to inquiries in regard to the use of respiratory apparatus in French mines, Consul W. H. Hunt, of St. Etienne, says that the utility of such is far from recognized, and although regulations prescribing the employment of these instruments have been recently decreed by the mining department, it should not be inferred that they were judged indispensable. The opinion of the mining commission appointed to study the subject is rather against them. The report says that "it recognizes that when another grave accident takes place in French mines public opinion will not understand the purely technical motives which might have influenced at present the commission in proposing to the department either to withhold any interference or to defer the solution until experiments pronounced for or against the apparatus already in use or those on trial in other countries." Consequently it was to satisfy public opinion that the use of respiratory apparatus was imposed on French mining companies.

It is true that none of those employed up to the present has attained the desired degree of perfection, but their defects and the necessary remedies can be known only by experience. It is to this end that England and Germany have been putting them on trial. The Government commission on mines, appointed a year ago in Great Britain, speaks in its first report of experiments made with different respiratory apparatus. Although granting that the results obtained were satisfactory, the English commission was somewhat of the same opinion as the French. It found that certain persons overestimated the value of the apparatus in great mine disasters, but that it was capable of rendering good service in fighting underground fires.

Every hoisting engine should be provided with an indicator so that the engineer can know the exact position of the cage in the shaft. The simplest form of indicator is made of a small drum, driven from the main shaft of the engine, on which a light chain or strip of leather belt is coiled. The leather is carried over a small pulley and a weight is attached to the end in such a manner that the weight will slide vertically in its frame. As the cage is raised the weight descends and reaches the bottom of its frame, when the cages meet half way up the shaft, the belt then coils on the drum in the reverse direction and the weight rises to the top of the frame as the cage reaches the landing of the shaft. When the cage is nearing the landing at the surface, the indicator is so arranged as to ring a bell attached to its frame.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

When robbing is started, it is necessary to keep the pillars in line as they are drawn back. Any pillars out of line receive an unequal and greater share of pressure, which is apt to cause them to be so crushed that they cannot be taken out.

Wire used with electrical blasting apparatus should be of the best quality, made of copper of the greatest purity, and well insulated. If of inferior quality the effective power to be obtained from the machine will be reduced. Connecting wire should never be smaller in size than the fuse wire which it joins.

The object of timbering a roadway is not only to keep the roof up when it is bad, but also to prevent a good roof from becoming bad. In many cases it is cheaper to take loose rock down than to keep it up with timbering. When the roof breaks in the form of an arch it will remain that way for a long time with very little timbering. If the conditions are known to be favorable the roof should be allowed to fall until an arch is formed.

In Natal, during 1906, 788,198 tons of coal were mined by machinery; 519,287 tons were produced in 1905, and 276,819 tons in 1904. A marked increase in machine mining in that country is shown by the following percentage. In 1901, 16 per cent. of the total output was machine mined, 1902, 24 per cent., 1903, 24 per cent., 1904, 32 per cent., 1905, 46 per cent., 1906, 63.6 per cent. Out of the 111 machines in use, 25 are electrically driven and 85 are driven by compressed air.

The remarkable expansion of the coal output of India during the year 1907 has enabled that country to easily maintain her position at the head of the coal-producing dependencies of the British Empire. Compared with the preceding year, there was a striking and significant increase of 1,349,884 tons, or 17.4 per cent. The output amounted to 9,112,663 tons. Of this 8,617,820 tons, or 94.57 per cent were produced in Bengal, exceeding the output of the preceding year by 1,383,717 tons.

The United States Geological Survey reports that the total production of coal in Alaska in 1906 was 5541 short tons, an increase of 1767 tons over the figures for 1905, when the production amounted to 3774 tons. In view of the quantity of fuel consumed in Alaska and by steamers plying between the Territory and the ports of the Pacific States, the tardy development of the coal beds in Alaska is

somewhat remarkable. The consumption of coal in the Territory appears to be about 140,000 tons, compared with which the local production is insignificant.

The length of a prop should be in proportion to its diameter, usually it is from ten to twelve times the diameter. The average prop of these proportions has an ultimate compressive strength of about 3000 lb. per square inch upon its sectional area. If a prop is much longer than ten diameters, its strength is diminished, as it breaks by buckling and not by being crushed. In order to get the maximum strength, a prop should have flat, square ends, so that every fiber in the sectional area will bear its part of the pressure. All props should have a cap of soft wood between the ends and the roof.

The Dandot coal mine of India has a system of timbering that compares favorably with any other system used in any country. The seam is from 2 ft. to 3 ft. thick, and is worked by the longwall method. Wooden "chocks," 2 ft. square, are built at a distance of 4 ft. 6 in. apart, measuring from center to center. Props are set in advance the same distance apart, and these form centers for the "chocks" as the work progresses. Planks 1½ in. thick and 6 in. wide are set above the "chocks" and props and kept close to the face. Thus the miners are always protected by timber when working. The timber is set by specially appointed men.

In working a thick seam pitching over 50 deg. and giving off large quantities of gas, the gangways should be driven along the roof or top slate so as to give greater security to the haulage roads. When the gangways are built in this way, the chutes may be constructed at such an angle as will permit the coal to be under the control of the loader. The airways should also be driven above the gangways. When the breasts are working the airways need not be used, but may be boarded up as the air passes through the crosscuts and the faces of the workings, since the gangways are made intake. The great advantage of this method is that when the breasts are worked up to the limit, it gives a permanent return for the air and greater security for the gangway and airway roof.

A school of safety for mine foremen is being formed by the Delaware, Lackawanna & Western Company, upon the principle that prompt and effective application of State laws and its own rules will be the best preventative of accidents in its mines. Competitive examinations

are to be held every six months. The company's collieries have been divided into four districts, each under a superintendent and assistant. The districts average about five collieries, and examinations in each district will be carried out separately. An examining board, consisting of the general manager, his assistant, and the chief engineer, will examine the men in a hall especially engaged for the purpose. After all examinations have been completed, and the answers recorded by a stenographer, each man's work will be gone over and marked according to its merits. To the district showing the highest average for all men examined will be awarded a trophy, which will be retained by that district until the next examination. If any district wins the trophy three times in succession it may retain it permanently.

Experience has shown that there is no part of a pump upon which the efficiency so much depends as the water piston or plunger, whose efficiency in turn depends greatly upon the system of packing used. A common method of packing is to use split rings placed in grooves in the block, similar to a steam piston, but, as with steam, the pressure gets behind the ring and forces out against the walls of the cylinder or barrel, causing increased friction and loss of efficiency. It is also true that as the water pressure is often much higher than with steam, and the plunger cannot be lubricated, this difficulty is enhanced. There is also the question of efficiency against leakage, and so low has this been that in some makes of duplex type pumps, packing rings have been dispensed with, the lesser evil of reduced efficiency being preferred to the uncertainty and trouble caused by ordinary packing rings. Another method sometimes employed, is the gland-packed piston, where soft packing is compressed, so as to enlarge its diameter by screwing down a gland ring. This is probably one of the worst types of piston, as the friction may be enormously increased from screwing down the gland too tight. One of the best types of water piston is filled with cone shaped rings to fit the conical ends of the block and are held in position by a plate, containing three small spiral springs which give flexibility for automatic adjustment. No pressure can possibly exist behind the rings and the block, and the pressure against the ring causes it to automatically adjust itself to the sides of the barrel and so prevent leakage, at the same time friction is reduced to a minimum. This system of packing is at once simple and efficient.

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The Prospects for Copper

It is expected by some, who are in a good position to judge, that soon after the end of the year a sharp rise in the value of copper will take place, the reason for this view being that at about that time the output of the refineries will begin to show the curtailment at the mines in October and November. Also by that time the currency difficulty will doubtless have been overcome. There is no question that the accumulation of stocks was greatly reduced by the heavy sales at the end of October, although since then the current production has increased them again to some extent. Conditions will doubtless soon be ripe for a rise (perhaps they have already been discounted), but if there be such a movement it will be dependent upon revival of demand by American consumers and will be controlled by the stocks in second hands.

However, if a further rise takes place there is little reason to anticipate that it will be either high or of long duration, for the reasons that (1) American industry has entered upon a period of recession and reduced demand, as is now recognized, and (2) the day of a large production of cheap copper from Bingham, Ely and elsewhere is close at hand. Indeed, it would have been here already had not certain companies underfinanced their construction accounts and become placed in a vexatious position by the financial panic, while others have deemed it the cautious policy to go slow temporarily. If recent events in the metal and stock markets be read between the lines, some inferences may be drawn respecting the aims and wishes of those interested in the production of comparatively costly copper which is about to be replaced by much cheaper copper just when the demand for copper has become greatly restricted.

It is time for producers to forget the abnormally high prices of the last two years and make up their minds to carry on their business in a rational way. We mean that the producers who were able to make a profit out of copper that cost 15c. to produce ought to thank their lucky stars for this ability while it lasted, but ought not to draw such long faces because they can not always do so. Even now the price for copper is fairly high, as witness the annual averages for Lake for 10 years previous to 1906, as follows:

1896.....	10.88	1901.....	16.55
1897.....	11.29	1902.....	11.89
1898.....	12.03	1903.....	13.42
1899.....	17.61	1904.....	12.99
1900.....	16.52	1905.....	15.70

The average for these 10 years, including periods of low prices and high prices, is 13.89, which is only a little more than the price for Lake copper today. When the boom started two years ago last summer, conservative engineers and promoters, in connection with new enterprises, took 13c. as a basis for calculations and referred to 15c. as something to be expected in good times. Memories are indeed short that forget the general exultation when the price reached 15c. at the beginning of 1905. Why then should there be the present gloomy prognostications that the industry is going to the dogs unless we have a speedy return to the abnormal and unsafe levels of 1906?

It is true that in some cases the cost of production increased legitimately, by which we mean increased because of more costly labor and material; we exclude increased cost of production because of de-liberate mining a lower grade of ore. On the other hand, in some cases the cost of production did not materially increase, as observe the Copper Range company, which reported the following figures:

BAL TIC			
Year.	Cost Per Lb. of Copper.	Cost Per Ton of Rock.	Yield Per Ton of Rock.
1903.....	8.00	\$2.43	.....
1904.....	7.66	2.12	22.14
1905.....	8.25	1.56	22.74
1906.....	8.37	1.52	22.15
CHAMPION			
1903.....	8.88	\$1.60	27.2
1904.....	8.42	1.61	27.6
1905.....	8.47	1.66	26.0
1906.....	8.21	1.65	25.2
TRIMOUNTAIN			
1904.....	9.88	\$1.80	19.1
1905.....	10.50	1.59	18.4
1906.....	11.40	1.86	18.8

In the case of the Western mines, which suffered increased labor costs, conditions have now returned to the normal by the reduction in wages, and also the reduction in the number of men, the latter naturally increasing the average efficiency.

The simple facts of the situation are that the mines which have a high cost of production because of costly labor and material, or other unfavorable conditions, or low grade of ore have been naturally eliminated. Similarly, those mines which took advantage of an exceptionally high price for copper to realize something from their reserves of low-grade ore, which otherwise would have been impossible, have been driven back to their normal conditions. In many cases the advisable

or necessary readjustments require a little time which may justify a temporary suspension of production, but it may safely be said that any copper mine which can not operate profitably at a price of 13 to 14c. for copper is not an attractive investment.

The Cyanide Process

Philip Argall, in a scholarly paper, entitled, "Steps in Cyanidation," read recently before the Colorado Scientific Society, reviews the history of the development of the cyanide process for gold extraction. In the concluding pages of this paper he discusses what cyanidation has done for the benefit of the mining industry and the advance of civilization. This is an extremely difficult question to answer statistically, because the industrial results of the cyanide process are so complex, comprising broadly (1) the gold which is yielded directly by it and (2) that of which it induces the production by other methods. Thus, the mines of the Witwatersrand would not as a whole pay to operate if it were not for the cyanide process; yet the actual amount of gold extracted by the latter does not exceed 25 per cent. of their total production. Consequently in their case the direct influence of the cyanide process is 25 per cent., while the indirect is 75 per cent.

The world's production of gold in 1906 was about \$408,000,000, of which about 30 per cent. came from South Africa. Mr. Argall concludes as follows: "If we allow \$70,000,000 for gold recovered from placers, by smelting and other processes, I believe it is fair to assume that one-third of the remainder has been recovered by cyanidation, a matter of \$112,000,000—we will, however, call it \$106,000,000—produced directly by the cyanide process; and if we estimate the direct and indirect influence of cyanidation on the gold output of the world, we must place the figure at not less than \$170,000,000, which approximates the world's total production of gold and silver 50 years ago, while the \$106,000,000 estimated as the direct production of the cyanide process in 1906 equals the world's entire production of gold when the process was introduced by MacArthur."

Although the cyanide process has unquestionably been responsible for a large part of the great increase in gold pro-

duction during recent years, which has led some political economists to argue that because of that fact the value of gold has been cheapened, as manifested by the increased value of other commodities, it is unsafe to arrive hastily at any such conclusion. The cyanide process has greatly increased the production of gold by making available many resources of ore that previously could not be worked at all, but there is slight evidence to show that the increased production of gold has on the whole cost any less per ounce than the smaller production of 20 years ago used to cost. This is clearly evident from the case of the mines of the Witwatersrand, which according to Mr. Argall could not be worked at all without the cyanide process; but even with the cyanide process, in spite of the fact that many of the mines there are ostensibly paying large dividends, it is a grave question whether a considerable number of them, especially "the deep levels," be not actually unprofitable.

Gold Stealing in Nevada

We have many times referred to the evil of "high grading," i.e., the stealing of rich ore, which has caused so much trouble and loss to mine owners at Kalgoorlie, Western Australia, and at Cripple Creek and Goldfield, in the United States. In this connection some remarks by Waldemar Lindgren, of the U. S. Geological Survey, in his recent report on the production of gold and silver in 1906 are significant. Mr. Lindgren says:

"The practice of stealing ore was carried on to a disgraceful extent during the year in the rich mines of Goldfield. The principal mine officers estimate that ore to the value of \$1,250,000 was appropriated in that camp during 1906, and state that ore worth \$250,000 was recovered from the thieves. Several suits in the courts for the recovery of parcels of ore indicated that the statement was well founded. Much rich ore is probably still secreted, and will gradually reach the mints in 1907. The conditions prevailing at Goldfield in the last months of 1906, were, however, exceptional."

The ore produced at Goldfield is almost exclusively gold-bearing, its silver content being insignificant. The total production of gold at Goldfield in 1906, as

reported from the mines to the Geological Survey was \$7,026,154. Consequently if \$1,250,000 were stolen, the thefts amounted to about 18 per cent. of the reported production. We find it difficult to believe that these thefts attained so marvelously high a figure as estimated by the mine officials at Goldfield. Especially does this appear improbable in view of the fact that the Mint statistics, which are based on the production of refined gold and silver, fail to indicate the re-appearance of so much stolen gold in the places where it ought to show up, although as Mr. Lindgren points out, some of the stolen gold was doubtless still in hiding at the end of the year and would not reach the Mint until 1907. But whether the gold stolen at Goldfield in 1906 was more or less than \$1,250,000, it is well known that the amount was large and it is a pity that something adequate cannot be done to eradicate the evil.

Troops at Goldfield

About two weeks ago the miners at Goldfield struck because the bank troubles did not permit them to be paid in cash. Since then trouble has been brewing, and on Dec. 5, President Roosevelt, at the request of Governor Sparks, of Nevada, ordered troops to be sent to Goldfield to preserve order. The prompt action of the Governor and the President is commendable. Although there had been no noteworthy disorder up to that time, there were strong prospects that there would be, and it is far better to preserve order than merely to restore it. The preservation of order is a part of the constitutional guarantee of liberty to the citizens of the United States. The constitution would not be so often trampled upon in this respect if public officers always did their duty.

Goldfield is the end of the trail of disorder that has led through Butte, the Coeur d'Alenes, Cripple Creek, Leadville and Telluride. It is to be hoped that conditions will now shape themselves so that the operators of mines there will be given a fair chance; so that they will be able to manage their own affairs on business principles, run their mines on the principle of the open shop, if they so desire, eliminate the danger of assassination and physical injury, and eradicate the shameful scandal of ore stealing.

Suspension of Operations at Butte

The suspension of operations at practically all of the mines of the Amalgamated at Butte, except the Boston & Montana, and at the great Washoe smelting works, is evidently designed not to curtail production any further but to concentrate upon the most profitable property, which happens to be the Boston & Montana and work it at the most economical capacity. Of course this is good engineering and common sense. The closing of so many mines may incidentally bring some other advantages in future conditions, while perhaps the farmers will not be so anxious to shut up the Washoe works permanently after they have seen how things look with it idle. The position of the North Butte and Butte Coalition companies, which have been shipping their ore to the Washoe works, is unfortunate, inasmuch as there is nowhere else for them to dispose of their ore. The situation is one that also gives the minority stockholders of the Anaconda company cause for reflection.

Lake Superior Mining

Probably there is no mining region in the world where the output of ore per man employed is greater than on the Mesabi iron range in Minnesota. The mine inspectors' reports for the fiscal year 1906-7, covering St. Louis and Itasca counties, which include the Mesabi and Vermillion ranges, give a total of 25,585,000 tons of ore mined, with 16,535 men employed; showing an average of 1547 tons mined per man. This does not express the full amount of work done, since the stripping in the open pit work and other development involved the removal of 14,510,000 cu.yd. of barren rock and earth. This is estimated to be equal to the mining of about 7,750,000 tons of ore, and would bring the work done up to the equivalent of 2016 tons mined per man employed. This high average is due to the large proportion of work done by steam shovels and other machinery. The average for the Mesabi range alone would be somewhat higher than this, since the mines of the Vermillion range are all deep underground workings, where the output

per man is necessarily smaller than in the great open-pits of the Mesabi.

In the Old Range mines in Michigan—including the Marquette, the Menominee and the larger part of the Gogebic iron range—the total number of men employed was 17,304, and the tonnage of ore was 12,367,000; the average per man was 714 tons. This is also a high output, considering that the Old Range mines are chiefly deep mines.

In the copper district of Michigan there were reported 7,580,000 tons of rock mined with 20,580 men employed; an average of 368 tons per employee. Here the mines are deep mines; moreover the employees include a number in rock-houses, mills and other surface work, while in the iron mines there is little or no milling work, the movement of ore being the main business.

The Consolidated Zinc Company

It is certainly audacious to attempt to bring out a zinc mining consolidation in a time like the present, and statements that are made in behalf of the Consolidated Zinc Mining Company, a Chicago promotion, are considerably at variance with the facts. It is unnecessary to take them up with any detail, because when the smelters are putting furnaces on dead-fire and when the operators of mines in Missouri, Kansas and Wisconsin are closing down for the reason that they cannot make money under existing conditions, it is rather absurd to suppose that a new \$20,000,000 company, whose property is chiefly in the Wisconsin field, is going to be able to pay dividends at the rate of 12 per cent. per annum beginning Jan. 1, 1908.

It would not be a bad scheme to effect some consolidations of mining interests in Missouri, Kansas and Wisconsin, which might (1) eliminate royalties by compounding in the capital account the interests of the present fee-owners, (2) introduce some economies in mining and milling by the effect of operations on a larger scale, which would be possible even in the Joplin district, and (3) enter the smelting and manufacturing business. Moreover, a time like the present, when property can be purchased cheaply, is suitable to begin if the necessary funds be available (which is not apt to be the case). But no such enterprise is going to pay dividends from the start, and a com-

pany which talks about reducing the present cost of production by 50 per cent., which talks about a "thousand-ton (zinc) smelter," and about a market which has risen almost constantly since 1873 with no prospect of falling now! manifests such amazing ignorance of the business it proposes to engage in that investors will hardly feel confidence in its claims.

DISSATISFACTION WITH MINERS who do not speak English and do not assimilate with their American neighbors is not limited to the mine operators of West Virginia. Mine owners in Pennsylvania are also reported to be anxious to get rid of many thousands of mine laborers of the same class, and to substitute for them miners from Great Britain. The objection to the foreigners seems to be that they take too many holidays with a consequent interruption of operations and delays in filling contracts. The local papers have no sympathy with the operators and remark that since the mine owners originally encouraged the influx of cheap labor they had better put up with it.

A BRIEF CONTRIBUTION by Mr. Barbour on the "Cost of Shaft Sinking at Goldfield," published in this issue, is a noteworthy contribution, because it is one of that desirable kind which gives mining costs with minute detail. Professional literature is in need of enrichment by more contributions of this character. In this particular case the costs are especially interesting, inasmuch as comparatively little has heretofore been published upon the practice at Goldfield. Attention will, of course, be directed to the excessively high prices of everything required. As Mr. Barbour remarks, this explains why ore assaying \$50 per ton cannot be profitably mined at Goldfield at present.

WE REMARKED SOME TIME ago, in reporting the preliminary statistics of the Geological Survey respecting copper production in the United States in 1906, that probably they would be revised. This has been done. The revised and final report of the Geological Survey gives 917,805,682 lb. The report of the JOURNAL and "The Mineral Industry" for the same year was 917,620,000 lb. Thus it appears that the check is remarkably close.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Negative Results in Pyritic Smelting

I have read with interest the contribution of G. F. Beardsley on "Negative Results in Pyritic Smelting" and the reply of Messrs. Hixon and Lang to the same. I take pleasure in adding something to this discussion.

Mr. Beardsley attributes the failure of the process to the undue liquation of the sulphides, but I must say that I agree fully with Mr. Lang in the belief that the trouble is really to be found in an improper composition of the furnace charge, assuming that I understand this correctly from Mr. Beardsley's paper. I read his article to mean that the furnace charge consisted of the ore (the analysis of which he gives), from 3 to 6 per cent. of coke, slag, and some limestone. In his case there seems to be no question of the deficiency of silica and probably an excess of coke, certainly so in the case of anything above 3 per cent.

I have had occasion during the last year, in supervising the operation of two blast furnaces, to change these successfully from partial pyritic smelting to true pyritic smelting. In making this change, I received much aid from the valuable papers of Robert Sticht in *Metallurgie*, during 1906, and from those of Lewis T. Wright in the *Mining & Scientific Press* of the same year. From my recent experience, I would outline the following essentials as requisite for success in pyritic smelting, the violation of any one of which is almost certain to lead to failure:

ESSENTIAL CONDITIONS

(1) As the heat for the operation is furnished chiefly by the oxidation of the iron and to a less extent by that of the sulphur, these two constituents must be present in the charge within certain well defined limits. The requirement of the matte for iron and sulphur is secondary.

(2) As the furnace practically chooses its own slag, the basis of which, in normal pyritic smelting, seems to be the mono-silicate of iron, other silicates acting merely as diluents, free silica must be furnished for the formation of this mono-silicate in such quantity as the rate of the oxidation of the iron demands. This, therefore, fixes the amount of silica within certain limits. A portion of the heat of the process is also derived from the combination of the ferrous oxide with the silica. The presence of silica also pre-

vents to a large extent the superoxidation of the iron to magnetic and ferric oxides.

(3) As a certain rapidity of oxidation is necessary in order to maintain the critical temperature of the furnace and variations in this rate lead to much trouble, a constant amount of air should be furnished the furnace. This, within my experience, for good running should not be less than 300 to 325 cu.ft. of air per minute per sq.ft. of hearth area. This figure is of course approximate only and represents the air delivered to the blast pipe at the blower by a certain number of revolutions of the blower. This amount of air determines the rate of oxidation of the iron to FeO, and of course also the amount of silica which must be furnished this FeO.

(4) As the presence of other bases forming silicates in the slag is not a source of heat to the process like that of iron, except the little furnished by their combination with silica, their total amount must be limited so as not to burden the furnace to the exclusion of oxidizable iron and sulphur. The amount of other bases present should rarely exceed 16 per cent.; at least 4 per cent. of this should be lime and not more than 8 per cent. (at the most 10 per cent.) alumina.

(5) The amount of coke should not exceed 3 per cent. at the most; 2 per cent. or less is usually better. The presence of too much coke will manifest itself at once by the increased matte fall and other troubles. It is right here that the chief practical difficulty most frequently arises, for ordinary blast furnace labor will insist on feeding just a little more coke than is directed. This "little more" in pyritic smelting may prove very harmful to the furnace.

CHARGE REQUIRED

In order to satisfy the above conditions, I finally arrived at the following data for the proper blast-furnace charge. The charge considered as a whole was made up of pyrite, quartzite (gold bearing) ore, coke, limestone and slag. It had to contain: iron from 31 to 32.75 per cent., of which at least 30 per cent. was unoxidized; silica from 23 to 24 per cent., of which at least 21.5 per cent. was uncombined.

These percentages are figured on the charge exclusive of the coke, slag and limestone; sulphur, under the above conditions, ranged from 28 to 30 per cent.; the amount of fowl slag, from 5 to 8 per cent. The amount of limestone on the charge varied from 2.5 to 4 per cent. Percentages in

this case being figured on the whole charge as the unit. It may be noted here that the addition of slag and limestone simply acts as a burden on the furnace although some slag is quite necessary. These data correspond to the blast unit of 325 cu.ft. of air per minute. I should like to give details of furnace, etc., but refrain from taking up further space with such matter.

These data apply to the case where the copper contents of the charge are low, from 0.5 to 3 per cent.; for high copper, the relations given may have to be modified somewhat. Considering the case of Mr. Beardsley, the analysis of the ore given is: Silica, 10.1 per cent.; iron, 44.68; alumina, 6.85; lime, 1.19; magnesia, 1.14; sulphur, 27.84; copper, 1.77; nickel, 5.62 per cent. This ore, with 3 per cent. coke, some slag and limestone, made up the furnace charge.

I assume that Mr. Beardsley's blast was adequate and constant. It is then evident from an inspection of his analysis and the facts stated, that the silica in the charge is very deficient, even assuming that it is free, which it evidently is not. The result to be expected is exactly what occurred: cold furnace, much low-grade matte, little slag. I can verify this from personal experience, for several of my furnaces instead of pulling through as Mr. Beardsley's did, were frozen up. I might also state that you can also freeze up a furnace in pyritic smelting on too much silica. The limits for this compound are rather closely defined, the other factors being constant. I also believe that Mr. Beardsley's percentage of coke was too high.

MATTE FALL

In pyritic smelting it is not possible to take as the basis of the calculation the amount and grade of matte to be formed unless this falls well within the limits of the charge as outlined. As iron, and to a lesser extent sulphur are the fuels, the first consideration of the process is to oxidize a sufficient quantity of these in a given time interval to attain the critical temperature necessary to carry on the process. If from a given unit of charge too much iron is required for the matte, not enough is left for fuel. It is for this reason that pyritic smelting is particularly adapted to ores low in copper and not to those of high grade. This also applies to copper and nickel. In this connection it is interesting to point out the remarkable achievement of Mr. Sticht at Mt. Lyell, whose recent work shows a

matte fall figured on the total charge of but 4.3 per cent., the furnace charge as a whole containing 2.14 per cent. copper and the matte containing 40.66 per cent. This is attainable only by close work as regards the relation of blast (amount of air), silica and iron. Considering the ore as of constant composition and the amount of it in each furnace charge as not variable the blast remaining constant, the furnace is regulated by varying the addition of silicious ore.

While I have never been able to gain quite the concentration given by Mr. Sticht, I have come close to it and am convinced that Mr. Sticht in his paper, and later in "Peter's Principles of Copper Smelting," has accurately enunciated for the first time the fundamental principles of the art.

HIGH ALUMINA SLAGS, CRUSTED TOP

Concerning one other point in Mr. Beardsley's paper, there is no doubt that the alumina in his ore is high and makes up a disproportionate amount of the earthy bases permissible. As to whether it is so high as to cause serious trouble, I am not in a position to form an opinion, not knowing fully all the facts in the case. From my own experience I know that slags as high as 10 per cent. alumina can be made.

Concerning Mr. Hixon's remark that the excessive flow of matte is due to the remnants of the old charge in the furnace, I but partially agree with him. I have turned furnaces running on a partial pyritic charge with 15 per cent. of Eastern coke, over to a pyritic charge with 2 per cent. of coke with but a small increase in the matte fall and that only for a short time. The method of procedure was to let the furnace charge go down to the first jackets as in blowing out, running on about 200 cu.ft. of air per minute per square foot of hearth area, then filling the furnace rapidly to the top with the pyritic charge and increasing the blast to the normal for pyritic smelting, viz., from 300 to 325 cu.ft. per minute, at once, not gradually. In this way we experienced very little trouble.

One point, however, gave rise to annoyance, and I believe this trouble is at present still experienced in Tennessee and in California, viz., when running on a true pyritic charge, the crusting of the furnace on top. Mr. Sticht at Mt. Lyell states that he does not experience this trouble. These crusts form at the jackets and grow out into the furnace at the top. The crust is of a transitory nature entirely and does not extend down into the furnace. It is, however, very troublesome at times. I believe that the difficulty is due to too low a furnace and that it could be remedied by using higher furnaces. The crusts are aggravated by the presence of sulphide fines, but I do not believe that they are caused by them. It would be of interest to hear the

opinions of other metallurgists on this point.

CHARLES H. FULTON.

Rapid City, South Dakota, Nov. 9, 1907.

Tube-mill Lining

In the JOURNAL of Nov. 23, H. W. Hardinge lays claim to the so-called El Oro tube-mill liner.

This liner was, as far as I know, first used at the plant of the El Oro Mining and Railway Company considerably more than two years ago, and the photograph to which Mr. Hardinge refers was taken by Walter Neal at the Dos Estrellas plant in January or February of the present year; and after the liners had been in use there for many months.

The rib liners which we put in, were put in to replace the ordinary rectangular castings sent out by the Allis-Chalmers Company, which had to be held in place with cement. The linings put in at Dos Estrellas were copied from the liners used by the El Oro Mining and Railway Company.

C. E. RHODES.

Guanajuato, Mexico, Nov. 30, 1907.

The Wage Scale in Hopkins County, Kentucky

It was stated in the JOURNAL of Nov. 2, with respect to Hopkins county, as follows: "The dispute over the wage scale in this district seems to have a prospect of settlement. At a meeting held in Indianapolis last week, the executive board of the United Mine Workers, took action on a proposed scale which will probably be adopted."

Since the above report is incorrect it would be interesting to know how it originated. The executive board of the United Mine Workers has no more control of the wage scale in Hopkins, Webster and Christian counties, Kentucky, than have the savages of Tierra del Fuego, and there is no wage or other dispute between the miners and the operators of these counties, nor has there been for more than 30 years. There are no union miners in the above counties, and neither miners nor operators pay tribute or allegiance to Indianapolis.

JOHN B. ATKINSON, Pres.,

St. Bernard Mining Company.

Earlington, Ky., Dec. 3, 1907.

"Calcium Light" or "Limelight"

I have frequently noticed in the JOURNAL editorials dealing with the necessity for simplifying and correctly using terms employed by the engineering fraternity. It is seldom that the JOURNAL itself errs in

this respect, but in the issue of Aug. 3 I find (on pp. 209 and 210) the phrase, "illustrated by calcium light views." Surely the old phrase "limelight" will serve our purpose even in these ultra-scientific days. Otherwise may I suggest that "calcium oxide light" would be more correct if your correspondent objects to the simple life.

HAURAKI.

Auckland, New Zealand, Oct. 4, 1907.

["Calcium light" is the common expression. "Calcium oxide light" would be more precise but would be rather an affectation in view of the common usage of the abbreviated term. "Limelight" unfortunately has a place in the vocabulary of slang.—EDITOR.]

Mining without Engineers

In the JOURNAL of Nov. 9 I wrote a few lines concerning the Mitchell Mining Company, an organized corporation with a capital of \$8,000,000, the stock of which has been dealt in freely during the last few years in New York and Washington.

Through circumstances upon which I do not feel sufficiently informed to speak, this corporation has fallen into financial difficulties. The president and founder, George Mitchell, has been deposed, new officials installed, and a circular issued to the stockholders asking their cooperation in rehabilitating the company.

In the same number of the JOURNAL, p. 892, there was a news report of this reorganization in which the statement was made: "The committee states that it has had an investigation of the physical condition of the property made by competent engineers."

Now, a remarkable fact about the Mitchell mine is that no such examination as stated has been made by the reorganization committee. Moreover, the mine, since it passed the development stage, has been conducted by the company without the aid of consulting, examining or operating mining engineers, and no physical report or examination of the Mitchell mine, including maps and sampling plans, is in the hands of the present administration. To me it seems impossible that an operating mine can be conducted without such knowledge; or that the stockholders, who are almost amateurs in mining, can reorganize and re-finance the company without the aid of consulting engineers.

Furthermore, that the reorganization committee should, in a circular not altogether complimentary to Mr. Mitchell, assert that it has made a physical examination of the property, when it has done no such thing, is beyond my comprehension.

In justice to Mr. Mitchell it might be said that while he was in active administration of the mine, he was undoubtedly in possession of data concerning the physical nature of the property, and as a

mining man assumed the technical responsibility himself.

These comments are not written from any personal interest. I gave my endorsement to the Mitchell property when it was a geological prospect and under no circumstances can I seek or desire a fee from the company. Furthermore, I have only a kindly feeling for Mr. Mitchell, the unfortunate stockholders and the reorganization interests. It does seem, however, that the condition is one that justifies the inquiry whether an investment of \$8,000,000 in a mining enterprise does not call for the employment of competent, technical advice.

There is a well founded prejudice among mining men about having their ground turned down in the prospective stage by incompetent engineers, but when the prospects become mines it certainly seems as if engineering is a necessity and that amateur investors should learn this fact. I shall certainly advise the many investors who apply to me concerning assessments to put up money for no other purposes at present than procuring engineering advice. ROBERT T. HILL.

New York, Dec. 2, 1907.

New Publications

THE GEOLOGY OF NORTH CENTRAL WISCONSIN. By Samuel Weidman. Wisconsin Geological and Natural History Survey, Bulletin No. XVI. Pp. 695; illustrated. 6½x9½ in.; cloth. Madison, Wisconsin, 1907: Published by the State.

This voluminous report, containing 76 plates and 38 maps and cuts, is one of a series intended to describe the geology of the State, and especially the northern part. It is stated that the report is not complete, but only an addition to the knowledge of the region already existing. The work throughout shows great care in preparing and compiling a great mass of scientific research and in presenting the data in pleasing form and profusely illustrated.

HYDRAULIC AND PLACER MINING. By Eugene B. Wilson. Pp. 355; illustrated. 5x7¾ in.; cloth, \$2.50. Second Edition, re-written. New York; 1907: John Wiley & Sons.

Contents. Geology of placer deposits. Placer prospecting. Hydraulic mining, salt mining, booming, culm mining. Development of placer mining: pan, rocker, sluicing, long tom, sluice boxes, transporting power of water, flow of water in sluice boxes, transporting power of water, flow of water in sluice boxes, grade. Riffles, undercurrents, Hungarian riffles, dump. Water supply, miner's inch, weirs, flumes. Pipe lines, flow of water through pipes, strength of pipes, pipe bends, water gates, air valves, pressure box, ditch lines, flow of water in ditches, siphons. Giants and

hydraulic elevators. Placer mining investments, cost of hydraulicking, the clean-up, retorting the mercury, drift mining, blasting gravel banks, mining in Alaska. Mining in North Carolina, log washer, steam shovel mining, cableway mining. Dredging, description of dredges. Traction dredges, dry placer mining machines, dry washers. Black sands. United States mine laws, Canadian Yukon laws. Information in Hydraulics.

The second edition of this book was the result of the increased activity in placer mining. This volume has been rewritten and brought up to date. The author has drawn freely upon the writings of engineers which have appeared in various technical journals and the book is profusely illustrated with photographs and drawings of operations. Unlike several other books on placer mining and dredging, this volume has not the appearance of a manufacturer's catalog. The information is conveyed in a simple and pleasing style and too much technicality is avoided.

THE CHEMISTRY OF COMMERCE. A Simple Interpretation of Some New Chemistry in Its Relation to Modern Industry. By Robert Kennedy Duncan. Pp. 262; illustrated. 5½x8 in.; cloth. New York, 1907: Harper & Brothers.

Contents: Introductory. Catalysis. The problem of the fixation of nitrogen. The rare earths and some of their applications. High temperatures and modern industry. Modern chemistry and glass-making. Industrial alcohol. Floral perfumes. The making of medicines. The new microbe inoculation. Cellulose. Industrial fellowship.

The readers of *Harper's Magazine* are familiar with the articles which make up this book. Collected in book form they constitute a series of essays, dealing with recent progress in some of the important subjects of industrial chemistry, which although intended primarily for the layman is by no means to be overlooked by the technologist. We confess to having read the book from alpha to omega with absorbing interest. We can earnestly recommend it as a work which offers both profit and entertainment. It touches upon many subjects which are of interest to the metallurgist.

Above all things the work is a plea for the adoption in America of the scientific methods of investigation which have given preëminence to the chemical industry of Germany. There are some American industrial companies which are already working on similar lines, but Professor Duncan is correct in asserting that the majority of our industries are characterized by chemical stupidity and sinful waste. As an antithesis to the high degree of development in certain industries in Europe, Professor Duncan gives a highly amusing chapter upon the backwardness and gross ignorance in certain branches of glass manufacture in the United States.

Professor Duncan has a wonderfully graphic and picturesque literary style, which makes his work a pleasure to read, and must, we think, make all his points perfectly clear to any layman who has a college education or the equivalent thereof. This, together with his general excellence, causes us to forgive the few technical errors which he has made.

THE PROCEEDINGS OF THE CHEMICAL, METALLURGICAL AND MINING SOCIETY OF SOUTH AFRICA; WITH APPENDIX. July, 1903-1904. Pp. 826, illustrated, 5½x9 in.; cloth, \$6. Transvaal, 1907: Published by the Society. New York, 1907: by Hill Publishing Company.

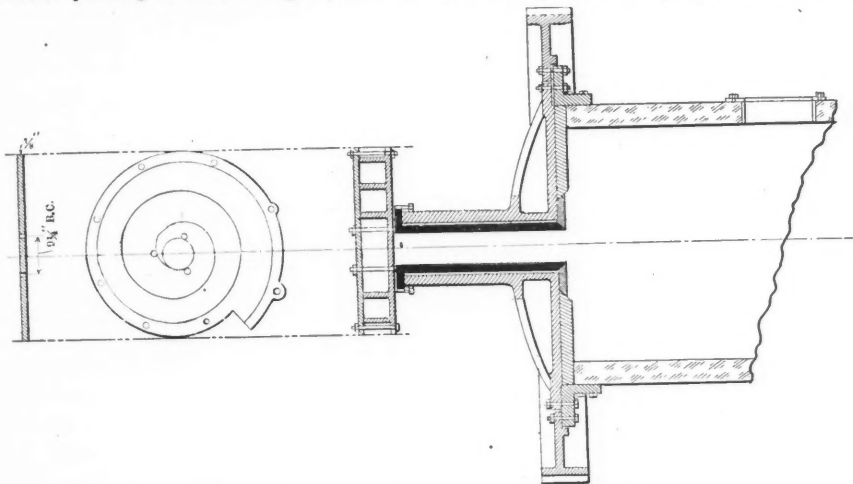
Contents. The president's (S. H. Pearce) inaugural address. Some mine gases: their toxicology and possible connection with miner's phthisis, by A. Heymann. A system of crushing rock in stages by wet process, and suggestions as to how this object can best be achieved, by Edward D. Chester. A further system of crushing rock in two stages, by dry process, with high-class cross-grinding rolls (Wegerif type). Observations on the metallurgical practice of the Witwatersrand, by Harry S. Denny. An automatic pump sampler, by James Higham. The ventilation of deep levels, by Thos. Johnson. The precipitation of gold from cyanide solutions, by W. A. Caldecott and E. H. Johnson. Notes on classification, by T. Lane Carter and D. V. Burnett. A new and rapid method of detecting and estimating gold in working cyanide solutions, by James Moir. The manufacture of nitro-glycerin explosives, by William Cullen. Some improvements in cyanide works clean-up appliances, by James E. Thomas. Underground handling and transport of ore (chiefly in reference to the Rand), by Chas. B. Sauer and George Carter. A development in electrolytic precipitation of gold and silver from cyanide solutions, by E. M. Hamilton. Notes on smelting and cupellation, by F. L. Piddington. Notes on the limitations of the cyanide process, by H. T. Durant. A colorimetric method for the determination of gold in cyanide solutions, by Prof. A. Prister. Ankylostomiasis: A forewarning, by Walter C. C. Pakes. Notes on mill construction, milling and amalgamation, by I. Roskelley. The determination of constants in working cyanide solutions, by Gerard W. Williams. The composition of tobacco smoke, by James Moir. The decantation process of slimes treatment, its possibilities and limitations, by E. J. Laschinger. An industrial method for the determination of the oxygen in working cyanide solutions, by Prof. A. Prister. The modern theories of the flow of water and their application in gold mining, by Prof. H. S. Hele Shaw. Analyses of some Witwatersrand soils, by Edward H. Croghan. Consumption of zinc in cyanide plants; nature, cause and effect, by Walter H. Virgoe.

A Spiral Feeder for Tube Mills

By W. H. Fox*

Operators of tube mills for wet crushing have experienced the trouble and annoyance of having to shut down to renew the packing around the stuffing box which connects the feeder to the trunnion of the mill. The packing wears from the action of the sand and solution and as a result, the feed-end of the mill is usually in a bad condition. Various devices have been tried to overcome this trouble with more or less success.

A year ago, while experimenting with a 14x5-ft. tube mill, it was suggested to use a spiral sand pump for feed purposes, the idea being to attach the pump directly to the trunnion, when it would take its motion from the mill itself. A feeder was made by bending a sheet of steel, 6 in. wide, in the form of a spiral. A 6-in. space was left between curves, and the sheet was bolted between two plates, using rubber packing to make a tight joint. A



SPIRAL FEED ATTACHED TO TRUNNION OF TUBE MILL

hole 6 in. in diameter was cut in the center of one plate and a pipe-flange bolted around it. A short 6-in. nipple was screwed in the flange and fastened to the mill with another flange, cap-screwed to the end of the trunnion. This spiral dipped into a trough which was made a trifle larger than the outside dimensions of the pump, into which the ore and solution were fed in the proper proportions. More than 3000 tons of ore was fed by means of this device without any stop or repairs. Pulp as thick as seven parts of ore to three of solution was fed without clogging. The pebbles necessary to keep up the stock in the mill were also fed through this pump, which avoided the usual method of shutting down the mill to remove the man-head.

The feeder proved so satisfactory that eight 22x5-ft. mills were installed and each was equipped with devices of this kind. They were made of cast iron and

*Superintendent, Colorado plant, United States Reduction and Refining Company, Colorado Springs, Colo.

the arrangement and mode of attachment are shown in the accompanying illustration. More than 100,000 tons of ore has been handled with these cast-iron feeders and no trouble has been experienced. As much as 160 tons per 24 hours per mill has been put through, and the capacity of the feeder is far in excess of this quantity. Only a small amount of wear is shown, and this is at the intake edge of the spiral, due to the scouring action of the sand in the trough. The spiral was made larger in diameter than necessary so that it could wear to one-half its diameter and still feed. A large tonnage can be put through the mill before renewal will be necessary.

Death Valley Borax *

By O. M. Boyle, Jr.

The lack of transportation facilities has always been more or less of a hindrance in developing borax properties in Death

valley. Owing to the difficulty of the transportation out of Death valley and the present excess of the borax supply over the demand, these fields are not being worked. They are owned principally by the Pacific Coast Borax Company.

In spite of the abundance of borax mineral, a good claim is more valuable than copper property in the Greenwater district. This is because of the attempt of the borax corporation to obtain a monopoly of the article. In the attempt to perfect a monopoly, Smith has been compelled to keep the American Borax Company, whose works are at Daggett, and the Stampler Chemical Company, as well as all other competing firms, out of business. It is reported that these smaller companies have nearly exhausted their borax holdings. They are, therefore, exceedingly anxious to obtain more land, and the Pacific Coast Borax Company is equally anxious to prevent them from obtaining any. For this reason it offers high prices for all new discoveries, though it has no present use for them.

A method of keeping competition out of the field is to discourage prospecting for borax. The Death Valley region is particularly barren, water is scarce and the sources of food supply are widely separated. One oasis is, however, particularly notable, the Furnace Creek ranch on the edge of Death valley, 28 miles below Furnace townsite. This is near the point where Furnace creek, a small stream of warm water, empties into Death valley. The land is extremely fertile and produces good crops of hay, grapes, figs and other tropical fruits. Indians under the direction of a foreman attend to the farming. Although the only camp between the Greenwater district and Bennett's wells on the opposite side of Death valley, it offers no shelter to strangers. Prospectors are not allowed to obtain food at the ranch nor supplies of any sort. In fact, the Pacific Coast Borax Company owns and operates this single fertile spot in the entire region, it is claimed, in order to close the country against prospecting strangers.

In spite of the efforts of the company, new deposits of borax are being found. Many discoveries, after having been examined by engineers of the Pacific Coast Borax Company, were rejected as not being worth exploiting and subsequently these have turned out to be of considerable value. In some cases the company has recognized its mistake and is now bidding for property in competition with other people who desire to obtain control of it. Development seems to be the only way of proving the existence of ledge borax deposits, and the Death valley region will probably remain the chief source of supply for many years to come. This district is still far from being fully opened up.

valley. This condition will, however, be changed upon the completion of the Tonopah & Tidewater Railroad which is now being constructed from Ludlow on the Santa Fe. This new railroad is owned by the Pacific Coast Borax Company, which is controlled by F. M. Smith and is usually referred to by his name. It is estimated that this company has enough borax in sight to supply the entire United States for a century.

Formerly considerable quantities of borax were obtained from the borax works in the Amargosa valley, but these works have been closed for many years, and the mineral is now obtained chiefly from the Lila C. mine which is located in the hills on the western edge of the Amargosa desert, not far from the copper camp of Greenwater. Where the Amargosa cañon widens at the abandoned borax works the river has left rich fields of borax over the entire floor of Death

*Abstracted from *California Journ. of Technology*, Sept., 1907.

Troops at Goldfield

The following formal appeal by Governor Sparks, of Nevada, to the President of the United States was dated Dec. 5 and was made public on Dec. 6:

"At Goldfield, Esmeralda county, State of Nevada, there does now exist domestic violence and unlawful combinations and conspiracies which do now so obstruct and continue to so obstruct and hinder the execution of the laws of the State of Nevada, and now deprive and continue to deprive the people of said section of the State of the rights, privileges, immunities, and protection named in the Constitution of the United States and of the State of Nevada, and which are secured by the laws for the protection of such rights, privileges, and immunities; and the constituted authorities of the State of Nevada are now and continue to be unable to protect the people in such rights, and the reason of such inability and the particulars thereof are the following:

"Unlawful dynamiting of property, commission of felonies, threats against the lives and property of law-abiding citizens, the unlawful possession of arms and ammunition, and the confiscation of dynamite with threats of the unlawful use of the same by preconcerted actions.

"The lawfully constituted authorities of this State are unable to apprehend and punish the perpetrators of said crimes, and to prevent the commission of other threatened crimes, and unless the relief hereinafter requested is granted, this State and the lives and property of large numbers of its people will be irreparably affected and damaged, contrary to the peace and dignity of the United States and of the State of Nevada.

"Therefore, pursuant to article 4, section 4 of the Constitution of the United States, and to sections 5297 and 5298 of the revised statutes, therefore, I, John Sparks, Governor, do hereby respectfully request that your excellency, Theodore Roosevelt, President, do immediately send to Goldfield, Esmeralda county, Nev., two companies of the troops of the army of the United States."

The President immediately ordered General Funston, commanding at San Francisco, to send the necessary force to Goldfield, and the latter ordered thither five companies from Fort McDowell and four companies from Monterey with a machine-gun platoon, all of the Twenty-second Infantry, in command of Colonel Reynolds. The troops arrived at Goldfield, Dec. 7. It is reported that an attempt was made to dynamite the train bringing them in.

The Mine Owners Association has made the following statement respecting the situation:

"The mine owners have notified the Goldfield Miners Union that all contracts, agreements and understandings heretofore existing are at an end.

"We propose to adopt fair and reasonable rules for the operation of our properties and to employ men irrespective of whether they belong to the union.

"We believe there are enough courageous and fair minded miners in Goldfield who are weary of the tyranny of the union and who when they know they will receive ample protection will come forward and work the mines. If there are they will receive the preference, but if there are not we will be compelled to get them from other sources."

It is reported to be the intention of the operators to resume mining on Dec. 11, and after forcing the local tradesmen to lower their prices wages will be reduced from \$5 per day to \$4 per day.

United States Reduction and Refining Company

Announcement was made last week that owing to trade conditions, the directors of the United States Reduction and Refining Company had decided to suspend the quarterly 1½ per cent. dividend on the preferred stock. In a statement to the stockholders President Hawkins said:

"Your company is in a sound financial condition and is treating a satisfactory tonnage of ore, though at somewhat reduced charges, owing to competitive conditions referred to in the last annual report.

"It is believed that the preferred dividend will be earned during the current quarter, but as the competitive mill will soon be rebuilt and ready again to enter the market for ores, and as its management has a declared policy of cutting the rates for treatment, it becomes necessary to maintain your company in a strong position to meet conditions and to reduce still further the treatment charges if necessary to maintain its position.

"Your directors have the fullest confidence in the ultimate outcome of the situation, and believe that the results will be the same as in the case of numerous other similar undertakings, all of which have been short-lived.

"The business of the United States Smelting Company, owned and operated by your company, has been affected by prevailing industrial conditions. Its product (zinc-lead pigment) was fully contracted for, but its customers have found it impossible under present conditions to take and pay for the stock of finished produce ready for market upon which it cannot realize for the reasons stated.

"It is also carrying a large stock of ores and supplies. Owing to the large amount of money required to continue operations, under prevailing market conditions the plant has been closed temporarily, and until its stock of finished product can be disposed of. It is expected that this will be accomplished by Feb. 1, 1908, or soon thereafter, but in

the meantime and until conditions change, your company must maintain itself in a strong financial position.

"All things considered, the outlook is encouraging for an early resumption of dividends."

Mining in South Australia

The progress of the mining industry of South Australia for the fiscal year ending June 30, 1907, is reviewed by T. Duffield, secretary of mines. Mining in this State is relatively unimportant as compared with the other Australian states. During the year under review, only 6950 men were employed in mining and mineral works, of which 5000 were engaged in copper mining, 900 in gold mining, 450 in salt mining, 50 in silver-lead mines and the remaining 550 in working various unclassified deposits.

Several Government prospecting expeditions were in the field, but their results on the whole were not encouraging. On the other hand, several boring outfits operated by Government aid are reported to be securing satisfactory results.

The following figures show the output of ores and metals for the calendar year 1906 as compared with 1905.

	1905.	1906.
Copper (cwt.).....	130,959	164,160
Lead (cwt.).....	1,040	1,000
Copper ore (tons).....	2,563	(a)
Gold (oz.).....	10,983	13,961
Ironstone (tons).....	84,483	75,226
Limestone (tons).....	44,498	31,940
Salt (tons).....	32,500	55,000
(a) Included in copper.		

A shipment of 2000 tons of iron ore from the Iron Knob mine was sent to England, but as a general thing, over-sea freights are too high to allow a continuous business. This shipment contained 97 per cent. oxide carrying 68 per cent. metallic iron.

Mining Locations in California

SPECIAL CORRESPONDENCE

An interesting case will shortly be tried over a dispute as to legal ownership of a mine in the Salmon Lake section in the northern part of Sierra county, California, the point to be determined whether a mining location without boundaries marked on the ground by brush lines, stakes or other means, constitutes a valid location. It has been a custom with the miners in that section to "brush" the boundaries of their locations, but in this case the original locators did not do so, though they did put down corner stakes. The suit arises on conflicting locations made by George McGee and partners and the Loyalton company, the former claiming the latter's location invalid, because corners were established. The law governing such locations would seem to be pretty well established by this time, but the local custom will be pleaded in this case.

Personal

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

P. K. Lucke has opened an office in Monterey, Mexico.

F. F. Sharpless has returned to New York from the West.

C. W. Purington has reached London from Vladivostok, Siberia.

J. H. Lewis, of Tucson, Arizona, is in Mexico on professional business.

C. E. Bradley, of Pioche, Nevada, is in Mexico to examine mining property.

W. E. Defty, of Phoenix, Ariz., is at present in Yavapai county, Arizona.

John E. Hardman, of Montreal, has been examining mines in Nova Scotia.

N. B. Knox is at present in London, but will return to Japan early next year.

James Moore Elmer is in charge of the Old Hundred mine at Silverton, Colo.

A. M. Yonge is at Amador City, Cal., engaged in sampling the Bunker Hill mine.

W. M. Thompson, of Oaxaca, has returned to Mexico after some time in New York on business.

H. I. Miller has returned to New York, after several months of professional work in southern Mexico.

John W. McKay and A. R. Ditman, of New York, are in Oaxaca, Mexico, on professional business.

Victor S. Hills, of Denver, has gone to Arizona to inspect mining property in the Vulture mountains.

Fletcher Harnshaw has returned to New York from a trip to the Atlin district in British Columbia.

John C. McMynn has resigned his connection with Robert W. Hunt & Co., Chicago, taking effect Dec. 1.

C. H. Brooks, of the San Domingo Mining Company, Guadalajara, Mexico, is in New York on a business trip.

Capt. Alexander MacKenzie has succeeded Captain Opic as head mining captain of the Calumet & Hecla mine.

M. E. MacDonald, of Guanajuato, Mexico, has returned home after several months in New York on business.

E. G. Spilsbury, of New York, has returned from Guanajuato, Mexico, where he made a series of experiments at the Peregrina mill.

A. Heise, president of the Eastern Mining Company, of Masbate, has returned to the Philippines after a trip to the United States.

C. Colcock Jones has returned to Los Angeles, Cal., from an extended trip through northern Arizona, on professional business.

George Crerar has resigned the superintendency of the Dominion Copper Com-

pany's smelter at Boundary Falls, British Columbia.

Eugene G. Herndon, of the Dodge Coal Storage Company, Philadelphia, has been appointed resident engineer for the company at Chicago.

Capt. James Chynoweth, of Calumet, Mich., is at Globe, Ariz., in the interest of the Superior & Boston Mining Company, of which he is president.

H. Harris, formerly superintendent of the Hall Mining and Smelting Company's smelter at Nelson, B. C., is taking a trip to Australia; he left Vancouver Dec. 6 last.

J. J. Smith, president San Javier Copper Company, Chicago, was recently in Fundicion, Sonora, Mexico, on his way to the property of the company in this district.

Chas. L. Rand, who has been in Cuba, in connection with the iron-ore development work now being carried on by Pennsylvania steel interests, has returned to New York.

C. A. Rice is superintendent of the Providence Mining and Milling Company's property in the Joplin district, not D. T. Boardman, as was stated in the JOURNAL of Nov. 9 last.

Leonard Lehlbach, mining engineer and director of the Lepanto Mining Company, has returned to Manila, Philippine Islands, after an extended trip to the United States on business.

R. O. Jones, for nine years past associated with the Jeanesville Iron Works at Hazleton, Penn., has become chief engineer of the Dayton Hydraulic Machinery Company at Dayton, Ohio.

John M. Brooks, assistant superintendent of the Compania Metalurgica y Refinadora del Pacifico, has returned to Fundicion, Sonora, Mexico, from a vacation trip to the United States.

John R. Farrell, who has been engaged in Africa during the last five or six years as chief engineer for the Tanganyika Concessions, Ltd., was a recent visitor in New York, on his way to his home in California.

Charles Simister has been appointed general superintendent of the Crow's Nest Pass Coal Company's collieries in British Columbia. He has been mine manager for the company, first at Carbonado and latterly at Michel.

Wm. P. Barba, superintendent of the steel foundry of the Midvale Steel Company, Philadelphia, and Jas. C. H. Ferguson, Pacific Coast representative, are making an extended visit to the smelters of Montana, Utah, Arizona and Mexico.

E. A. H. Tays has resigned the position of general manager for the United Mining Company, of 100 Broadway, New York City, and is now in no way connected with that company. He left Den-

ver on Dec. 1, for San Blas, Sinaloa, Mexico.

Charles Catlett, mining engineer of Staunton, Va., is engaged, with Mr. Merriam, geologist, and Mr. Forbes, of the coke department of the United States Steel Corporation, in making an examination of the properties of the Tennessee Coal, Iron and Railroad Company in Tennessee and Alabama.

Felix Cremer, formerly with the Guanajuato Amalgamated Gold Mines Company, La Luz, Guanajuato, has accepted a position as ore buyer with the Compania Metalurgica y Refinadora del Pacifico, S. A. Henry W. Edwards has also taken the field as ore buyer for the same company.

Louis Katona, a Hungarian metallurgist, has been visiting mines and smelters in the Kootenay and Boundary districts of British Columbia. He came to Canada after having been similarly engaged in several European countries. He will spend some time in the United States and precede thence to Australia.

James D. Hurd assumed the duties of general manager of the Crow's Nest Pass Coal Company, with offices at Fernie, B. C., on Nov. 16. His predecessor, G. G. S. Lindsey, has been appointed president of the company, with headquarters at Toronto, Ont., in place of Senator Cox, who had been president for nine years.

Obituary

Charles A. Molson, one of the best known mining engineers in the West, was accidentally shot and killed while on a hunting trip in Idaho. His remains were sent to Montreal, Canada, for interment.

William H. Ainey, who died recently at Allentown, Penn., aged 73 years, was for many years prominent in the iron industry of the Lehigh Valley. He had been president of the Lehigh Iron and Steel Company for several years.

Col. Charles A. McNair, veteran ironmaster of St. Louis, died in that city Nov. 28, aged 76. He was born in Pennsylvania and went to Howard county, Mo., with his parents when he was 8 years old. He removed to St. Louis 41 years ago, and had ever since been actively engaged in the iron business. At the time of his death he was president of the St. Louis Blast Furnace Company, a successor to several earlier concerns.

Samuel C. Walker, president of the Harbison-Walker Refractories Company, died at his summer home, Shields Station, near Pittsburg, Nov. 23, after an illness of several months. Mr. Walker was born in Allegheny 59 years ago and lived in that city all his life. For many years he was connected with Walker, Dunlevy & Co. and remained with that company until 1889, when he became connected with the Harbison-Walker Company, of

which he was president. When the Harbison-Walker Refractories Company was organized in 1902 he was made president. He was one of the best known business men in Pittsburg and had amassed a large fortune.

Sir James Hector, formerly chancellor of the University of New Zealand, who many years ago was geologist of the Palliser boundary-marking expedition and rendered invaluable services in connection with explorations in British Columbia and other parts of northwestern Canada under Captain Palliser, died recently at Wellington, New Zealand. He discovered the Kicking Horse pass, in the Rocky mountains, through which the Canadian Pacific railway runs to the Pacific Coast. Sir James Hector was a graduate of the University of Edinburgh, Scotland. He was created K.C.M.G. in 1887 in recognition of his distinguished services in Canada as a geologist and explorer. After leaving Canada he went to New Zealand, where, as chancellor of the University of New Zealand he occupied a prominent position. He retired from the chancellorship in 1903 and shortly afterward, in company with his only son, revisited scenes of his early labors in the Rocky mountains. While so engaged the son contracted fever from which he died at Revelstoke, B. C. The bereaved father returned to New Zealand, where he lived in comparative retirement the few remaining years of his life.

Societies and Technical Schools

American Society of Mechanical Engineers—At the 28th annual meeting, New York, Dec. 3, the report of the tellers showed a total vote of 1249 and the election of the following officers: M. L. Holman, president; Prof. L. P. Breckenridge, Fred J. Miller and Arthur West, vice-presidents; W. L. Abbott, A. C. Humphreys and H. S. Stolt, managers.

Canadian Mining Institute—The president of the Canadian Mining Institute, Frederic Keffer, of Greenwood, engineer in charge of the several mines of the British Columbia Copper Company, has issued a circular letter to all western members of the Institute requesting them to attend a meeting to be held at Nelson, B. C., on Jan. 15, 1908, at which steps will be taken to organize a western branch. In his letter Mr. Keffer says: "It being difficult for members of the Institute residing in the western provinces of Canada and the adjacent United States territory to attend the meetings of the Canadian Mining Institute, which are usually held in eastern Canada, the council suggest that a branch of the Institute be formed, to include this district, with a view to holding regular meetings in the West, and

thus more largely participating in the general work of the Institute."

The names submitted by the council as nominees for the offices and council of the proposed western branch are, respectively, as under:

For President—A. B. W. Hodges, Grand Forks, B. C.

For Secretary—E. Jacobs, Victoria, B. C.; J. W. Collis and E. Cave Brown-Cave, both of Vancouver.

For Council—Paul S. Couldrey and P. Stuart, Rossland, B. C.; J. J. Campbell and Leslie Hill, Nelson, B. C.; E. C. Musgrave, Vancouver, B. C.; W. M. Brewer, Victoria, B. C.; O. E. S. Whiteside, Blairmore, Alberta; J. C. Haas, Spokane, Washington.

Western members now serving on the council of the Canadian Mining Institute will be *ex-officio* members of the council of the western branch.

Industrial

The William B. Pollock Company, Youngstown, Ohio, recently shipped four large slag-ladle cars to the Great Cobar Copper Company, in New South Wales. The dumping apparatus on these cars is operated by electricity. They were designed by the J. C. Buckbee Company, of Chicago.

The DuBois Iron Works, DuBois, Penn., has canceled previous arrangements and now has its own offices in Buffalo, N. Y., in the White building, with Harry H. Pratt as manager. H. J. McCormac is general representative in charge as manager at Pittsburg, with offices in the Park building, as formerly.

The Twin City Equipment Company, of Minneapolis, has purchased two acres of ground at the Minnesota Transfer, midway between Minneapolis and St. Paul, where it will build shops which will give employment to shovel engineers when idle, or passing through and temporarily detained. Repairing of locomotives and steam shovels, mining and lumbermen's equipment and machinery for making frogs and switches will be installed.

During the six months preceding Nov. 1 the Allis-Chalmers Company sent out machinery on orders as follows: May, 23,772,242 lb.; June, 22,139,757; July, 24,225,760; August, 26,006,434; September, 26,268,764; October, 27,821,682; total, 150,234,639 lb. From these figures it will be seen that, while there has recently been some cessation in new business, or contracts for future fulfillment, the receipt and installation of machinery by industrial, lighting and power companies indicates continued progress.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Niles - Bement - Pond Company, 111 Broadway, New York. Pond Rigid Turret Lathe. Pp. 43, illustrated, paper, 6¼x9 in.; 1907.

The Brunswick Refrigerating Company, New Brunswick, N. J. Refrigerating and Ice Making Machinery. Pp. 48, illustrated, paper, 6x9 in.

Golden Anderson Valve Specialty Company, Fulton Building, Pittsburg, Penn. Steam and Water Specialties. Pp. 56, illustrated, paper, 5½x8 inches.

The Dartium Syndicate, Ltd., 28 Basinghall street, London, E. C., England. How to Make Steel Castings and Tool Steel in the Ordinary Iron or Brass Foundry, by means of the Dartium process. Pp. 18, illustrated, paper, 5½x8¼ in.

Fort Wayne Electric Works, Fort Wayne, Ind. Instruction Book. No. 3028. Type K Single-Phase Integrating Induction Wattmeters. Pp. 40, illustrated, indexed paper, 4½x7 in.; January, 1907. Bulletin No. 1098. Type MPL Belted Generators for Light and Power. Pp. 6. Bulletin No. 1100. Small Direct Current Motors, Type L. Pp. 7. All illustrated, paper, 8x10½ in.; July and August, 1907.

Construction News

Hosmer, British Columbia—The Pacific Coal Company has let a contract for the construction of a quarter-mile trestle between incline and tippel at its new mine near Hosmer, Crow's Nest Pass. R. G. Drinnan, recently appointed general superintendent, is now in charge here.

Slocan, British Columbia—The Hewitt Mining Company is having an aerial tramway constructed between its Hewitt silver-lead mine near Silverton, Slocan, and the Wakefield concentrating mill, a distance of about 5600 ft. Geo. Stilwell is superintendent of the Hewitt mine.

Ladysmith, British Columbia—The Tye Copper Company is building a wharf 210 ft. long with fixed and movable ore-bunkers, and installing unloading appliances to be electrically operated. These are to facilitate the transfer to the smelter storage bins of ore arriving from northern British Columbia, Yukon and Alaska. An incline trestle runs from the wharf to ore bunkers, near sampling mill and blast-furnace house, which have a storage capacity of 5000 tons. A winding engine will haul ore, in trains of five cars each, about 1200 ft. up to the top of bunkers, the difference of elevation being about 180 ft. The improvements have been designed by W. J. Watson, manager of the smelter.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives
at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 4—A fire which occurred in the Fremont Consolidated gold mine, at Drytown, Amador county, resulted in the death of 11 miners, who were lowered into the shaft after the noon hour, when no one knew of the fire. The skip jammed in the shaft and but two of 13 men escaped. After the connecting drifts of the Fremont and Gover shafts had been bulkheaded and the collar of the latter had been boarded up to smother the fire, Superintendent Arthur Goodall started to flood the mine. Later, Goodall and a party went down the Gover shaft and found their way to the bulkhead, which they blew open with dynamite. Goodall and the party then went to the Fremont shaft and made an opening. They were able to descend in the skip to the 300-ft. level, when they were driven back to the surface by the stifling smoke. Other attempts made to descend met with the same result. The fire at the mine is now under control, but the miners have been unable to get lower than 300 ft. in the shaft or to enter the tunnels from the Gover shaft, leading to the Fremont, on account of the gases. It is supposed a cave occurred in the Fremont after the timbers had burned, thus preventing circulation. Steam is being used to force the gases out of the mine.

At Keswick, Shasta county, the last of the matte produced at the smelter was shipped away Dec. 3. The shut-down of the great plant is complete and there are less than 50 men on the Mountain Copper Company's payroll at Keswick. These include men employed in operating the Iron Mountain Railroad, which will continue to haul ore from the Iron Mountain and Hornet mines at Keswick station for shipment to the company's reduction plant at Martinez. The foundry will continue in operation. This does work for the Martinez plant and also custom work for the Mammoth Copper Company, at Kennett. A small force is kept at work in the machine shops for the Iron Mountain Railroad.

The Graciosa Oil Company, of this city, owning extensive oil lands at Santa Maria, Santa Barbara county, is in rather a fix to fill its contract of 10,000,000 bbl. of oil for the Japanese government. While the Union and Associated Oil companies had an option each on one-third of the contract, they will hardly take the option up in view of the advancing prices of oil. Oil men say the Graciosa company cannot fill the contract

from its own wells by nearly one-half, and stands to lose \$1,000,000 if forced to purchase oil to fill it. It is doing its utmost to escape the terms of the contract, but an ironbound clause makes it impossible to withdraw without heavy loss. The contract was made a year ago at 42c., and oil has since risen to \$1 in the Santa Maria field, from which the Graciosa draws, and will go higher, it is believed.

Hydraulic mining on a large scale will soon begin at the historic old Nevada mine at Red Dog, Nevada county, where once stood a prosperous village. The new retaining dam is composed of pine and spruce logs built up in compartments and planted on solid bedrock. Each crib is filled with granite boulders. The dam is one of the finest of its kind in California. It is 25 ft. wide on top and 106 ft. long and is so built that as soon as the river bed behind it is filled up it can be raised by adding tiers of logs. It will hold in check six miles of debris, and some idea of the amount of dirt which may be backed up can be obtained when it is stated that at points the river is 600 ft. wide. The pipe-line has been laid and all is in readiness to set the giants going when the rains come. J. S. Goodwin and the Nicholls family own the mine.

On the banks of the Pajaro river, below Watsonville, Santa Cruz county, back of the shores of Monterey bay, experiments are being carried on in the direction of handling auriferous black sands profitably. These are being made by J. J. Morey and others. A rather elaborate plant has been erected.

The electric furnaces at Heroult, Shasta county, for the production of ferro-silicon, will shortly start up. Production at Heroult had been suspended temporarily, owing to the necessity of getting all of the power company's transmission lines in order for the winter season, and now that this has been accomplished the high voltage required at Heroult will again be turned on and continued without interruption. The cells for the battery of furnaces to be installed at the electric smelter are in process of construction. In all, 14 are to be erected.

The men at both mine and smelter of the Union Copper Company, at Copperopolis, Calaveras county, have been discharged, though it is expected that work will be resumed in the spring.

The first quartz mill ever brought into Modoc county is now being set up in Hoag district. The mill will be driven by water power, for which a ditch has been

constructed. The fall secured is about 150 ft., which will give ample force to work all the machinery.

Brandy City, in Sierra county, has been virtually deserted since the adverse decision in the matter of hydraulic mining over 20 years ago. At last, however, the Brandy City Mining Company is making preparations to resume work on the old Brandy City gravel mine. These preparations consist of the building of about six miles of wagon road from Indian Valley to Brandy City, a bridge across the North Yuba at Indian Valley, the re-building of the old Hoosier flume, which takes the water from Cañon creek to the mine, and the construction of a long bedrock tunnel for drainage. The company will build restraining dams in accordance with plans already approved by the California Debris Commission. Geo. F. Taylor is superintendent in charge of the work, with Frank Strandberg as general foreman. At present about 75 men are employed at the various camps.

Salt Lake City

Dec. 6—The Utah Consolidated Mining Company is making efforts to prolong the operation of its copper smelter nine miles south of Salt Lake City. Convinced that it is futile to try to continue smelting in the Salt Lake valley, the management is now endeavoring to obtain a stay of execution until a new plant can be built. With this object in view, a conference was held with a committee representing the farmers. The result was the calling of a mass meeting of the farmers who appeared as plaintiffs in the smelter smoke case, which resulted in the decree of injunction forbidding the smelters to operate on ore containing sulphur in the charge in excess of 10 per cent. It is expected that the farmers will join in a stipulation asking the court to modify its decree to permit the smelter to operate until the company has time to erect a new one, which will be about a year. The Utah Consolidated has purchased a site in Tooele county, which can be reached from the mine direct by aerial tramway.

The Bingham Consolidated smelter will go out of commission about Dec. 15. By about that date it is expected that the ores on hand will be cleaned up. The company has recently made a sweeping reduction in its office and mine forces.

A new wage scale will go into commission in Bingham on Jan. 1, amounting to a reduction of 25c. a shift all around.

About a year ago wages in the district were voluntarily increased 25c. a shift; later, another increase was voluntarily granted to remain in effect while copper had a market price of 18c. a pound or better.

The smelter of the Utah Smelting Company, near Ogden, will probably remain shut down indefinitely. The company began business scarcely a year ago and entered into active competition with other custom plants in the Salt Lake valley. Ores were purchased and paid for promptly until the late financial stringency came on, and when the price of copper began to recede, the management found that it had a lot of money tied up in ores bought when copper was at a high price, which meant a big deficit. While it was operated the smelter was kept busy. The matte was sold to the United States Smelting, Refining and Mining Company.

The annual meeting of the Gemini and Godiva mining companies resulted in the election of John Q. Packard, president; Edward W. Packard, vice-president; L. S. Hills, treasurer; Jackson McChrystal and Robert Harkness, directors of both. The Gemini paid dividends amounting to \$20 a share during the year, or a total of \$100,000. Both mines are in the Tintic district.

Denver

Dec. 6—The influx of old Cripple Creekites still continues unabated, every train bringing in its quota. These are the men who drifted away, attracted by strange gods and other booms, but are now returning to their first love. Most of these are of the better class of workmen, and their return presages continued prosperity for the district.

Lessees operating the Little Clara, of the Work company, situated on the southeastern slope of Gold hill, have made a most unusual discovery for Cripple Creek, an ore carrying good values in silver and lead, besides \$5 to \$10 in gold.

An interesting development in the fight over the management of the El Paso company occurred this week, when the broker of James F. Burns sold to himself, for the latter's account, the 72,000 shares of El Paso which had been hypothecated by A. L. Burris to secure a loan made to him by Burns. This block of stock is now owned by the ex-president of the Portland, bringing his El Paso holdings to (it is said) 150,000 shares; and the fight has assumed a triangular form, with James F. Burns, at one angle, criticizing the present management on specific matters, Mr. Burris, as self-appointed guardian of the stockholders' interests, on another angle, going after the management in a general way, and Mr. Bernard, the president of the company, on the remaining point. It promises to be a merry war, and public and stockholders alike are interestedly watching. It might be men-

tioned in passing that it is rumored Burns is likely to endeavor to regain his control of Portland affairs, at the next annual meeting in February.

A receiver has been appointed to assume charge of the Animas Power and Water Company, operating near Silverton. The Federal authorities have finished their sampling operations on the property of the Boston-Colorado Copper Company, situated near Salida, and the samples have been shipped to Chicago for testing. This concern was promoted by "Professor" Colvin, dancing master of Salida, in whose business methods the Government took such interest that his indictment for using the mails for fraudulent purposes resulted about a year ago. It seems a pity that it is necessary for the Government to go to such trouble and expense to prove fraud charges.

Quarterly statements by all the local national banks to the controller of the currency, made Dec. 4, indicated a healthy financial condition, without exception, the reserves falling in no case as low as the required 25 per cent. of deposits.

On Dec. 1, the breast of the Cripple Creek drainage tunnel had reached a point 1140 ft. from the portal.

Indianapolis

Dec. 9—The demand for coal in this State has been falling off during the past week. The Brazil Block Coal Company, in Clay county, which could not keep up with its orders a few weeks ago, has only one mine at work now. Similar reports come from the bituminous districts. This is the first time in many years at this season that the companies have closed, even temporarily, any of the large mines of the State.

Considerable interest is manifest in the conference to be held in this city on Dec. 9. This will be attended by operators from Pennsylvania, Ohio, Illinois and Indiana, and by the officials of the United Mine Workers. It will decide whether an inter-State convention shall be called to consider the wage scale. President John Mitchell is expected to attend.

Toronto

Dec. 10—The British-Canadian Smelter, Ltd., has erected a plant in the business section of Toronto and recently began treating, by a new process, two carloads of ore from the La Rose mine of Cobalt. The fumes were so objectionable that complaints were at once made and a fine of \$50 and costs was imposed on the company. Application has been made by it to the city for 25 acres of marsh land at Ashbridge bay to be used as a site for smelting operations. In consideration of this grant the company agrees to build a smelter employing 500 men.

London

Nov. 30—The affairs of the San Miguel Copper Mines, Ltd., one of the Spanish properties controlled in Germany, are in a very unsatisfactory condition, and at a recent meeting of shareholders, a new board of directors was chosen. Some months ago some of the deeper levels caved in, and since that time, operations have been confined to the open-cut workings. The directors representing the original promoters resigned at the time, and since then there have been a number of appointments and resignations, nobody seeming to care to take up any permanent responsibility. The new board elected at the meeting of shareholders contains some able men, and matters should be put straight again before long.

The Ouro Preto Gold Mines of Brazil, Ltd., does not at present make enough profit to do more than pay the preference share dividend. There are 36,634 cumulative 10 per cent. preference shares and the dividend has been paid up to date. The ordinary £1 shares, of which there are 100,000, have only received distributions of 1s. in 1895, 1s. in 1896 and 6d. in 1902. During the year ended June 30 last 72,703 tons of ore were milled, yielding 24,500 oz. of bullion, realizing £95,872; the expenses in Brazil and London were £84,480. After adjusting minor items, the balance of profit was £14,527, out of which the preference dividend for 18 months, from Dec. 31, 1905, to June 30, 1907, was paid, absorbing £5,495, while £8933 was written off for depreciation, cost of new plant, etc. The mine continues to open up considerable bodies of ore of about 0.4 oz. per ton, and with the improved plant recently erected the profits on this ore should before long be sufficient to bring dividends to the ordinary shareholders.

The report of another Brazilian gold mine controlled in London has also been issued this week. This is the St. John Del Rey Mining Company, and the report is for the half year to Aug. 31. The amount of ore milled during this time was 76,899 long tons and the gold bullion produced realized £162,324. This extraction is equivalent to about \$10.25 per long ton. The working costs, including development, were £113,780 or \$7.10 per ton, while taxes, London expenses, etc., represented £11,029 or \$0.67 per ton. The net profits were £37,515, out of which preference dividends at the rate of 10 per cent. per annum and ordinary dividend at the rate of 5 per cent. per annum were paid. The balance of profit was £13,547, which is placed to the account for the redemption of the debenture bonds. The yield of ore has increased considerably during the past six months, being as above stated \$10.25 per ton as compared with \$8.35 during the previous six months.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Consolidated Zinc Company—Frank Nicholson, who was the president of this recently organized company, has resigned the position, which it is understood he accepted only on conditions. His withdrawal evidently implies that he did not find the conditions to be as represented.

Alabama

Republic Iron and Steel Company—The purchase of the control of the Tennessee Coal, Iron and Railroad Company by the United States Steel Corporation has resulted in the separation of the management of that company and the Republic Iron and Steel Company, which have been the same for the past two years. John A. Topping, of New York, chairman of the board of both companies, remains in that capacity with the Republic company, and Tracy W. Guthrie, president of the Republic company, at Pittsburg, Penn., also remains. The local management of the Southern district of the Republic company, with offices at Birmingham, Ala., is made up as follows: Auditor, treasurer and temporary general manager, W. A. Green, former treasurer of the Tennessee; manager of sales, Dwight S. Guthrie, formerly with the Republic, at St. Louis; purchasing agent and manager of commissaries, B. F. Tyler, who held the latter position for both companies; assistant traffic manager, W. H. Johnson, formerly in that position for both companies; general superintendent of blast furnaces, F. B. Keiser, formerly superintendent of Thomas furnaces for the Republic company; general superintendent of rolling mills, Wm. Wuthenow, who held that position for both companies; superintendent of coal mines, H. S. Geismer, formerly division superintendent of Warner mines for the Republic; superintendent of ore mines and quarries, W. J. Penhalegon, recently appointed assistant general superintendent of ore mines for both companies.

Tennessee Coal, Iron and Railroad Company—The only changes in the organization of this company since the purchase by the Steel Corporation are as follows: George Gordon Crawford, formerly manager of the National Tube Works plant at McKeesport, Penn., has been appointed president, with headquarters at Birmingham, Ala.; L. S. Beecher, formerly assistant to Chairman Topping, in New York, has been appointed treasurer; F. B. Winslow, of the Steel corporation, has been appointed auditor. T.

M. Nesbitt, formerly auditor of the Tennessee-Republic companies, is assistant auditor of the Tennessee company. The positions of traffic manager and general superintendent of rolling mills, made vacant by the Republic company taking the men in those positions, have not yet been filled.

Arizona

Tombstone Consolidated Mines Company—What is believed to be an important discovery was made in the Lucky Cuss mine below water level, early in November. The ore showed a good deal of native silver besides the usual horn silver, and is high in gold and lead. Judging from the character of the ore and its position, the new discovery is believed to be the downward continuation of the main orebody of the mine which was lost at about water level many years ago. Some of the workings at Tombstone are beginning to show copper, especially in the Emerald mine, and it is hoped that important bodies of copper ore will be developed with depth. The pumping of water has lately been showing a decline. On Oct. 1 the amount was about 5,300,000 gal. per day; toward the end of November the average was about 4,800,000 gal. per day.

GLOBE DISTRICT

Old Dominion Mining and Smelting Company—A decision in favor of the company in its suit against A. S. Bigelow, of Boston, and Leonard Lewisohn, of New York, in which the total award is placed at more than \$1,700,000, was rendered Dec. 5 by Judge Sheldon in the Supreme Court. Alleged wrongful conversion of 50,000 shares of the stock of the Old Dominion Copper Mining Company, of Baltimore, by Mr. Bigelow and Mr. Lewisohn was the basis of the suit.

The Old Dominion Copper Mining Company, of Baltimore, was capitalized at \$500,000, and issued 25,000 shares of stock at a par value of \$20. It is claimed that in 1895 W. A. Meridith, of Boston, acting for Mr. Bigelow and Mr. Lewisohn, agreed to buy the stock of the Baltimore company for \$40 a share. Later, Mr. Lewisohn made a new agreement at the same price. In the mean time the Old Dominion Mining and Smelting Company had been organized, Mr. Bigelow and Mr. Lewisohn turning into it the stock of the old company, receiving, it is alleged, considerably more than they paid for.

The new company began two suits against Mr. Bigelow and Mr. Lewisohn to recover the value of 30,000 shares and 20,000 shares which, it was alleged, they had illegally obtained. Judge Sheldon made an award in the first suit of \$700,000 and interest from September 18, 1895, and \$48,000 and interest from the same date in the second suit.

California

AMADOR COUNTY

Valparaiso—In this mine they have made a chamber in the tunnel large enough to install a horse-power whim hoist. A number of rich pockets have been found in this property.

CALAVERAS COUNTY

Bullion—At this property, Albany Flat, near Angels, a double-compartment shaft is being sunk and hoisting works are being put up.

Casinelli—The real gravel bed of the channel has been struck in this mine showing exceptionally good value.

Packard—Water has enforced a temporary suspension of operations, and new machinery is to be installed. C. Gardella is superintendent.

EL DORADO COUNTY

Gilbert—At this mine, near Greenwood, a tunnel is being run to tap the lode at 300-ft. depth.

Shamrock—This mine near Greenwood Creek, has been purchased by James Toman, who is developing it.

Spanish—L. E. Pease and other Michigan men have bought this old mine at Greenwood, and put a large force of men to work.

INYO COUNTY

Furnace Creek Copper Company—This company at Greenwater, having a 500-ft. shaft, has started to sink 1000 ft. further, to see what will be developed with depth.

MADERA COUNTY

Buchanan—At this copper mine a 200-ft. shaft is being sunk to strike the orebody below the old works.

Green Mountain—A diamond drill is being used in this copper mine to prospect the ore at greater depth than the present shafts reach.

NEVADA COUNTY

Empire Gold Mines—During the in-

stallation of the new compressor most of the machine men have been laid off. There is ore enough broken down to keep the mill busy until the men are put back at work.

Gray Eagle—Extensive improvements in the way of new buildings, additional concentrators and a new hoist, are being put in at this mine at Maybert.

Washington—This mine has been bonded to Frank M. Leland, who plans extensive development. The mine was the second quartz property to be worked in the county.

PLACER COUNTY

Blue Cañon Gravel Mine—In this mine at Blue Cañon, after long prospecting operations, pay gravel has been struck.

Crater—This mine having been pumped out, the vein is being tested at the different levels.

Polar Star—At this mine, Dutch Flat, where the gravel was washed off down to the cement years ago, it is found that this cement, capping the bedrock, pays well and a larger force of men is at work.

PLUMAS COUNTY

Mountain Lion—This group of claims at Genesee, recently bought by Mr. Lummis, of Nevada, is being opened by a tunnel which is now 600 ft. in.

Red Mountain—This company is installing a new 10-stamp mill at its property below Spanish Ranch.

SANTA BARBARA COUNTY

Our local correspondent was in error in stating in the issue of Sept. 14 that the Point Sal Mining Company at Point Sal, Santa Barbara county, California, had closed down its mining operations. On the contrary, the patented mechanical appliances for handling the ocean-beach sand and saving the gold were only completed about that time, and have since been put in operation. The higher bluffs or banks of sand back of the beach are hydraulicked with water under pressure through a nozzle, and carried by gravity and sluices to the machinery devised to wash the sand and obtain the gold. The deposits of auriferous black sand are extensive in that locality, and the company has expended a large sum of money in its preliminary experiments with the Hoyt type of dredge, which is in use for washing these sands and saving the gold.

SHASTA COUNTY

Gladstone—This mine at French Gulch, owned by the Hazel Mining Company, has 70 men at work and the mill is crowded with \$15 ore.

Midas—After a long search the ledge has been found in entirely new ground. The mine is at Knob, in Harrison gulch district.

SIERRA COUNTY

Alaska—Specimen ore has been found

in the drift from the new shaft of this mine at Pike City. The strike was made in the Casserly vein.

TRINITY COUNTY

Bonanza King—Extensive snow-sheds have been built at this mine so that the men can go to and from work in the winter. Another bunch of rich ore was recently found in the vein.

Cleveland—W. R. Beall is working this mine, adjoining the Bullychoop on the Shasta-Trinity divide, and has provided accommodations so that men can work all winter.

TUOLUMNE COUNTY

Dutch Mining and Milling Company—The creditors have agreed to submit to an assessment to raise revenue to have the mine unwatered, for the purpose of having it re-surveyed to determine the extension and location of drifts, crosscuts and veins.

Colorado

LAKE COUNTY—LEADVILLE

The money stringency in the East has had its effect out here, as nearly every zinc mill in the State has closed, and will remain down until the stringency passes over. This has had the effect of closing down zinc shipments from the district, but the general feeling is that everything will be adjusted by the first of the year and new contracts will be made. The Arkansas Valley plant has also taken advantage of the present squeeze to get rid of a heavy tonnage of ore that has been lying on its dumps for the past 10 years and convert it into money; all the large producers of the district have been instructed to curtail shipments for the present.

There is still a demand for iron ore, and a heavy tonnage is going out from Fryer, Iron and Carbonate hills.

In the Thirteenth street drill-hole, the depth gained is 650 ft., and the drill is passing from the lake bedding into solid formation; the outlook is encouraging, all of the cores being now heavily stained porphyry.

Breece Hill—Tim Gorman has secured a lease on the Peggy McCallum, and at present is installing machinery. The shaft is 100 ft. deep, and from the bottom drifts will be run to catch the orebody that was opened above; in addition to this the property contains a good body of iron that crops at the surface.

Cleveland—On account of the pinch this property, South Evans gulch, has been obliged to curtail shipments of its medium grade of ore, but is still sending to the Salida smelter all of its rich ore that comes from development work.

Milwaukee Tunnel—Work is going steadily ahead on this property, Big English gulch, but on account of the lateness of the season work will be carried on

during the winter by hand. In the spring power will be installed and the tunnel driven by machine drills.

Old Valley—This mine, South Evans gulch, at one time known as the Brattleboro, is again in commission, being under lease to W. Page and associates. A new shaft is being sunk and the lessees expect to catch the Cleveland orebody to the south. The shaft will go down 700 ft. The lessees are after the rich ore found in the Cleveland.

Rock Hill—Several weeks ago a drift was started from the lower level of the Reindeer, 450 ft., to be driven to the Coon Valley to the south, with the object of opening the orebody supposed to be in that property. During the week the objective point was reached and also the ore; the body is several feet wide and is similar in character to that found in the Reindeer; the bulk of the ore at present is a lead sand with hard carbonates on the outside; this runs from 7 to 20 per cent. lead and 10 to 20 oz. silver per ton.

Twin Lakes—The strike recently made in the tunnel of the Ontario Mining Company, Mt. Elbert, improves both in quantity and quality as the tunnel is driven ahead. Working will be continued during the winter months.

Idaho

SHOSHONE COUNTY

Shoshone Concentrating Company—This is a new concern organized by W. A. Bradley and associates. The company has a lease on the tails of the Wardner mill of the Federal Mining and Smelting Company. The erection of a plant to handle 350 tons per day is already well under way. It will be equipped with rolls and Huntington mills for crushing, five water impact screens, twelve jigs of a special design of W. A. Bradley, six suspended vanners and eight Card tables. An elevator of the dredge type will be used for the elevating of the tails to the supply bin.

Stanley Mining Company—This company, near Burke, has recently cut its vein with its lower tunnel, and developed about 10 ft. of high-grade antimony ore, carrying gold. The same body was developed in the level 150 ft. above and shows marked strength at the greater depth. The deposit is an anomalous one; though in the heart of the silver-lead area, it seems to be of an entirely different character. While the majority of Cœur d'Alene ores carry very small quantities of antimony and gold, both are insignificant commercially and metallurgically, while the Stanley vein as well as producing a high-grade antimony ore, has produced gold ore carrying \$40 per ton. The latter occurs free, associated with the antimony and with the quartz. The management promises to begin the erection of a 10-stamp mill to handle the gold rock.

Washington Water Power Company—This company is completing a second power transmission line from Spokane, Wash., to the Cœur d'Alenes. The line, when completed, will be over 100 miles in length, transmitting under a tension of 60,000 volts, duplicating the line already in operation, which delivers about 14,000 horse-power.

BLAINE COUNTY

South Packer—This property, on Loon creek, has been closed down for the winter.

Indiana

CLAY COUNTY

Although coal was procured from outcroppings in Indiana as early as 1837, the first shafts were sunk in Clay county in 1854 by William Campbell, James Kennedy and David Thomas; not one of whom survives. It is now proposed to erect a monument in honor of these coal pioneers.

A tract of coal land containing 160 acres, five miles east of Clay city, has been sold for \$25 an acre, a very conservative price. A coal shaft on the place supplies the home trade for miles around. It lies near the track of the new Monon railroad and will now be thoroughly developed by Chicago men who have bought the property.

GREENE COUNTY

Houseville Field—The completion of the New Monon railroad through Greene county has occasioned the development of the Houseville coalfield which embraces a large area of block coal land. Several coal companies invested in this land some time ago and made a number of satisfactory tests, but the work of sinking shafts and developing the field was suspended with the completion of the railroad.

Linton Field—It is stated that nearly 2000 miners are idle in the Linton field because the companies paid the men in checks. One or two other fields are likewise affected. Conditions, however, are varying, some men returning to work after a few days of idleness. In one instance 200 foreign miners made a riotous attack on their fellow miners who either refused to quit work or returned to the mines.

VIGO COUNTY

The directors of the Forest Coal Company, the Cumings Coal Company and of the New Pittsburg Coal and Coke Company have taken steps to dissolve the corporations. The property has been sold, debts paid, and the business of the companies closed up. D. M. Cumings, J. P. Gilmore and J. K. Deifert are directors.

WARRICK COUNTY

The operators of the four local coal mines near Boonville, where non-unionists were employed, with the exception of one man, still refuse to sign the union wage scale, and they have closed down. Many patrons depending on the local mines for fuel are embarrassed by the shutdown. It is thought that all the operators will sign the scale in time, employ union men and raise the price of coal.

Maryland

ALLEGANY COUNTY

Consolidation Coal Company—This company has sold all the railroad coal cars which it owned, 2223 in number. The Baltimore & Ohio purchased 1709 and the Cumberland & Pennsylvania Railroad took 514, as well as 1000 belonging to the Somerset Coal Company. It is understood that these transfers have been made on account of the Interstate Commerce Commission action on private cars.

Michigan

COPPER

Calumet & Hecla—This company has erected a new shaft house and combined boiler and engine house on the site of its new No. 18 shaft. A small Lidgerwood hoist is being installed and as soon as this can be put in commission, sinking will go forward. The new Nordberg hoist at No. 13 shaft has gone into regular commission and the duplicate of this plant for No. 16 shaft is nearing completion. At the stamp mills a force of men is engaged in installing the machinery for the new recrushing plant. At the new boiler house the 20 Babcock & Wilcox boilers are being assembled and the coal and ash conveying machinery installed. The first consignment of the 40-ton steel rock-cars has been received. These cars are to take the place of the present 5-ton cars, now in use, as soon as the change to the standard gage has been completed. At the company's power plant, the new 2000-kw. generator, together with the necessary switchboard apparatus, will soon be finished. At the substation three additional 500-kw. transformers are being installed.

Lake—An order has been placed for a hoist which will be installed on the site of the new shaft now sinking.

Quincy—An addition to No. 8 hoisting plant has been completed and a new air compressor of 5000 cu.ft. per minute capacity is to be installed.

Seneca—This company has encountered the ledge in trenching at a depth of about 30 ft. It is an amygdaloid formation. A diamond drill is also at work on this property and several holes are to be put

down between the copper-bearing formation and the sandstone; this will give valuable information regarding the various copper-bearing lodes and also data for further development work.

Missouri

JOPLIN DISTRICT

Much prospecting and small leasing is being done by miners thrown out of work by the shut-down of many mines. Hand windlasses and horse hoists are more in evidence in the district than for many years.

Federated Mining and Milling Company—The 14 mines of this company have shut down on account of the low price of ore.

Common Law Mining Company—The 250-ton wooden mill for this company has been completed.

Home Run Mining Company—This new company has been incorporated for \$56,000 to operate a 10-acre lease on the Guinn land north of Webb City. A shaft is already down to the ore at 180 ft. and has encountered rich sheet ground.

Chapman & Lennan—A rich strike has been made in an old abandoned shaft near the Bull Dog mine and the owners will erect a mill on the strike.

Old Judge Mining Company—This company is erecting a 250-ton mill near Oronogo to replace the old 100-ton structure. The new mill will cost \$30,000 and will be one of the most complete in the district.

Montana

MADISON COUNTY

Butte-Potosi—This company has stopped work on its property in Potosi cañon, near Pony, on account of the financial stringency. It is understood that work on the property was making a favorable showing.

Nevada

WHITE PINE COUNTY

According to the pamphlet "Watch Ely Grow," for November, the first unit of the Steptoe concentrator is now housed in, and the machinery is being rapidly installed. The portion of the power plant which will take care of this unit is fast nearing completion, and will be in readiness when required for service, say, four months hence. At the Veteran mine of the Cumberland-Ely, the large four-compartment shaft will be finished within 60 days. The railroad extension to this point has been completed and henceforth supply deliveries will be made direct to the property. A branch line has been put in to the Wedge and Ada properties, which are

being rapidly placed in condition for regular production. At the Nevada Consolidated, stripping has been practically finished for open cut mining on the Eureka property. The steel gallows frame is erected at the Star Pointer shaft, and both mines are now practically ready to produce ore. The Nevada Consolidated is opened up for production on a big scale and development work has been discontinued until regular shipments are started. At the Cumberland-Ely, the largest number are employed that can be used to advantage in broadening the developments prior to commencing production.

New Mexico

GRANT COUNTY

Burro Mountain—On Cherry creek, Brown & Co. have shown up, in their shaft, a vein of sulphide ore carrying 10 per cent. copper. George Sublett has organized a corporation, among Silver City investors, to take over his claims, to be called the North Burro Copper Mining Company. South of Ballard's peak, a vein has been struck, showing chalcocite ore of shipping grade. The prospecting hole sunk from the surface, with the Cyclone drill, by the Azure Mining Company, has shown a 30-ft. orebody in Emerald ground at a depth of 150 ft. Holes will be bored on the Malachite and other claims of the company. As soon as the new pumps can be installed in the National shaft, sinking will be continued until the orebodies are developed in depth. The new 1200-ton mill, soon to be erected by the Chemung Copper Company, will be located near Boston gulch, where it will be convenient for the output of the company's three shafts. The great Sampson mine of the Burro Mountain Copper Company, is showing new ore reserves as development proceeds, but only enough ore is being stoped, by the caving system, to keep the small mill in operation. Near the Sampson, Alexander Woodburn is patenting his Thistle group, in whose two short adits indications of copper can be seen.

Silver City—The Hermosa company is erecting a new hoist over its Treasure Vault shaft at Santa Rita, and near by the Columbia Copper Company is actively developing several claims of its 600-acre holdings. The directors of the Bessemer Mining and Smelting Company recently visited the Continental and Anson S. properties of the corporation, near Fierro, and considered the erection of a copper smelter to handle the district's output. At Hanover, the Philadelphia shaft has reached a depth of over 200 ft., but shows only 2 per cent. copper at the bottom.

Lordsburg—The White Signal Company has shipped considerable \$80 ore from its Paddy Ford shaft, which is now nearly 100 ft. deep.

North Carolina

BUNCOMBE COUNTY

Georgia Barytes Company—This company, of Asheville, has obtained another charter, authorizing it to do a general mining business, and to deal in barytes and other minerals.

Oklahoma

The arrangements are nearly completed to transfer the coal properties owned by the Missouri, Kansas & Texas Railroad Company to a new company. This action is taken in consequence of the provisions of the Hepburn law forbidding railroad companies to mine coal for sale, which will take effect Jan. 1. The Rock Island Railroad mines will also be transferred to a new company.

Pennsylvania

BITUMINOUS COAL

Monongahela River Consolidated Coal and Coke Company—For the fiscal year ended Oct. 31, 1907, this company reports net earnings \$1,260,149. Charges were \$93,728 for insurance fund and \$103,365 for coal land depreciation; a total of \$197,093, leaving a net balance of \$1,063,056. From this dividends on preferred stock amounting to \$700,000 were paid and \$363,056 added to surplus, making a total undivided of \$2,425,742 at the close of the year.

Pittsburg Coal Company—This company's statement for the 10 months ended Oct. 31 is as follows:

	1906.	1907.	Changes.
Earnings.....	\$4,216,853	\$4,851,954	I. \$635,101
Charges.....	2,576,394	2,335,499	D. 240,895
Surplus.....	\$1,640,459	\$2,516,455	I. \$875,996

The charges this year included \$620,357 for depreciation of coal lands; \$808,998 for depreciation and renewals of plant and equipment; \$906,144 for interest on first-mortgage bonds.

South Dakota

CUSTER COUNTY

Saginaw—Work in both mine and mill will be resumed within 10 days, as the new hoist is completed and machinery about set.

Ivanhoe—Machinery is being installed in the new mill and cyanide plant and it is expected both will be in operation, shortly after Jan. 1.

Hartwell—Operations will soon be commenced on a steady basis. Tests show the ore averages \$12.45 gold per ton, part of which is free. An amalgamation plant and small cyanide mill will be erected.

LAWRENCE COUNTY

Tinton—The company has completed the

patenting of all its claims in the Bear Gulch district, representing 20 years of work.

Gilt-Edge Maid—The 200-ton cyanide mill resumed operations after a 10 months' shut down and is running nearly full capacity. Ore is taken from the open cut.

Custer Peak—The test mill is completed and will be started at once. It has a 20-ton Chilean mill. A new ledge running from \$4 to \$8 per ton gold has been discovered on Chicken ridge. The ore is reduced by amalgamation.

PENNINGTON COUNTY

Ruberta—Wilber Treadwell, representing the Boston-Treadwell Development Company, of Phoenix, Ariz., has made an examination of this group on Four Mile with a view toward purchase. The company has completed its 10-stamp test mill.

Annie—This, one of the older properties near Hill City, is about to resume. The shaft will be unwatered and a body of quartz rock from which gold averaging \$15 per ton was taken, will be developed. S. A. Baxter, of Lima, O., is the principal owner.

Utah

BEAVER COUNTY

Indian Queen Consolidated—Development work is progressing at this property vigorously; it is being opened by an adit. A new boarding house and other mine buildings have been recently completed.

Newhouse Mines and Smelters—The working force of this property has been greatly increased within the past week. The mill is being operated two shifts again, and crude-ore shipments will shortly be begun.

IRON COUNTY

Jennie Gold Mining—A good strike has been made on the 175-ft. level of this property. The values run high in a streak about 15 in. wide.

JUAB COUNTY

Colorado—This company is shipping 500 tons monthly to the Salt Lake smelters, or about one-half the amount marketed prior to the curtailment.

Uncle Sam Consolidated—This company is continuing development vigorously, but no shipments are being made at the present time.

Washington

LEWIS COUNTY

A coal deposit which promises well has been opened near Centralia, on the line of the Union Pacific extension to Tacoma. Development work has been started.

PIERCE COUNTY

Wilkeson—These coal mines were recently closed by a strike. The company

now announces that they will remain closed till the bunkers and other surface plant are overhauled and re-built.

West Virginia

MARSHALL COUNTY

Active development is in progress at several points in this county. The Bituminous Coal Company, of New York, is beginning work on a coal mine on the Cockayne property, near Glendale. The purchasers of the old Glen Easton mine are putting the plant in order to resume operations.

Canada

ALBERTA—LETHBRIDGE DISTRICT

Galt—The dispute between the owners of the Galt coal mine and its employees as to the interpretation of the clause in the agreement concerning the time of work that had been referred to arbitration, has been settled. The board found in favor of the contention of the company that it meant eight hours at the face, not from bank to bank, but Manager Naismith has announced that the offer made previously to the men will still hold good. Accordingly the men will work eight hours at the place of work, but will be allowed pay for half-an-hour a day extra for the time taken in going to and from work.

BRITISH COLUMBIA—EAST KOOTENAY

Consolidated Mining and Smelting Company of Canada, Ltd.—This company, owning the St. Eugene and other mines and the smelting works at Trail, has declared its seventh dividend. Owing to large expenditures on capital account found desirable, and the fall in the prices of metals, this dividend is at the rate of 5 per cent. per annum, instead of 10 per cent. as heretofore.

Crow's Nest Pass—The Crow's Nest Pass Coal Company has shut down its coke ovens at Michel and Fernie, owing to the almost general cessation of smelting operations in the Kootenay and Boundary districts and the difficulty in getting enough railway cars to allow of shipping fast enough to keep the coke wharves clear.

More than 800 men are engaged in construction work on the extension of the Great Northern railway from Fernie to Michel. Enough steel rails for more than 20 miles of road and 25,000 ties, have been delivered at Fernie. This extension will give the Great Northern its own connection with the Michel coal mines and coke ovens, in addition to those at Fernie and Carbonado, previously reached by its system.

Sullivan Group—An important new strike of lead ore has been made on the 100-ft. level. Developments in the shaft, which is being sunk to the 200-ft. level, are also satisfactory, the orebody continu-

ing down. Ed. Dedolph has resigned as superintendent of the Sullivan smelter at Marysville. The enlargement of the Huntington-Heberlein plant at these works is to be undertaken shortly, a sufficient ore supply to warrant it having been assured by recent developments in the mine.

BRITISH COLUMBIA—ROSSLAND

The Rosslund miners have voted, by a considerable majority, to accept the proposed reduction in wages. Consequently there will be no closing of mines.

BRITISH COLUMBIA—SLOCAN

Ore Shipments—During the current year the heaviest shippers of ore from Slocan mines have been: Whitewater, 15,532 tons; Montezuma, 2900 tons; Standard, 624 tons; Rambler-Cariboo, 323 tons; Canadian Group, 85 tons. All this was silver-lead ore.

ONTARIO—COBALT DISTRICT

The Coniagas and Buffalo companies were recently assessed for income tax at \$100,000 each by the town of Cobalt. They appealed to the Ontario Railway and Municipal board, contending that they were not liable to a tax on incomes until the amount of their capital expenditure had been realized. The board dismissed the appeal and upheld the assessment. The case will probably be taken to a higher court.

ONTARIO—PORTAGE BAY DISTRICT

Cobalt Union—A cross-vein of smaltite and niccolite has been struck in the shaft at 60 ft. A large force of men is engaged in development work.

Coleman—A new vein of smaltite has been discovered 1½ in. wide by trenching.

QUEBEC—LAKE MEGANTIC DISTRICT

Megantic Syndicate Mining Company—Development work on the recently discovered gold reef at Marston is proceeding as far as weather conditions will permit. The vein is of white quartz 17 ft. wide, lying between two walls of slate and displays visible gold. Gold has frequently been found in small quantities in the river, but this is the first discovery of gold-bearing quartz in the district.

YUKON TERRITORY

A. J. Beaudette, Dominion government mining engineer, has returned to Dawson from a trip to Clear creek, where he has been ascertaining the flow of water, several applications for water rights having been filed. One applicant, Alex. McDonald, wants 1000 miners' inches. He has been engaged about two years opening up a number of claims on the creek preparatory to doing extensive hydraulicking for which he wants a good supply of water.

Fortymile District—Falls creek will be one of the busiest in the Fortymile dis-

trict this winter with 60 or 70 men at work prospecting over a considerable area, ranging from 27 below to 52 above "discovery." Though it is only a few months since gold was discovered on this creek, prospects are sufficiently good to warrant the belief that it will soon be a regular producer. The creek is about 50 miles from Dawson, by the Glacier road to the Forty-one house and thence nine miles to Falls.

Men working on the Forty-mile dredge have located discovery and adjoining claims on Sourdough bar. They claim they have 6 ft. of 6c. dirt. Before the dredge ceased operating for the season it had worked up to the line of the concession lease. The run of gold continued into a blind bar, on which the men located claims; they will work during the winter. Two steam boilers are already on the bar and it is intended to take out a large dump of gravel before next season's thaw.

Yukon Consolidated—By the last week in October the roads to the creeks were frozen, so that heavy freight could be moved. On Oct. 23 teams hauled from Dawson to Bear creek a number of sections of the big steel siphon for the Klondike crossing of the Consolidated (Guggenheim) Company's water system. Each section weighs about four tons.

Mexico

CHIHUAHUA

Calabacillas Mining Company—This company is opening up a large body of low-grade gold ore southeast of the Lluvia de Oro in the Urique district.

MEXICO

National Metal Company—It is reported that this company has sold its refinery at Nonoalco to a French syndicate and will hereafter devote its attention to the purchase of ore. The plant began operations in 1905, and has handled bullion to the value of more than \$40,000,000.

OAXACA

Hunboldt—This mine in the Ocotlan district has been purchased by the Commonwealth Mining Company, of Boston, Mass. A two-compartment shaft with crosscuts every 50 ft. will be begun at once. The company also owns the Don Juan, Aztec No. 1, La Marjorie and La Margarita mines in the same district.

San Juan—This mine in the Taviche district recently shipped 100 tons of ore which averaged \$400 per ton.

GUADALAJARA

Cuartas—The new compressor plant at these mines in Bautista district southwest of Ameca has been completed and placed in operation. Thomas M. Hughes is superintendent.

Purisima—A new hoist is to be installed on the main shaft of this mine in the Ayutla district.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 11—The anthracite trade is generally dull, notwithstanding the heavy shipments reported in November, and it is quite probable that December will show a decrease in tonnage. The trade in prepared sizes is quiet, owing to continued mild weather, while the demand for steam sizes has dropped considerably.

The bituminous-coal trade in the East is also dull, the demand for steam coal having fallen off on account of the closing of many factories. The coastwise trade is quiet, consumers in the ice-making ports being generally supplied, while others are holding back on orders.

In the West there has been a general recession in trade, and the financial stringency is making itself felt in a smaller demand. A curtailment of production is in evidence at many points. For once, car service is generally good.

The conference at Indianapolis this week seems to point to a restoration of the Interstate Agreement next year.

COAL TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Nov. 30 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	4,177,256	5,192,324	I. 1,015,068
Bituminous.....	29,603,054	36,373,435	I. 6,770,381
Coke.....	11,670,480	12,533,292	I. 862,812
Total.....	45,450,790	54,099,051	I. 8,648,261

The total increase this year to date was 19 per cent. The monthly average for this year was 4,918,096 tons.

The shipments from mines of the Monongahela River Consolidated Coal and Coke Company for the fiscal year ended Oct. 31 are reported as follows, in short tons:

	1906.	1907.	Changes.
River coal.....	4,682,160	5,221,947	I. 539,787
Railroad coal.....	1,940,722	2,232,210	I. 291,488
Total.....	6,622,882	7,454,157	I. 831,275

The total increase was 13.4 per cent. River coal was 75.2 per cent. of the total in 1906, and 70.1 this year.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the 11 months ended Nov. 30 were 738,598 tons in 1906, and 907,619 tons in 1907; an increase of 169,021 tons.

Shipments of anthracite coal in November were 5,666,205 long tons, showing an increase of 483,352 tons over Novem-

ber, 1906. For the 11 months ended Nov. 30 the shipments by companies were, in long tons:

	—1906.—		—1907.—	
	Tons.	Per Ct.	Tons	Per Ct.
Reading.....	10,271,242	20.2	12,877,557	21.0
Lehigh Valley.....	9,132,959	18.0	10,625,844	17.3
N. J. Central.....	6,350,433	12.5	8,008,359	13.1
Lackawanna.....	8,409,033	16.5	9,461,177	15.4
Del. & Hudson.....	4,886,130	9.6	6,062,097	9.9
Pennsylvania.....	4,421,287	8.7	5,219,871	8.5
Eric.....	5,151,068	10.1	6,589,601	10.8
N. Y., Ont. & W.....	2,240,415	4.4	2,482,366	4.0
Total.....	50,862,567	100.0	61,327,672	100.0

All the companies showed increases, the larger proportional gains being on the Reading and the Erie. The total increase this year was 10,465,105 tons, or 20.6 per cent.

Coal receipts at Boston for the 11 months ended Nov. 30 are reported by the Chamber of Commerce as follows, in long tons:

	1906.	1907.	Changes.
Anthracite.....	1,495,726	1,874,654	I. 378,928
Bituminous.....	2,637,453	2,897,561	I. 240,128
Total domestic.....	4,133,179	4,772,215	I. 639,036
Foreign coal.....	607,392	491,439	D. 115,953
Total.....	4,740,571	5,263,654	I. 523,083

The foreign coal is chiefly from Nova Scotia, but some comes from Great Britain.

Shipments of anthracite coal by lake from Buffalo for the season to Dec. 1 were 2,537,960 tons in 1906, and 3,312,055 in 1907; an increase of 774,095 tons.

New York

ANTHRACITE

Dec. 11—The recent activity in the hard-coal market has nearly disappeared; both prepared and small steam sizes show considerable dullness. Prices are quoted as follows: Broken, \$4.50@4.75; egg, stove and chestnut, \$5; pea, \$3.25@3.50; buckwheat No. 1, \$2.75@3; buckwheat No. 2 or rice, \$2.15@2.25; barley, \$1.75; all f.o.b. New York harbor.

BITUMINOUS

Quietness prevails throughout the soft-coal market in all territories and prices have declined fully 25c. per ton since last week. Producers are working on old contracts but are fast catching up with their orders. Since new business is extremely scarce, this means that production, at nearly all the mines, must be curtailed in the near future unless a sudden and unexpected demand should arise. The general impression prevails throughout the trade that good business will not be seen until after the beginning of the year and

then that it will be to a limited extent only. Factories throughout New England are working very light or not at all, and the demand from this territory is small.

To the far East and along the Sound considerable coal is going forward on old contracts, but consumers are not booking much coal ahead. New York harbor shares the general depression and coal is selling at \$2.45@2.60; and one lot, which was on demurrage, was offered as low as \$2.25. All-rail trade is quiet; transportation is slow but car supply is naturally much improved on account of the lighter demands upon the railroads. Coastwise freight rates remain unchanged. Quotations are from Philadelphia, to Boston, Salem and Portland, \$1; to Lynn and Newburyport, \$1.25; to Portsmouth, \$1.05; to the Sound 85c. per ton.

Birmingham

Dec. 9—Coal production in Alabama is holding up well considering the general depression in other quarters. The Tennessee Coal, Iron and Railroad Company has begun mining coal in the new shaft in the Pratt Mines division. The mines of the Southern Steel Company, half a dozen in number, have either shut down or will be shut down this week. The railroads are furnishing all the cars that are needed to keep the mines in operation. There is not much coal being laid aside for future use, as far as can be ascertained, many of the coal bins at furnaces and at coke ovens already being filled.

Coke is dull and the production is being curtailed somewhat.

Chicago

Dec. 9—Depression continues in the coal market, though the volume of sales is increasing and the tone of business generally is improving. The tendency continues to buy only for immediate needs. There has been some trouble of the old sort—forced selling to escape demurrage charges—in the last week, notwithstanding the curtailment of shipments from Illinois and Indiana mines. Transportation troubles are no longer generally complained of; the problem before each dealer is not to get coal, but to find a market for it.

Prices on Western coals remain practically unchanged, lump or egg selling for \$2.15@3, run-of-mine for \$1.75@2 and screenings for \$1.15@1.40. Hocking Valley coal is quoted at \$3.40@3.65 for the

best grades, and is in large supply. Smokeless also is plentiful and weak. Run-of-mine smokeless sells for \$3@3.25, and lump for \$4.30@4.55. The demand for No. 8 Pittsburg continues steady and it is fairly strong at \$2.95@3.05. Youghiogheny is in fair demand and good supply at \$3.25 for 3/4-in. Anthracite is somewhat less in demand, though the amount of trade is fair. Chestnut is still scarce.

Cleveland

Dec. 10—The lake season has closed. The last coal cargo from Lake Erie was taken by the steamer "Frank Parry," which left Lorain, Dec. 9, for a Lake Michigan port.

Rail receipts of coal at Cleveland in November were 8790 tons anthracite and 741,946 bituminous; a total of 750,736 tons. Shipments of bituminous coal by lake for the month were 413,505 tons.

Pittsburg

Dec. 10—There has been a heavy decline in demand and as a result the leading producers have made a further cut in prices effective this week. The new rates provide for a reduction from the prices established on Dec. 1 of 15c. a ton, and present quotations are as follows: Mine-run, \$1.15@1.20; 3/4-in., \$1.25@1.30; 1 1/4-in., \$1.35@1.40; 1 1/2-in. nut, \$1.15@1.20; slack, 50c., all f.o.b. mine. It is understood that these prices could be shaded. Not more than 75 per cent. of the railroad coal mines in the Pittsburg district were in operation at the opening of the week, and it is likely that a number will close. There is an ample supply of railroad cars. It is reported that on the Pennsylvania lines alone fully 8000 coal cars are stored. The cause of dull conditions is the idleness of a number of iron and steel mills. All the river mines are operating steadily and there is not a large tonnage awaiting shipment to the lower ports, as most of the loaded coal got out on the last rise.

Connellsville Coke—Conditions have not improved and more ovens are idle this week. The H. C. Frick Coke Company is not operating more than 30 per cent. of its capacity, and about 50 per cent. of the independent coke ovens are down. Prices continue low and there is not much change from last week. Standard Connellsville furnace coke is quoted at around \$2 and foundry coke ranges from \$2.25 to \$2.75 a ton. One large independent interest has taken a contract for foundry coke for shipments through December and all of next year at \$2.75. Several fairly good contracts for foundry coke for shipment in the first half and through 1908 have been booked. The *Courier*, in its weekly summary, gives the production of coke in both regions at 210,323 tons. The shipments aggregated 6030 cars distributed as

follows: To Pittsburg, 2085 cars; to points west of Connellsville, 3393 cars; to points east of Connellsville, 552 cars.

Foreign Coal Trade

Exports of coal and coke from the United States for the 10 months ending Oct. 31, are reported as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
Anthracite.....	1,851,466	2,336,304	I. 484,838
Bituminous.....	6,378,483	8,675,258	I. 2,296,775
Total coal.....	8,229,949	11,011,562	I. 2,781,613
Coke.....	642,931	761,568	I. 118,637
Total.....	8,872,880	11,773,130	I. 2,900,250

These figures do not include coal bunkered, or sold to steamships engaged in foreign trade. The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1906.	1907.	Changes.
Canada.....	6,216,261	8,352,010	I. 2,135,749
Mexico.....	936,837	930,486	D. 6,351
Cuba.....	557,962	631,002	I. 73,040
Other W. Indies.....	267,750	358,304	I. 90,554
Europe.....	76,338	201,428	I. 125,090
Other countries.....	174,801	538,332	I. 363,531
Total.....	8,229,949	11,011,562	I. 2,781,613

The increase in exports to Europe was in shipments to Italy, which took 130,509 tons this year. The exports to other countries were chiefly to South America. The exports to Canada—75.8 per cent. of the total in 1907—were, in detail, as follows:

	1906.	1907.	Changes.
Anthracite.....	1,819,586	2,296,958	I. 477,372
Bituminous.....	4,396,675	6,055,052	I. 1,658,377
Total.....	6,216,261	8,352,010	I. 2,135,749

The increase in anthracite was 26.2 per cent., and in bituminous 37.7; the total gain being 34.4 per cent.

Imports of coal and coke into the United States for the 10 months ending Oct. 31, were, in long tons, as follows:

	1906.	1907.	Changes.
Great Britain.....	97,844	33,985	D. 63,859
Canada.....	1,202,349	1,161,876	D. 40,473
Japan.....	10,812	102,358	I. 91,546
Australia.....	152,568	416,894	I. 264,326
Other countries.....	4,581	7,315	I. 2,734
Total coal.....	1,468,154	1,722,428	I. 254,274
Coke.....	112,363	108,298	D. 4,065
Total.....	1,580,517	1,830,726	I. 250,209

The decrease in imports from Canada into California was made up by larger receipts of Australian and Japanese coal. Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Iron Trade Review

New York, Dec. 11—The curtailment of production is the chief point in the iron and steel trades at present. The production of pig iron has been sharply reduced

as the first step, and this has been followed by the closing or partial closing of a number of steel works and rolling mills. It is difficult to give exact statistics of the extent to which the movement has gone so far.

The market continues dull everywhere, with new business coming in only in a small way, where material is needed to complete work already ordered or in progress. Aside from this a few municipal contracts are the only work noted.

Rail orders are still waiting the settlement of pending questions between the railmakers and the railroads. It is possible that some roads also are quite willing to wait until the financial questions are more settled.

Continued mild weather promises a late closing of lake navigation. There is already an abundant supply of iron ore at the lower lake ports, so that the shipment of ore has almost ceased.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for October, and the 10 months ended Oct. 31, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
October.....	\$15,910,437	\$18,951,128	I. \$3,040,691
Ten months....	142,609,320	165,181,005	I. 22,571,285

The total increase for the 10 months was 15.8 per cent. The leading items of export for the 10 months were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	65,463	64,556	D. 907
Billets, ingots & blooms	180,632	66,163	D. 114,469
Bars.....	72,095	85,114	I. 13,019
Rolls.....	273,610	288,002	I. 14,392
Sheets and plates.....	90,673	102,563	I. 11,890
Structural steel.....	93,460	117,774	I. 24,314
Wire.....	144,170	132,299	D. 11,871
Nails and spikes.....	52,731	50,059	D. 2,672

The chief decreases were in wire and in billets, ingots and blooms. The larger gains were in bars and structural steel.

Iron and Steel Imports—Imports of iron and steel, including machinery, in the United States for October and the 10 months ending Oct. 31, are valued by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
October.....	\$3,407,763	\$2,419,184	D. \$ 988,579
Ten months....	27,784,650	34,117,204	I. 6,332,554

The increase for the 10 months was 30 per cent. The chief items of the iron and steel imports for the 10 months were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	265,665	459,040	I. 193,375
Scrap.....	11,130	25,619	I. 14,489
Ingots, blooms, etc.....	17,067	13,044	D. 4,023
Bars.....	28,754	32,761	I. 4,007
Wire-rods.....	15,081	14,295	D. 786
Tin-plates.....	43,846	51,623	I. 7,777

There were considerable increases in pig iron, in scrap—chiefly steel scrap—and in tin-plates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the 10 months ended Oct. 31 are reported as follows, in long tons:

	1906.	1907.	Changes.
Exports.....	256,384	224,021	D. 32,363
Imports.....	908,366	1,055,701	I. 147,335

Most of the exports were to Canada. Imports were from Cuba, Spain and Algeria.

Imports of manganese ore for the 10 months were 185,281 tons in 1906, and 173,045 tons in 1907; a decrease of 12,236 tons.

Birmingham

Dec. 9—There is no change in the pig-iron market situation in Alabama, the demand being slow and the production at low tide. A few inquiries are being received. The production in November, which was 126,156 tons, 25,659 less than in October, will be reduced in December. Some repair work is going on at furnaces, while raw material is being accumulated. The production of foundry iron will hardly be curtailed any more this year. The furnace and steel plants of the Southern Steel Company are to be closed down this week, this action being decided on by the receivers. All the material on hand at the plants of this company has practically been worked up and until there is a reorganization it is not believed the plants will resume operation.

The Tennessee Coal, Iron and Railroad Company is doing well at the steel plant at Ensley and a large force of men is employed in new construction. Besides the additional open-hearth furnaces, a foundry and machine shop will be erected at Ensley to do much of the work that is now done elsewhere.

Chicago

Dec. 9—Sales of pig iron continue small, and almost wholly for immediate needs. Inquiries are out for considerable iron to be delivered in the first half of 1908, but result in few contracts. Some furnace men are inclined to hold strongly to present prices and there is no great evidence of eagerness to sell at very low prices. The probability is that any contracts of good size would send prices upward, present lots being small and production being greatly curtailed.

Prices are only nominal on small lots. Southern No. 2 is quoted at \$15 Birmingham (\$19.35 Chicago) and Northern at \$19, minimum figures. Sales are rumored at 25 or 50c. less, but there are no open reports of such sales. Both sellers and buyers continue in a waiting mood.

Coke is weak, demurrage charges having forced the price down to \$5.65 for the best Connellsville, with West Virginia coke 20 or 25c. less.

Cleveland

Dec. 10—The shipping season is now practically closed. Reports from the Northwest show that iron-ore shipments in December were 90,817 tons only. Total lake movement for the season was 41,

288,755 tons, an increase of about 9 per cent. over last year.

General industrial conditions here are improving. In fact Cleveland has probably had less decrease, less shut-downs than any point of its importance in the West.

Philadelphia

Dec. 11—Basic pig iron has sold heavily for early delivery and negotiations for additional large lots are reported today as approaching conclusions. A few larger consumers are consulting southern makers with a view of doing business for next year. Wages are declining at many furnaces in eastern and middle Pennsylvania. A few large orders are reported this week for Nos. 1 and 2 iron and pipe foundries are also showing some interest. Prices are somewhat weaker and buyers could purchase just now to decided advantage. The tone of the market is stronger, however.

Steel Billets—The billet market is stronger to all outward appearances but the actual business done does not prove it.

Bars—Quotations continue at the old level and retail demand is good. Large orders are still exceptional.

Sheets—Our manufacturers are running at about the same capacity and some mills have quite a supply of marketable weights.

Structural Material—Pennsylvania mills are profiting by the structural work under way and projected in New York City. Some big orders have been secured.

Scrap—Not much is ordinarily done in scrap at this time of year. The lower grades are selling better than the higher.

Pittsburg

Dec. 10—Conditions in the iron and steel trade do not show any improvement, but on the contrary are more discouraging than at any time since the opening of the year. More mills are on the idle list, and there is but little new buying in any line. The United States Steel Corporation is adhering to its policy not to accept cancellations of orders, but enter them on the books as postponements. Despite this policy cancellations are being received. So far there has been no intimation that prices are to be reduced upon the opening of the new year, but it is understood that some readjustments are to be made. Independent mills contend that with the lower prices of pig iron that now prevail the Steel Corporation and other large makers of billets should recede from the stand taken not to cut the price of either bessemer or open-hearth billets. There is some talk of reducing wages early in the year, but it is called "readjustment." One large steel interest has taken the initiative and has ordered a cut of 10 per cent. at some of its plants. It is understood that the Steel Corporation does not

expect to make any serious reductions in wages, but prefers to keep up prices. The brightest spot is in the tin-plate industry. One large independent concern during the past week booked orders aggregating 50,000 boxes, which will keep its plant going steadily until April 1. The American Can Company has not yet figured out its requirements for next year, but will likely take its usual tonnage and the order will be placed with the American Sheet and Tin-Plate Company. There will not be any accumulation of stocks, and it will be possible to maintain the present price of \$3.90 a box for 100-lb. coke plates. All contracts taken, however, are guaranteed against a decline.

Pig Iron—A number of blast furnaces have been blown out during the week and most of the merchant furnaces in the Valley will be out of commission within a week. About 60 per cent. of the Steel Corporation's 95 blast furnaces are idle. No sales have been recorded for fully two weeks and prices are purely nominal. Bessemer is quoted at \$19, Valley furnaces, but fully \$1 less can easily be done. No. 2 foundry is quoted at \$18.50, basic at \$17.50, and gray forge at \$18, all f.o.b. Valley furnaces.

Steel—There is no change in the market for crude steel, bessemer and open-hearth billets still being quoted at \$28. Plates are firm at 1.70c. and steel bars at 1.60c.

Sheets—The sheet market shows a slight improvement, and there is less shading of black sheets than at any time since price cutting began. Black sheets are quoted at 2.60c. and galvanized at \$3.75c. for No. 28 gage.

Ferro-Manganese—Prices have declined \$1 a ton during the week, several small sales having been made at \$51.50, Pittsburg.

Dusseldorf, Germany

Nov. 30—The German Iron and Steel Union reports pig-iron production in Germany in October at 1,138,676 tons; being 47,656 tons more than in September, and 64,802 tons more than in October, 1906. The daily average was 36,367 tons in September, and increased 365 tons, to 36,732 in October. For the 10 months ended Oct. 31 the total was as follows, in metric tons.

	1906.		1907.	
	Tons.	Per Ct.	Tons.	Per Ct.
Foundry iron ..	1,757,409	17.0	1,873,127	17.3
Forge iron.....	718,653	6.9	647,487	6.0
Steel pig.....	777,845	7.5	849,150	7.8
Bessemer pig. ..	399,332	3.9	395,770	3.7
Thomas pig.....	6,693,618	64.7	7,061,626	65.2
Total.....	10,346,857	100.0	10,827,160	100.0

This shows increases of 115,718 tons in foundry; 71,305 tons in steel pig, which includes spiegeleisen, ferromanganese, ferro-silicon and all similar alloys; 368,008 tons in Thomas, or basic pig. There were decreases of 71,166 tons in forge iron and 3562 in bessemer pig. The total gain this year was 480,303 tons, or 4.6 per cent.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Dec. 11.

At all United States Ports in Oct. and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1907..	\$ 3,112,539	\$ 4,480,910	Imp. \$ 1,368,371
" 1906..	7,074,544	27,250,852	" 20,176,308
Year 1907..	52,992,352	35,343,130	Exp. 17,649,222
" 1906..	42,864,506	139,026,869	Imp. 96,162,363
Silver:			
Oct. 1907..	5,053,997	3,566,634	Exp. 1,487,363
" 1906..	3,549,017	3,882,522	Imp. 333,505
Year 1907..	53,024,790	38,054,858	Exp. 14,969,932
" 1906..	48,990,356	36,876,591	" 12,113,765

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Dec. 7 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 20,000	13,830,794	\$ 816,164	\$ 266,405
1907.....	34,838,544	79,955,101	49,005,267	3,085,395
1906.....	6,055,965	93,221,150	48,336,059	2,497,665
1905.....	34,619,503	10,689,671	32,859,937	4,092,467

Exports of gold for the week were to the West Indies; of silver to London. Imports of gold were from Great Britain, France and Cuba; of silver from Central and South America.

Specie holdings of the leading banks of the world, Dec. 7, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York			\$173,888,700
England.....	\$163,793,925		163,793,925
France.....	539,099,035	\$185,399,125	724,498,160
Germany.....	132,825,000	36,805,000	169,630,000
Spain.....	78,135,000	128,885,000	207,020,000
Netherlands.....	38,227,000	24,828,000	63,055,000
Belgium.....	17,036,665	8,518,335	25,555,000
Italy.....	192,930,000	25,535,000	218,465,000
Russia.....	622,610,000	25,535,000	648,145,000
Aust.-Hungary.....	228,260,000	58,180,000	286,440,000
Sweden.....	20,350,000		20,350,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

Dec.	Sterling Exchange.	Silver.		Dec.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
5	4.8590	57½	26½	9	4.8575	55½	25½
6	4.8635	57½	26½	10	4.8550	55½	25½
7	4.8550	56½	26½	11	4.8513	56½	26½

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to Nov. 28:

	1906.	1907.	Changes.
India.....	£ 14,292,796	£10,188,904	D. £ 4,103,892
China.....	430,700	331,750	D. 98,950
Straits.....	1,750	691,150	I. 689,400
Total.....	£ 14,725,246	£11,211,804	D. £ 3,513,442

Receipts for the week were £3000 from Australia and £153,000 from New York; £156,000 in all. Exports were £179,600, of which £15,000 went to India, £45,200 to

the Straits, £114,400 to China and £5000 to Australia.

Indian Exchange continues heavy, and for the third week in succession no Council bills were taken in London. Outside quotations were 15.88d. per rupee. Silver buying for India was extremely light.

The director of the Mint this week bought 300,000 oz. silver at 57.686c. per oz., deliveries in equal amounts at Denver, New Orleans and Philadelphia.

The silver market has suffered a heavy decline, owing to pressure to sell metal, with a lack of buying power. A slight reaction would seem to be in order, unless sales continue to be in large volume, which is not probable at present.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.44½	\$0.50
Peruvian soles and Chilean.....	0.40	0.45
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.87	3.90
Spanish 25 pesetas.....	4.78	4.80

Other Metals

Dec.	Copper.		Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.			New York, Cts. per lb.	St. Louis, Cts. per lb.
5	13½ @13½	13½ @13½	60%	30½ @4.00	4.40 @4.45	4.25 @4.30
6	13½ @13½	13½ @13½	61½	30½ @4.00	4.30 @4.40	4.20 @4.25
7	13½ @13½	13 @13½	30	3.90 @4.00	4.30 @4.37½	4.12½ @4.25
9	13½ @13½	13 @13½	60½	29½ @3.95	4.30 @4.37½	4.12½ @4.25
10	13½ @13½	12½ @13½	60½	28½ @3.95	4.30 @4.37½	4.12½ @4.25
11	13½ @13½	12½ @13½	59½	28 @3.90	4.30 @4.37½	4.12½ @4.25

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b.s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 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.

Copper—Domestic consumers continue to remain out of the market, and the European consumers, who bought heavily a short time ago, are now purchasing only small quantities. Consequently the market continues reactionary. The total transactions of the week have been small. Early in the week some export sales of a special brand of Lake were made at excellent figures, but since then the market for this class of copper has been quite nominal. At the close Lake copper is 13¼@13½c., and electrolytic, 12¾@13¾c. The average for casting copper is 12¾@13c.

Comparatively little business has been done in London in standard warrants. The market there has also been reaction-

ary, the close being £59 5s. for spot, £60 10s. for three months.

Refined and manufactured sorts we quote: English tough, £56; best selected, £64; strong sheets, £67.

Exports of copper from New York and Philadelphia for the week were 9783 long tons. Our special correspondent gives the exports from Baltimore for the week at 2308 tons.

A sample shipment of 20 tons of copper-silver ore has been received at the Tye Copper Company's smelter, Lady-smith, Vancouver Island, British Columbia, from a mine situated near Manzanillo, Mexico. If the experiment prove satisfactory regular shipments will follow. Smelting Mexican copper ores in British Columbia will be a new departure.

Copper Sheets and Wire—The base price of copper sheets is 20c. per lb.; for wire, 16½@16¼c. per lb.

Tin—The market in London has shown a rather weak tendency under comparatively small transactions in spot tin, while good-sized sales of futures were made. The market closes weak at £125 10s. for spot, £126 10s. for three months.

The domestic market was naturally influenced by the decline in London, which made buyers, if possible, more reticent than they have been heretofore. For spot tin a premium is still being realized, and sales are being made at the close at about 28 cents.

Lead—The position of this metal remains unchanged. Demand is small, and the stocks which have accumulated in the hands of producers are pressing on the market. The close is weak at 3.80@3.90c. New York.

The London market has had another sharp decline during the week, particularly for early delivery, and at the close Spanish lead is quoted £14 7s. 6d., English lead £14 10s.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull at 3.90c. Demand is exceedingly light even at this low price.

Spelter—Consumers are well supplied and stocks continue to accumulate in the hands of smelters. In consequence, prices have again declined, and the close is weak at 4½@4¼c. St. Louis, 4.30@4.37½c. New York.

The consumption of spelter in Europe also is poor, and the fear of exports from this side has caused a decline there, good ordinaries now being quoted £20 10s., specials £20 15s.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of Nov. 27, that the unsatisfactory condition of international money markets has been reflected in spelter prices which declined sharply, but have subsequently recovered somewhat under the stimulant of covering orders. For ordinary brands of spelter present quotations are 43.50@44.50

marks per 100 kg. (4.70@4.81c. per lb.) f.o.b. works. * Inquiries for zinc dust are satisfactory and prices in 10-ton lots, f.o.b. Stettin, are 42.25@42.75 marks per 100 kg. (4.56@4.62c. per lb.). Exports and imports of zinc ore and products from Germany for the 10 months ended Oct. 31 were as follows, in metric tons:

	Imports.		Exports.	
	1906.	1907.	1906.	1907.
Spelter.....	30,368	24,887	52,346	51,523
Zinc sheets.....	68	89	13,238	17,489
Zinc scrap.....	1,861	874	4,158	5,793
Zinc ore.....	146,488	148,458	35,701	28,904
Zinc dust.....	.....	788	.....	1,812
Zinc oxide.....	.....	5,441	.....	15,627
Lithophone.....	1,306	1,782	6,612	7,759

The total gain of exports of spelter and zinc sheets this year was 3428 tons.

Zinc Sheets—The base price is \$7 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

Antimony—The market is heavy and unsettled, with prices lower than last week. Among the outside brands Hungarian is weak and little or no business has been done. The local market is independent of that abroad and no importing is being done at present. Quotations are 95%@10c. for Cookson's; 9@9½c. for Hallett's; and 77%@8½c. for ordinary brands.

Quicksilver—New York quotations are \$45 per flask for lots of 100 flasks or over, and \$46 for smaller orders. San Francisco quotations are \$44.50@45.50 for domestic orders; for export nominal, at about \$1.50 lower. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

Nickel—For large lots, New York, the chief producer quotes 45@50c. per lb. according to size and terms of order. For small quantities, 50@65c., same delivery.

Platinum—While there is no quotable change in the market, still producers are inclined to believe that the tone will improve in the near future. However, this belief is not reflected in the price offered for scrap which has declined \$1 since last week. Quotations are as follows: Hard metal, \$28.50; ordinary, \$26; scrap, \$17@18 per troy ounce, with the latter price not offered except in cases of necessity.

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

	Per Lb.
Cadmium, 99.5% f. o. b. Hamburg.....	\$1.27@1.35
Chromium, pure (N. Y.).....	77c.
Copper, red oxide.....	50c.
Ferro-Chrome (60% Cr., 5% C.).....	9c.
Ferro-Chrome (60% Cr., 2% C.).....	22c.
Ferro-Chrome (60% Cr., 1% C. or less).....	42c.
Ferro-Molybdenum (50%).....	\$1.00
Ferro-Titanium (20%).....	70c.
Ferro-Tungsten (37%).....	30c.
Ferro-Vanadium (25-50% per lb. vanadium contents).....	\$4.90
Magnesium, pure (N. Y.).....	1.50
Manganese, pure 98@99% N. Y.....	75c.
Manganese-Copper (30@70%) N. Y.....	45c.
Molybdenum (98@99% N. Y.).....	\$1.65
Phosphorus, foreign red (f. o. b. N. Y.).....	90c.
Phosphorus, American yellow (f. o. b. Niagara Falls).....	42c.
Tungsten (best) pound lots.....	98c.
Ferrosilicon (50%) spot. Ex. ship Atlantic ports.....	\$89 ton.

Variations in price depend chiefly on size and condition of orders.

Imports and Exports of Metals

Copper—Exports of copper from the United States for the 10 months ended Oct. 31 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each.

	1906.	1907.	Changes.
Great Britain.....	19,700	18,297	D. 1,403
Belgium.....	1,841	930	D. 911
France.....	29,782	26,400	D. 3,382
Italy.....	7,027	6,844	D. 183
Germany and Holland.....	96,450	88,073	D. 8,377
Russia.....	3,136	1,676	D. 1,460
Other Europe.....	9,629	8,525	D. 1,104
Canada.....	1,611	1,178	D. 433
China.....	2,002	300	D. 1,702
Other countries.....	194	243	I. 49
Total metal.....	171,372	152,466	D. 18,906
In ores and matte.....	4,799	6,051	I. 1,252
Total.....	176,171	158,517	D. 17,654

The total decrease was 10 per cent. Actual quantity of ores and matte reported this year was 90,928 tons, of which 75,506 tons went to Canada, 15,061 to Mexico, and 360 to Europe.

Imports into the United States of copper and copper material for the 10 months ended Oct. 31, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico.....	31,882	13,916	45,798
Canada.....	11,692	4,182	15,874
Great Britain.....	11,474	.....	11,474
Japan.....	2,846	.....	2,846
South America.....	.....	2,955	2,955
Other countries.....	18,261	2,133	20,394
Total imports.....	76,155	23,186	99,341
Re-exports.....	394	.....	394
Net imports.....	75,761	23,186	98,947
Net imports, 1906.....	64,619	18,876	83,495

The total increase in the net imports was 15.452 tons, or 18.5 per cent. The actual tonnage of ores imported this year from Mexico was 95,706 tons; from Canada and Newfoundland, 100,215; from South America, 22,322; from other countries, 34,944 tons. Included in the receipts of metal from other countries was 5378 tons from Europe and 308 tons from Cuba.

The exports and net imports compare as follows for the 10 months:

	1906.	1907.	Changes.
Exports.....	176,171	158,517	D. 17,654
Net imports.....	83,495	98,947	I. 15,452
Excess, exports.....	92,676	59,570	D. 33,106

The decrease in the excess of exports this year was 35.7 per cent.

Tin—Imports of tin into the United States for the 10 months ending Oct. 31 were as follows, in long tons:

	1906.	1907.	Changes.
Straits.....	12,420	11,307	D. 1,113
Australia.....	859	532	D. 327
Great Britain.....	21,779	20,350	D. 1,429
Holland.....	444	807	I. 363
Other Europe.....	1,301	1,014	D. 287
Other countries.....	240	105	D. 135
Total.....	37,043	34,115	D. 2,928

The total decrease this year was 7.9 per cent.

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the 10 months ended Oct. 31, in short tons of 2000 lb. each:

	1906.	1907.	Changes.
Lead, metallic.....	11,256	8,583	D. 2,673
Lead in ores and base bullion.....	61,900	53,907	D. 7,993
Total imports.....	73,156	62,490	D. 10,666
Re-exports.....	40,090	41,369	I. 1,279
Net imports.....	33,066	21,121	D. 11,945

Of the imports this year 48,029 tons were from Mexico and 5496 from Canada. Exports of domestic lead were 67 tons in 1906, and 128 tons in 1907; an increase of 61 tons.

Spelter—Exports of spelter, zinc dross and zinc ores from the United States for the 10 months ending Oct. 31 are reported as below, zinc ore being in long tons, the others in short tons:

	1906.	1907.	Changes.
Spelter.....	4,049	414	D. 3,635
Zinc dross.....	12,258	8,608	D. 3,650
Zinc ores.....	22,730	13,991	D. 8,739

Imports of spelter for the 10 months were 2168 tons in 1906, and 1763 tons in 1907; a decrease of 405 tons. Imports of zinc ores for the four months, July 1 to Oct. 31, were 26,726 tons calamine and 2265 tons other ores; 28,991 tons in all. Previous to July 1 such ores were not reported.

Antimony—Imports of antimony into the United States for the 10 months ended Oct. 31 were as follows, in pounds:

	1906.	1907.	Changes.
Metal and regulus.....	5,706,652	6,913,074	I. 1,206,422
Antimony ore.....	1,588,281	2,604,650	I. 1,016,369

There was a considerable increase in metal, and a large gain in ore.

Nickel—Imports of nickel ore and nickel matte into the United States for the 10 months ended Oct. 31 were 12,521 tons in 1906, and 14,163 tons, containing 15,720,017 lb. metal, in 1907; an increase of 1642 tons. Metal contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte for the 10 months were 9,124,026 lb. in 1906, and 7,490,062 lb. in 1907; a decrease of 1,633,964 lb. this year.

Quicksilver—Exports of quicksilver from the United States for the 10 months ended Oct. 31 were 429,467 lb. in 1906, and 346,118 lb. in 1907; a decrease of 83,149 lb. this year.

Platinum—Imports of platinum into the United States for the 10 months ended Oct. 31 were 9829 lb. in 1906, and 5197 lb. in 1907; a decrease of 4632 lb. this year.

Aluminum—Exports of aluminum from the United States for the 10 months ended Oct. 31 were valued at \$283,542 in 1906, and \$285,278 in 1907; an increase of \$1736 this year.

Wisconsin Ore Market

Platteville, Wis., Dec. 7—The market for 60 per cent. zinc ore the first of the week was \$35 per ton, but the price declined toward the close of the week to \$33 per ton. Lead ore, 80 per cent., sold during the week at \$20 per thousand. Most low-grade producers have been forced to close down and unless the situation eases up within a week or so, thus enabling buyers to take on larger purchases, several of the companies equipped with calciners, now operating, will likewise be forced to close. New work has been affected by the prolonged slump and much prospecting has been discontinued.

Shipments for the week ended Dec. 7 were as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	422,280	.....	.....
Livingston	120,000	.....	.....
Mineral Point.....	120,000	.....	.....
Highland.....	110,250	.....	.....
Galena.....	110,000	.....	.....
Harker.....	69,000	.....	.....
Linden.....	60,000	.....	.....
Cuba City.....	.....	64,000	.....
Total for week....	1,011,880	64,000	.....
Year to Dec. 7.....	95,047,587	4,888,730	462,360

Hazel Green, Benton, Elmo and Rewey made no shipments during the week.

Missouri Ore Market

Joplin, Mo. Dec. 7—The highest price reported paid for zinc was \$36 per ton, the assay base ranging from \$28 to \$34 per ton of 60 per cent. zinc, and the average price of all grades being \$29.96. The highest price paid for lead was \$42 per ton, medium grades bringing \$36 to \$40, and all grades averaging \$39.08 per ton.

News reaches here of additional zinc smelting furnaces being placed on dead fire during the week, with rumors that more will follow the coming week. Smelters are reaching the conclusion that it is advisable to cease producing the metal until consumers get ready to take up the present stocks. Shallow mines that have laid idle for several years, since zinc ore has been a good price, are being sought by miners thrown out by the closing down of mills, and the large number thus employed, while individually producing but little, swell the aggregate tonnage. The past two weeks two big mills have been closed down in the Badger camp and the remaining three mills are operated only single shifts. One of these probably stopped work tonight. The American Zinc, Lead and Smelting Company reduced wages to all employees 10 per cent. on Dec. 1, discharging some employees altogether, and holds out little hope that any of the five big mills will be run after the first of the year, although the men have been notified that these will be continued at a further reduction, if the company can see its way clear to produce ore even a minimum of profit.

Following are the shipments of zinc and lead ore from the various camps of the district for the week ending Dec. 7:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	2,514,670	747,040	\$ 55,174
Joplin.....	2,103,290	350,070	40,643
Galena.....	760,750	166,370	15,118
Duenweg.....	861,830	44,170	14,672
Alba-Neck City.....	719,820	.....	12,286
Aurora.....	952,520	.....	9,199
Prosperity.....	367,890	41,040	6,686
Badger.....	375,720	.....	6,387
Granby.....	550,000	40,000	5,800
Spurgeon.....	173,980	82,530	3,258
Wentworth.....	166,020	.....	2,503
Stott City.....	110,640	.....	2,102
Quapaw-Baxter.....	.....	92,530	1,892
Carl Junction.....	65,340	22,390	1,559
Zincite.....	61,270	23,980	1,459
Carthage.....	83,090	.....	1,412
Oronogo.....	93,910	.....	1,245
Springfield.....	.....	56,340	1,126
Sarcoite.....	67,500	.....	948
Cave Springs.....	38,310	2,430	661
Totals.....	10,056,550	1,668,890	\$184,080

49 weeks.....550,946,200 81,288,630 \$15,012,614
Zinc value, the week, \$150,707; 49 weeks, \$12,176,545
Lead value, the week, 33,373; 49 weeks, \$2,846,069

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January...	47.38	45.84	January...	75.20	83.53
February...	47.37	47.11	February...	72.83	84.58
March.....	42.68	48.66	March.....	73.73	82.75
April.....	44.63	48.24	April.....	76.13	79.76
May.....	40.51	45.98	May.....	78.40	79.56
June.....	43.83	44.82	June.....	80.96	73.66
July.....	43.25	45.79	July.....	74.31	58.18
August.....	43.56	43.22	August.....	75.36	59.54
September..	42.58	40.11	September..	79.64	53.52
October....	41.55	39.83	October....	79.84	51.40
November..	44.13	35.19	November..	81.98	43.40
December..	43.68	.....	December..	81.89	.....
Year.....	43.24	.....	Year.....	77.40	.....

Chemicals

New York, Dec. 11—The general chemical market shows no change, and business is practically confined to regular contract shipments.

Copper Sulphate—There are few new orders for either spot or future delivery; dealers and producers are not looking for any decided activity until spring. Quotations are \$5.50 per 100 lb. for carloads and \$5.75 for smaller lots, but the usual shading of 25c. is said to prevail among independent dealers.

Exports of copper sulphate from the United States for the 10 months ended Oct. 31 were 18,654,734 lb. in 1906, and 6,393,424 lb. in 1907; a decrease of 12,261,310 lb. The exports this year contained the equivalent of 714 long tons copper.

Nitrate of Soda—Messrs. Mortimer & Wisner, New York, report the statistics of nitrate in the United States on Dec. 1 as follows, in long tons:

	1906.	1907.	Changes.
Stocks, Jan. 1.....	13,100	13,050	D. 50
Imports, 11 mos.....	281,680	285,845	I. 4,165
Total supplies.....	294,780	298,895	I. 4,115
Deliveries, 11 mos.....	288,780	293,145	I. 4,365
Stocks, Dec. 1.....	6,000	5,750	D. 250
Afloat for U. S. ports.....	95,000	60,000	D. 35,000

The quantity afloat includes all cargoes due to arrive at United States ports by March 15 next.

Phosphates—Exports of phosphates from the United States for the 10 months ended Oct. 31 were, in long tons:

	1906.	1907.	Changes.
Crude and rock... ..	818,201	868,239	I. 45,038
All other.....	24,849	36,187	I. 11,338
Total.....	843,050	899,426	I. 56,376

The larger exports this year were 268,425 tons to Germany; 148,165 to Great Britain; 119,881 to France; 71,590 to Italy.

Sulphur—Imports of sulphur and pyrites into the United States for the 10 months ended Oct. 31 were, in long tons:

	1906.	1907.	Changes.
Sulphur.....	65,380	20,018	D. 45,362
Pyrites.....	459,987	539,849	I. 79,862

The decrease in imports is due to the utilization of Louisiana sulphur in place of the Sicilian product. Estimating sulphur contents of pyrites, the total imports of sulphur were 249,376 tons in 1906, and 235,957 tons in 1907; a decrease of 13,419 tons.

Exports of sulphur for the 10 months were 14,252 long tons in 1906, and 31,430 tons in 1907; an increase of 17,178 tons.

Heavy Chemicals—Imports of heavy chemicals into the United States for the 10 months ended Oct. 31 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder 86,932,107	92,269,857	I. 5,337,750	
Potash salts.....241,765,085	276,383,400	I. 34,618,315	
Soda salts.....17,842,820	15,344,204	D. 2,498,616	

Exports of acetate of lime were 58,538,467 lb. in 1906, and 64,944,953 lb. in 1907; an increase of 6,406,486 lb. this year.

Mining Stocks

New York, Dec. 11—The advances made last week in the general stock market were only temporary, and were largely lost this week, which opened with rather a depressed feeling, and a general disposition to sell. It is evident that the period of liquidation is not yet at an end. Higher rates for money helped the depression. The copper stocks and the industrials were under special pressure. Amalgamated Copper sold down to \$47; American Smelting common to \$69¼; U. S. Steel to \$26 for the common and \$87¼ for the preferred; Utah Copper to \$15½ per share.

The curb market showed a parallel course, losing the slight gains made last week and closing dull and with a declining tone. The larger transactions were in Boston Copper around \$10; British Columbia Copper, \$4; Cumberland Ely, \$5¼; Nevada Consolidated, \$8¼. Nevada gold stocks are not in demand, but there were sales of Tonopah company at \$6¾, and Goldfield Consolidated at \$4. Of the Cobalt stocks, Nipissing was quoted at \$6¾, and Cobalt Central 22c. per share.

Boston

Dec. 10—The gains made on the upward break last week were nearly all lost this week on a market only moderately active. The market closes dull, with an inclination to weakness. In view of money conditions, the disinclination to invest, and

other apparent causes, no considerable improvement can be expected till after the turn of the year.

Another company has reduced dividends, the Daly West declaring only 30c. at the meeting this week.

There were sales of Calumet & Hecla at \$610. Wolverine brought \$110 today; Osceola, \$83; Mohawk, \$48.50; Isle Royale, \$17. Copper Range sold at \$53. with closing at \$54. Utah Consolidated was around \$31; United States Smelting, Refining and Mining, \$35.50; while Amalgamated sold down to \$46.50 at the close.

The curb was rather dull. Davis Daly and Nipissing were the more active stocks, but there was some trading in Cumberland, Ely and in Superior & Pittsburg.

STOCK QUOTATIONS

Table with columns for NEW YORK and BOSTON Dec. 10, listing various companies and their stock prices.

Table for N. Y. INDUSTRIAL stocks, listing companies like Am. Agri. Chem., Am. Smelt. & Ref., etc., with their respective prices.

Table for ST. LOUIS Dec. 7, listing companies like Adams, Am. Nettie, etc., with their respective prices.

NEVADA STOCKS. Dec. 11. Furnished by Weir Bros. & Co., New York.

Table listing Nevada stocks such as TONOPAH STOCKS, GOLDFIELD STOCKS, GREENWATER STOCKS, MISCELLANEOUS, and COLO. SPRINGS, with their respective prices.

New Dividends

Table listing companies and their new dividends, including Am. Sm'g & Ref. Co., Am. Sm'g & Ref. Co., etc.

Assessments

Table listing companies and their assessments, including Crown Point, Del Monte, Emerald, etc.

Monthly Average Prices of Metals

Table showing the average price of silver in New York and London from January to December.

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

Table showing the average prices of copper in New York and London from January to December.

New York, cents per pound. Electrolytic for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Table showing the average price of tin in New York from January to December.

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Table showing the average price of lead in New York and London from January to December.

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Table showing the average price of spelter in New York, St. Louis, and London from January to December.

New York and St. Louis, cents per pound. London in pounds sterling per long ton.