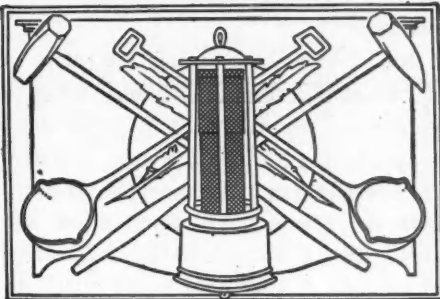


THE ENGINEERING AND MINING JOURNAL

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The Remarkable Situation in the Zinc Industry

The zinc industry has worked itself into a situation that is unparalleled in the memory of 20 years, and is likely to be of important effect upon the market for the metal. Briefly stated, there is already a shortage of the metal in Europe and there is prospect that there may be also a shortage in America. The causes leading to these conditions are different. It is useful to summarize their nature and devote some consideration to the probable results.

In the United States a chronic condition during the last 20 years has been a surplus of smelting capacity, a condition that is almost inherent to all branches of metallurgical industry. We have witnessed one radical change in zinc smelting, viz., the virtual abandonment of the old Belgian system in Kansas and Missouri, about 1900 - 1901, when the natural gas of Iola and other places began to be extensively used as fuel, but this change created no disturbance in general commercial conditions. In fact, it was contributory to the enlargement of smelting capacity, the natural-gas smelteries being built with much larger furnace units and larger aggregate capacity than formerly, while those of the old coal smelteries that were kept in good repair could be, and were, put into temporary operation when market conditions rendered that profitable.

The eventual failure of the supply of natural gas in Kansas and the probable transfer of the zinc-smelting industry to Illinois were early pointed out by us,

and these prospects were recognized by many engaged in zinc smelting. There has been a noteworthy construction of new works in Illinois, but by no means enough, and as often the case in such matters, the impending situation comes as more or less of a surprise.

The supply of natural gas in Kansas has been waning for several years, but has been eked out by new drilling, and now and then by the discovery of small outlying pools. It appears, however, that the supply at Iola will probably give out this winter, while at some other smelting points in Kansas the situation is critical, and continuance of gas supply is anticipated for only two or three years. It is considered by some persons in the smelting business that this coming failure of natural gas is going to create a distinct shortage in smelting capacity, with the result that the smelters will be able to exact practically their own terms for their spelter and pay for ore only what will suffice to maintain the production of the choice grades that they will especially want. We think that the tendency will be in those directions, but we think also that ameliorating factors will prevent, by very much, the markets from going to the extremes that some anticipate.

The total production of virgin spelter in the United States in 1909 was 266,462 tons. Of this, 157,998 tons were produced by smelters using natural gas as fuel, and 108,464 tons by smelters using coal. Smelters making sulphuric acid as a byproduct produced 103,087 tons of spelter. Some of these used natural gas as fuel, and some coal, the latter greatly predominating.

The total number of retorts at all works in the United States at the present time is about 95,430, of which 87,646 belong to the works making prime western spelter. Of these 46,772 are at natural-gas works in Kansas, and 11,104 at Bartlesville. It is to be anticipated that the larger part of the retorts at Iola (25,524) and at Chanute (1280), a total of 26,804 will be abandoned before the end of the coming winter. A complete abandonment would reduce the number of active retorts at these works from 87,646 to 60,842. The probability is that some of the Iola smelters will be able to maintain fitful operation of a few furnaces, but on the other hand, it will be difficult to maintain the full quota at other places, and a total of 60,000 retorts in activity is not an unreasonable estimate.

The operation of 60,000 retorts should permit the treatment of 500,000 tons of blende at a conservative estimate, and reckoning the high-grade Joplin ore and the lower grade of western ore in about the same ratio as used in 1909, should lead to the production of about 210,000 tons of spelter. Adding to this the production of those works that make other grades than prime western, we should foresee a total production of about 250,000 tons. The consumption of spelter in the United States in 1909 was about 262,000 tons. Thus, there is indicated an actual shortage if consumption should rise to the former rate.

We believe that this prospect is to a large extent the explanation of the recent rise in spelter. The halt in the upward movement is to be explained by the facts that production has not yet decreased so much as anticipated, while consumption is still lagging. Indeed, for the moment stocks in smelters' hands are believed to be accumulating, if anything, but the further decrease in the smelting capacity and increase in the consumption should start the price upward again.

However, although we believe that the tendency will be in those directions, we do not believe that there will be anything spectacular. Shortage in producing capacity always brings out something previously considered dead. There are several old coal smelters that might be put in operation again. Some of the natural-gas smelters will change their furnaces to oil burners, even if oil costs the equivalent of 5@7c. per 1000 cu.ft. of gas. The Bartlesville smelters can add quickly to

their capacity. The proportionate use of high-grade ore would be increased so as to make the most out of available capacity. All of these things, and others, would happen if the margin between spelter and ore should become large enough.

But, anyway, the spelter market is in an unusually secure position. While it may go up materially, on the other hand it can hardly go down, except, perhaps, for some trifling and temporary set-back, even if consumption should continue slow. This is because of the substratum of strength that we have in the European situation.

On the other side there is now an actual shortage of spelter, resulting from the great consumptive demand and the restriction of production under the terms of the convention. There is some fear that the market may pass beyond the control of the convention before the end of the year. The London price has already risen to the neighborhood of 5.20c. If consumptive conditions should become unfavorable in this country, we might easily meet with chances to export spelter. Such an event is not likely to transpire, but it is something worth bearing in mind.

The European convention will probably be renewed upon terms providing for unlimited production until conditions lead to an accumulation of stocks beyond a certain figure, after which an agreed restriction will come into effect. The present convention has been as successful as its promoters ever anticipated, and it is, we believe, the first European spelter convention that has not ended in dissension and disruption.

The American Iron and Steel Institute

The meeting of the new American Iron and Steel Institute, a report of which is given elsewhere, is of interest mainly from the clear and full explanation of its purposes given in the presidential address by Judge Gary. Its British namesake is purely a technical body, publishing each year a number of papers which are of the highest interest and authority to iron and steel makers everywhere. In the program of the American Institute, the technical side is mentioned, but only

in an incidental way; and of the four papers presented, only one could be considered as at all technical. Indeed, all the papers and their discussions were a subordinate feature of the meeting and took up only a small part of its time.

The object of the new association, according to its president, is chiefly the discussion of the ethical questions relating to the iron and steel trade. By this he seems to have meant partly the relations of members to labor, but chiefly the business questions which may arise, and most especially those relating to prices and competition. Judge Gary disclaims any intention of fixing prices through the medium of the association; but he lays stress on the great advantages of conference, of exchange of knowledge and opinions on business conditions, and on the benefits of avoiding undue competition and consequent reductions in quotations. In short, he seems to point to the association chiefly as an agency to regulate the trade and keep manufacturers in line for united, or at least, harmonious action. Reading between the lines it is evident that as the technical side is subordinate to the ethical, so the ethical in turn is really subordinated to the opportunity for conference and agreement.

The presence of the foreign guests of prominence and the special attention paid them may be taken to indicate that the institute will extend its opportunities for conference to the international trade as well as to home business. As to this point, however, nothing is definitely stated.

The Associated Portland Cement Manufacturers—the cement trust of Great Britain—closed its fiscal year recently with no balance available for the common stockholders; in fact the accounts show a small deficit. The report frankly acknowledges that the present position of the combination is due chiefly to the loss of foreign trade, because, “both in America and on the Continent the manufacture of Portland cement proceeded apace owing to the adoption of scientific methods of manufacture; and largely by the disinclination of the British manufacturers to discard prevailing methods and adopt new ones, trade was lost owing to the superior quality of the foreign trade.” The remedy suggested is the introduction of modern machinery into British plants.

Cyanide Developments on the Rand

JOHANNESBURG CORRESPONDENCE

The Butters filter plant has now started working on the Crown mines. This plant was designed to treat 500 tons in 24 hours, the design being based on experience elsewhere. The Rand slimes have, however, proved so amenable to treatment that the capacity is proving to be nearer 1000 tons than 500. The plant is treating slimes in 18 hours that would need extensive decantation tanks and a four-day treatment. The solutions going through the extractor box are diminished nearly 50 per cent. in volume with contents correspondingly increased. The finished cake contains 30 per cent. of moisture. The plant consists of two sections, each of five compartments of 150 leaves with a filtering area of 81 sq.ft. The leaves are treated periodically in a weak solution of hydrochloric acid to remove carbonate of lime. Similar plants will be erected at the Robinson, New Modderfontein and Modderfontein B mines, so that it appears that the Rand metallurgists will now gradually forsake the time-honored decantation system with its costly tanks and circulating system and adopt American methods.

MERRILL ZINC DUST PRECIPITATION TO BE TRIED

Another American system that has been successfully tried on the Village Deep and which will be installed in the new plant on the Brakpan and Modderfontein B mines is the Merrill zinc dust

G. A. Denny¹ recently has something to say regarding the alleged conservatism of metallurgists here in the past and perhaps the charge was not altogether unfounded. There is now, however, a keen desire to test every new process under working conditions.

UNDERGROUND INNOVATIONS

Underground, hammer drills using solid steel and equipped with air-feed stopping bars have largely replaced piston machines in raises, but no attempt has yet been made to work overhead stopes with filling by these means, though the Randfontein mines are eminently suitable for this experiment, the reefs lying at a steep angle. In September, 1910, a record was established in incline-shaft sinking. The main incline shaft of the Van Ryn Deep was sunk 279 ft. in one month by rock drills, the previous record was that of 261 ft. on the Brakpan mine.

September Operations of Goldfield Consolidated

The preliminary operating report for September, 1910, of the Goldfield Consolidated Mines Company shows 24,218 dry tons mined, with a gross value of \$843,224. This is an increase of 48 tons mined, but a decrease of \$46,744 in value, as the ore carried only 1.69 oz. gold per ton against 1.78 oz. in August.

MILLING OPERATIONS

The figures on milling were: Dry tons milled, 24,095; average value per ton, \$31.42; total value, \$751,164; loss in tailings, \$52,258; value of metals recovered,

New ore was found on main levels as follows: Mohawk 250-ft. level, 100 tons, averaging 0.46 oz.; 450-ft. level, 200 tons, averaging 0.44 oz.; Clermont 600-ft. level, 369 tons, averaging 0.70 oz.; 900-ft. level, 70 tons, averaging 0.46 oz.; 1000-ft. level, 121 tons, averaging 2.26 oz.; total, 860 tons, averaging 0.81 ounces.

None of these developments are worthy of especial attention except that on the 1000-ft. level of the Clermont shaft. This ore was exceedingly good for 35 ft. along the drift, and gave every indication of proving to be an im-

SEPTEMBER EXPENSES AT GOLDFIELD CONSOLIDATED.

	Amount.	PerTon.
General expenses:		
Bullion tax and Marketing		
bullion.....	\$ 17,000	.....
Administration, etc.....	18,000	.....
Total general expenses..	\$ 35,000	\$ 1.44
Mining.....	85,000	3.51
Marketing high-grade ore...	7,500	0.31
Transportation.....	3,000	0.12
Milling:		
Milling and cyaniding....	62,500	2.59
Marketing concentrate		
residues.....	9,000	0.37
Construction.....	25,000	1.03
Net cost.....	\$227,000	\$ 9.37
Loss in tailings.....	52,258	2.16
Total costs and losses....	\$279,258	\$11.53

portant orebody, but the value suddenly diminished and the ore dropped below pay grade. The locality still looks promising for ore to come in again. Even with present developments it is likely that the occurrence is an important one, for experience shows that such a showing of ore is probably in an important ore channel, and there may be much larger bodies either above or below the level.

CONSTRUCTION

Substantial progress was made during the month on the various improvements that have been under way for some months. The fire-protection scheme is nearly completed, and the reservoir on Columbia mountain is full of water. The mill is receiving water through this line, so that the danger of water shortage in the future is practically eliminated. The work is not completely finished, owing to the slow delivery of hydrants and fittings, but a measure of fire protection is already provided.

The Laguna headframe and ore bins are erected. The storage battery is installed, but not connected. All steel work is practically in place on all the buildings, including the new refinery and heating plant at the mill.

Scheelite is now being mined in the Moose River district, Halifax county, Nova Scotia, by A. A. Hayward. It is claimed that the ore can be concentrated to 75 per cent. calcium tungstate, the chief impurity being arsenical pyrites.

SEPTEMBER PRODUCTION, GOLDFIELD CONSOLIDATED.

	Wet Tons.	Dry Tons.	Oz. per Ton.	Value.
Combination.....	4,837.80	4,620	1.33	\$127,000
Mohawk.....	8,373.75	7,997	1.19	196,726
Red Top.....	4,132.60	3,946	1.69	137,833
Clermont:				
Milling Ore.....	7,887.32	7,532	1.86	289,605
Smelting Ore.....	132.03	123	36.21	92,060
	25,363.50	24,218	1.69	\$843,224

precipitation process. Mr. Nicolaus, consulting engineer of the French Bobs mine, Barberton, was, however, the first to erect and work with Butters filter and the Merrill process and he has also erected Brown-Pachuca tanks for treating the somewhat refractory slimes obtained from this ore.

The management of the Meyer & Charlton mine is still carrying out experiments with the object of dispensing with the amalgamation blankets now being used. As I have before stated, I believe that a cheap and effective system of concentration for the coarser particles of gold in the pulp is all that is necessary in Rand metallurgy and could be easily devised. I see that

\$698,906; percentage extracted, 93.04 as compared with 93.43 in August, 94.03 in July, and 95.47 in June.

The profit from ore of \$34.82 per ton in value was \$25.79 per ton, and the total profit was \$563,966, or 66.88 per cent. of the value; as compared with total August profits of \$623,415 and a percentage of 70.05.

DEVELOPMENTS

Advance work at the various shafts is given as follows: Combination, 654 ft.; Mohawk, 1466; Red Top, 145; Laguna, 357; Clermont, 1134; total, 3756.

This is equal to one foot of development for every six tons mined.

**Mex. Min. Journ.*, Aug., 1910.

CORRESPONDENCE and DISCUSSION

Views, Suggestions
and Experiences of Readers

Seeking Employment

The most serious disadvantage of gold, silver and copper mining and metallurgy as a field for employment is the comparative shortness of the engagements. The average period is probably under two years. Common causes of this are failure of the mine, personal disagreements and change of management, none of which reflect on the employee more than on the employer. The savings of two years can be spent easily in seeking the next position. The fact that after a delay of greater or less length another position is obtained not only proves that there are enough positions to "go around," but it shows that the method of getting employer and employee together is nothing short of barbarous. The anxiety and the loss of time and money is as foolishly wasteful for the one as for the other. The trouble and even the suffering accompanying these intervals of lack of employment, particularly where wife and children are involved, are inexcusable in an engineering profession. Where each man must make his search unaided it is as though there were no central exchange for telephones, so that to reach a desired person it were necessary to find the other end of his line.

FILING SYSTEM INDICATES NO LACK OF OPENINGS

The last two years, during which I have been with my present employers and the several years preceding, during which I represented the Butters and the Moore companies, traveling through the Western States and through Mexico, have given me an extended acquaintance among mining companies and plant operators. One result of this acquaintance has been an increasing correspondence having to do with connecting up employees and employers. During the last year this correspondence has reached a volume which has forced the adoption of a definite system. Before the system was evolved it sometimes happened that a particularly suitable man or position was remembered too late. And the number of applicants greatly exceeded the number of known openings. Until recently, therefore, my impression has been that the number of men out of employment actually exceeds the number of positions vacant, though of course the converse is true. The difficulty has been the discovery of the requirements of the mining companies. The system developed has

proved so valuable thus far, that I am presenting it in the hope that an increase in the number of correspondents will add proportionately to the value of the file.

THE VALUE OF RECIPROCITY

One letter received some time ago from an engineer has served as a key to the problem and has been the means of adding ten-fold to the number of vacancies. In writing for information, he mentioned and described two positions in his camp which were vacant. It readily will be seen what the result will be if each correspondent can and will do the same. The reciprocity idea is what has made the scheme a success.

Even though at the time he writes a man may know of no vacancy or probable opening which would interest another, it is usually only a short time until he does. The way it works out is that a superintendent knows of a required hoisting engineer, electrician or cyanide shift man, while he himself is seeking a change. Or the constructing engineer who is after another contract knows that a superintendent and crew are required for a mill or smeltery which he has about completed. A mining stockholder recently asked that an examining engineer be recommended to report on a plant in California, and the engineer who went was able to help two others to positions with no effort on his part beyond a few well directed inquiries.

The most important technical question of keeping continuously busy, of making changes and of advancing one's position, heretofore has depended on personal acquaintance, advertisements and luck, whereas I have found that it can be solved with a minimum loss of time, with no expense and with mutual advantage to all concerned if it is treated coöperatively. I am glad to offer my letter file as a "central" for connecting applicants to positions for no consideration other than assistance in placing the other fellow.

MARK R. LAMB.

Milwaukee, Wis., Sept. 10, 1910.

Reported Discoveries in Red Mountain Mines, Colorado

In the JOURNAL of Sept. 3, 1910, a paragraph attached at the bottom of the Denver correspondence on page 473, is incorrect and misleading in its statements regarding the reported strikes in the Red Mountain section of the San

Juan. The alleged width and value of the ore have not yet been proved by shipments to be true, and are based on unreliable selected-sample assays. When the returns came from the 20 tons shipped to Durango, it would have been time enough to make positive statements as to the value of the ore.

I opened the Guston mine myself, and was on the spot when the Yankee Girl was discovered. There was no "reddish zinc ore" on the outcrop of either of these mines or at depth. The ores down to 75 ft. were bright galena and chalcopryrite in the Yankee Girl, and galena and gray copper in the Guston. The formation is andesite breccia, and the ore in elliptical pipes or chimneys in the same, formed, it is supposed, by mineral solutions along horizontal bedding planes, and derived from the andesite, the chimneys always being near a dike, the ore often merged into the andesite. On the contrary, the ore deposits of Cement creek occur in lodes, and the attempt to make out that the vertical chimneys in andesite extend in a "continuous zone" over Red mountain and down along the Cement Creek side is rot.

W. WESTON.

Denver, Colo., Sept. 9, 1910..

Adapting Automobile Engines to Wagon Freighting

Several attempts have been made lately to adapt the light and powerful gasoline motors to the problem of heavy haulage over wagon roads. To develop their full power, gasoline engines of the type used in automobiles must, of course, run at high speed, and to apply this power to road haulage the motor must not only be geared down, but some means must be provided for getting a secure grip on the road surface so that the power developed is converted into drawbar pull.

Of course, this may be secured as in the steam traction engine by gearing the prime mover into heavy road wheels, but by doing this the main advantage of a light motor is lost. Even if the motor truck were used as a freight carrier there would have to be a lot of surplus metal in the road wheels and frames to make it effective in pulling a wagon train.

VARIOUS METHODS TRIED

One method that has been tried and claimed to operate successfully in hauling ore is to mount a gasoline motor

in the lead wagon connected to an electric generator, which furnishes current to small motors geared to the rear wheels of each wagon in the train.

Another method that was tried in California a couple of years ago was to lay a wire cable along the road, anchored at suitable intervals. The traction device was an automobile engine geared to a couple of sprockets. The sprocket chains carried grip blocks; the dormant cable was picked up by a small sheave so as to lie between the two chains, when these were pressed against the cable the engine pulled itself and the trail wagons along the cable. This arrangement had the advantage that practically no dead weight was carried and the full power of the engine was effective in pulling the wagons. The disadvantage of the method lies in the high cost of installation, as it requires a 1¼-in. cable the full length of the road, and if the road were a public highway the highway commissioner might object to laying a cable.

PROPOSED MODIFICATION OF CABLE METHODS

It has occurred to me lately that this plan of pulling a string of ore wagons can be applied in another way without going to the expense of laying a dormant cable; in the following manner: Use practically the same wagon equipment as for a 20-animal team, perhaps adding an additional trailer and using slightly heavier wagons so about 30 tons of ore can be carried. Mount a 40-h.p. gasolene engine in the lead wagon. Gear the engine shaft direct to a drum shaft with a worm. Mount two loose drums on this shaft to be driven by frictions. The gear ratio should be such that the drums will wind about 200 ft. of rope per minute. All the preparation the road needs is to anchor short chains in the road at intervals of 400 ft., and at lesser intervals on curves and heavy grades to act as snubs for the hauling line. Use about 1200 ft. of 5/8-in. wire rope for the pulling line, an end being fastened to each drum, two grab hooks to be fastened to the line, each about 400 ft. from the respective ends of the rope. A snatch block to be drawn by a team of horses.

METHOD OF OPERATION

The method of operation would be to hook the grab hook into the anchor, throw the clutch into the drum and release the other drum. This would pull the train to the anchor, the team hitched to the snatch block would walk along at the same speed as the train advanced, unwinding the rope from the loose drum, and when the wagons were up to the first anchor, the teamster would hook the other grab into the anchor ahead, at the same time the engineer would change his frictions and the process would be repeated. In normal operation the team would be walking steadily ahead with possibly a

momentary stop at each anchor, the wagon train would, of course, slacken speed a little, but not necessarily stop at each shift of drums.

CROSSING MUDHOLES

As short, stiff grades are encountered on most roads as well as mudholes and soft spots, some means must be provided for giving the engine a powerful purchase to avoid getting stuck. It would complicate the engine too much to have two or three sets of speed gears, and in this case it is unnecessary, as the drums can be quickly rigged to act as a differential block when a stiff pull is required. This is accomplished by unwinding one drum and allowing the rope to wrap in the opposite direction, the other drum having three or four wraps deep will be of larger diameter. If a chain is strung out from the anchorage and fastened to the snatch block and the drums both thrown in clutch, we have a powerful differential pull. By alternately pulling with the engine and pulling the snatch block ahead with the team, the load can be hauled beyond the heavy stretch of road.

ADVANTAGEOUS ON LONG, HEAVY GRADES

This method of haulage should operate to marked advantage on long, heavy grades, in fact there would be no necessity of grading roads with long, winding detours to cross ridges. When teams or traction engines are used for heavy hauling the grades on the wagon roads must, where possible, be kept down to less than 10 per cent., which calls for much expensive side-hill cutting to get a fairly good road through a rough country. With the system above outlined, a road could be run up the slope of a fairly steep hill, the limiting grade being that up which a team could no longer drag the pulling rope, i.e., about 38 per cent. A good example of the advantage of engine power over horse power may be witnessed in the logging operations on the forest reserves. Here the only timber that may be cut are the matured trees near the summits of the ridges, the forest growth in the cañons and valleys being left to conserve the snow fall for irrigating the river valleys lower down. The portable sawmills are located on the ridges and many of the logs are pulled uphill, on the 15- to 25-deg. slopes of the ridges, on which an eight-horse team can hardly drag a single log. On the operations where donkey engines and cables are used for yarding the logs, a 10-h.p. engine will easily drag three or four logs up a steep hillside.

NET TRACTIVE EFFORT OF FREIGHTING TEAMS

In computing the tractive forces that may be expected from a gasolene engine winding a tow line, a third must be deducted for friction loss if worm gearing is used. Automobile engines should not

be expected to run continuously at more than one-half their rated capacity, so that an engine rated 40 h.p. will show 14 h.p. of net tractive effort. This is just about the tractive effort that can be sustained by an 18- to 20-animal freight team.

Anyone watching a well-trained freight team lugging a string of loaded ore wagons would think that they exerted much more than 33,000 foot-pounds per animal per minute. Three years ago I had a good opportunity to note the hauling power of the freight teams on the borax road from the mines in Ventura county to Lancaster, Cal. One team in particular of 16 horses made an exceptionally large tonnage that summer. Their average gross load being 44,000 lb. outbound, the heavy end of the road was the first 18 miles out from the mines, the average adverse grade was 1.8 per cent., the ore wagons had a road resistance of about 2.4 per cent., that is, they would run free on downgrades of from 2.2 to 2.5 per cent. At this rate the average drawbar pull was 115 lb. per animal and as this team walked 260 ft. per min., each animal developed 27,200 foot-pounds per minute of net tractive effort.

GEORGE C. MCFARLANE.

Denver, Colo., Sept. 29, 1910.

Cobalt Ore Assays

I notice an item was sent you for publication in the JOURNAL, Sept. 17, about the Nova Scotia mine, in the Cobalt district, reporting a discovery assaying 10,000 oz. silver.

The publication of such assays as these is misleading. The highest-grade ore from the Cobalt camp comes from the Crown Reserve, and its highest-grade hand-picked material assays about 5500 ounces. Ten thousand-ounce assays might doubtless be obtained from picked specimens, but I think you would find the average to be one-fourth of this.

SAPIENS.

Cobalt, Ont., Oct. 13, 1910.

Bedded Gold Quartz Veins

In the JOURNAL of Sept. 24, 1910, the article on "Bedded Gold Quartz Veins near Poto, Peru," contained, under the subheading, "Gold-bearing Bedded Veins," "the gold-bearing bedded veins, locally called *mantoa*, vary," and there the sentence ends.

It should read "the gold-bearing bedded veins, locally called *mantos*, vary from ¼ to 4 in. in average thickness. The omission is regrettable, as the vein thicknesses are not elsewhere given and their size is of great interest from a commercial standpoint.

E. COPPÉE THURSTON.

Ancon, Canal Zone, Oct. 3, 1910.

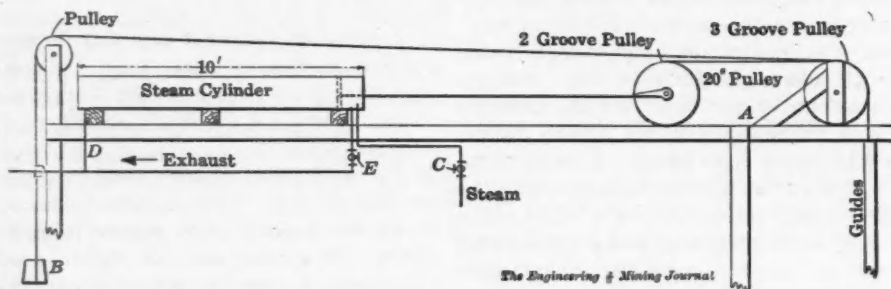
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

A Simple Form of Lift

The accompanying sketch shows a coal lift used at some of the steam plants on the Mesabi range. The coal is dumped on the ground outside the boiler house. It is then loaded by hand into one-ton cars and trammed to this lift and elevated to the bunkers. In most of the newer plants, where it is possible, the coal is discharged direct from the railroad cars to the bunkers, thus saving the extra handling with the lift.

The device is operated by a steam cylinder about 10 ft. long by 12 or 14 in. in diameter. At the end of the piston rod is a double-grooved sheave over which two $\frac{3}{4}$ -in. cables operate. One end of these cables is fastened at *A*, so that in this way when the piston moves 10 ft. it will lift the car 20 ft. The car platform works between guides and is balanced by a counterweight *B*. Steam is turned on at *C*, the exhaust *D* being open,



SKETCH SHOWING PISTON ARRANGEMENT FOR COAL LIFT

forcing the piston along and lifting the car of coal. To lower the car, shut off the steam and open the exhaust valve *E* and the weight of the car will operate the device by gravity.

The area of the piston must be such that the product of the area, steam pressure and distance shall be in excess of the load, multiplied by its distance. If these are equal it gives a balanced system and no movement takes place. The amount of steam consumed is small, simply enough to fill the cylinder. The steam and exhaust valves may be at any convenient place, not necessarily as shown in the diagram.

The annual statement of the Alaska-Treadwell Gold Mining Company, for the year ended May 31, 1910, shows that 1,003,699 ft. were drilled in the mine and 918,904 tons of ore broken during the year. Therefore on an average one ton was broken for every 1.09 ft. drilled.

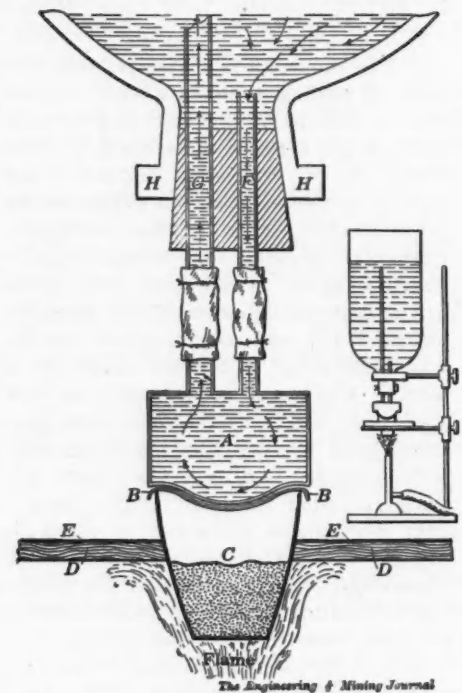
Drafting Conveniences

A board upon which to cut paper, tracings or blueprints may be easily made by taking one 1x6-in. soft-pine board 4 ft. long, and fastening on one side, pieces of tongued and grooved 1x3-in. flooring. The pieces of flooring are cut 6 in. long and are placed across the grain of the 4-ft. board. The flooring pieces are fastened by screws through the 1x6-in. board, leaving the surface free from nails or screws. With this arrangement the knife when cutting the paper will cut across the grain of the flooring boards, and will not have a tendency to run off line as is the case when cutting lengthwise the grain of the board or table. Again, when one has a good table, it is not advisable to cut on the table as the surface soon becomes badly scratched and cut.

This board may also be used as a paper weight when handling large maps. Another good paper weight is a small canvas

dimensions of crucible are 4.75 cm. in depth and diameter at top. The jacket *A* is connected to tubes entering the water reservoir *H* by two rubber tubes. This tubing should be stiff enough to furnish a firm pressure on the lid of the crucible *B* and there should be sufficient free rubber to permit of play, so that the lid may be removed, without disturbing the rest of the apparatus; 3 cm. between connections is ample.

An iron plate *E* is made to fit the crucible, with an opening large enough to permit three-fourths of the crucible to extend below. The plate rests on a $\frac{1}{4}$ -in. asbestos board, also fitted to the crucible. The object of the iron plate is to prevent



APPARATUS FOR QUICKSILVER DETERMINATION

the enlarging of the hole in the asbestos by use; it may be omitted where the apparatus is not used much. *H* is an inverted $\frac{1}{2}$ -gal. acid bottle, with the bottom removed. Care should be taken to fit the cork tightly, and it should be bound to prevent it being forced out by the pressure of water, or the handling of the apparatus.

CIRCULATION OF COOLING WATER ASSURED

The tube *G* enters the reservoir *H* through the cork, as is shown, and extends to within 5 cm. of the top. The tube *F* merely extends through the cork. As will be seen, this furnishes a circulation

bag about 3x4 in., loaded with one or two pounds of shot.

The James Apparatus for Quicksilver Determination

BY GEORGE A. JAMES*

The apparatus shown in the accompanying sketch has been thoroughly tried for a period of three years in the assay for quicksilver, in the laboratories of the George A. James Company, and has proved more satisfactory than any other I have used.

Referring to the accompanying sketch, *A* is a water-tight jacket made of copper or silver foil of No. 24 wire-gage thickness. It nests in a silver lid *B* which covers the nickel crucible *C* and extends down over the edges of the same. The

*Assayer, 28-32 Belden place, San Francisco, Cal.

of water through the jacket A, the hot water rising to the top of reservoir through G and the cold water returning through F. This circulation of water cools the silver dish exposed to the mercury fumes which are condensed on its surface and weighed.

WATER BETWEEN CRUCIBLE COVER AND WATER JACKET ACTS AS INDICATOR

From one-half to two grams of ore are mixed with an equal bulk of precipitated chalk and four times its weight of iron filings, which will pass a 50-mesh sieve, and from which particles under 80-mesh have been removed. These filings should be carefully cleansed of all grease by washing with alcohol or carbon bisulphide. This charge is placed in the nickel crucible, and the apparatus put together, the weight of the silver foil B first being determined. A drop of water is put into the depression of the foil top to the crucible to insure an intimate association with the water jacket, and to indicate at the end of the process if too high a temperature has been used. If this water is not found, in part, after the distillation, it is not safe to pass the assay:

ADDITION OF CALCIUM CARBONATE TO CHARGE ADVANTAGEOUS

The part of the nickel crucible extending below the plate is kept at a red heat for 15 min. The crucible is then allowed to cool and the foil removed and weighed. Increase of weight represents metallic mercury. It should be observed if the foil shows any indication of mercury outside the part covering the inside of the crucible. This would indicate a loose cover, or too high a heat. The addition of calcium carbonate prevents the too rapid heating of the mass, and the carbonic acid liberated tends to loosen the mass, and permits the fumes to distil easily. The apparatus is to be recommended for accurate work and duplicate assays made using it should agree perfectly.

Guard Rail for Winzes

A suspended guard rail for winzes is used at the Buffalo & Susquehanna mine at Hibbing, Minn. The winze, which is used as an ore chute, is usually at one side of the track, and it is necessary to turn the car through 90 deg. in order to dump it. There is no opening between the track rails. On account of using wide timber cars, posts cannot be set close to the track to which guard rails may be attached. The guard rail is therefore suspended from the two caps nearest the winze, and braced to the posts of these two sets. The guard is about 4½ ft. from the ground, and just far enough from the track so that it is not in the way of the trammer. At the same time it is near enough so that a man would strike the guard rail before falling into the

winze. In the event of slipping there is a chance for a man to catch hold of the rail and thus save himself from a serious accident.

Turning Device for Tramway Track Cables

Among the general directions given by the companies that erect tramways is the one to turn the cable frequently so as to equalize the wear on the track cable, but that has proved to be a direction easier to give than execute. For instance, at the United States tramway at Bingham, the tramway men tried, without success for over a year to turn the cable. The directions usually given by manufacturers are for twisting the cable by means of stilson wrenches.

Sections of the cable can easily be turned, but it is a far different matter to make the cable stay in the new position, for if not held it gradually works



RUTTLE TURNING STRAP FOR TRAMWAY CABLES

back to the old position. This inability to turn the cable regularly greatly shortens the life, for the wear is not evenly distributed about the circumference. To obviate this difficulty, Joseph Ruttle, foreman of the Highland Boy tramway, Bingham, Utah, has devised a method of turning and holding the cable that is certain in its operation. The device for accomplishing this has been in use some time, and it is probably as much due to its use as to any other one cause that the old Highland Boy tramway was noted for the long life of its track cables.

The Ruttle turning strap, as shown in the accompanying halftone engraving, consists of an iron strap 2½ in. wide, made of No. 12 band steel that is clamped to the track cable by means of two T-head bolts, which have their flat heads turned toward the passing buckets. This band steel is continued to form an arm 12 in. long, and then a ¾-in. round rod is bolted to the end of this arm be-

tween two nuts working on a right- and left-handed threads. In order to prevent the outer bolt from working off and allowing the arm of the clamping strap to swing around and catch on the bucket, causing a wreck, a cotter pin is inserted in a hole drilled through the end of the rod. This rod is made long enough to pass through the detaining brace, or loop, which is made by bending double a ¼-in. round rod. This iron loop is just wide enough for the arm of the turning clamp to move freely back and forth, with the stretch of the cable, and is made 3 ft. long, so as to provide for that much stretch. The detaining brace, or loop, is fastened by means of two ¾x4-in. lag screws to the timbers of the tower, the rod being flattened to ⅜ in. where it comes in contact with the tower timbers. These turning straps are put on the track cable at each tower.

Whenever a man watching the tramway notices that the track cable is wearing, or about once in two weeks, the cable is turned one-eighth way around by means of stilson wrenches, the clamping bolts on the turnings clamp having been previously loosened. Then the clamp is again tightened on the cable, and the procedure repeated at the next tower. Needless to say, the twisting must be done in the direction of the twist of the cable, or else the strands will be un-
laid.

Simple Proof for Multiplication and Division

A simple and accurate method for proving multiplication and division problems, which arise daily in mining and metallurgical work, consists of casting out the nines as shown in the following problem:

Suppose we multiply 33,725 by 879 and obtain a product of 29,644,275. To prove this multiplication add together all the figures of the multiplicand which in this case equals 20. Taking out the nearest multiple of 9, which is 18, leaves a remainder of 2. In the multiplier the sum is 24. Taking out 18, the nearest multiple of 9, leaves 6. Now 6 x 2 = 12, and taking 9 out of 12 leaves a remainder of 3; this should equal the remainder after taking the nearest multiple of 9, which is 36, out of 39, the sum of the digits in the product. In case any of the remainders equal zero, the process is the same, for the zero is treated as any other figure.

$$\begin{array}{r}
 33725 \text{ sum} = 20 = 2 \\
 879 \text{ sum} = 24 = 6 \\
 \hline
 303525 \\
 236075 \\
 269800 \\
 \hline
 29644275 \text{ sum} = 39 = 3
 \end{array}$$

In division the operation is reversed. The nines are all cast out of the divisor, dividend, remainder and quotient. The

remainders from the quotient and divisor are multiplied together, 9 cast out, which leaves 3. To this is added the remainder after casting out the nines from the division remainder. This sum is 7 and is equal to the remainder, after casting out the nines from the sum of the dividend digits wherein lies the proof.

38 sum = 11 = 2

879) 33739 sum = 25 = 7

sum = 24 = 6 2637

2 × 6 = 12 = 3 7369

4 7032

7 337 sum = 13 = 4

At first this process seems cumbersome, but a little practice will enable one to do all of it mentally, setting down only the remainders after casting out all the nines from each of the sums.

A Handy Appliance for Leaching Tests

BY O. E. JAGER*

The apparatus illustrated by the accompanying sketch will be found an improvement over the old style arrangement of bottomless bottles for conducting leaching tests in the laboratory.

A 2x2-in. piece, A, about 15 in. long, is mounted on four legs made of light battens, so as to stand about 16 in. high. The front legs B are made vertical, while the back legs C are inclined backward and spread, as shown in the sketch, to give stability. Two strips, D and E, are let into the piece A, and project about one-quarter inch above its surface. The strip D has a piece of rubber tube glued along its upper edge to act as a buffer. This completes the carpenter work.

The blacksmith has now to make the ring and rod F and the bearings G. The former is made of 1/2-in. round iron, according to the dimensions shown, so as to allow both ends to project clear of the wooden stand. The cross piece H, two in. long, is welded to main rod F, at right angles. The bearings G are made from two pieces of 3/4-in. angle iron, three inches long, and having in the center a semicircle cut in which crosspiece H can rest. The angles G are drilled for screws to attach them to the piece A.

When the apparatus is assembled, as shown in the sketch, the main rod F has a see-saw movement of about 1/2 in. The sample for treatment is placed in the funnel, which is then counterbalanced by hanging weights from the hook L, an empty Munktell filter-paper box being a handy thing for this, as it can be loaded as required with scrap iron, nails, stones, etc., to give a good adjustment.

The bottle P, containing the leaching solution, is set on a shelf at

*San Luis Potosi, Mexico.

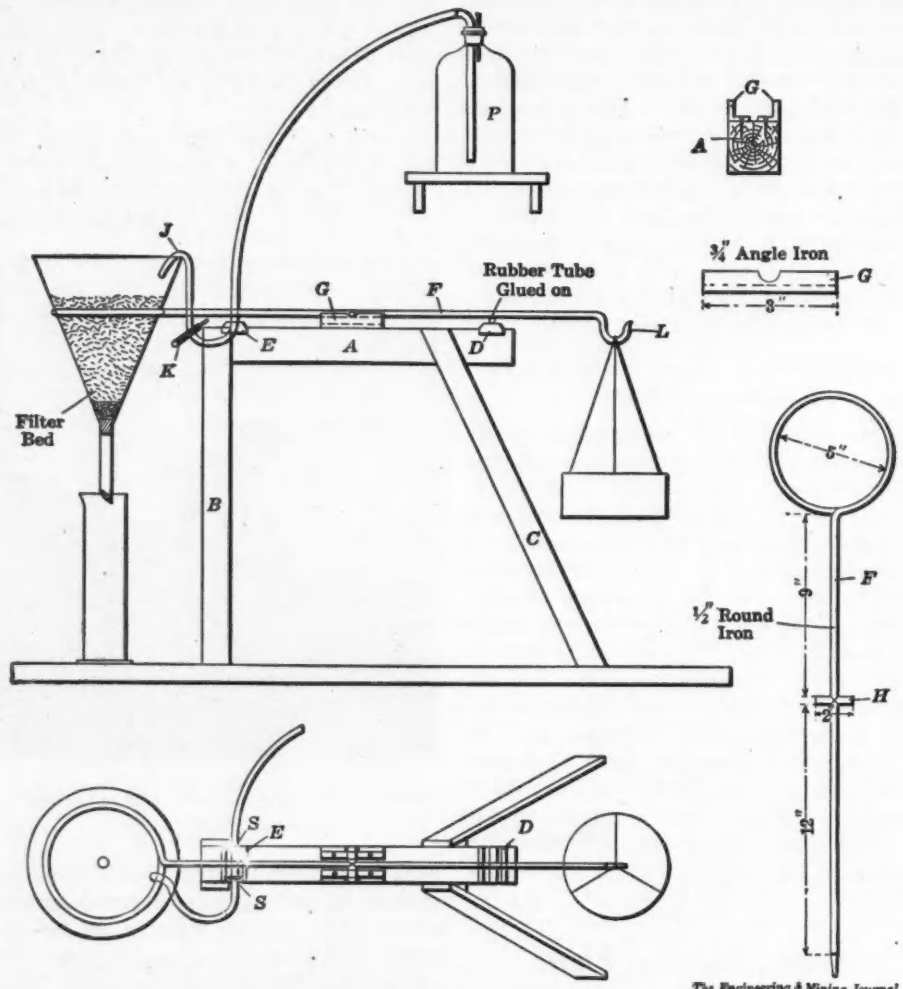
a suitable height. The rubber tube from this bottle is passed under the rod F, and secured to the top of strip E by a couple of double-pointed tacks SS. The rubber tube terminates in a bent glass tube J, enabling it to hang over the edge of the funnel. While balancing the apparatus, the spring clip K is kept closed.

The siphon from the bottle of leaching solution having been started, the funnel is allowed to fill till the ore is covered to the required depth. The clip K is then closed, and more weight added to the counterbalance, till the rod F just fails to turn. K can now be left open, as the apparatus will regulate itself. A lit-

better regulation as to time of contact, a funnel with a glass cock in the stem is recommended. The above apparatus is easily and cheaply made, is simple and reliable in action and capable of fine adjustment.

Shovel Racks for Warehouse

A convenient rack for shovels may be made by suspending from proper supports in the warehouse two 1-in. gas pipes, 1 3/4 in. apart, so that the shovel handle will just pass between the pipes.



EXPERIMENTAL PERCOLATION APPARATUS

tle further adjustment may be necessary before steady percolation is established, on account of the solution required to wet the ore thoroughly.

As the solution percolates through the funnel, the weight on this side decreases, and the counterbalance falls. This opens the tube on E, and allows more solution to run into the funnel till the weight increases sufficiently to make the funnel sink, thus compressing the tube on E, and cutting off the flow of solution, and so on continuously, till required amount of solution has percolated, this amount being regulated by the depth to which the glass tube is set in the bottle P. All connections must, of course, be air tight. For

The shovel is then turned 90 deg. and slid over to the end of the rack. In this way they nest closely, take up little room, and the stock is easily counted at any time. The rack is placed high enough for a man to walk under the shovel.

At the Granby smeltery, the self-fluxing ores from the company's mines produce a slag of about 44 per cent. in silica, and from 0.20 to 0.25 per cent. in copper, and at times even lower copper losses are obtained. According to F. E. Lathe (*Bull. Can. Min. Inst.*, June, 1910) the specific gravity of the slag is about 3, owing to its low content in iron.

Mine Haulage Line Material

To properly insulate the line of a trolley-haulage system in a mine is difficult on account of the limited space allowable for insulation and, the seepage from the walls and roof, which, together with the moisture and acid in the air, make it necessary to use insulation capable of standing up under the most adverse working conditions. The proper insulation of a haulage system is a protective measure in that if properly insulated the trolley line cannot become a maker of trouble, while without good insulation it becomes a possible source of danger.

COMPACT HANGERS

Fig. 1 shows a ceiling suspension designed to be attached to horizontal timbers where the headroom is limited. The total depth of the suspension is only 1 3/4 in. The body castings are of malleable iron and the stud bolt is heavy, solid, drop-forged steel. The multiple-petticoat construction gives a long surface distance from stud to outer rim, which prevents leakage due to moisture. Fig. 2 shows a somewhat similar form of timber suspension, provided with only two petticoats, and therefore, not so effective against moisture as the form shown in Fig. 1.

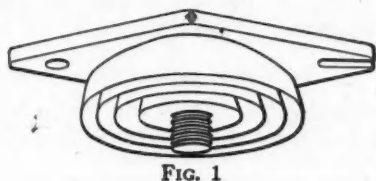


FIG. 1

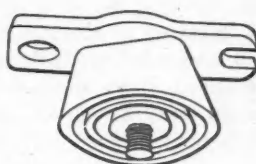


FIG. 2

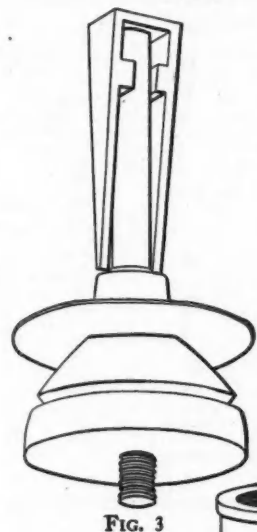


FIG. 3

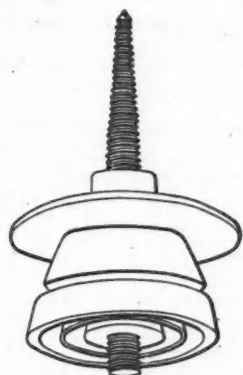


FIG. 4

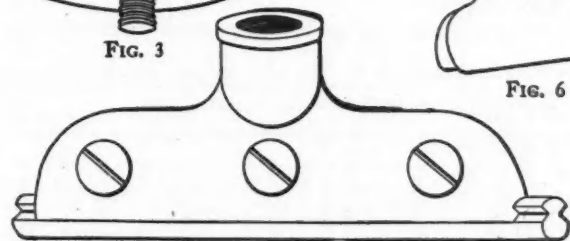


FIG. 5

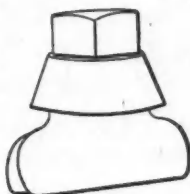


FIG. 6

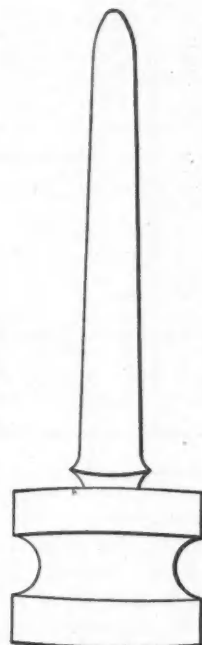


FIG. 7

The Engineering & Mining Journal

HAULAGE LINE INSULATORS

DESIGNS ILLUSTRATED HAVE BEEN ADAPTED TO MINE SERVICE

The forms of haulage-system line material illustrated herewith have been tried out in service and are the survivors of a large number of designs which were tested. The metal parts are uniformly tough and sufficiently strong to stand the strain for which they are designed. The insulating material used is known as "electrose" and has been found especially well adapted to mine service. It is molded under high pressure and temperature around all parts where insulation is needed.

Figs. 3 and 4 illustrate forms of suspension suitable for mounting directly on a mine roof. They measure only 1 3/4 in., from top to ear contact surface. Any of the several designs of expansion bolts may be had with either at the preference of the mine operator. The additional petticoats used and large insulating surface insure the maximum amount of safety.

MECHANICAL SCREW CLAMPS

Two forms of mine clamps are shown in Figs. 5 and 6. Fig. 5 is known as a mechanical-screw clamp because

of the method of securing a hold on the trolley wire. The clamp illustrated by Fig. 6 is so constructed that the operation of attaching it to the hanger stud provides ample compression of its jaws to securely clamp the trolley wire under the most severe conditions. The clamp is but 3 in. long and, therefore, offers no obstruction to the trolley wheel on curves of any radius. One style of clamp serves for figure-8 wire ranging in size from 0 to 0000, and a second for grooved wire of the same sizes.

A self-locking, self-draining, feed-wire insulator is shown in Fig. 7. The pin is first driven into the wall or roof and the insulator is then slipped over the end of the pin and given a quarter turn to lock it securely in position. The pin is made of malleable iron and the insulator of the highest grade of tough white porcelain. These forms of line-construction material, carried by the Western Electric Company, have given satisfactory results in mine service.

Mine Labor and Accidents in the Transvaal

The number of employees in the mines of the Transvaal in July is reported by the State mining engineer as follows:

	White.	Colored.	Total.
Gold mines.....	25,077	200,003	225,080
Diamond mines.....	864	12,800	13,664
Coal mines.....	456	9,346	9,802
Other mines and works	537	5,993	6,530
Total.....	26,934	228,142	255,076

White men were 11.1 per cent. of the working force in the gold mines; 6.3 in diamond mines; 4.7 in coal mines; 8.2 in other mines and works; being 10.6 per cent. of the total number of employees. The gold mines employed 92.9 per cent. of the whites, and 87.7 per cent. of the negroes; or 88.2 per cent. of the whole number.

The number of casualties reported in July was as follows:

	White			Colored		
	Killed.	Injured.	Total.	Killed.	Injured.	Total.
Gold mines....	5	23	28	101	118	219
Diam'd mines..	2	2	2	2	16	18
Coal mines....	..	..	..	2	3	5
Other.....	2	2	2	1	2	3
Total.....	5	27	32	106	139	245

Per 1000 employees..... 0.19 1.00 1.19 0.47 0.61 1.08

The total number of killed was 111, or 0.44 per 1000; of injured, 166, or 0.65 per 1000. There was one exceptional accident, at the Simmer & Jack gold mine, in which one white and 27 colored men were killed.

The State of California is erecting a large number of metallic sign posts in the desert sections of the State, including the Death Valley district, near the Nevada-California line. The signs indicate the direction and distance to the nearest water.

Prospecting with Churn Drills at Miami, Ariz.

Average Rate of Drilling, 21 ft. per Day. Large Bits Cut Faster Than Small Ones. Traction Star Drills Used. Deepest Holes 600 Feet

B Y H. A. F U L D *

All the data used in this article are taken from the drill log of one of the copper companies in the Miami district, Ariz. The first 10 holes, drilled by two No. 23 traction Star drills (1000-ft. machines), are cited as examples.

A soft schist and a decomposed granite are the principal rocks encountered in this district, although a soft dacite is also of some importance. The holes to which the following figures apply, were driven 400 to 600 ft. in depth. The country is mountainous, necessitating much road building. The country rock is badly fissured; is soft as a whole, but containing hard streaks varying in thickness from 5 to 15 ft.; consequently much caving is encountered. A 10-in., or larger, bit is used to start the hole; next in order follow bits approximately 7 5/8-, 6 1/4- and 4 1/2-in. The drill cuttings are sampled every five feet.

TIME CONSUMED IN VARIOUS OPERATIONS

Table 1 gives the actual time employed in the various duties. Under drilling and sampling, in column two, are included such items as measuring, bailing and delays of any sort lasting not more than 15 min. In the last column is tabulated the amount and size of casing lowered into each hole. Table II, except for the first three columns, consists of the figures given in Table 1, worked out to percentages.

The average rate of drilling was 21.08 ft. per shift. This is high for the district. It may be attributed to good supervision and to the fact that all these figures represent day work. The average advance, barring accidents such as "fishing," is higher for a shallow hole, as the actual time consumed in bailing a deep hole, putting in greater length of casing, raising and lowering the tools, measuring, etc., is more. Friction also hinders much in deep drilling.

The columns concerning casing are seen to be directly affected by the length of casing lowered into the hole. Removing casing is always a shorter operation than lowering it. Delays, repairing, casing and casing removal increase out of proportion, with great depth of hole, and in the order named.

In Table III, under column two, is tabulated the total advance at the end of each successive shift. This advance is an average of the total daily advance of the 10 holes. The last two columns are derived from the first two. The average

*Mining engineer, Miami, Ariz.

speed, as given in column four, has been plotted against the total shifts and the total distances are given in the accompanying diagram.

FAST DRILLING IN SHALLOW HOLES

When drilling is commenced (called spudding) the speed for the first 100 to 150 ft. is better than at any other period. From the diagram it is evident that delays, incident to moving and setting up, affect adversely the early averages. The high speed drops somewhat as depth is attained, and the curves continue evenly until a sudden break in both is observed.

The curves shown are characteristic of this district. A different kind of rock, a less mountainous country, different style of "setting up" and lower wages might give an entirely different curve. The record of each hole as given begins from the time the casing on the last hole is removed. All delays incident to dismantling, moving and setting up are thus chargeable to the new holes and affect the beginning of the curve.

ECONOMIC CONDITIONS

In summer, a light corrugated roof is placed over the drill platform; in winter,

TABLE I. DISTRIBUTION OF TIME IN HOURS.

Hole	Drilling and Sampling	Repairing	Moving	Lowering Casing	Removing Casing	Other Delays	Depth	No. Shifts	Casing Lowered	
									feet	inches
1	310 40	16 25	9 30	33 20	19 00	64 05	595	39	342	7 1/2
2	227 35	10 05	5 35	13 20	12 00	65 45	550	29	455	6 1/2
3	276 20	13 20	7 20	5 00	3 00	70 20	615	32	545	4 1/2
4	280 00	1 0	4 00	15 00	12 00	47 40	500	30	339	7 1/2
5	186 15	8 30	12 30	5 30	5 00	13 00	415	20	400	6 1/2
6	163 30	5 30	13 00	.....	.....	51 30	435	19.5	272	7 1/2
7	160 00	6 15	21 00	5 15	1 45	15 45	417	17.5	300	7 1/2
8	162 10	4 40	16 00	3 00	6 00	34 10	425	19.0	300	7 1/2
9	127 00	10 15	14 00	.....	.....	12 30	336	14.0	412	6 1/2
10	101 55	1 00	23 00	.....	.....	24 05	345	12.5	254	7 1/2

TABLE II. PERCENTAGE DISTRIBUTION OF TIME.

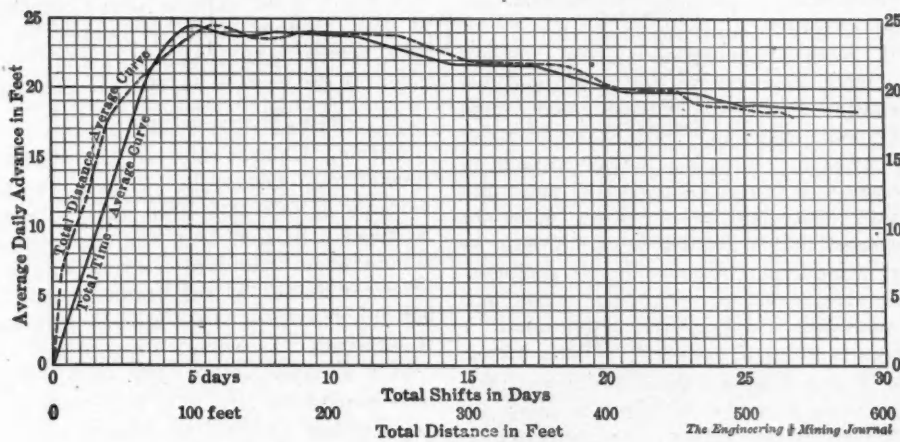
Hole	Total Hours	Average Feet per Shift	Drilling and Sampling	Repairing	Moving	Lowering Casing	Removing Casing	Delays	Repairing	Delays
1	468	15.3	66.5	3.50	2.20	7.10	4.05	13.7	6.20	20.6
2	348	18.9	65.5	3.02	1.58	3.84	3.44	18.9	4.63	28.9
3	384	19.2	72.0	3.47	1.89	1.3	0.78	18.3	4.82	25.4
4	360	16.6	77.8	0.28	1.10	4.17	3.34	13.2	0.36	17.0
5	240	20.75	77.6	3.54	5.20	2.3	2.08	5.43	4.55	7.0
6	234	22.3	70.0	2.35	5.55	.....	.....	22.0	3.36	31.50
7	210	23.8	76.3	2.96	10.0	2.48	0.83	7.5	3.90	9.85
8	228	22.4	71.3	2.04	7.02	1.31	2.62	14.9	2.88	21.2
9	168	24.0	75.6	6.10	8.34	.....	.....	7.45	8.70	9.85
10	150	27.6	68.3	0.67	15.3	.....	.....	16.02	0.99	23.60
Average	279	21.08	72.09	2.79	5.81	3.21	2.45	13.74	4.04	19.49

This is due to the first string of casing, with its attendant delay, being lowered into the different holes. The curves now continue evenly, dropping gradually as greater depth is attained. A second break, due to the lowering of the second string of casing, is followed by a third gradually decreasing the average.

none. A seasonable change in the curve could thus be expected. Due to the intense heat of this district during the summer season, the sharpening of a large bit calls for a rest which causes greater delay. The drill crew is paid \$6 and \$4.80 per day of 12 hours. Where wages are lower, a lower drilling efficiency is ob-

tained. A crew drilling day shift only do 50 to 60 per cent. more than a crew working double shift (12 noon to 12 midnight and *vice versa*). A fishing job, lasting from an hour to a week or more, plays havoc with the drill record. A management trying to stint, not only lowers the average, but increases the cost per foot of hole drilled as well. An extra driller or helper on two or more machines is always useful, and does not increase the cost per foot of hole. He will be of use in casing, in moving the machine, and in the upkeep of the drills, thus prolonging their life while increasing the first-cost charge per foot of hole drilled. A team should always be at hand; an accident will cause a temporary shut-down until the repair parts can be obtained. When holes are driven deeper than 600 ft., the average advance falls off rapidly.

In general, it may be said that the "average" curves will be effected by the kind of rock, contour of the ground, wages, season and weather, and the personnel of the management.



RESULTS WITH CHURN DRILLS AT MIAMI, ARIZ.

TABLE IV. AVERAGE RATE OF CUTTING OF VARIOUS BITS.

Hole	Speed with 10-in. Bit		Speed with 7 1/2-in. Bit		Speed with 6 1/4-in. Bit	
	Average Feet Drilled	Average Feet per Shift	Average Feet Drilled	Average Feet per Shift	Average Feet Drilled	Average Feet per Shift
1	220	20.0	100	16.6	122	18.7
2	240	24.0	212	19.3	...	...
3	143	20.4	319	19.9	...	...
4	200	14.3	105	17.5	85	21.2
5	140	20.0	145	24.2	...	...
6	75	25.0	300	27.3	...	...
7	312	31.2	65	22.0	...	...
8	125	20.8	185	31.0	...	...
Average.	...	21.96	...	22.33	...	19.95

In Table IV are tabulated average speeds for three different sized bits. A 10-in. string of tools weighs 2181 lb.; a 7 1/2-in. set, 1994 lb., and a 6 1/4-in. set, 1773 lb. A 10-bit in a run of 5 ft., cuts out about 450 lb. of rock; a 7 1/2-in. bit, about 260 lb. and a 6 1/4-in. bit, approximately 180

TABLE III. AVERAGE DAILY FOOTAGE OBTAINED IN 10 DRILL HOLES.

No Shifts.	Total Advance Ft.	Daily Advance, Ft.	Average Speed, Ft.
1	5.8	5.8	5.8
2	24.9	19.1	12.05
3	42.4	17.5	18.1
4	84.9	42.5	22.47
5	116.5	31.6	24.49
6	138.0	21.5	24.05
7	159.1	21.1	23.67
8	184.9	25.8	23.94
9	208.3	23.4	23.88
10	231.3	23.0	23.78
11	254.0	22.7	23.67
12	270.4	16.4	23.03
13	286.7	16.3	22.49
14	302.2	15.5	21.97
15	322.3	20.1	21.81
16	342.1	19.8	21.68
17	364.4	22.3	21.72
18	380.6	16.2	21.36
19	391.7	11.1	20.74
20	402.5	10.8	20.20
21	414.2	11.7	19.72
22	435.0	20.8	19.77
23	451.3	16.3	19.63
24	460.0	8.7	19.18
25	469.0	9.0	18.65
26	486.5	17.5	18.72
27	501.8	15.3	18.58
28	511.8	10.0	18.28
29	528.8	17.0	18.25
30	536.7	7.9	17.90

Sand Filling on the Rand

JOHANNESBURG CORRESPONDENCE

Sand filling on a large scale has now been started in several mines on the Rand and the practical difficulties which naturally arise in the course of the application of the methods are being dealt with and overcome. One difficulty has been in building water-tight bulkheads between the drift pillars left at the bottom of the stopes to be filled. These ore pillars are often split or cracked by subsidences and the ground leaks badly unless large quantities of grass or similar material are employed to stop cracks. The greater portion of the water is drawn from above the sands as they settle, through timber bulkheads at the sides of the stopes. The question of introducing some binding material, as cement, with the water in the first portions of sand sent down is proposed.

CYANICIDE SOUGHT FOR MILL SANDS

It is obvious that an enormous saving would be made if sands could be sent directly from the cyanide tanks below for filling. The cost of stacking on dump which amounts to 5 to 8d. per ton would be avoided and the sand-filling process would then pay for itself. The chemists on the field are making experiments with various cyanicides in order to find the one cheapest and most suitable to destroy any dangerous trace of cyanide in the sands and it is almost certain that this investigation will result in success.

The old dumps contain large quantities of free acid and ferric salts and it is estimated that, in sand filling on a large scale in a mine like the Robinson the cost of lime would amount to £70 or £80 per day. The problem of acid water formed by the slow leaching and oxidation of sand when they are packed in stopes is one that will require consideration in mines having any water as the effect of this acid on rails, tools, pipes and pumps will later be a serious consideration. It has been proposed to bore vertical holes through the overlying quartzites and pass sands either dry under a low air pressure on wet directly down to the deeper mines. At present all sands are sent in iron pipes, which will afterward be wood lined, down the shaft and along levels and old stopes to the working places.

At its properties in Bingham cañon, the Utah Copper Company is operating 18 steam shovels, and it is reported that two more have been ordered. Practically all mining is being done by steam shovels, amounting under present curtailment to about 13,000 tons per day, although the property is being prepared for a daily production of 20,000 tons.

lb. It would therefore seem that the smaller bits with almost the same weight of tools, cutting out only 60 per cent. and 40 per cent. of the material cut by a 10-in. bit, would give much higher rates of speed, but this is not the case.

This paradox, excepting delays due to depth as mentioned above, may be accounted for by the following reasons: As smaller casing is introduced, the same-sized rope and tools (2-in. manila cable and 4-in. auger stem) are continued in use. These, dragging against the sides, and in the smallest casing forming an air cushion, tend to lower the speed. Moreover, ground water is encountered in all the holes at depths of from 150 to 250 ft. Once the tools strike permanent water, and it must be borne in mind that casing seldom keeps out this underground flow, the speed diminishes. Figures are not available to give the percentage decrease in speed. The relatively high speed of spudding is another determining factor in raising the average speed of the largest-sized bit.

The American Iron and Steel Institute

The first annual meeting of the American Iron and Steel Institute was held in New York, Oct. 20. At the opening session the most important matter was the address of the chairman, E. H. Gary, head of the United States Steel Corporation, setting forth the purposes of the association, which are to be far from strictly technical.

COMPETITION AND ASSOCIATION

He dwelt on the necessity of eliminating cut-throat competition and the finding of some basis on which producer and consumer may meet each other, with the result of making prices more stable and avoiding sudden fluctuations and disturbances of trade conditions.

Disapproving of price agreement not only as against the law, but also because of its economic inefficiency, Judge Gary expressed himself in favor of healthy competition, aided by a fair understanding among all concerned through business publicity. This he declared to be the main purpose of the institute.

PURPOSES OF THE INSTITUTE

After welcoming the foreign men, Judge Gary described the development of the steel industry in this country during the last 30 years to emphasize the need and the opportunities of the institute. He continued substantially as follows:

"And so this institute was created upon a basis so broad that there is no limit to the good which may be accomplished. It is intended that ethical questions shall be considered as important as economic or scientific ones. Primarily the institute was organized, and should be so conducted, for the benefit of its members. It should result in decided pecuniary advantage to all. Also, the consideration and discussion of ethical questions, particularly affecting those outside of the membership, but connected with or interested in the conduct of their affairs, should be deemed just as essential and should result in material benefit to all.

"One of the most important business matters at this time, and perhaps at all times, is the maintenance of stable conditions in the iron and steel industry, and to this is attached the question of prices. For periods, at least, in the past, unsatisfactory conditions have been the rule and not the exception. Violent, sudden and wide fluctuations in prices have recurred, and they have been detrimental to everyone connected with the business and to the public generally. The steel and iron industry, more or less recognized as the barometer of trade, has had an influence on general conditions for good or bad, and much of the time for bad. . . .

"It is not the intention to advocate fixed, unchangeable prices. The effort to maintain reasonable prices in the steel trade is not by any means contrary to the law of supply and demand, but the whole question should depend upon mutual consideration and decision. The remedy proposed is that in times of low demand production should be reduced, and when high prices prevail the customer should wait. . . .

THE FUNCTION OF CO-OPERATION

"How shall we bring about these ideal conditions? Real, hearty and continued coöperation on the part of the members of this institute will secure satisfactory results. Full disclosure of his business by each to the others, a disposition to assist and benefit each other as far as practicable and proper, and conduct founded on the belief that healthy competition is wiser than destructive competition will be effective.

"Some of you may say that, in your opinion, based on the past, a fair and just equilibrium cannot be maintained except by some agreement on the part of those interested. It is a sufficient answer to make that you have no right to enter into such agreement, but the law does not compel competition—it only prohibits an agreement not to compete. If competitors are in frequent communication and make full disclosures to each other in regard to their business, it will follow as a natural result that no one will take advantage of the information thus received to act unjustly or dishonorably toward his neighbor."

Judge Gary's address occupied nearly all the morning session. In the afternoon four papers—the full titles of which have heretofore been published—were read and discussed.

PAPERS AND DISCUSSIONS

The first paper, by James A. Farrell on "Foreign Relations" was discussed by E. C. Felton, president of the Pennsylvania Steel Company; George F. Perkins, of J. P. Morgan & Co.; E. Schaltenbrand, of the Stahlwerksverband, and E. A. S. Clarke, president of the Lackawanna Steel Company.

William B. Dickson made an address on "Betterment of Labor Conditions in the Steel Industry," which was discussed by Charles Kirchhoff, Edgar S. Cook, president of the Warwick Iron Company, and Edward Bailey, president of the Central Iron and Steel Company.

Charles Kirchhoff read a paper on "The International Metallurgical Congress in Düsseldorf." Willis L. King read one on "Contract Obligations," which was discussed by Charles M. Schwab, Charles S. Price, president of the Cambria Steel

Company; H. B. Bope, first vice-president of the Carnegie Steel Company, and others.

In the evening the members of the institute and their foreign guests were entertained at a dinner in the Waldorf-Astoria.

THE EXCURSIONS

On Saturday, Oct. 15, the members of the institute and their visitors were taken on an excursion around New York harbor and up the Hudson, visiting the chief freight-shipping docks and other points. On Sunday evening, Oct. 16, they left New York on a special train for Buffalo, where the Lackawanna Steel Company's plant and other works were visited. Some time was also spent at Niagara Falls.

On Oct. 18, the special train reached Chicago, and two days were spent there, visiting the Illinois Steel Works and the new plant of the Indiana Steel Company, at Gary. Other points of interest were also visited, and a second dinner was given to the visitors on Monday evening.

THE FURTHER PROGRAM

Leaving Chicago late on Oct. 19 the special train arrived in Pittsburg on the morning of Oct. 20. Two days were to be spent in visiting iron and steel works is and about that city, closing with an informal dinner at the Hotel Schenley, and the departure of the special train for Washington. Saturday's proceedings included a reception by the President and trips around the city. The excursion and the meeting were to be closed by the return of the special train to New York, on Sunday morning, Oct. 23, when the party would disband.

THE FOREIGN VISITORS

The list of foreign guests included a number well known in European iron and steel circles. Their names are as follows:

Austria: William Kestranek and Dr. Eugene Herz, Prager Eisen-Industrie Gesellschaft.

France: R. de Labriolle, Comptoir d'Exportation des Produits Metallurgiques; Herman Harjes, Paris.

Belgium: E. Tonneau, Société John Cockerill; J. Van Hoegaerden, L. Spaak, Société d'Ougree-Murihay.

Germany: Baron von Bodenhausen, Fried. Krupp Aktiengesellschaft; H. Eissner, Harn'sche Werke; F. Harlinghausen, Phœnix Aktiengesellschaft; Karl Stevens and H. Zapf, Lahmeyer Werke; E. Schaltenbrand, chairman Stahlwerks Verband.

Great Britain: Sir John Randles, Moss Bay Hematite Steel Company; G. Scoby Smith, Bolckow, Vaughan & Co.; Sir Charles Allen, Ebbw Vale Steel and Coal Company; William P. Peat, Lon-

don; T. Frame Thomson, Otis Steel Company; Alfred M. Mossrop, Dorman, Long & Co.; S. J. Robinson, Wm. Jessop & Sons; T. Scott Smith, Samuel Fox & Co.; Harry Steel, Jr., Steel, Piech & Tozer; F. Hill and E. W. Manson, Richard Hill & Co.; Joseph Ellis, Working-ton Iron and Steel Company; M. Mann-nerg, Frodingham Iron and Steel Com-pany; Lincoln Chandler, Metropolitan Amalgamated Railway Carriage and Wagon Works; John O'Connor, John Brown & Co., Ltd.; P. M. Cunningham, Stewart & Lloyds, Ltd.; David Colville, David Colville & Sons.

Bringing in a Gusher

SPECIAL CORRESPONDENCE

The following is a brief history of well No. 1 of the Consolidated Midway Oil Company, in the Midway-Sunset field, California. This well officially flowed when the gates were opened at the rate of 4500 bbl. in 1½ hours, or at the rate of 72,000 bbl. in a 24-hour day. The well in question is situated in Section 30, T. 12 R. 23. on what is commonly known as "Maricopa flat," and lying about one mile due east of the famous Lake View gusher.

PREPARING FOR THE GUSHER

The well was "spudded in" on March 2, and started to flow on June 20 at a depth of 2167 ft. The management was prepared for a possible gusher and had on hand two 10-in. crane gates, of 670 lb. each and tested to 250 lb. pressure. These were connected immediately, with the result that this well has been under complete control, from the first. The gates were then opened, which allowed the wells to flow and resulted in a gain in volume of some 60 per cent. from the time of first opening the gates to their closing, 1½ hours later, which was done by hand in 40 sec., at which time the well was flowing at the rate of approxi-mately 60,000 bbl. per 24-hour day.

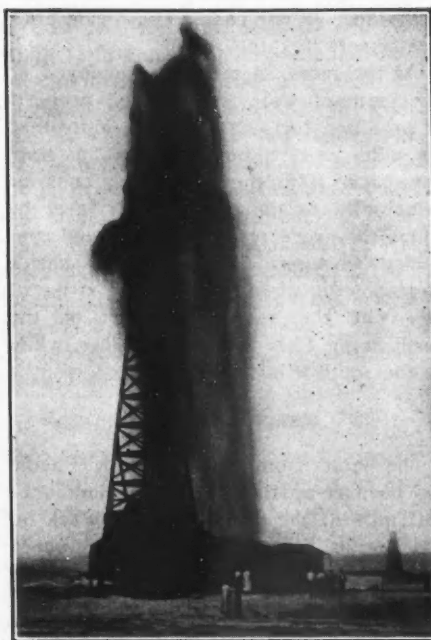
SIZE OF CASING USED

The 16-in. casing was carried to a depth of 670 ft., at which depth 12½-in. casing was used and carried to a depth of 1215 ft., from this depth a 10-in. casing to the bottom of the well, or 2167 ft. When the gates are open the oil shoots in a steady stream to a height of about 70 ft. above the crown block of the derrick, which is 84 ft. in height. No water was encountered after 670 ft. The casing rests on a hard shell. One was encoun-tered between 2132 and 2165 ft., and was about 2½ ft. in thickness. After drilling through this about 25 ft. of fine sand was encountered, after which the second and bottom shell was drilled through, about 5½ ft., which resulted in the steady flow of the well.

The oil is now about 17 or 18 deg. B.; when first encountered it was 19 to 19½ deg., and is a fair average of the oil of this section.

NO BENDS IN DELIVERY PIPE

Considerable discussion has resulted from allowing the oil to shoot directly up through the 10-in. casing and gates in-stead of turning and leading at right an-gles, which is the method usually em-ployed by other wells, particularly on the west side. E. A. Wiltsee, consulting en-gineer of the company, considered this method preferable, because of less action of the oil sands against the casing and gates, in a direct flow, than if a turn were made and the oil flowed at right an-gles. The reason for having two gates



WELL NO. 1 OF CONSOLIDATED MIDWAY OIL COMPANY

is that the lower gate is to be used simply in the case of an emergency. Be-tween the lower and upper gates is 2½ ft. of 10-in. casing and above the upper gate is attached about 18 in. of the same weight of 10-in. casing, through which the oil is allowed to flow on the opening of the gates.

Geological Survey Investigating Behavior of Great Salt Lake

The present behavior and past history of Great Salt Lake is attracting more and more attention each year, and is now the object of a special investigation by the Geological Survey. The Weather Bureau precipitation records, beginning in 1863, present a comparatively accurate record of the levels of the Great Salt Lake dating back to the year 1850. In 1850 the lake stood at 3 ft.; in 1868 the

water rose to 14 ft., dropped to 7.5 ft. in 1873, and rose again to 14 ft. in 1877. The lake then gradually lowered until the water stood at 2.4 ft. in 1902 and 2.2 ft. in 1905. Since 1905 the water has gradually risen, reaching the 6-ft. mark in May, 1910. The lake is now falling.

California Oil Dividends

The dividends paid in September by the California oil companies, which are listed on the San Francisco Stock Exchange, and their dividends to date, are shown in the accompanying table.

SEPTEMBER DIVIDENDS OF CALIFORNIA OIL COMPANIES LISTED ON SAN FRANCISCO STOCK EXCHANGE.

Name of Company.	Sept. 1910	Total Paid to Date.
Amalgamated Oil Co.	\$ 50,000	\$1,600,000
American Petroleum.	50,000	1,744,407
Caribou Oil and Mining.	20,176	821,586
Claremont.	10,000	385,000
Columbia.	9,922	334,753
Del Rey.	3,927	19,638
Empire.	2,000	10,000
Home.	2,000	486,000
Kern River.	2,000	132,000
Mascot.	10,000	50,000
Monte Cristo.	50,000	690,000
Mexican Petroleum.	87,693	3,499,501
New Penn Petroleum.	5,000	20,000
Palmer.	18,020	358,481
Paraffine.	3,000	33,000
Pinal.	15,000	976,844
Producers.	40,000	120,000
Record.	7,500	100,000
Royalty.	6,667	29,400
S. F. & McKittrick.	15,000	445,000
Sauer Dough.	5,985	553,214
Sesnon.	7,000	146,000
Sovereign.	5,000	100,000
United Petroleum.	40,376	2,421,213
Union.	124,813	7,117,133
United Oil.	12,831	47,255
West Coast.	20,816	124,896
Total for Sept., 1910.	\$669,010	

The total is apparently \$400,907 less than in August, which is, in the main, ac-counted for by a \$400,000 capital distri-bution in that month by the Thirty-Three Oil Company. The total disbursed to date by companies listed on the San Francisco exchange is \$35,385,515, but it should be remembered that not all the dividend payers are so listed.

Report of Tonopah-Belmont

The seventh annual report of the Tono-pah-Belmont Development Company covers the operation of that company for the year ended Feb. 28, 1910. The re-port shows that during the year 36,930 dry tons of ore and 32,230 tons of waste were mined at a cost of \$7.784 per ton of ore produced. This cost was made up as follows: Mining, \$4.83; depreciation of mining equipment, \$0.39; development, \$2.56. The costs per ton including de-velopment for the years 1908 and 1909 were respectively \$7.894 and \$7.815.

During the first eight months of the year under review 37,166 dry tons of ore

were milled at a cost of \$4.057 per dry ton treated. For nine months of 1908 the average cost was \$7.825 and in 1909 \$4.379 per dry ton milled. The average gross value of the ore mined and milled during the first eight months of the last fiscal year was \$14.40 per ton as compared with \$14.16 for the previous year. The average gross value of the ore shipped to smelters during the last three months of the year was \$34.89. A profit of \$105,885 was earned during the year. The assets of the company, as of Feb. 28, 1910, were valued at \$3,497,198.

Mason Valley Mines Company

The following information is given by E. N. Skinner, engineer for Thompson, Towle & Co.: The developments at the Mason Valley property in Lyon county, Nevada, in the last six or eight months have been the most important since active operations began. Some large oreshoots are being opened up, among them is one 230 ft. long, 45 ft. wide, averaging 5 per cent. copper; another, 135 ft. long with ore in both faces, 40 ft. wide, assaying 3 per cent. copper; another, 220 ft. long, 54 ft. wide at the north, and 32 ft. at the south, the whole stope averaging 5 per cent. copper.

ORE ON THE 470-FOOT LEVEL

The most important of the recent developments has been the encountering of ore on the 470-ft. level, at a distance of 335 ft. from the main winze below the 400-ft. level. This ore was struck after passing through 120 ft. of oxidized and leached material, followed by 100 ft. of barren limestone. From this position the drift was turned to the east and then to the north, where the orebody was encountered. The drift is over 60 ft. in the ore. The material is of good grade, being composed of chalcopyrite disseminated through the gangue. Thirty-five cars from the first 20 ft. of this development assayed 4.2 per cent. copper. This body is nearly under one of the big shoots on the 400-ft. level, and connection will be made to prove the ore continuous. The 470-ft. level is 520 ft. below the surface at this point. The wide leached zone on this level points to the possibility of encountering rich secondary ores in depth. It is the intention of the management to sink the main winze and prospect these orebodies at greater depth.

The Mason Valley property has been a difficult one to develop, owing to the occurrence of the orebodies in limestone. However, the general trend of the shoots is now being fairly well determined. At the present time the work of opening the stopes is in progress to put them in condition for actual mining which will be by the overhand-stopping method. The ore-

bodies as originally estimated had an average width of 32 ft., while the average is now shown to be at least 45 ft.; in one place 54 ft. is exposed, with ore still in the face.

ORE RESERVES, 1,000,000 TONS

Recent computations of the ore reserves place this figure at approximately 1,000,000 tons, assaying 3.9 per cent copper. No estimate of the ore on the dumps has been made, but there is probably 35,000 tons broken, assaying over 3 per cent. copper. Recent analysis of the ore from composite samples shows the material to be a more desirable fluxing mixture than was heretofore believed. The new analysis shows the composition to be as follows: Iron, 16 to 17 per cent.; lime, 16 to 18 per cent.; sulphur, 12 per cent.; and silica, 38 per cent. The ore is practically self fluxing.

At the mine 24 men are employed on development work, placing the property in condition for actual mining. More than six miles of development work has been done since 1906, this work being confined principally to the three-tunnel level by which the property is developed, and connected workings. The company has a large amount of territory on the strike of the vein, the nearest oreshoot on the north being 1500 ft. from the line, while on the south it is 150 feet.

SMELTING PLANS

The spur from the Southern Pacific has been completed to within about one-half mile of the smeltery site. Work on this line is being pushed and it should not be long before the site will be placed in railway communication with the main line. The management has already given orders for lumber and brick, and these will be sent in at once and the work of grading will soon be begun. The smeltery will be of 800-tons capacity, consisting of two blast furnaces of 400 tons each. A reverberatory furnace and a converter plant are under consideration. Electric power will be obtained from one of the power companies for operating the blowers and other machinery. It is the intention to treat 400 tons of Mason Valley ore and 400 tons of custom ore daily. The company has a contract with the Nevada-Douglas for the treatment of 10,000 tons of ore per month. It is expected that after crediting the earnings derived from custom smelting, the cost of producing copper will not be more than eight cents per pound.

The engineers are now figuring on a tramway from the mine to the Copper Belt railroad. This line would be $1\frac{1}{2}$ miles in length and have a difference in elevation of 600 ft. from ore bins at the mine to the railroad. The line will have a capacity of 100 tons per hour, and should handle the material in an eight-hour shift.

Tunnel Driving at Record Speed

SPECIAL CORRESPONDENCE

The work on the Laramie Poudre reservoir project is being rushed by the contractor, who wins a bonus of \$300 per day for each day gained in completing 12,000 ft. of tunnel under the two-year contract. During the past five months a distance of 4260 ft. of tunnel has been finished. In the month of May a distance of 513 ft. was driven from the east portal of the tunnel. This established a new record for hard-rock tunnel driving, and in the month of August 527 ft. was driven in the same heading, beating the May record by 14 ft. The work was under the supervision of the contractor's son, Jay McIlwee, who is only 21 years old.

McIlwee gained his first reputation in driving the deep-drainage tunnel at Cripple Creek at a rapid rate of speed, after five contracting firms had thrown it over.

The drills used in doing this work are a Colorado product and manufactured by the Leyner Engineering Company, of Denver, Colo. Three No. 8 air drills are used on a horizontal bar in each heading and the cut holes are drilled 12 ft. deep with the balance of the holes 10 ft. deep. Du Pont and Independent powder are used in blasting. Seven $1\frac{1}{4}$ x8-in. sticks of 100 per cent. powder are placed in the bottom of each of the cut holes and are tamped within $2\frac{1}{2}$ ft. of the collar of the holes with 60 per cent. powder.

A report has just come from Vergis G. Coy, assistant chief engineer for the irrigation company, to the effect that 485 ft. were driven on the east end of the tunnel for the month of September. The rock in which the tunnel is being driven is of a close-grain red and gray granite and requires the strongest powder to break it. Mr. McIlwee is claimed to be the first man to use 100 per cent. powder in rock work. This powder was manufactured by the du Pont company for springing oil wells, but it also proves advantageous in breaking hard granite rock.

The Laramie Poudre Reservoir and Irrigation Company project is the second largest in the Western States. It is estimated that it will cost \$5,100,000 to bring the water from the Laramie river through the tunnel to the Cache la Poudre river and on down to Greeley, where it will irrigate 125,000 acres.

The importations of diamonds and other precious stones into the United States for the fiscal year ended June 31, 1910, were valued at approximately \$47,800,000, according to the Bureau of Statistics. Importations for the year 1907 were \$42,500,000, while in 1900 only \$14,200,000 worth of precious stones were imported.

Assay of Arsenical Nickel Cobalt Silver Ore

BY DENISON K. BULLENS *

The chief difficulties in the assay of ore from the Cobalt district are: (1) Sampling; (2) the high-silver content and (3) the presence of nickel, cobalt and arsenic. The ore from the Cobalt district constitutes a class in itself and cannot be accurately sampled by ordinary methods, due largely to the presence of native silver or silver-arsenical alloys which are unevenly distributed. With high-grade ore of this type the common methods of mechanical or hand sampling will not give a correct sample.

SAMPLING OF COBALT SILVER ORE

There are two general systems characteristic of Cobalt high-grade ore sampling now in use, and as types there may be considered that method in vogue at Copper Cliff¹ and that used by a New York concern². The former method is as follows:

The ore is weighed when received, and crushed with a Buchanan jaw-crusher. After a small shovelful for a moisture sample has been taken, the ore is dried on steam drying plates, fed to an Allis-Chalmers ball mill and ground through a 20-mesh screen. The ore as it passes through the screen is automatically sampled with a 27-in. Snyder sampler which cuts out a 1/10 portion. Fifty per cent. of the milled ore is finer than 100 mesh, and 80 per cent. is finer than 50 mesh.

The main sample is shoveled over twice, coned and quartered. The two parts thus obtained are treated as independent samples, each being coned and quartered to 100 lb., and from this point cut down with a Jones sampler to 20 lb. One of the halves of the final 20-lb. sample is sealed and kept for future use. The other sample is thoroughly dried, ground in a Sturtevant disk grinder, assisted sometimes by pebble mills, until the fines pass through a 100-mesh sieve. The fines and metallics are weighed and sampled separately, the fines having been mixed by one to three hours' rotation in a pebble mill. The metallics remaining in the ball mill after the completion of the run are removed, weighed and melted and the resulting bullion, speiss and slag are weighed, sampled and accounted for separately. Mechanical sampling is likewise employed at Deloro and Denver for Cobalt ores.

*Newton, Mass.

¹A. A. Cole, *Proc., Can. Min. Inst.*, March, 1908.

²A. R. Ledoux, *Can. Min. Journ.*, Vol. XXX (1909), p. 388.

FOUR SAMPLES TAKEN

By the second method the ore is put through a Blake crusher and crushed to about 1¼ in. The ore is then passed on to revolving screens with 1-in. and ½-in. holes respectively. The oversize of the former goes back to the crusher, and the oversize of the latter goes to rolls set at ¼-in. The entire body of ore is then placed upon the sampling floor and thoroughly mixed by shoveling into ridges, and then divided into four parcels. Each lot is then coned and quartered down to about 1000 lb. and put through rolls and mills until all the material, including metallics, will pass an eight-mesh screen. This ore is then mixed by shoveling and put through a Jones sampler and worked down to 35 or 40 lb. It is then ground to pass a 20-mesh sieve. Each of the four lots or samples is worked down separately. The further treatment of the samples is then very similar to that described under the first method. The average assay of the four lots is taken as the representative and final value.

ASSAYING OF COBALT SILVER ORE

The assay of the Cobalt ore may be considered from the standpoint of its silver contents relative to the amount of nickel and cobalt present. For this discussion only two cases need be considered, namely: (1) High silver contents with high nickel and cobalt, and (2) low silver contents with high nickel and cobalt. All others may be assayed by any of the numerous methods for ordinary ore.

The object of the assay is to collect the silver in metallic lead and flux off the nickel and cobalt in the slag, as the latter impurities tend to pass into the lead button, hindering cupellation and giving incorrect results. If nickel is present in the lead button to the amount of 0.5 per cent., a scum of NiO will be left upon the cupel. If over this amount, the button will finally become coated with the oxide and freeze. In assaying we have two processes open: The crucible method and the scorification method. In general it may be said that the scorification assay has the disadvantage of requiring a high opening-up heat, which tends toward a possible loss of silver and the use of less pulp, which may not give as correct a sample as would be possible with the larger weight of ore generally used in the crucible assay. On the other hand, crucible assays generally take less time and give higher results than scorification assays.

The impurities causing the most difficulty in the assay of the Cobalt silver ore are nickel, cobalt and arsenic. These may be present as the arsenates, arsenides, sulphides, sulph-arsenides, as well as secondary or decomposition products with rather indefinite characteristics, resulting from the weathering of the original minerals.

CRUCIBLE ASSAY

In the crucible fusion if the nickel and cobalt are present as oxides or oxidation products the assay is a comparatively simple affair, as these oxides may be held in igneous solution by an excess of litharge, or they may unite with silica to form silicates; in either case they pass into the slag. But if the fusion contains iron sulphides, or alkaline sulphides, the nickel silicate thus formed may be reduced in part to a nickel matte and nickel, the latter alloying with the lead. If arsenic is present in the fusion, the nickel silicate may be partially decomposed and a speiss result. These secondary interactions may be reduced to a minimum, however, by making a quick fusion, and by using such precautions as used with sulphide ore.

Sulphide Ore—On the other hand, and much more commonly, the nickel, cobalt and arsenic may be present as the original unoxidized minerals, such as millerite, niccolite, smaltite, cobaltite and mispickel. These will dissolve in an excess of the alkali sulphide or flux, the nickel giving the slag a brownish color. Cobalt sulphide is much more easily taken into solution by the slag than the nickel sulphide. For sulphide ore the slag should be below a monosilicate, and high in soda, as basic slags have a high solvent power for the sulphides of the metals. Arsenic may also be slagged off by an excess of the alkali flux and a low temperature. In order to prevent reduction as far as possible, the fusion should be made quickly.

Use of Litharge—The question of litharge has been taken up by R. W. Lodge in his paper,³ in which he gives the results obtained from a series of assays upon rich arsenide-nickel and cobalt ores from Cobalt, Ontario. These results are uneven and low in silver when high litharge is used in the crucible assay, the silver apparently passing into the slag. The unevenness of the results is shown by the fact that some ore carrying considerable nickel, cobalt and arsenic gave as good results as ore low in these

³"The Effect of High Litharge in the Crucible Assay for Silver," *Trans. A. I. M. E.*, XXXVIII (1907), p. 638.

metals, while other ore gave extremely varying results. When obliged to use the crucible method with ores containing high nickel, the litharge should be low, and such an amount of ore be taken that both high litharge and niter are avoided.

Iron—Results obtained from the use of the iron method show that, with proper precautions of low temperature and a large excess of the alkali flux, this method may be used for comparatively high arsenide-nickel and cobalt ores, although too high nickel gives hard and brittle buttons which have a tendency to scale when hammered.

Borax—The use of borax has been found advisable, as it lowers the slag-formation temperature, thus lowering the temperature at which the fusion must be conducted. It also gives a viscous character to the slag at its formation point, holding the lead globules in suspension in the fusion until the ore has been decomposed.

Charge—The weight of ore used in the assay necessarily depends upon the amount of nickel, cobalt and arsenic

nickel will color the slag blue and black respectively, covering up the yellow color of the litharge.

Charge—The following charge has been found to give good results: Ore, 0.10 assay ton; lead, 65-75 grams; borax glass, 3 to 5 grams; and silica, 1 to 3 grams. Fusion to be made at medium heat.

The foregoing paragraphs apply to ore containing both high silver contents and high impurities. For this class of ore the scorification method has shown itself to be the more accurate, giving more even and reliable results. By using a correction assay for the slag, results may be obtained which closely approximate the wet methods of analyses for

slag off the impurities by holding them in igneous suspension in the fusion by means of a basic and high litharge slag. This method (using high litharge) was found undesirable in the case of high silver contents, but proved efficient for low-silver ore. The scorification assays were made by students of the Pennsylvania State College, each sample being assayed by a number of students, so that check results could be obtained, and the personal equation eliminated as much as possible. The results show that the crucible-method results were higher in each case than the average scorification-method results. By plotting the per cent. difference between the results thus obtained as abscissas, and the ounces of silver per ton of ore as ordinates, the accompanying curve was obtained.

From the curve it may be seen that the scorification results gradually approach the crucible method as the silver contents increase, and from results not here given it is seen that with high silver contents it would exceed the crucible-assay results. Thus, for low silver with medium or high nickel, cobalt and arsenic, we may conclude that the scorification assay is inapplicable.

CONCLUSIONS

For the assay of silver ore from the Cobalt, Ontario, district, I would make the following generalized statements:

(1) For ores having high silver contents with high nickel, cobalt and arsenic, the scorification method is preferable, although the crucible method may be used if low litharge, high soda and basic slag, quick fusion and low temperature be observed.

(2) For ores and products having low-silver contents with high nickel and cobalt, the crucible method, using high litharge, is preferable.

Colorimetric Estimation of Vanadium

A method is given by A. W. Gregory (*Proc. Chem. Soc.*) for the estimation of small quantities of vanadium, based on the color reaction which takes place when a solution of vanadium in concentrated sulphuric acid is added to a solution of strychnine in the same acid. A violet color is first formed, and this changes to orange. As the latter color is quite permanent, and is proportional to the quantity of vanadium present, a comparison of the color produced with that given by a known amount of vanadium under similar conditions indicates the amount of vanadium present in the solution tested. This test is not given by titanium, tungsten, or molybdenum, nor does their presence in relatively large quantities interfere with the formation of the color given by vanadium. Iron interferes with the reaction and must be removed before the test can be applied.

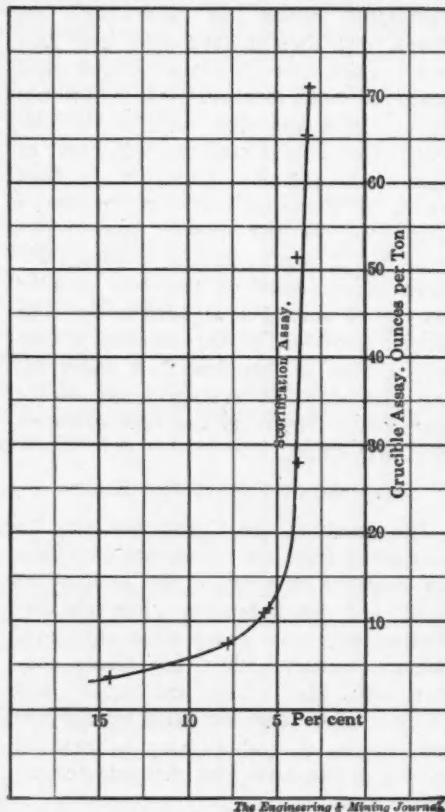
TABLE SHOWING DIFFERENCE BETWEEN CRUCIBLE AND SCORIFICATION ASSAYS.

Crucible Method, Oz. Silver per Ton.	Scorification Number of Assays.	Scorification Average of Assays, Oz. Silver per Ton.	Difference between Crucible and Scorification Assays.	Percentage Difference.
4.32	2	3.70	0.62	14.3
8.28	4	7.65	0.63	7.62
10.84	4	10.20	0.64	5.90
11.56	6	10.90	0.66	5.71
29.46	5	28.3	1.16	3.93
53.60	8	51.56	2.04	3.96
67.42	5	65.20	2.20	3.30
73.68	5	71.30	2.38	3.23

which the pulp contains. In ore in which these are large in amount, it is found that as low as 0.1 assay ton or even 0.05 assay ton of pulp must be used to avoid an excessive amount of the impurities named. In the last cases, the great advantage of the crucible assay over the scorification method is entirely offset.

SCORIFICATION ASSAY

In the scorification method the aim is to produce a litharge or oxide slag by means of an oxidizing fusion with metallic lead. During the melting period the ore rises to the surface of the lead bath, and is later attacked by the oxygen of the air during the roasting stage. Oxidation of the impurities also takes place during the scorification or slagging stage, as the litharge (formed from the oxidation of the lead bath) gives up its oxygen to the cobalt, nickel and arsenic, itself being in turn reoxidized by the iron oxides or directly by the air. The oxides formed unite with the silica or borax, forming a fusible slag. The cobalt and



SCORIFICATION AND CRUCIBLE ASSAYS COMPAED

silver. These conclusions are based upon work done by numerous assayers.

ASSAYING LOW-GRADE SILVER ORE

But with the decrease in production of high-grade silver ore, increased attention has been given to water concentration and cyanidation of low-grade material, so that the assay of the poorer ore and mill products now takes an important stand. In order to determine the relative accuracy of the crucible and scorification methods of assaying Cobalt ore, assays by both methods were run on low-grade ore, and products consisting of middlings, tailings and slimes, all of which contained nickel and cobalt in varying amounts.

COMPARISON OF THE TWO METHODS

The crucible assays were made with a high litharge charge, the idea being to

Yoquivo Mine and Mill, Western Chihuahua

Results of Two Years' Development at This Silver-Gold Property.
High-grade Ore Shipped and Mill Operating. Details of Mill Run

B Y W. H. S E A M O N*

The Yoquivo mine is on a small mountain stream, locally dignified by the title "Rio Trinidad." It is 40 miles west of Cuesta Prieta, a station on the Mountain division of the Kansas City, Mexico & Orient railway. A good trail connects with the railway with easy grades.

The property is controlled by two brothers, J. S. Qualey of New York and Charles Qualey of Chihuahua. They took hold of the property after it had been abandoned by its early owners and while it produced some excellent ore in the early days of its history, it was scarcely more than a good prospect when they bonded it, considering it worthy of an expenditure of \$50,000 in development. They assumed this venture as a personal risk. The present satisfactory condition of the property is due to the manager, Charles Qualey, who had the support of R. V.

and about four miles distant there is a water-power site that can be relied upon for at least nine months in every year. The situation is healthful.

About 6000 ft. of development has been completed. The orebodies are at their highest known point 900 ft. above the tunnel level, and winzes to a depth of 100 ft. below show excellent ore. While the extent of the orebodies has not yet been accurately defined, the management feels confident of sufficient ore to run the plant for three years.

ADDITIONAL EQUIPMENT PLANNED

Stone buildings, well constructed, for the salaried employees, an office for the manager, another for the assay plant, an engine and boiler house, and a store building have been in use for some time past. There is a 10-stamp mill, one tube

at the mill ore from every point on the property. All of these improvements are under way.

HIGH-GRADE ORE SHIPPED

Exploration was begun about two years ago and the mine began shipping ore 10 months ago. The mill was put in operation in July, 1910, and the results of the first run and cleanup have just been made known. Previous to the starting of the mill about 10 shipments of assorted ore, in car lots, was made. Three grades of ore were shipped; the first grade ran 8000 oz. of silver and 55 oz. of gold to the ton; the second grade 2000 oz. of silver and 18 oz. of gold and the third grade 900 oz. of silver and from 5 to 6 oz. of gold. Now that the mill is running it is still considered advisable to quickly hand sort the mine run, culling out the high-grade ore for shipment.

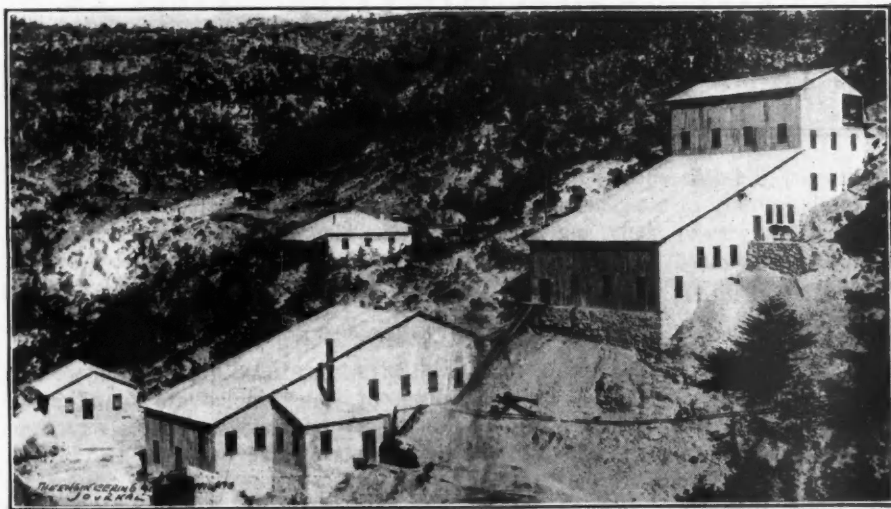
FIRST MILL RUN

The first lot run through the mill was 650 tons of the regular mine run, after culling out the readily seen pieces of high grade, and contained 97,979 oz. of silver and 843 oz. of gold, equivalent to 150 oz. of silver and 1.3 oz. of gold per short ton or \$108 per ton.

The silver occurs chiefly as the sulphide with some bromide and native silver. The gold is free but carries some silver. The associated minerals are malachite, azurite, chalcopyrite and galena; these minerals run mostly with the high-grade ore. By closer culling, the milling ore can be kept quite free from these minerals, objectionable in cyaniding, leaving as a milling ore a mixture of quartz, calcite and fragments of andesite.

Awaiting the completion of the first tube mill the entire burden fell upon 10 Allis-Chalmers 1050-lb. stamps, working through a 40-mesh screen. The stamps were dropped 105 times per minute, with a drop of 5 in., using a 9-in. chuck block. The stamp duty was 1.25 tons. The cyanide solution at the start was made 3 per cent. but it was soon increased to 6 per cent. on account of the copper giving trouble in precipitation.

There are two No. 3 Overstrom tables in the mill, one for each set of stamps. The concentrates produced weighed 8228 tons and averaged 5705.6 oz. of silver and 40.08 oz. of gold per ton, or in all, 46,945 oz. of silver and 329 oz. of gold, representing an extraction by concentration of 47.91 per cent. of the silver contents and 39.08 per cent. of the gold. The concentrates carried 5 per cent. copper.



YOQUIVO MILL, WESTERN CHIHUAHUA, MEXICO

Neely as mine superintendent and J. Tomkin as metallurgist.

The property covers about two miles in length of a strongly cropping contact vein of quartz with andesite and rhyolite walls. The general course of the vein is approximately north 50 deg. east. The orebodies are variable in width from 14 ft. to 8 ft. In addition to the regular mine run of ore large-sized pockets of high-grade ore are found at frequent intervals.

The elevation of the mine-tunnel entrance is 6700 ft. above sea level and adjacent peaks rise to an elevation of 8200 ft. The hills are covered with timber. A good supply of water is at hand

*Mining engineer, Apartado 247, Chihuahua, Mexico.

mill and a 50-ton cyanide plant running. The power plant is of 250 h.p. and consists of four boilers furnishing steam to two Chandler-Taylor engines which drive the dynamos that supply power to every machine in the mill and mine, besides lighting the buildings and the mine. The foundations for doubling the capacity of the power plant are completed. All parts of the property have telephone connection with the office of the superintendent. The equipment, in construction, consists of an additional tube mill, increasing the size of the cyanide plant to 100 tons; the building of a dam four miles distant, for the development of a water power to take the place of the steam plant for nine months in every year, and the erection of an aerial tramway which will deliver

CYANIDING WITH PACHUCA TANKS AND BUTTERS FILTER

The pulp is thickened in a nest of 24 spitzkasten, each 4x4 ft.; the underflow from these machines contains 30 per cent. of solids and is carried, by gravity, to 3 Pachuca tanks, 26x10 ft. The clear overflow is pumped back to the mill storage tanks. Each charge is agitated about 40

CYCLE OF FILTERING OPERATION.

	Min.	In. Vacuum.
Filling filter box.....	4	
Taking on cake.....	40	14
Removing surplus.....	12	5
Filling with solution.....	4	5
Washing with solution.....	120	14
Removing surplus.....	10	5
Filling with water.....	5	5
Washing with water.....	20	14
Throwing off cake* and discharging.....	6	..

*The cake is thrown off under a pressure of 20 ft. head.

hours and is then passed to a cone storage tank and from there passed to a 30-leaf Butters filter. In the filter press the

average thickness of the cake was $\frac{3}{4}$ in. and the cycle was 3 hr. 40 min., as shown in the accompanying table.

The metals are precipitated by zinc dust and are pumped into a Shriver, 24x24, filter press. At first zinc shavings

EXTRACTION AT YOQUIVO MILL.

	Oz. of Silver.	Per Cent.	Oz. of Gold.	Per Cent.
55 bars, containing.....	48,569.44	49.57	500.46	59.32
Concentrates.....	46,945.50	49.91	329.74	39.08
Residues, carrying.....	2,465.10	2.52	13.47	1.60
Total extraction.....	.....	97.48	.....	98.40

only were used but this was early changed to zinc dust and the tails from the press run through a zinc box. By this means a rich product was obtained, the greater part of the copper passing to the zinc box. The press precipitates were thoroughly dried and found to contain 80 per cent. of bullion of an average fineness of 0.936. The precipitates are melted with the usual fluxes in a Faber du Four furnace and the resulting bars shipped without remelting.

Throughout the run the silver in the washer and press tails was estimated by a solution of sodium sulphide; a few drops of this solution added to 100 c.c. of the solutions to be tested denotes the silver contents sufficiently close for all practical purposes. In using this method only an occasional solution assay is needed as a check; the results obtained by the sodium sulphide agree closely with a 20 a.t. assay.

The consumption of cyanide was 1.6 parts to each part of silver and the lead acetate consumed was $\frac{1}{2}$ lb. per ton crushed.

The plant throughout is driven by individual motors. When the first tube mill was put in commission the stamps were only required to crush through a 20-mesh screen and when the second tube mill is in commission the screen mesh will be made 12- and possibly 10-mesh. With a 20-mesh screen the stamps handle 4 tons per stamp.

The concentrates and high-grade ore are shipped to the smeltery at Chihuahua, while the bullion is sent to Monterey.

A Brief Method for Calculating Interest

BY JAMES J. SMITH

In the November bulletin of the American Institute of Mining Engineers there is a paper entitled, "A Method of Calculating Sinking Funds and a Table of Values for Ordinary Periods and Rates of Interest," by J. B. Dilworth, of Philadelphia. It consists of an algebraic method for such calculations, with examples. The subject is of some interest to me because I recently had to do a considerable quantity of figuring of this kind. I found a brief method which, although of greater accuracy than the ordinary methods for industrial operations, may not necessarily be acceptable in purely financial transactions.

The method does away with periods at which payments shall be made and interest added, and carries on the whole operation continuously. This is obviously correct when the earning power of a property is being estimated for a given term of years; for, in practice, the income would not be held for six months or a year and then banked, but would bank as fast as possible and its value to the owner would begin at the time of its receipt.

Interest is treated the same way, for the following reasons: (1) That in ordinary banking practice it is added in every time a depositor's book is balanced, or at the end of the minimum period of compounding in saving funds; (2) convenience of calculation, as will be shown;

(3) because the difference is inconceivable in all ordinary cases. This statement will be a surprise to many, but, if one dollar be compounded at 6 per cent. interest for 20 years at 12, 6, 4, 3, 2 and 1 month intervals and continuously, the amounts will be, \$3,207, \$3,262, \$3,281, \$3,291, \$3,304, \$3,310 and \$3.32, respectively.

It will be seen that at the end of 20 years the increase from annual to semi-annual is 5.5 per cent. of the original sum, while that from semi-annual to monthly is 5.8 per cent. and less than 2 per cent. of the final sum.

Such slight differences are insignificant in evaluating mining properties and the divergence from the accepted semi-annual method is far within the limit of error possible in the fundamental data of value, even leaving out of account that in large transactions interest commonly occurs and is added in at much less than semi-annual periods in ordinary commercial life.

FORMULAS DERIVED FOR CALCULATING INTEREST AND PRINCIPAL

Granting the correctness of the continuous method we may derive two formulas that cover all possible cases. Let S be the final sum; S_1 the original sum when there are no annual payments or additions other than interest; a , the rate

of interest expressed as a decimal; t , the time in years, and, for convenience of expression, let $\log^{-1}x$ be the number whose \log is x , in the same way that $\sin^{-1}x$ represents the arc whose \sin is x . Then we have $\log \frac{S}{S_1} = at$; or $\frac{S}{S_1} = \log^{-1} at$.

All logarithms used are naperian or natural, of which tables are found in all engineers' handbooks. They are common logarithms divided by 2.30258.

To find what any sum amounts to at the end of a given period with a given rate of interest, we have a and t and their product gives the logarithm to be sought in the table. The number corresponding to this gives the ratio by which to multiply the original sum to find the final one. For instance, in the case above, with 6 per cent. and 20 years we have, $at = 0.06 \times 20 = 1.20$, and the number of which this is the logarithm is 3.32, as given, for the sum to which \$1 would amount under these conditions, as shown above.

In the case of a certain annual sum K , paid continuously, the other symbols remaining as before, we have:

$$\log \left(\frac{aS}{K} + 1 \right) = at, \text{ or } \frac{aS}{K} = (\log^{-1} at) - 1,$$

$$\text{Hence } S = \frac{K}{a} \left[(\log^{-1} at) - 1 \right]$$

This does not look as simple as it really is, because $\log^{-1} at$ is a number taken direct from the table. An example will demonstrate better than a page of explanation. Suppose \$20,000 annually be put at $4\frac{1}{2}$ per cent. compound interest for 21 years. What will be the whole amount at the end of that period?

Now $a = 0.045$, $t = 21$, $at = 0.945$, and $\log^{-1} 0.945 = 2.573$; whence $S = \frac{0.200}{0.045} \times 1.573 = \$699,111$. On the other hand, if the problem be to find the time in which a given sum per year will equal a certain stated sum, the solution is as simple and easy.

Suppose a given sum, say \$250,000, be loaned, how soon will it be paid off with interest at 6 per cent. by payments of \$23,000 per year, made at such short intervals as to be virtually continuous? The interest on \$250,000 at 6 per cent. is \$15,000 and of the \$23,000 per annum this amount must go for interest charge, leaving \$8000 per annum to extinguish the principal.

Here $S = 250,000$, $K = 8000$ and $a = 0.06$. Then $\frac{aS}{K} = 1.875$, $(\frac{aS}{K} + 1) = 2.875$, $\log 2.875 = 1.056$, and $t = 1.056 \div 0.06 = 17.6$ years. Without having a table designed for the purpose, I think nothing could be easier than this, considering the difficulties of solving such problems in the customary ways.

FOR MINING OR INDUSTRIAL INVESTMENTS
TABLES SHOULD NOT BE BASED
UPON SUMS PAID IN ADVANCE

I wish to call attention to the fact that all the tables I have seen for giving the amount of \$1 per year for any number of years at a given rate of interest, specify distinctly \$1 "paid in advance." This is absolutely unfair in returns from mining or industrial investments, for the returns from these are not paid in advance, but are paid at a more or less uniform rate throughout the year. To credit the interest on the returns for a whole year, as if they had been paid at the beginning of that year, is to give a half-year's interest that has not been earned and to compound the loss annually.

This is bound to work a great injustice to one party or the other, or to deceive an investor as to the return he will really get. In brief, then, where settlements are to be made at definite intervals, of an exact amount of money loaned, interest will usually be computed as at present, by the formula of Mr. Dilworth or some similar one, but where estimates are to be made of the ultimate financial result of a given business, extending over a term of years, the formulas here given are vastly quicker and more convenient and represent the actual results more accurately.

For the benefit of those who dislike using formulas the origin of which is not

given, I append a simple derivation of these by the oft-despised methods of calculus. In the first case, let dS be the increment of the sum S during the indefinitely short time dt . The rate of increase for a year is a , the interest rate, and for this short time dt we had $dS = aSdt$,

$\therefore \frac{dS}{S} = a dt$. Integrating, we get $\log S - \log S_1 = at$, or $\log \frac{S}{S_1} = at$. In the second case the increment for the time dt is made up of two parts; namely, the interest of the sum S , which is $aSdt$ as before, and the proportion of the annual payment K for the time dt which is Kdt .

Then we have $dS = aSdt + Kdt$, $\frac{dS}{aS + K} = dt$, $\therefore \frac{1}{a} \log \left\{ \begin{matrix} S = S_1 \\ S = 0 \end{matrix} (aS + K) = \right.$

t . When $t = 0$ $S = 0$ and $\frac{1}{a} \log (aS + K)$ becomes $\frac{1}{a} \log K$. Hence $\frac{1}{a} [\log (aS + K) - \log K] = \frac{1}{a} \log \left(\frac{aS + K}{K} \right) = \frac{1}{a} \log \left(\frac{aS}{K} + 1 \right) = t$ or $\log \left(\frac{aS}{K} + 1 \right) = at$ as given above.

This shows the derivation to be simple and clear.

Tin Mining Stimulated by
High Prices

LONDON CORRESPONDENCE

While other metals, particularly copper, seem to be in the doldrums, tin has continued active and the recent corner in spot tin forced the London price up to £166 per ton.

About three years ago this metal reached the highest price to which it has attained for many a year, that is, something over £200 per ton, from which high level it gradually fell to £130 per ton in the earlier part of the year 1909. The rise from this lower level was at first gradual, the greater part of the difference between that and the present price having been effected, as stated above, quite recently.

Naturally, to tin miners this rise was most welcome. The discredit into which Dolcoath had fallen because a dividend had been passed, was more than made good and, looking farther afield the tin mines in the Straits, as well as those in Cornwall, advanced into greater favor. But, more than these, the effect of this rise in price of tin has been to call attention to the alluvial tin fields of northern Nigeria. In that country it was the Niger Company which first began working on any scale, obtaining from their Taraguta mine in 1907 about 185 tons of tin oxide, from which figure the product

of this mine has regularly increased so that it is now producing at about double the above-mentioned rate. In the meantime, other companies have become active, from which it is reasonable to expect that the output of tin from this country will increase.

Graphite Mining in the Province
of Quebec

QUEBEC CORRESPONDENCE

There is considerable activity in graphite mining in the vicinity of Buckingham, Quebec. A mill is being erected on the Stewart Graphite property, 6 miles from Buckingham, on the Lievre river. The capacity of the mill will be 5 tons of finished graphite per day, and it is expected an extraction of at least 8 per cent. will be effected from the rock, which contains flake graphite.

The Bell graphite mines, owned by an English company, are being developed extensively preparatory to the completion of the mill which is now in course of erection. The property is located $3\frac{1}{2}$ miles east of Buckingham and comprises several hundred acres of graphite lands. The occurrence of graphite is confined to the stratified gneiss formation, striking almost north to south and dipping 70 deg. west. The main lode, on which most of the work is being done, is from 4 to 6 ft. wide and consists of flake graphite disseminated through the banded gneiss; the main constituents of the ore are quartz, feldspar, a little lime, and iron pyrites. The mill will be finished inside in a few weeks and will treat about 70 tons of rock which is expected to yield from 4 to 5 tons of finished graphite per day. The whole power plant, consisting of two locomotive boilers of 250 h.p. each and a high-speed engine of 150 h.p., has been imported from England.

The Diamond Graphite Company, a New York corporation, is operating its properties $6\frac{1}{2}$ miles north of Buckingham. The mill has been producing regularly since February, 1909, about $2\frac{1}{2}$ tons of flake graphite of No. 1 and No. 2 quality per day. The ore is mined at a distance of $1\frac{1}{2}$ miles from the mill and consists of disseminated flake graphite through a matrix of foliated gneiss.

At the Amherst Graphite property, 80 miles northwest from Montreal, belonging to "Graphite Limited," a Montreal company, the main shaft is down 75 ft.; at 100 ft. a drift will tap the orebodies toward the south 125 ft. distant. The ore consists partly of pure compact and partly of disseminated graphite through a highly feldspathic and pyroxenic matrix. A great deal of the graphite is associated with wollastonite (CaSiO_3). The erection of a milling plant on the property is under consideration.

Agglomerating Ore Fines and Flue Dust

Production of Flue Dust a Function of Velocity and Temperature of the Gases. Process Produces a "Chemical Briquet" in a Mechanical Form

BY HERBERT HAAS*

Putting ore fines in proper physical condition for blast-furnace smelting is a subject which has always received the attention of blast-furnace managers, as is evinced by the variety of means proposed to accomplish this purpose.

Briquetting had at one time been introduced extensively in most copper and lead smelteries, but the unsatisfactory product obtained coupled with its high cost finally led to its rejection. Occasionally favorable circumstances make briquetting commercially successful; thus at one works they have a supply of argillaceous ores, which furnish an excellent bond for the dry ore fines and dust.

Where concentrating mills are located in close proximity to the smelting works, the slimes produced in the ore-dressing operations can be used for agglutinating the fine dry ores and dust by passing the mixture through a pug mill and then through an auger machine. This practice is used at the Washoe works.

For clinkering copper and lead ores the rotary kiln is out of the question on account of the large metal losses such practice would entail. Moreover, the cross-sectional area of the kiln being restricted, and the escaping gases of a high temperature, they would carry with them fine particles of ore, and chambers or filters would be required to collect the dust.

THE GROENDAL PROCESS

The Groendal process of briquetting and clinkering the bricks, is reported to be in successful operation in Europe in treating magnetite concentrates (the product from magnetic separation). In this process the fine ore is compressed in powerful machines. The bricks are loaded on steel trucks covered with a refractory insulating material. These are transferred to a kiln or clinkering furnace to be subjected to a high temperature, usually created by producer gas or waste gas from iron blast furnaces, and are removed when clinkered. The latter part of the process is not essentially different from that of ordinary brick burning. The briquetting of the iron ore is an expensive operation and cannot be compared with the highly efficient and cheap process of pugging in combination with the large capacity of the auger machines in brick manufacture.

It is evident that the cost of briquetting by the Groendal process will not

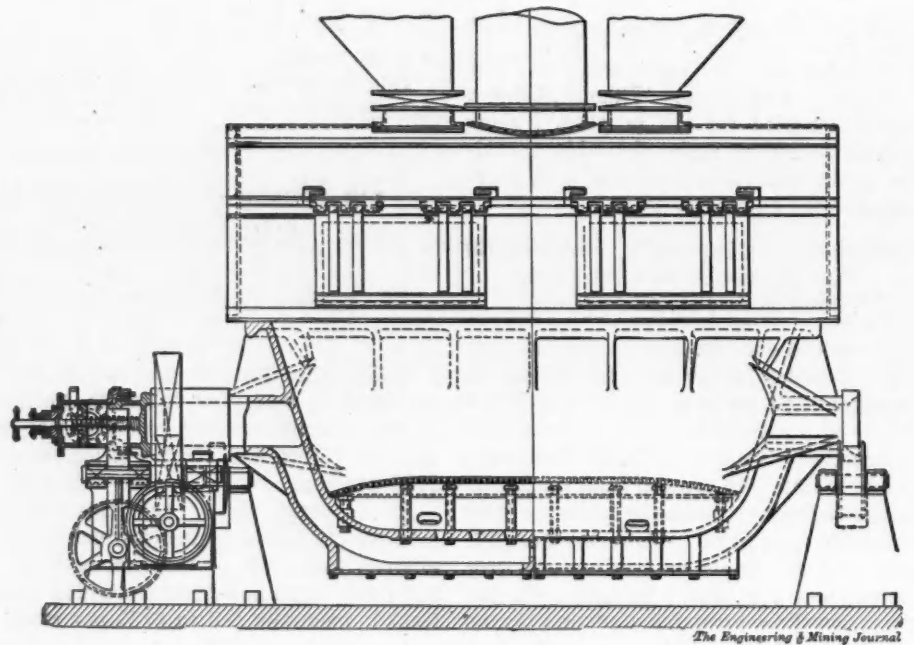
*Superintendent, McNamara Mining Company, Tonopah, Nev.

differ from that in plunger and toggle presses used in copper and lead smelteries. Furthermore, the added expense of heating the kilns, which with the high cost of fuel at some of the Western smelteries, is an important item.

FACTORS INFLUENCING THE PRODUCTION OF FLUE DUST

Before describing my process of sintering ore fines, it may be well to consider the causes that influence the production of flue dust. The source of flue dust, generally, is the charging into the furnace of pulverulent ores without previously putting them into proper physical condi-

ture may drop to 100 deg. C. immediately after charging fresh stock, it also increases to as much as 600 deg. C. before charging again, with a rise in velocity to 1100 ft. per min. In the downtakes the velocities are usually from 1000 to 1500 ft. per min. It is at once apparent that at such speeds any dust in suspension will be carried over into the dust chambers and unless the speed there is reduced to fully 400 ft. per min., some of the dust will find its way into the atmosphere. The more modern works embody in their flue construction a short flue with a large cross-sectional area to reduce the speed of the gases to 200 ft.



THE HAAS SINTERING BOWL

tion. But given the same physical character of ore, more flue dust will be made in the copper furnace than in the lead furnace. In the copper furnace the burden is kept low, as a rule, to increase oxidation and burn off the sulphur. This tends to create hot tops. Thus the average temperature of the copper furnace waste gases at the throat is fully 300 deg. C.

Owing to the small bosh in copper-furnace construction, the cross-sectional area at the throat is but slightly larger than that at the tuyeres. The high temperature and limited area produce high gas velocities, which at the throat are fully 750 ft. per min. While the temper-

per min. It is far more effectual in precipitating dust than a long one with limited cross section and correspondingly higher speeds. After the dust has been settled there is no harm in having a speed of 600 ft. per min. at the stack entrance.

On the other hand, in lead smelting a strongly reducing atmosphere is desired. This is secured by having a large bosh a short distance above the tuyeres (8 to 18 in. in 4 to 6 ft.) and sloping furnace walls (in modern lead furnaces as much as 1/2 in. in 12 in. vertical height) and carrying a high burden. In certain cases when producing calcareous slags, the burden is carried 20 ft. deep. Thus, while the ratio of hearth area to that at

the throat is 1:1.2 or 1:1.3 in the copper furnace, it is 1:2 in the modern lead furnace. A requisite of successful lead-furnace operation is the prevention of hot tops with its attendant oxidation of the lead causing high silver and lead losses. In good practice the average temperature of the waste gases in lead smelting should not exceed 150 deg. C. at the throat. The top should be "cold."

AIR REQUIREMENTS PER TON OF BURDEN THE SAME

Thus in the lead furnaces there is a large cross-sectional area at the throat and a low temperature of the outgoing gases, which are the determining factors in reducing the gas velocity. But attention must be called to the fact that the air requirements of the lead and copper furnace per ton of burden smelted are practically the same, for the smaller amount of coke burned in copper smelting compared with lead smelting, a larger amount of sulphur has to be oxidized. With a deficiency in sulphides, the coke

riodical slips, and other difficulties, all attributable to the fines.

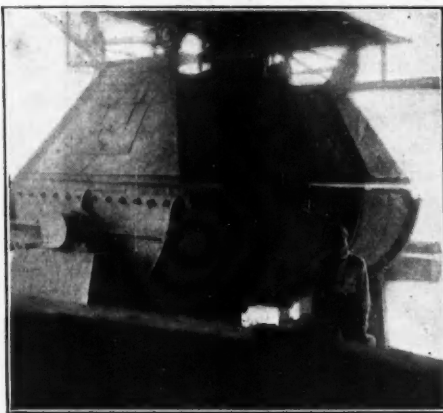
CAPACITY A FUNCTION OF VOLUME AND NOT PRESSURE OF AIR

The physical condition of the charge has a direct bearing on the blast pressure used. While large furnaces have large burdens and are proportionately wider at the tuyeres, and the power of penetration of the blast has to be increased by an increase in pressure, mere pressure, however, does not increase capacity. Pressure is primarily a function of resistance. It is the volume of air blown into a furnace in a unit of time and the rapidity with which the coke and sulphur are burned that determine capacity.¹ The physical and chemical composition of the charge affect speed more than either pressure or volume of air. With a properly prepared charge, from which all fines have been removed and sintered, fully 25 to 30 per cent. greater speed can be obtained with less coke on the burden, and greatly reduced pressure and volume of air.

The practice of charging fine and coarse ore directly into the furnace, and then treating the flue dust, approaches this subject in a roundabout way. The furnace is not operating under the most efficient conditions possible with the result that large quantities of dust have to be rehandled, frequently amounting to from 7 to 10 per cent. In some instances the dust is recharged as part of the burden. In another instance two parts of flue dust to one of calcines are smelted in a reverberatory furnace. This flue dust results from feeding a large portion of fines and concentrates directly into the blast furnace.

SINTERING TO PRODUCE A SUITABLE CHARGE FOR BLAST FURNACES

The process of sintering I here propose is applicable to copper and lead ores and depends on the heat generated by the oxidation of sulphides to agglomerate with them any ore fines and dust. From 8 to 12 per cent. sulphur suffices for



HAAS FURNACE IN OPERATION



DISCHARGING THE SINTER



THE AGGLOMERATED SINTER

used in copper smelting must be increased, and there is also fully twice as large a capacity per square foot of hearth area at the tuyeres, as in lead smelting, so that practically double the quantity of gas is made in the unit of time, the volume of which is further greatly augmented by the high temperature. For these reasons the gas velocity at the throat of the copper furnace is from 750 to 1100 ft. per min., while at the throat of the lead furnace it is only from 150 to 200 ft. per minute.

These, then, are the factors influencing the formation of flue dust in the copper and lead furnace. The lead smelter dreads fine ores not so much because of the flue dust they produce, as for the irregularities they cause in smelting. Large quantities of flue dust are made only when blow-holes occur. These, however, are the direct result of the irregular, uneven descent of the burden, the formation of accretions, the packing of the charge, sifting of fines in front of the tuyeres, the hanging of the stock with pe-

It can be said that the furnace sets its own pace. In iron smelting, where pressures are much higher than in copper smelting, the tonnage smelted per square foot of hearth area is much less. The burden capacity of the iron blast furnace approaches more nearly that of the lead furnace.

As the physical condition of the charge greatly influences the smelting speed, and this has an important bearing on costs, the rational way of coping with the flue-dust nuisance is to separate all material smaller than $\frac{1}{4}$ in. from the coarse, and put it into proper condition before charging into the furnace. At some works, (Balaklala, Bully Hill), this is done; the fine ores, when sulphides, are roasted in MacDougal furnaces and then smelted in a reverberatory with the small amount of dust made in the roasting and blast-furnace operations.

¹It may be of interest to note here that with the cheap production of oxygen by Linde's and Claude's processes, it has been proposed to enrich the air used in smelting with oxygen and thereby intensify the rate of smelting.

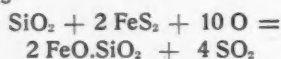
this operation. Where there is a deficiency in sulphur, coal or coke dust or screenings will supply this want. The heat derived from the oxidation of the sulphides fuses and sinters the particles into a scoriaceous mass. The product is broken up and is then in the most desirable form for the blast furnace.

The fine ore is screened from the coarse, and all fines, flue dust and concentrates mixed as nearly as possible in such proportions that the resulting sinter will be a finished blast-furnace charge, which on account of its peculiar cellular structure admirably facilitates the reduction of the metals in the blast furnace. The coarse ores are bedded independently of the fines, or stored in bins and drawn in the requisite amounts for a blast-furnace charge. As the sinter is already a finished blast-furnace charge, it would not enter into the charge calculations, but would be distributed equally among the furnaces. This would simplify blast-furnace practice, increase fuel efficiency, accelerate the furnace speed,

and lower smelting costs all along the line.

The sinter will reduce the amount of dust made and what dust is made can be treated under the most favorable conditions. It will thus readily be seen that this "chemical briquetting" is far superior to the mechanical pressing of fines. The product is an intimate mixture of small clinkered metal and gangue particles, with CaO, SiO₂, FeS, FeO, Cu₂S, etc., in close proximity and by reason of their small individual volumes offering a larger surface, hence larger contact to each other. They are therefore in the most favorable condition for reaction and this partially explains the accelerated speed. Fritted together, they are a mechanical mixture of the slag and metal constituents, which on melting separate into the chemical double silicate of iron and lime and the reduced metal.

When the method is used for agglomerating copper concentrates, it is conducted purely as a sintering process. The roasting of the sulphides is prevented by sintering while the copper-iron sulphides are fused into a solid mass. This retains the greater part of the sulphides undecomposed and makes them available as a valuable source of heat in the blast furnace. The process approaches pyrite smelting, the only special requirement is the provision of quartzose ores for fluxing purposes. It may be contended that it is an advantage to treat fine sulphides in pyrite smelting, as these become more rapidly oxidized. It has been my experience that blocky massive pyrite is oxidized readily, with a desulphurization of from 80 to 90 per cent. so long as there is a continuous reaction between SiO₂ and the iron sulphide, in the presence of air, thus



It is for this reason that quartz ores are an absolute requisite in pyrite smelting. The higher the free silica contents, the better.

DETAILS OF HAAS SINTERING APPARATUS

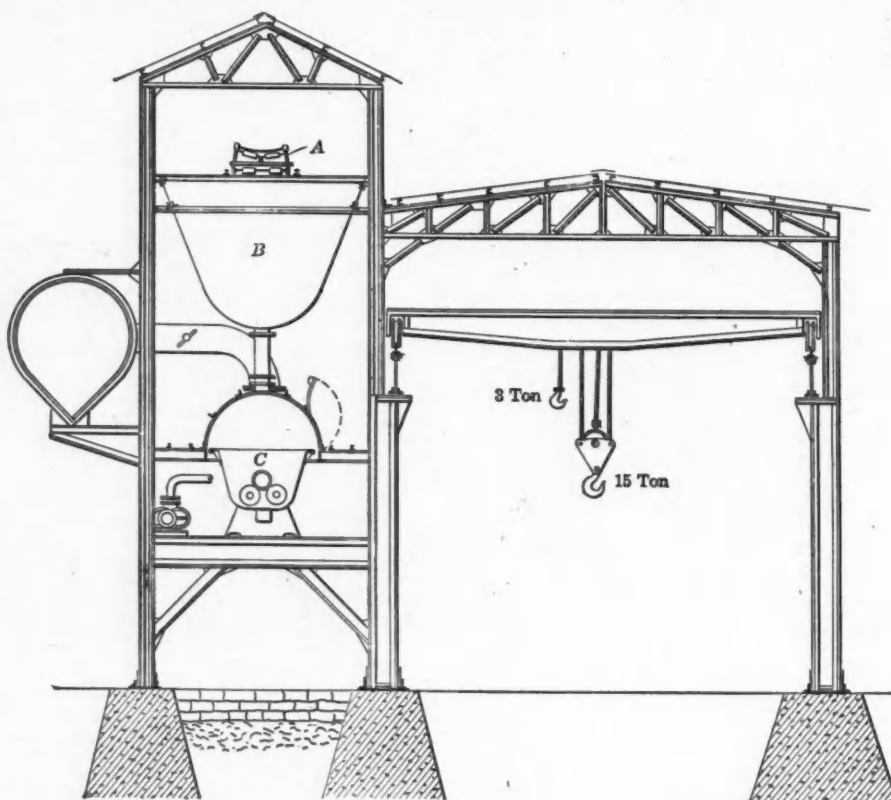
The apparatus shown in an accompanying illustration embodies a number of improvements suggested by the one used at the works of the Compañía Metalúrgica de Torreon, at Torreon, Mexico. Our improvement is the bowl of semi-circular cross section, 6x12 ft., with beveled ends. The lines of the bowl and the curvature of the grate adopted are those found to give the best results and are an essential feature to successful operation. The bowl is made of cast steel and has cast integral with it, hollow trunnions, through which the air is admitted to the windbox and through a number of ports is diffused underneath the perforated grate plates. The grate is of cast iron and made in four sections. These are held down by bolts and are supported by distance pieces of

1½-in. black pipe, and by a rim on the inside periphery of the bowl.

For the removal of ashes or fine material which may sift through the grate openings, two handholes are provided on each long side of the bowl. Similar handholes are in the windbox. The trunnions are finished to 16 in. outside diameter and rest on riding wheels of the same diameter, carried by suitable stands. One pair of end wheels has guide flanges, whereas the other pair has straight treads to allow for the free expansion and contraction of the bowl. In the end of each trunnion is a spherical recess or concave flange, which is finished to receive the spherical male end of the universal air connection. The air connections are stationary, the joint between the

shaft. The second reduction is made by a steel worm and worm wheel, and the third reduction by a pinion meshing a spur gear on the trunnion of the apparatus. The worm wheel and worm run in oil at points of contact. To the armature shaft is fitted an electrically operated magnetic brake. The motor is operated with regulating and reversing controller, having 12 steps forward and reverse. This places the apparatus under absolute and instant control of the operator.

The apparatus is covered with a sheet-steel hood with cast-steel or cast-iron ribbed heads. The steel roof of the hood is reinforced with angles. The middle flange is for connection with the gas flue, and those at each end for bolting to the



A BLAST-ROASTING PLANT

trunnions and the spherical head being adjusted by means of screw, piston and spring. This permits of tilting the apparatus without breaking the air connections or moving the hood, which is also stationary, and of recharging it within five minutes from the time of dumping.

APPARATUS TILTED BY MOTORS

The air in this manner is well distributed underneath the apparatus, and by keeping the trunnions cool, it avoids a large decrease in the strength of the cast steel. The apparatus is tilted at the rate of one revolution per minute by means of a 10-h.p., series-wound d.c. motor, or high torque induction motor. The first reduction is made by a pinion on the armature shaft engaging a spur gear keyed to a worm

spouts of the sulphide and fine-ore bins immediately above. On each long side of the hood are hinged drop doors, which are placed in such a way as to give the operator easy access to any portion of the grate and apparatus.

AIR PRESSURE AND VOLUME AUTOMATICALLY REGULATED

As the proper regulation of the air pressure and volume is most important, and variations of one-half ounce may cause serious irregularities in the working of the charge, each apparatus is fitted with an individual Connersville positive-pressure blower driven by a 3-h.p. induction motor by means of a cut cast-iron gear and rawhide pinion. Blower and motor rest on the same bed plate. The pressure and volume are regulated by a

diaphragm pressure regulator or by an air bell and tank. The pressure at which the apparatus is to operate for a certain length of time being determined, the regulator is set to that pressure, and if the resistance in the sintering apparatus should increase, the pressure is kept at the desired point by the rising of the air bell or the blowing off of the air with the diaphragm regulator. This makes the operation of the apparatus practically automatic.

PRIMING FURNACE SUPPLIES FUEL FOR SINTERING OPERATION

To supply the required fuel for the ignition of the sulphides and the starting of the sintering operation, a priming furnace is used, in which an inferior coal is kept on fire. The priming furnace is a steel cylinder, lined with brick, having a cast-iron, perforated grate properly supported over a hopper-shaped ashpit. Air for burning the fuel is furnished by a small fan or blower. The fuel hopper is charged from a fuel bin above and the gases are conducted into the same flue system that serves the roaster gases. The cast-iron top plate of the furnace is water cooled. One priming furnace serves 10 roaster units. When an apparatus is ready to be charged the blast is turned on in the priming furnace and when the fuel is ignited the amount required to cover the grate of the sintering apparatus is drawn into a scoop car and wheeled to the apparatus.

The fuel, when dumped, is leveled over the grates and a light blast is turned on to ignite the coal thoroughly, when the first charge of about 4000 lb. of sulphides is dropped from the ore and flue-dust bins above. When this becomes hot on top, the second charge is dropped and so on, until the entire charge of 10 tons is spread over the apparatus. Sintering takes from 6 to 12 hours, depending upon the degree of desulphurization desired. Thus, with lead ores, when the finished sinter should not contain more than 2 per cent. sulphur, it requires from 10 to 12 hours. The chemical composition of the charge also influences greatly the time required. Toward the end of the operation the charge is blown with increased pressure to sinter it thoroughly, after which the roaster is tilted and emptied of its contents.

A MODEL SINTERING PLANT SHOWN

An accompanying illustration shows a section through a blast-roasting and sintering plant embodying a few novel features. With this design it is proposed to divert all fine ores, concentrates, and what flue dust is produced, to separate beds in the proportions of a stock mixture. The bedding is done with mechanical spreaders. From these beds the material is picked up by power buckets or shovels and charged into small hoppers, which feed a conveyer system that de-

livers the material into revolving mixers. The mixer discharges unto another conveyer running over the storage bin *B* above the sintering apparatus *C*. Automatic reversing trippers with spouts on each side distribute the material in the bin. Arc gates control the supply of ore through ore spouts to the roasters. The stands supporting the roasters are carried by structural steel framework some distance above the ground floor, so that the sinter, when the apparatus is tilted, will fall 10 to 12 ft., and in falling break up. It is caught in a large boat of steel plate, reinforced with rails.

A crane gallery, being a portion of the building housing the sintering units, is served with a four-motion crane, with 15-ton main hoist and 3-ton auxiliary. At one end of the crane gallery is stationed a 36x24-in. Blake crusher, which serves to break the sinter into proper-sized pieces for the furnace.

SINTERING COSTS

The cost of a plant along these lines, equipped with 20 units having a minimum capacity of 20 tons per unit per day, or 400 tons per day for the entire plant, two primer units, crane gallery and crane, crushing plant for breaking sinter, is estimated at \$7500 to \$8000 per unit, erected at leading Western smelting centers. The accompanying table is a liberal estimate of the cost of sintering in such a plant, with labor at \$2 per shift of eight hours, or \$6 per day of 24 hours.

COST PER TON OF SINTERING WITH 400-TON PLANT.

FUEL AND LABOR.	
Fuel for primer, 1 per cent. on charge, @ \$2.50 per ton.....	\$0.025
Six men for priming, two per shift, @ \$2.....	0.03
One and one-half man per unit, @ \$2.....	0.15
Six crane men @ \$2.50.....	0.06
Three crane operators @ \$3.....	0.03
Three foremen @ \$4.....	0.03
Six laborers @ \$2.....	0.03
POWER.	
50 horsepower-hours per unit for air @ 1c.....	0.025
800 horsepower-hours for crushing sinter @ 1c.....	0.02
600 horsepower-hours for operating crane @ 1c.....	0.015
Crusher repairs, wear and tear, supplies, etc.....	0.03
Repair of plant, wear and tear, supplies, etc.....	0.10
Amortization: 10 per cent. on \$8000 per unit.....	0.11
Interest on invested capital, 5 per cent. on \$8000 per unit.....	0.055
Total estimated cost of sintering per ton.....	\$0.680

To this must be added the cost of bedding, mixing and conveying the material to be sintered, which may vary from 5 to 20c. per ton, depending on the mechanical facilities provided for doing this work. With the time of sintering reduced to eight hours, the above costs would be reduced to 55c. per ton. The total cost of bedding, mixing, conveying and sintering should not exceed 75c. per ton of material sintered, in a well regulated plant, and with labor at \$6 per 24-hour working day. At the Torreon works, with only one unit in operation, and no mechanical

arrangements for handling the material, the total average cost extending over a period of several months was 1.75 pesos.

The accompanying halftones show the apparatus at Torreon in operation, after the discharge of the sinter, and the broken sinter. All of the equipment here described is patented and protected by patents pending. It is manufactured by the Wellman-Seaver-Morgan Company, of Cleveland, Ohio.

Favorable Mining Legislation in Cuba

A recent United States consular report states that the committee on agriculture, industry and commerce, of the Cuban House of Representatives, has reported favorably a bill exempting mining claims and properties, under exploitation or not, from all national, provincial and municipal taxes for a period of 10 years, and extending this exemption for a full 10 years to all mining claims and properties put in operation at any time within the original 10-year period.

During a period of 30 years all vessels entering Cuban ports in ballast, coming from any foreign or Cuban port, and which clear with a cargo of minerals or other products of Cuban mines, are to be entitled to the remission of one-half of the port and tonnage dues paid on entry. During a similar period mineral products are to be exempt from payment of export duties.

During a period of 10 years, machinery, apparatus and railway material imported into Cuba for use in mining and metallurgical industries are to pay no more than the minimum duty prescribed for similar articles when imported for use in the most favored Cuban industries.

According to a report of the secretary of agriculture, labor and commerce, there were 1231 mines and concessions having a total acreage of about 230,000 on Dec. 31, 1907. The province of Oriente leads with 857 mines and concessions, of which 9 were coal, 223 copper, 20 gold, 271 iron, 218 manganese, 3 petroleum and 106 other minerals. The remaining operations are distributed among the provinces of Pinar del Rio, Habana, Matanzas, Santa Clara and Tamaguay. There are also large deposits of iron of good quality which remain unexploited, and also extensive peat beds which, at some future day, will be utilized as fuel and in the production of nitrates.

A report issued by the Mines Branch of the Canadian Department of Mines states that surveys of the iron-ore deposits in the Ottawa valley, near Chats Falls, 30 miles west of Ottawa, show large bodies of ores, which, under the electric smelting process, may be profitably exploited.

Mining Ethics on the Rand

BY ROWLAND GASCOYNE *

Among the Rand mines there is almost always some hobby that is being ridden to death. First, it may be the labor question in its different color phases of white, black or yellow, then the reduction of labor costs by the use of drills, or again the splitting up of the mining properties into small units for flotation as separate companies, to be followed by a wholesale system of amalgamation into some of the largest operations in the world.

REDUCTION OF WORKING COSTS THE CRY

For the last year or two the reduction of working costs has been attracting much attention, and with the Rand practice of publishing individual monthly mine costs there has naturally been a competition among the mines, particularly those with cheap mining facilities, to reduce the working costs to a minimum.

Some time ago there was a wholesale strike among the white, machine, big-check men against the increased use of machine drills, and as a result cheaper men were introduced, the old hands lost former contracts which were not renewed, and white wages were in consequence considerably reduced. To obtain good wages more work had to be done, resulting in increased efficiency and a general decline of working costs, the end of which is not yet in sight.

During the last two years the average cost of working in the Rand has fallen several shillings per ton. In April it was 17s. 6d. per ton with a grade of 28s. 1d., leaving an average profit of 10s. 7d. per ton, while it is confidently expected that in time the average working cost for the whole of the Rand will be brought down to 14s. per ton milled.

INCREASE IN PROFITS NOT IN PROPORTION TO DECREASED COSTS

The reduction of working costs, however, has not always meant an equivalent increase in profits; for instance, the working costs in March, 1909, were 17s. 4d., recovery value 28s. 10d., profit 11s. 5d. per ton, while in March, 1910, the working costs had fallen to 17s. 1d., the recovery value to 27s. 6d. and the profit to 10s. 5d., the profit being a shilling per ton less, in spite of the fact that the costs of working were 3d. per ton lower.

As an explanation of this anomaly, those who control the management of the gold mines say that it is due to the lower working costs enabling a lower grade rock to be crushed at a profit than under the old régime.

*Mining engineer, Ermelo, Transvaal.

Throughout the Rand it has been the custom to leave, wherever possible, the unpayable rock behind in the stopes, and lately, especially when labor was scarce a good deal of this has been broken and sent to the mill. The absorption of the hitherto rejected low-grade developed rock into the accounts has made the labor-scarcity bugbear less appreciable. It has also enabled the management to continue reducing the average working cost per ton milled, but as the figures given above show, these reduced working costs have been effected at the expense of lowering the grade, and, what is perhaps worse, at a considerable reduction of profit.

IMPORTANCE OF ULTIMATE PROFIT DISCOUNTED

In some quarters it is recognized that in this race for low working costs, the object for which mines are generally exclusively worked, namely, profits, has been, to some extent, discounted or overlooked. The bare mention of such a possibility has of course raised howls of disgust among some of the mine managers.

That there is, however, substance to the arguments against the continued quest of lower working cost is shown by the following example: Consider a mine with a monthly milling capacity of 30,000 tons, stope width 4 ft., yield 25s., cost 21s. 6d. per ton. The profits would be £5250 per month. Now suppose the working costs must be reduced, and to do this lower grade and more cheaply worked rock is mined, possibly by increasing the width of the stopes a foot, thereby bringing down the recovery value to 20s. per ton. The object aimed at will have been achieved, as the working costs will have been lowered from 21s. 6d. per ton to 20s. per ton milled, but the profit will also have disappeared. This may be an exaggerated example, as no manager would knowingly aim to run a mine at no profit; but the figures are quite reliable, and establish the fact that crushing low-grade rock affects the recovery value more than the cost and causes a marked effect on the profits. This seems to be the tendency of conditions on the Rand.

RUN THE MILLS TO SUIT THE MINES

Granting that the lowering of the costs makes available thousands of tons of developed ore that can be worked at a slight profit, the question arises as to how this altered condition of affairs is best to be taken advantage of. Hugh F. Marriott of the Eckstein group of mines has recently

visited the Rand and caused somewhat of a mild sensation by insisting that the mills should be run to suit the mines, and not, as has hitherto been the practice on the Rand, the mines worked to suit the mills. He would work no ore but that known to be capable of producing a fair profit, and would therefore deal with the ore according to its merits. This doctrine has naturally caused much discussion on the Rand, where in some quarters it is regarded as sailing near to selective mining, i.e., picking out the most payable section of the reef and leaving the rest.

Naturally the question arises as to where the differentiation is to be made between ore workable and ore unworkable at a fair profit. If the race is to be for maximum profits in place of lowest working costs some of the managers may be charged with "picking the eyes out of the mine," a practice hitherto shunned on the Rand.

COMPLICATIONS DUE TO VARIABILITY OF GRADE

Mr. Marriott's suggestion to only work ore capable of producing a fair profit cannot always be strictly followed on the Rand, where the grade often varies considerably on limited areas, and to work out only payable ore would in many mines seriously affect the system of working, probably in the end landing the mine in a bad way. Frequently unpayable ore has to be worked in order to get at payable ore, and sometimes stope faces that sample as low as 3 dwt. often treble or quadruple in grade within a few feet. What is meant by Mr. Marriott is probably that the manager aim at the highest profits possible, consistent with the best operation of his mine.

TON MILLED OR SQUARE FATHOM STOPED

Another proposal by Mr. Marriott to substitute the square fathom stoped for the ton milled in the monthly returns as a cost and productive unit has also met with opposition on the Rand, principally on the ground that to alter the present practice in that direction would be equivalent to throwing doubt and suspicion upon those in charge of mining operations.

It has already been shown how easy it is for the ton-milled unit to be so increased as to lower the working costs per ton and even destroy the last vestige of profit. So if low working costs per ton are to decide the merits of the manager, basing the costs on the tonnage milled readily allows of the manipula-

tion of the cost sheet, whereas the square fathom stoped would perhaps enable a manager or consulting engineer to detect any spot not conducive to efficiency or economical mining.

CLEANER STOPING PROVES PROFITABLE AT ROBINSON DEEP

The objective on the Rand seems now to be veering round in the direction of cleaner mining and larger profits per ton by crushing such rock as to obtain the highest yield. This cleaner stoping idea seems to have received some confirmation from the results obtained at the Robinson Deep mine. The results of the operations for the first four months of 1910 are summarized in the accompanying table.

SUMMARY OF OPERATIONS AT ROBINSON DEEP MINE.

Month, 1910.	Stamps.	Tons Milled.	Value.	Per Ton.	Working Costs, Per Ton.	Total Profit.	Profit, Per Ton.
Jan.....	300	47,900	£71,418	29s. 10d.	18s. 1d.	£28,121	11s. 9d.
Feb.....	300	43,100	66,970	31s. 1d.	18s. 0d.	28,242	13s. 1d.
Mar.....	300	44,400	71,269	32s. 1d.	18s. 3d.	30,806	13s. 10d.
April.....	240	42,400	69,459	32s. 9d.	18s. 6d.	30,189	14s. 3d.

It will be seen that with a less number of stamps dropped, a lower tonnage milled, the grade improved and the costs increased, but the profits were nearly £2000 higher for April than for January, when 5000 tons more were milled; the profit per ton milled was appreciably higher. The results are the reverse of those attained on the Rand during the last two years, when the tons milled have increased, while the working costs per ton and profits have both decreased, the latter out of all proportion to the reduction in working costs.

TWO POLICIES OPEN

The possibilities for mining operations on the Rand are, therefore, to go in for cleaner stoping, if possible sending out of the mine nothing but ore that can be milled at a fair profit, thus attempting to obtain the maximum possible profit; to go in for as large a mill as possible, bring down the costs to the lowest limit by means of a large output, and to send out of the mine all ore that can be worked at any profit. The conditions at each mine will have to decide which is the best policy to pursue. It is evident that where the mine is comparatively shallow and the ore of fairly uniform grade, the clean stoping policy may be pursued with advantage, but to obtain the best results of the small-mill policy as much of the rock as is unpayable will have to be left behind in the mine.

UNIFORMITY OF GRADE DETERMINING FACTOR

Where the gold content of the ore varies considerably over limited areas, it seems likely that in the long run the big-mill and output policy will best suit the mines. Then the question as to where

the line is to be drawn between the payable and unpayable ore will clearly depend upon the conditions prevailing at each individual mine. The question of development naturally somewhat complicates the situation, as at the present time development charges seem to be carried by the higher grade ores only. However, the time seems fast approaching when considerably less will be spent on development in mines with ore of variable grade, as the mining conditions will make it necessary to extract the whole of the reef. Already there are some mines on the Rand where 3-dwt. ore will easily meet all charges, development included. Whichever policy is pursued there will, however, always be room for abuse, and the best

and it is probable that the deposits extend far beyond the areas examined, forming, perhaps, the largest phosphate field in the world.

All public lands supposed to contain valuable phosphate deposits are now withdrawn from entry, but it is understood that the withdrawals are only temporary and are intended to enable the Geological Survey to determine exactly the character of the lands, to prevent further entanglements of entry, and to preserve the present status of the lands until action is taken by Congress.

A Rapid Sampling Filter

One of the difficulties which all cyanide-mill men have to contend with is that of obtaining quick and accurate samples of the work being done in the treatment tanks, as the treatment progresses. This applies both as to the solution and the slimes. The usual method of settling and decanting the solution from the sample, then adding wash water, mixing, settling and again decanting, is a long and tedious process, and the final results are often only obtained after the treatment is completed.

An adaptation of the Just Process Company's silica sponge is claimed to enable accurate sampling of both slimes and solution in a few minutes after the original sample has been taken from the treatment tank. The pulp sample is poured into any convenient receptacle and the filter is immersed in it. Connection is made through a Wolff bottle to a convenient suction line and a cake of any desired thickness is drawn on the porous cylinder, the clear solution being caught in the bottle.

For washing, the cylinder with the cake on it is placed in another jar containing fresh water, and the suction continued until the solution shows no further reaction for KCN. The cylinder is lifted from the jar and the vacuum continued until the cake is so dry that it cracks and can be removed with a spatula, leaving the surface of the silica sponge perfectly clean and ready for the next sample.

Frequent experiments have shown that in 15 min. from the time of taking the sample from the treatment tanks, the solution is ready for titration and the cake is dried and ready for the assay furnace. These filters are being manufactured by the Just Process Company, 45 Broadway, New York.

A lot of 320 mules left Lancaster, Mo., Aug. 29, for service in the De Beers diamond mines in South Africa. They went by rail to Quebec, thence by steamship to Cape Town, and again by rail to Kimberly. The mules were all from Missouri, and warranted to do good service by Col. W. P. Hall, who collected them.

results will be obtained where the milling policy adopted harmonizes best with the underground conditions.

Western Phosphate Deposits

The availability of even low-grade phosphate rock for use as a fertilizer gives importance to the extensive phosphate deposits in Idaho, Wyoming, and Utah, many of which are on government land. The total area of public phosphate lands now withheld from entry is more than two and a half million acres.

Portions of the lands thus withdrawn were examined in 1909 by Geologists H. S. Gale, R. W. Richards and Eliot Blackwelder, of the United States Geological Survey, whose reports have just been published. The deposits are described and mapped in detail and estimates are given of the available phosphate in the several areas considered.

NATURE OF THE PHOSPHATE ROCK

The phosphate rock is chiefly of oölitic structure, consisting of masses of round grains closely cemented together with other material, generally calcite. These grains differ greatly in size in each mass of rock, ranging from microscopic pellets to pebble-like bodies half an inch in diameter. Chips of shells and small fragments of plants are in places included in the rock. The rock at different places differs in color, ranging from gray to jet black, the darker shades being probably due to the presence of bituminous matter.

LARGE PHOSPHATE RESOURCE

The areas examined contain more than 267 million tons of high-grade phosphate rock, little of which has yet been mined,

¹Bull. 430-H. U. S. Geol. Surv.

The Lordsburg Mining District, New Mexico

By E. D. Fry*

The Lordsburg mining region is 2½ to 10 miles south of Lordsburg, Grant county, N. M., and embraces the low, short range of the Pyramid mountains. It lies in the angle formed by the Southern Pacific Railroad on the north, and the Arizona & New Mexico Railroad on the east. The first discovery of ore was made in 1870. Nothing of importance was done, however, until 1880, when the Southern Pacific was completed to Lordsburg. The greatest activity of the early days was at this time. The mining camp of Ralston, afterward called Shakespeare, sprang up in the hills as if by magic. Several attempts at milling and smelting were made, but the ore proved too difficult for the methods of treatment then in vogue.

GENERAL GEOLOGY

The Pyramid range seems to be of Tertiary age. The focal point of dynamic energy was centered about Pyramid peak, from which it takes its name. The principal country rock is andesite. In the central and northwestern part of the mining area the rocks are more coarsely crystalline.

There appear to be two general types of veins or zones. The first is the true fissure toward the central and northern parts of the range. The second is the sheared or shattered zone in the southern part of the mining area. In either case the enrichment appears to have been from below, as shown in the Eighty Five company's Emerald shaft, where a depth of 500 ft. has been attained, and in the Superior workings, which are down 500 ft. These two properties have attained the greatest depth. In these properties the zone of oxidation extends 400 ft. deep. Subsequent action of descending waters has altered the primary sulphides near the surface, redepositing the metallic contents at greater depths, forming the zone of secondary enrichment.

FAVORABLE RESULTS OBTAINED AS DEPTH IS GAINED

The most favorable aspect of this region is noted in the gradual enrichment of the ore with depth. In every case where a depth of 200 ft. or more has been attained the ore is of a higher grade and less silicious. The Lordsburg mining region is divided into two districts, viz: The Pyramid district occupying the country about the base of Pyramid peak and the Virginia district embracing the remainder of the range north of the Pyramid district and south of the Southern Pacific railway railroad.

*Lordsburg, New Mexico.

Geyserite in Germany

JENA CORRESPONDENCE

Geyselite, also called pealite or silicious sinter, a variety of opal ($\text{SiO}_2, x \text{H}_2\text{O}$), is known to occur in large quantities only in the Yellowstone park, in Iceland and in New Zealand. On account of its peculiar physical properties it is extensively used in the manufacture of enamel, bisque and silica glass, to all of which it imparts great resistance to heat and indifference to sudden variations in temperature.

By act of Congress, the United States forbids the exploitation of minerals in the Yellowstone park, hence the geyselite occurring there remains intact; the exploitation of geyselite in Iceland has been granted by the Danish government to a French syndicate, and the sole right to extract the geyselite of New Zealand is vested in an English-American syndicate.

quire any blasting. It is trammed to the sorting place where boys break the large lumps and pick out the whitest pieces. These are loaded on cars and by means of a gravity tramway sent down to a mill where they are reduced to a fine powder. In this shape it is sacked and hauled to the railway station. The geyselite has a foliated structure and in its hollow places frequently shows traces of quartz crystals which detract somewhat from its value. The quarry is owned by a private company of Usingen.

The Zacatecas-Durango Railroad

Consul General Charles M. Freeman, of Durango, Mexico, reports: Before the merger of the National Lines of Mexico a concession had been granted to build a railroad from the city of Durango to Gutierrez, a station in Zacatecas on the Mexican Central. American capitalists were to finance the road, and engineers



GEYSERITE QUARRY AT USINGEN, GERMANY

The marketing of this valuable mineral is thus nearly a monopoly.

OCCURS AS A FISSURE IN DEVONIAN SLATE

It was natural then that the recent discovery of a deposit of geyselite near the town of Usingen in the Taunus mountains that promises to become quite productive was hailed with satisfaction by German consumers. Upon the occasion of a casual visit to the famous watering place of Homburg vor der Höhe, I made an excursion to the geyselite quarry which is situated nearly due north from there and may be reached in 1½-hours' time. The deposit fills a fissure in clay slate of the Devonian age about 200 ft. wide and may be traced on the surface for 1000 ft. or more. It is at present quarried on a small scale, only four men and a number of boys being employed. The rock thus far exposed is loose and does not re-

were locating the line. The panic of 1907 stopped this and when times were such that work might be continued the merger was accomplished. The National Lines of Mexico acquired the concession and will build the road which, on account of the lack of railroad facilities, is practically undeveloped. The new line will be, approximately, 155 miles long, about the same distance as the present line from Durango to Torreon; 62 miles will be in the State of Durango, 93 miles in the State of Zacatecas. An outlet is thus made for the important mining camps of Sombrerete, 9000 inhabitants; Chalchuitas, 4000; and a number of smaller ones. The estimated cost of building the road, exclusive of rolling stock, is \$3,000,000, and to make sure of its completion the State of Durango has given \$300,000 subsidy, the state of Zacatecas \$340,000, and private individuals \$70,000. The greater part of the right of way has been donated.

Notes on the Archean Rocks of Mexico

SPECIAL CORRESPONDENCE

Along the Pacific coast and extending as the floor of the ocean, and in the interior of Oaxaca and Chiapas and the southern part of Puebla there are Archean rocks of considerable area. Those along the coast are of little moment, except geologically, inasmuch as to my knowledge there have not been discovered mineral depositions of consequence, whereas the development of these rocks in the interior is the seat of mining activity, particularly for gold.

The basal member of this series of the oldest known rock group is a biotite granite, grading through a granitic gneiss to gneiss and crystalline schists. On the Pacific coast in Chiapas, Oaxaca, Guerrero, Sinaloa, Sonora and part of Michoacan they form the base of the coastal range and often the western flanks. In Colima, Jalisco, Tepic and part of Michoacan, however, the Mesozoic sedimentary and Tertiary igneous rocks completely cover the Archean, reaching to and beyond the ocean's edge. Here we find a country resembling that of the Central Plateau, containing fissures mineralized at times to a commercial grade. In Michoacan, where the Sierra Madre del Sur begins to rise, the younger rocks thin out and cease, while the underlying crystalline schists reach the surface and extend to the south.

CENTRAL BASIN OF MEXICO

The Central basin of Mexico is composed of strata of Cretaceous sedimentaries, the depth of which is certainly remarkable, followed to the south, near Mexico City, by a region of modern volcanoes from which there have been poured thick beds of basic lava extending well into Puebla and Guerrero. In the interior of Puebla, Oaxaca, and Chiapas, extensive development of the Archean rocks is met, and passing under the Sierra Madre del Sur is again picked up on the west coast. Not infrequently in Puebla and Oaxaca a vigorous erosion has worn its way through the Mesozoic, exposing the underlying Archean formation of crystalline schists, gneiss and granite. The younger rocks evince a certain independence of their own, clearly distinct from the ancient, and without any intimate relation other than a simple contact. The intrusive and eruptive rocks have been forced through the older rocks, which underly the sedimentaries. Any intermediate group, that is, Paleozoic formations, seems to be wanting here as elsewhere throughout Mexico. There are found in places certain schistose rocks lying between the Archean and Mesozoic, apparently for the most part conformable

with the latter, and clearly of a sedimentary origin of not earlier than late Jurassic.

ARCHEAN ROCKS ON PACIFIC COAST

A comprehensive history of the Archean rocks of Mexico has not been compiled. The isolated situation of large areas along the Pacific coast and their lack of mineral deposits have not been conducive to intelligent and thorough investigations. Moreover, intense and recurring dynamic activities have tended to partly obscure their past. They are supposed to have played a leading rôle in the physiography of Mexico's lofty coastal ranges. Along the coast the relief has been carved by the erosion of younger sedimentary and igneous rocks, the more ancient rocks enjoying far less prominence due to lying at the base of the ranges or on the Pacific slopes. In the interior the Archean alters the topography, and is much better known to the geologist, engineer and prospector. It also rises to much higher altitudes than along the coast. In the latter case crystalline schists are more common; the gneiss and granite are deeper, while in the interior the lower series, that is, the gneiss and granite, are often at the surface and at the same time much higher than even the crystalline schists of the coast. It is rather the exception to encounter Archean granite in quantity along the coast. Certain diorites and granites in Guerrero, and syenites and granites in Michoacan of a later age should not be confused with the Archean granite.

CHARACTER OF ARCHEAN ROCKS

In a bulletin of the Sociedad Geologica Mexicana under the title of "L'Archaïque de Cañon de Tomellín," Ordóñez states that in a general way one may say that in the deeper parts of the Mexican Archean a biotite granite dominates, slightly schistose, and sometimes intercalated with a white mica gneiss and series of amphibole and pyroxene gneiss. These two last types are not thick nor do they occupy a well defined position within the first. Passing from one horizon to another the biotite gneiss is succeeded by important series of green chloritic schists and mica schists which form with the biotite gneiss an extensive group, particularly in the lower part of Guerrero not far from Acapulco, also on the isthmus of Tehuantepec. In these localities the granite and the gneissic granite are found under the biotite gneiss. He says that the patches of crystalline schists along the Pacific coast have been dis-

sected at different epochs by systems of fissures, now filled with quartz and pegmatites, which in places are garnet and tourmaline bearing. The aspect of the crystalline schists in the interior is absolutely different. They are darker; the stratification is more pronounced; the lamination more readily discerned; they exfoliate with facility, while folding and faulting are not uncommon.

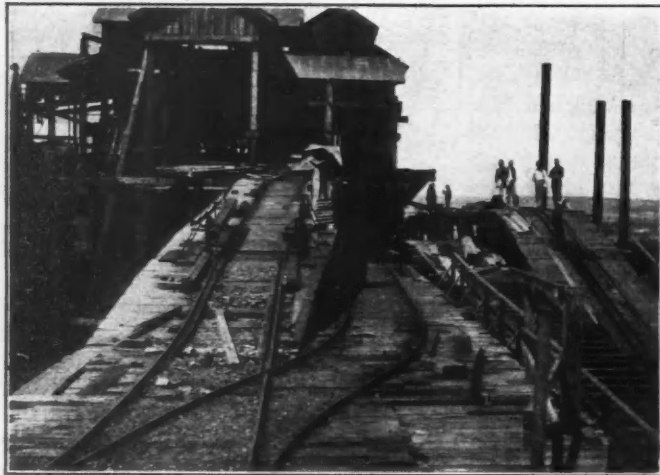
IGNEOUS INTRUSION

The pressure of the overlying Mesozoic strata and the stresses produced by the intrusion of igneous rocks, incidental to the mountain-forming processes of the Pacific and Gulf ranges, have distorted and ruptured to a greater extent the interior Archean rocks. Fusion has effected a certain recrystallization in places and resulted in the segregation of some of the minerals. The frequent lenses of quartz resemble magmatic segregations rather than deposition from aqueous solutions. A similar genesis may account for the presence of the pegmatites which are of frequent occurrence. Garnet zones have been developed; also segregations of such dark minerals as amphibole, pyroxene and biotite, in addition to being present as primary constituents of the rocks. Following this rearrangement of the minerals, came block faulting, shearing and crushing, apparently caused by the inequalities in the pressure and stresses within the rocks introduced by erosion. Graphite, serpentine and chlorite bear witness to friction and alteration of primary minerals. The metamorphic rocks in which stratification has been produced exhibit generally a slight dip to the north, but locally are often crumpled, folded and crushed.

In the southern part of Puebla the Archean is represented by mica schist and some gneiss, both of which are highly dissected by numerous small and medium quartz lenses. This region is also of some interest to the mining engineer, as commercial deposits of silver and copper ores are found. But my experience leads me to believe these deposits are confined to the Mesozoic sedimentaries; and where there are Archean rocks in the locality, I suspect that the depth of the former is not great. I believe that these deposits are in many cases but the remnants of veins worn down to their roots by erosion. Without doubt this region is part of the metalliferous province to which central and northern Puebla belong; in the latter case, however, the Archean rocks are deeply buried, and the mineral deposits bid fair to be of commercial importance.

GOLD CONCENTRATES ALONG FAULT ZONES

In Oaxaca the gneiss as a rule is auriferous. This metal is frequently concentrated in sheared and crushed zones. The desideratum ought not to be so much a strong quartz lens as a zone which has been subjected to shearing and shattering. Frequently the path of least resistance has been determined by quartz lenses which later have become mineralized; but not all quartz lenses are mineralized, even slightly; the quartz veins in the gneiss of Oaxaca are in poor repute, and numerous abandoned workings exist today. Rich stringers and pockets of gold ore, more or less common in the mineralized lenses, have been the *ignis fatuus* which has bolstered up the hope of the operator, but invariably a lack of persistency has characterized the deposit. The more promising developments in this district are recorded where the mineralization has taken place in a sheared zone, or where a considerable movement has occurred in conjunction with the accidental presence of a quartz lens. It



TIPPLE AND TRACKS OF THE NEW SABINAS COMPANY

should be recognized that sheared and crushed zones are the indications of the more extensive concentration of gold, irrespective of whether or not quartz lenses are in evidence, and that the latter are but segregated matter from the immediate rocks rather than vein or lode filling.

Accompanying the gold there is usually a small amount of pyrite, occasionally arsenopyrite, and a trace of copper. While silver may be also present, it is only a matter of a few grams. The gangue is highly silicious, often entirely of amorphous quartz. The gold is largely free milling, and when amalgamation is followed by cyanidation a saving of over 90 per cent. is assured. Operations are being conducted in the gneiss at such camps as Santa Catarina, El Parian, El Socorro, Tlacolula, Peñoles and Ejutla. At certain properties, for instance, Santa Sofia, El Socorro and Zavaleta, most encouraging showings have been made both in grade of ore and tonnage developed.

Coal Mining in Mexico

BY ANDREW ROY*

Sixty miles south of Eagle Pass, on the line of the Mexican International railroad, in the State of Coahuila, Mexico, there is an extensive coalfield, which is being rapidly developed. The coal belongs to the Cretaceous formation and ranges from 4 to 7 ft. in thickness. This field was entered by an enterprising coal company of Americans 10 years ago, which organized as the Las Esperanzas Coal and Coke Company.

The venture was so successful that it attracted other coal men, and there are now five large coal companies operating in this field, namely, Esperanzas Coal and Coke Company, operating three mines; the Compañia Carbonifera, four mines, with headquarters at Agujita; the Compañia Carbonifera, five mines at Rosita; the Coahuila Coal Company, five mines at Palau; the New Sabinas Coal and Mining Company, one mine.



MINING TOWN OF AGUJITA, MEXICO

AGGREGATE OUTPUT OF COAL

The aggregate output of coal of this field last year exceeded 2,000,000 tons, and will considerably exceed this amount the present year. A new company is drilling for coal at present and will begin sinking several shafts the coming fall.

Two of the companies make coke from the coal, the Esperanzas Company, and the Carbonifera Company, at Agujita. The Rosita Company is building ovens and will soon be producing coke. The coal makes a good, firm coke, and finds a ready market in southern Mexico.

The miners of this field are all native Mexicans. The temperature of the mines ranges from 70 to 90 deg. The miners disrobe before starting to work, and wear a thin robe around the lower parts of their bodies. On the whole they make good miners. The coal being of lignite age is soft and easily undercut. Many

*Agujita, Coah., Mex.

of the miners are men of high character, and after they return from their work, they wash all over, don good clothes and a sombrero, and walk about town with erect figure and proud mien.

This class will compare favorably with our American miners. Some of them own their own houses. The climate is so mild in winter, that frost and snow never come.

Mexican Salt Concession

A concession has been granted for the exploitation of the salt deposits on the west coast of the State of Jalisco. Practically the entire output will be exported and sent to the cities of the Pacific coast by water, and it is quite probable that they will be of sufficient volume to affect the price of that commodity in such cities as Los Angeles, San Francisco, Portland, Tacoma and Seattle. This concession, with those already granted, brings the total number of those of recognized

importance up to three. The largest of these concessions is in the Tres Marias group of islands, a short distance from the port of San Blas, in the Territory of Tepic. These deposits are controlled by a Mexican syndicate, which has California connections for the sale of its output. Consul-general Arnold Shanklin says that it is believed that the salt deposit for which the new concession has been granted presents opportunities for an output larger than that at Tres Marias.

In July, 1909, 200 stamps were dropped in the mills of the El Oro Company at El Oro, Mexico, the average stamp duty being 4.25 tons per 24 hours, and a total of 24,236 tons were crushed. Three tube mills were added to the equipment of one of the 100-stamp mills, the other mill closed, and by June, 1910, a stamp duty of 10.33 tons had been attained. Everything is slimed and in June, 30,026 tons were treated, or about 1000 tons per day.

West Virginia Oil and Gas Notes

SPECIAL CORRESPONDENCE

In the extreme southwest corner of the State, where the wildcatter has been fairly active all through the year, there is less prospecting than at any previous time in the past 2½ years. Kanawha county has three tests drilling and one rig up, located in Elk-Cabin creek and Malden districts. Although it has had a more thorough testing than any other county, only a few light pumpers have ever been found. Wayne and Cabell counties each have one rig, but in these counties only one pool, the Big Lime (in the latter) has ever been found. Drilling recently has been to find the extension of the Big Lime pool.

In Logan county, the Bremmer Oil Company has lately struck a 5,000,000-ft. gasser on the Guyan river, but no oil has yet been discovered in the county.

A very large area has been leased in Putnam county. Much of it is held in large blocks by some of the larger operating companies, and there is already evidence that they intend to give their holdings a thorough test. In Curry district, gassers of fair volume have been found and this is accepted as an encouraging feature.

The test work that was projected early in the year in Upshur county has not materialized. It will be of some interest to see some systematic testing there.

THE LINCOLN FIELD

In Lincoln county, owing to the way the old wells are holding up, assisted by the new, the daily production of the county is showing only a small decrease. There is a little test work starting and under way along the edges of the producing district.

THE RITCHIE FIELD

On Tucker's run, in Curtis district, the United Fuel Gas Company has drilled a test on Sparks farm through the Berea grit and has a 5,000,000-ft. gasser. Near by, the same company has drilled its test on the R. H. Petty farm through the Berea grit, and has a gasser with a capacity of 8,000,000 ft. a day. On Stover Fork, the United Fuel Gas Company has a 6,000,000-ft. gasser at its test on the S. Blackwell farm. The same company's test on the W. Roberts farm is a good gasser in the Berea grit.

On Hushers' run, Grant district, the Jersey Oil and Gas Company has drilled a test on the F. Marsh farm, through the Keener sand, and has a gasser with an estimated capacity of 30,000,000 cu.ft. a day.

On Indian run, Murphy district, the Carter Oil Company has shot No. 3 well

on the G. Y. Rexroad farm and has an 80-bbl. producer in the Keener sand.

The Fischer Oil Company has shot its No. 7 on the P. R. Tharp farm and it produced 90 bbl. the first 24 hours.

TYLER AND WETZEL FIELDS

On Middle Island creek, Lincoln district, the Melrose Oil and Gas Company's No. 9, on the J. Meredith farm, is a natural producer good for 100 bbl. a day, and the Pure Oil Company's No. 9, on the R. W. Kyle farm is showing the same production in the Keener sand. The Schlagel & Fried producer, in the Maxon sand of Union district, has declined considerably from its initial yield of 340 bbl. per day.

On Fishing creek, Grant district, N. S. Snyder & Co. shot their test on the M. J. Welch farm and have a Gordon-sand producer, yielding 110 bbl. a day. This well is a wildcat, for the nearest Gordon-sand production is a mile to the east, so the strike makes the development of a new pool probable. The same people drilled on the P. Fleming farm on the North fork and, finding nothing in the Gordon, passed to the Fourth sand and struck a 4,000,000-ft. gasser.

THE OHIO FIELD

At Wheeling, the Warwood Oil Company was incorporated with \$40,000 capital, by S. Nesbitt, Jr., L. S. Whitehead and E. W. Westwood.

At Glen's run, on the river front, in Richland district, there has been no new development since the Virginia Oil and Gas Company completed its test on the W. A. Stenger farm and got a gasser. There are four test wells drilling in that district, and these, when completed, will furnish some pointers as to the probable future of operations in the development. Up to the present there has not been much discovered. One gasser and two light producers are all that have been completed.

THE ROANE FIELD

A good deal of interest has been centered in the Big-Injun sand territory in the Smithfield district. Late completions to the south and southeast of developments show that the producing limits in these two directions have been reached, this opinion being based on the recent completion of six dry holes. Inside of defined limits, on Clover and Rush runs, there are still good producers to be had, and in that locality there is the greatest activity. The completed wells range from light pumpers to 50-bbl. producers.

On Green creek, Walton district, the

United Fuel Gas Company's No. 13 well, on the D. Larch farm, is a strong gasser, estimated at 10,000,000 cu.ft. a day.

Roane is one of the two counties that has been able to show an increase in development work during the summer. Walton district held the lead for many months, but has now been supplanted by Smithfield. Recent efforts in the last field named have not been very successful, numerous dry and gas wells having been encountered where better results were expected; unless an extension can be found in some other direction, there will be a let up in operations in that district. A few of the larger operating companies are curtailing development work and starting nothing new, except where it is necessary to protect the leases that are about to expire by limitation. The production of the county has increased steadily all through the year, and it has furnished a greater volume than any other county in the lower southwest.

THE CALHOUN FIELD

Calhoun county has been fully tested. A large amount of territory has been leased in this county and the chances are favorable for finding additional production. On Bear run, Sheridan district, the Sherwood Oil and Gas Company has drilled on the Bachman farm through the salt sand and has a gasser with a capacity of 4,000,000 cu.ft. a day.

THE MONONGALIA FIELD

It was recently the opinion of some practical operators, based on certain geological conditions, that a new field could be opened in Clinton, Clay and Cass districts. All of the tests completed were drilled through all sands, and all proved failures. A very large acreage is under lease, but there is nothing to indicate a renewal of operations. The gas companies were jointly interested in this experimental work, and hoped to find a new and convenient source of supply. The neighboring fields have been pretty well exhausted, and each year sees the larger companies forced to go farther into the interior of the State for a supply that will meet the demand. Greene county, in Pennsylvania, and Wetzel and Monongalia counties in West Virginia, seem to be no longer capable of supplying any considerable amount.

THE MARION FIELD

On West fork, Grant district, the Hope Natural Gas Company, on the J. N. Koon farm, is through the fifth sand and has a fair gasser. On Koon run, in the same

district, the same company on the Z. T. Richter farm, secured a fair gasser in the Bayard sand.

On States fork, Mannington district, the Burt Oil Company has a promising producer in its No. 4 on the Baker farm. When the pay was tapped in the 30-ft. sand, the well began to flow and produced 185 bbl. the first 12 hours. It looked as if it might develop into a real gusher when drilled deeper, but it failed to increase its production and declined to the pumper class in a few weeks.

OTHER FIELDS

In Harrison, Doddridge, Tyler and Lewis counties, the various gas companies operating in the lower southwest have increased their development work. All have been meeting with good success and it is not likely that any of the companies drawing their supply from West Virginia will be troubled with a shortage during the coming winter. Full one-half of the work under way in the counties named is booked by the gas companies.

In the southern end of the Shinnston pool, Harris, Groves & Co. have another good well on the Thompson farm. At 70 ft., in the 50-ft. sand, the second pay was encountered and the well increased its flow to 20 bbl. an hour and placed 500 bbl. to its credit the ensuing 24 hours. No. 2 on the same farm is still holding up to 250 bbl. a day.

A few months ago the production of the Shinnston pool was down to about 2000 bbl. a day. Then the extensions were discovered and since the production has been increased to about 3500 bbl. a day, and the size of the walls now coming in makes it look as though it could be held at that point for some time.

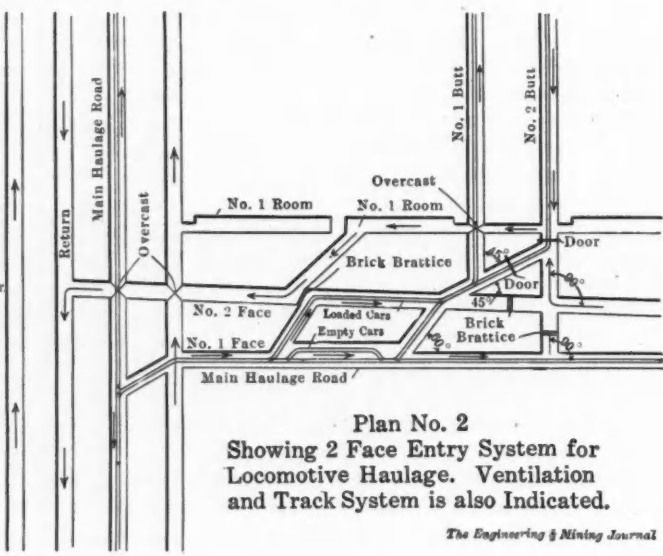
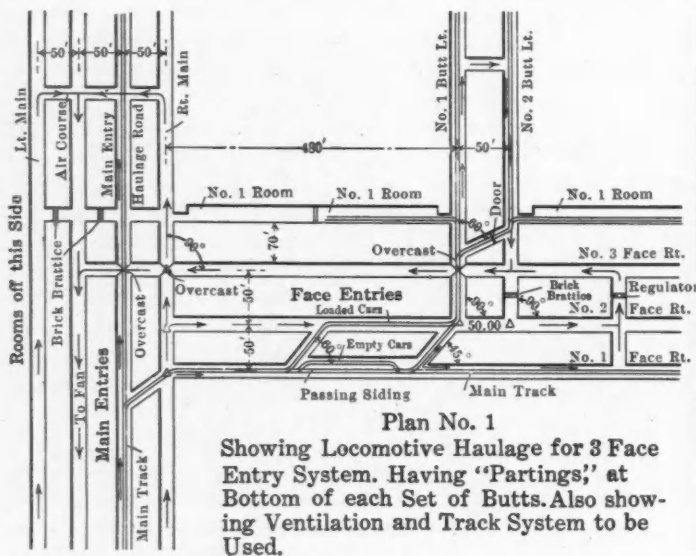
On Rock Camp run, southwest of the Old Wolf Summit field, there is a Gordon-sand development that has been under way for several months. A total of a half dozen wells is now drilling. Groves, Rowland & Co. and Hoffmeir & Deegan were the first to get the work started when they secured good producers at their initial wells on Dennison's farm.

Arrangement of Partings in a Coal Mine

BY H. J. NELMS*

The arrangement of partings at the bottom of butt entries usually gives a mine superintendent considerable trouble in keeping ventilation intact. The plans accompanying this article show the three methods that are usually employed in modern mines where locomotive haulage on face entries is used.

It is common practice for the mine operator to use a locomotive weighing from 10 to 20 tons on his main entry, and to employ such locomotives to haul the coal from the big inside parting to the tippie or bottom of the shaft; the operator likewise uses a locomotive weighing from 5 to 8 tons on his face entries, which motor gathers the coal from the rooms and delivers it to small partings. See Plan No. 1.



Plan No. 1
Showing Locomotive Haulage for 3 Face Entry System. Having "Partings," at Bottom of each Set of Butts. Also showing Ventilation and Track System to be Used.

Plan No. 2
Showing 2 Face Entry System for Locomotive Haulage. Ventilation and Track System is also Indicated.

The Engineering & Mining Journal

The discovery of an east and southeast extension to the Shinnston pool, in Clay district, has been the incentive for a renewal of activity, the South Penn Oil Company being the largest holder of leases in the extension and the most aggressive in development work. There are about a score of strings of tools running, and of this number the South Penn Company has about three-fourths. The production of the pool is higher than three months ago, due to the completion of new wells in the east and southeast extension. To the northeast of the old development, on Horner's run, Miller & Co. drilled in their No. 5 on the Nimshi Nuzum farm and secured a producer that had the highest initial production of any well recently completed. It was credited with making 585 bbl. the first 24 hours after it was drilled into the 50-ft. pay. Miller & Co. have been meeting with very good success on this farm; Nos. 1 and 2 were large producers.

On Duck creek, Grant district, the Hope Gas Company's test on the H. J. Burnside farm is holding up to 25 bbl. a day. It was completed recently and got its oil in the Gordon sand. There is a good deal of speculation as to the result of the next tests in that locality, as previous to drilling this well the territory was regarded as good for gas only.

The Rogers-Brown Iron Company, of Buffalo, N. Y., is planning the construction of a fleet of barges to operate on the present Erie canal and adapted also to use on the new enlarged canal. The boats will be equipped for use on both salt and fresh water and fitted with moveable hatches similar to those on the large lake ore boats. The tugs will have dynamos and electric cranes for handling pig iron to and from the docks. The latest design of coal-saving machinery will be used.

USING FOUR MAIN ENTRIES

The plan shown in Fig. 1 illustrates the arrangement used where the operator employs four main entries, or three main entries and three face entries, the latter turning off the mains at 90 deg. The first face entry has a haulage road on it. The chute for the butt entry turns off this face entry at an angle of 45 deg., while the butt entry turns off the second face entry at 90 deg. Between the main entry and the butt entry chute a 60-deg. chute is turned off the first face entry and connected to the second face entry. The first face entry is double-tracked from this latter chute to the butt-entry chute. See Fig. 1. The gathering locomotive coming off the main entry from the main parting, comes down the face entry to the double track here mentioned, where it enters the side track and cuts off 15 empties, leaving them on the siding. The lo-

*Castle Shannon, Penn.

comotive then continues on to the next butt where it gathers its loaded trip off the second face entry on which is located the loaded cars.

By this method the first two face entries are intakes and the third face entry is a return airway; by putting in an overcast at the intersection of the third face entry and the first butt entry, the ventilation is kept intact and you get rid of all doors on the motor road. When this plan is used, the locomotive never has to wait for the empty cars to be pulled into the butt entry by a "balky" mule.

ARRANGEMENT WITH TWO FACE ENTRIES

Plan No. 2 shows the arrangement when only two face entries are driven. This scheme is advisable when the coalfield is very narrow and it does not pay to drive three face entries. Fig. 2 also shows the arrangement of the "parting" and the system of ventilation. The first face entry as before is used as the main haulage road, and chutes are driven in the same manner. It is worthy of note that No. 1 room here is used for a return airway; note also that overcasts and brick stoppings are to be used. It is good policy to leave a rib 25 ft. thick between No. 1 and No. 2 rooms in this case, and drive No. 1 room 15 ft. wide.

PARTING ON BUTT ENTRY

Plan No. 3 shows the usual method of providing an air lock at the bottom of the

his ventilation if the motor collects its trip off the butt or face entries and doors are used in the system of ventilation. Usually where this is the case, motormen open the doors when going through them, and the doors are not then closed until the locomotive gets its trip and again comes through the door. If the locomotive gets off the track or wrecks itself, the door is generally forgotten until the wreck is cleared up.

Suction Device for Drawing Off Coke-Oven Fumes

By ALFRED GRADENWITZ*

Many schemes have been suggested of late years for eliminating the thick smelling fumes evolved by the charging of coke ovens. In connection with these schemes the charging gases were merely

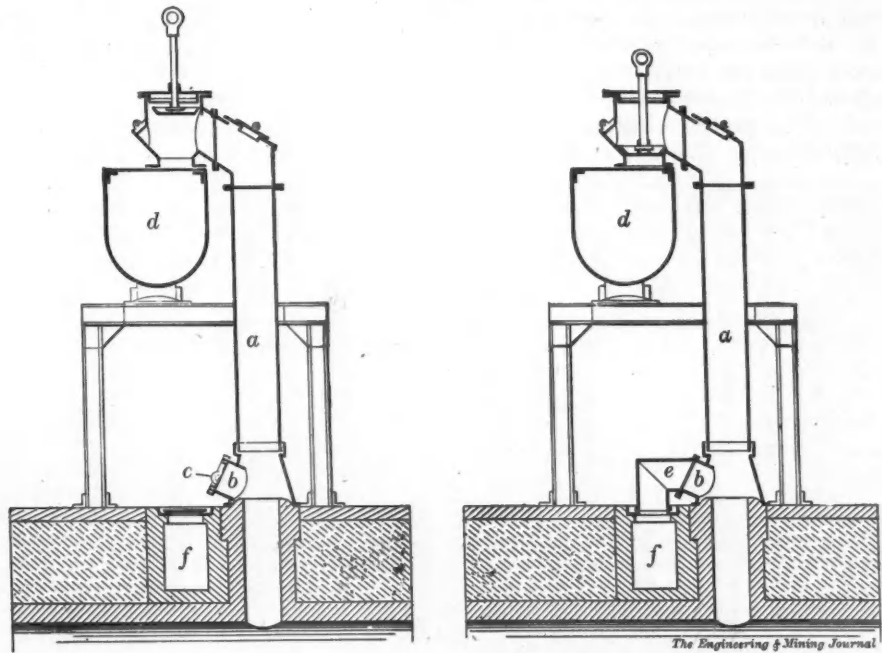
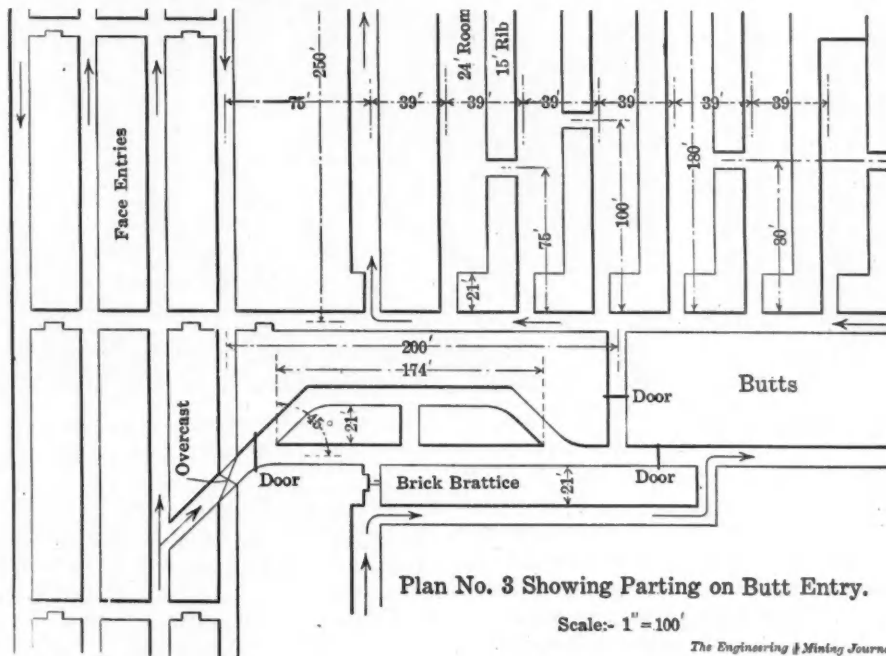


FIG. 1. GENERAL DESIGN OF SUCTION DEVICE FOR DRAWING OFF COKE-OVEN FUMES



Plan No. 3 Showing Parting on Butt Entry.

Scale:- 1" = 100'

butt entries, and instead of putting the parting on the face entry, to have it located on the butt entry. The run-around entry driven here should have two tracks on it and be driven 16 ft. wide.

The mine foreman cannot be too careful in the location of his partings, for they will cause considerable trouble to

The Ofoten railway, which connects the large iron mines of Swedish Lapland with the port of Narvik, in Norway, is to be electrified. Contracts for the equipment have been let to the Siemens-Halske Company, of Berlin. This will be the first electrically operated road used chiefly for freight.

drawn off and carried through the chimney into higher strata of the atmosphere. While avoiding any immediate nuisance to the neighborhood, these devices failed to do away with the danger of explosion in an extensive gas conduit (which moreover interfered with the operation of the ovens) and a number of explosion traps had to be arranged to lessen this danger.

The process recently designed by F. J. Collin at Dortmund (Westphalia) seems to be free from this drawback, affording a perfect safety against explosion:

As seen from the accompanying figures, the gases and fumes escaping from the oven chamber during the charging and discharging of the ovens, as well as any combustible obstructions found in the vertical pipe *a* (so far as they are not carried along), are conveyed into a channel *f* arranged in the cover of the coke oven. This channel, kept permanently at a red heat by radiation from the ovens, insures an instantaneous combustion of the gas and air mixture drawn in. After combustion, the gas is discharged through the channel, either directly into a chimney or into a discharging channel.

The connection between the vertical tube *a* and the channel *f* is effected by a knee *e*. The neck *b*, situated imme-

*Regensburgerstrasse, Germany.

diately above the cover of the furnace is kept generally closed by a simple lid *c*. Whenever an oven is to be charged, the operator will cut off the vertical pipe by a valve actuated with a lever, and after opening the lid *c*, will apply a short light sheet-iron knee *e* with one end to the neck *b* and with the other, to an opening in the furnace cover which is generally kept closed by a lid. This opening leads into the channel *f* which runs alongside the whole oven battery. As there is no risk of explosion, there is no necessity for providing any explosion traps, the more so as the knee, at its entrance into the red-hot channel—where a slight explosion would not be impossible—is applied so loosely that any explosion would

immaterial fraction of the oven cover and is filled with gases only at rare intervals, there is no risk of putting the oven cover to excessive heating, liable to interfere with the recovery of by-products.

British Columbia Mines Bureau Enforces Laws

SPECIAL CORRESPONDENCE

The department of mines, British Columbia, requires its mine inspectors to enforce the laws, particularly in regard to operation of coal mines. Lately, at Ladysmith, Vancouver island, a special commission thoroughly investigated a charge brought against mine foreman

found him unfit to discharge his duties as foreman, and required him to surrender his second-class certificate of competency, which was thereupon cancelled. The necessity for a strict observance of the coal-mining regulations was emphasized when, on Oct. 5, 1909, an explosion took place in one of the mines of the Extension colliery and 32 men lost their lives.

Entombed Miners Found Alive

Six miners who were entombed in mine No. 2 of the Coahuila Coal Company, Palau, Mexico, have been taken out alive. These men had been without food or water for six days. They were securely walled in by a heavy fall of rock, caused



FIG. 2. SHOWING SCHEME FOR ELIMINATING THE FUMES EVOLVED BY THE CHARGING OF COKE OVENS

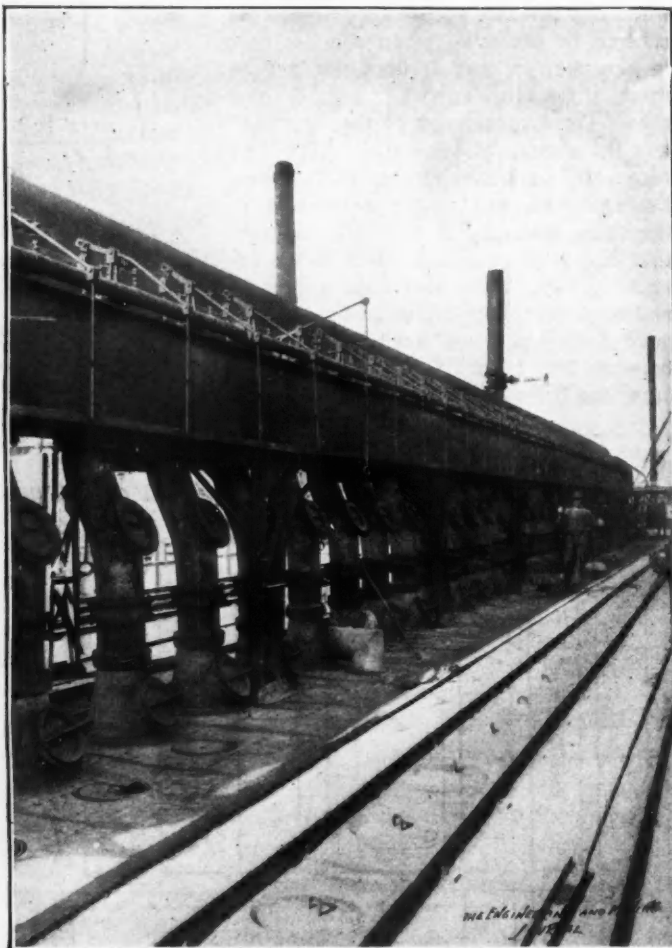


FIG. 3. ANOTHER VIEW OF DEVICE FOR DRAWING OFF FUMES AND AFFORDING SAFETY AGAINST EXPLOSION

simply throw it aside. It may be said that though this arrangement has been used for some time in many of the Westphalian mines, no such explosion of ever so small dimensions has so far occurred. In Fig. 3 the channel is made visible by a number of lids in the series of vertical pipes.

Apart from its small first cost, the apparatus shows the advantage of being readily fitted to any existing coke oven system and requiring no special superintendence. The workmen are said fully to appreciate the convenience of this scheme. As the channel only takes up an

David McKinnell, for not having taken the steps required of him in the discharge of his duty as foreman to secure the removal of discovered gas in No. 3 mine, Extension colliery, owned by the Canadian Collieries (Dunsmuir), Limited.

The charge was brought about by James S. Black, making complaint that McKinnell had unfairly deprived him of his position of fire-boss, because he had reported the presence of inflammable gas in a working place. The commissioner, after hearing much evidence, reported that McKinnell had been guilty of gross negligence, in consequence of which he

by the explosion; this barrier prevented their death from afterdamp. Rescue parties are working steadily. Thirty-five bodies have been brought to the surface. It is now estimated that 150 men were killed.

New York City in 1909, consumed about 11,350,000 tons of anthracite and 4,300,000 tons of bituminous coal; 15,650,000 tons in all. Beside this 4,550,000 tons of bituminous coal was bunkered or loaded on sea-going steamships. New York uses about 19 per cent. of the total production of anthracite.

i PERSONAL i

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

J. Parke Channing has returned to New York from an extended western trip.

Dr. James Douglas is expected home October 24, on his return from the West.

Henry F. Strangways arrived in New York last week from Peru, and left for Salt Lake City after a short stay.

J. Q. Taylor, of Chihuahua, Mexico, has organized an exploration party for investigations in Western Chihuahua.

George E. Laughlin, of Oaxaca, Mexico, is in New York in connection with negotiations for the Rosario mine at Taviche.

Hon. Wm. Templeman, minister of mines for Canada, has returned to Ottawa after having spent the summer in British Columbia.

R. G. McConnell, of the Geological Survey of Canada, left Stewart, Portland Canal, B. C., late in September on his return to Ottawa.

S. E. Bretherton, San Francisco, has been at the Afterthought mine, Ingot, Cal., and is now at the Dominion gold mine in Plumas county.

W. W. Leach, of the Geological Survey of Canada, is returning to Ottawa after a season's geological work in the Skeena river district, British Columbia.

Osmond E. LeRoy, of the Geological Survey of Canada, has gone to Franklin camp, Boundary district of British Columbia, to make geological investigations.

Newman Erb, president of the British Columbia Copper Company, Ltd., has visiting the company's mines and smeltery in the Boundary district of British Columbia.

F. M. Kurie last month examined and reported on the Highlander lead-silver mine at Ainsworth, B. C., for the Highlander Mill and Mining Company, of Philadelphia.

Robert E. Palmer, manager underground department, Rio Tinto mine, Huelva, Spain, after an absence of 10 years is visiting British Columbia, whence he went to Spain.

Justus Hofmann and Josef Jeller of the Witkowitz Steel Works, Austria, are in the United States visiting steel plants in the Chicago, Central Western and Eastern Pennsylvania districts.

M. Polhemus has been appointed manager of the American Zinc, Lead and Smelting Company, at Joplin, Mo., succeeding C. W. Landrum, who will have charge of the company's lease.

The firm of Smith & Laird, consulting mining engineers, at Bisbee, Arizona, has been changed to Smith & Ziesemer; the members of the new firm being Franklin W. Smith and Ralph A. Ziesemer.

W. E. Upham, of Duluth, Minn., formerly superintendent for the General Development Company, at Planet, Ariz., is spending some time at Planet completing an exhaustive geological examination of the district.

C. V. Verrill, son of Prof. A. E. Verrill, of Yale, has joined Andrew G. Larson, of Vancouver, B. C., as consulting mining engineer. Mr. Verrill was at one time on the staff of John Hays Hammond in South Africa.

Thomas H. Watkins, now of New York, but formerly of Scranton, Penn., has filed a voluntary petition in bankruptcy. He has been well known as an operator in the anthracite region and in the Pennsylvania bituminous country. He was a member of the Anthracite Strike Commission of 1903.

C. H. Shamel, of Seattle, Washington, sailed Oct. 11 from San Francisco, for the Philippine islands. He will spend four months investigating the mining and geological features of the islands. Afterward, he will spend some time with friends in China and make brief stops on the Malay Peninsula, Ceylon and Hindustan, returning by the way of Europe. He will return to Seattle in the fall of 1911. While in the Philippines, his address will be Elk's Club, Manila.

+ OBITUARY +

James S. Garvin, manager of the Moosehorn Mines, Elk Lake, Ont., and one of the pioneers of that area, died suddenly Oct. 8. He formerly practised law in Toronto.

James Hudson died at Hanging Rock, O., Oct. 5, aged 70 years. He was connected with the old Pine Grove Charcoal Furnace Company for many years and was one of the pioneers in the Hanging Rock iron district.

Joseph G. Collins, a well known mining man, died Oct. 10, at Chihuahua, Mexico, where he had lived for a number of years. He was born in England and had worked on the Comstock lode, in Nevada, before settling in Mexico.

Absalom Beaton, manager of Colliery No. 2 of the Dominion Coal Company, of Glacé Bay, N. S., died suddenly Oct. 12. He was 36 years of age and had been in charge of No. 2 colliery for two years, having previously held other responsible positions with the company.

William B. Dana died Oct. 10 at his country home at Mastic, Long Island, aged 81 years. He was born in Utica, N. Y., and graduated from Yale Univers-

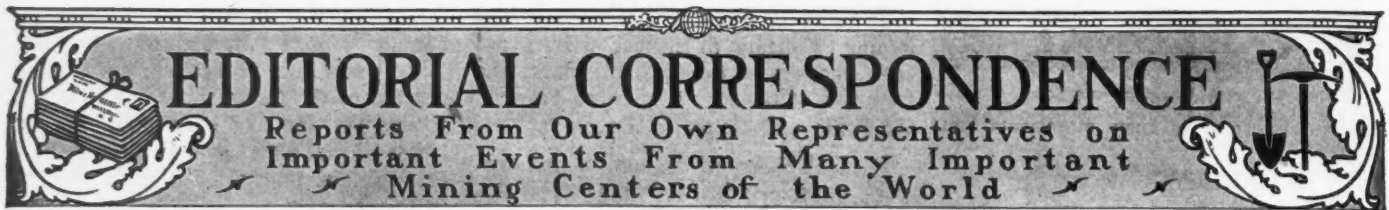
ity. In 1859 he moved to New York and bought *Hunt's Merchants' Magazine*. Some years later he brought out the first number of the *Commercial and Financial Chronicle*. He had been publisher and editor of that paper ever since, making it the financial journal of highest standing in this country.

Jacob H. Taylor, for many years one of the most prominent coal operators in Maryland, died Oct. 8, at Towson, a suburb of Baltimore. Mr. Taylor was of the old school of coal men, and was born in 1818. When a young man he engaged in the wood and lumber business, and later believing firmly that coal would take the place of wood as a fuel, he bought nearly 10,000 acres of coal lands in central Pennsylvania. These properties have been worked successfully by the Taylor & McCoy Coal Company and the Glenwhite Coal Company. They are today large producers of coal and coke, with a daily capacity of more than 2000 tons. He also operated in Maryland coal property. He was one of the men instrumental in inducing the Maryland Steel Company to locate at Sparrows Point, near Baltimore.

SOCIETIES and TECHNICAL SCHOOLS

Anthracite Miners' Institute—The Pennsylvania Coal Company and the Hillside Coal and Iron Company—both subsidiaries of the Erie—have given jointly \$10,000 to the Young Men's Christian Association at Pittsburg, Penn., to aid in maintaining its schools for the instruction of miners.

California Oil Men's Association—An attempt was made a few years ago to bring the oil men of the State into the California Miners' Association so that a strong State-wide organization could be maintained of both gold miners and oil operators. The oil men, however, could not see at that time no need of an organization, none of their interests being threatened by adverse legislation or department rulings as had been the case with the gold miners. Of late the laws and rulings have seriously affected the oil industry of the State in a detrimental way. At a recent mass meeting of oil operators at Bakersfield, the California Oil Men's Association was organized and about 200 oil operators have already signed the rolls. The Association is to consider and suggest remedies for the difficulties which confront the oil industry from time to time. Three men from each of the 10 oil districts of the State were appointed to arrange matters, and now the powers of the executive committee have been given to a governing board of 11 persons who will carry on the real work of the organization. C. T. Fox is the chairman of this board, and G. S. Johnson is secretary.



EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on
Important Events From Many Important
Mining Centers of the World

San Francisco

Oct. 15—One furnace at the Balaklala smeltery at Coram has been blown in and coupled up with the Cottrell fume-condensing plant, which is now handling the smoke. The Cottrell installation, at Balaklala is an extensive one, entailing an expenditure exceeding \$150,000. Mr. Cottrell personally superintended the installation, and is in charge of it at present. The cessation at the Balaklala and Bully Hill smelteries has worked a severe hardship not only on those companies but the mining men of Shasta county generally, and it is a cause of congratulation that the former at least, is enabled to resume operations.

An extensive plant is being installed by the Gold Mountain Hydraulic and Dredging Company on Willow creek, near Bucks, in Plumas county, which is the largest of the kind in the county since the closing down of hydraulic mining 30 years ago. The reservoir on the head of Willow creek covers 14 acres, this being formed behind a dam 25 ft. high and 100 ft. long. The water is conveyed in a 24-in. pipe a mile and three-quarters to the mine, where it is delivered under a 200-ft. pressure. A mile from the lower end of the pipe line there is a steep ravine with high rock walls, and here a large rock and concrete dam is being constructed for impounding the débris and preventing it entering any streams where it is likely to do damage. The placers worked in this section in early days yielded largely, but no small company could undertake the expense of hydraulicking them as a unit. S. D. Graves of Los Angeles, is president and George W. Fagg superintendent of the company. The mine will be in readiness for work with the opening of the water season.

Denver

Oct. 17—An important discovery has been made by Charles Gagner, manager of the Bagley tunnel, at Animas Forks, above Silverton. The tunnel has been driven 6000 ft. into Houghton mountain, to intersect a series of veins, well known by their strong outcrops. One of these was the Red Cloud, which was cut in the Bagley tunnel 4500 ft. from the portal, but in a very lean place. Some men were put at work to prospect the surface, some 400 ft. west of where it was intersected by the tunnel, and soon uncovered a fine vein of silver-lead ore, also containing gold. The ore is from 1 to 3 ft. in width, and is concentrating ore, chiefly galena, copper and iron pyrite in a quartz

and rhodonite gangue. In the tunnel several veins of concentrating ore of a similar character were intersected, and now the building of a mill is planned by the company. It is a curious fact that nearly all the long crosscut tunnels in the State driven to intersect lodes known to be rich on the surface, have cut them in lean or barren places between the ore-shoots, to reach which much drifting on the vein has to be done.

In the La Plata region, near Durango, rich strikes continue to be made, and the whole district is coming in more than usual prominence. A few days ago, in the Yellow Eye group of mines, a streak of almost solid telluride of gold, about 2 in. wide, was opened, the extent of which, however, is not yet known. The mine is under lease to F. N. Beach, of La Plata City. James Doyle, one of the three discoverers of the Portland mine, at Victor, is also working 50 men on the Doyle Consolidated group, and it is stated that ore teams will be kept busy until winter, hauling to a shipping point.

Butte

Oct. 17—The Washoe Sampling Works, destroyed by fire a few months ago, will be rebuilt at once. Since the destruction of the old works all custom ores have been sent to the Anaconda, where they have been treated at the sampler connected with the smeltery, but this method has been found to be inconvenient to prospectors and small mining companies, and the Anaconda company has, therefore, decided to replace the works. The new works will have a capacity of about 1500 tons per day and will be constructed of reinforced concrete with steel beams, and cost \$100,000. It is planned to have them ready for operation by March 1, 1911.

The attorneys of the Anaconda company have gone to San Francisco to appear before the United States Court of Appeals in the smoke case. This case was heard in Butte more than a year ago, and after reviewing the evidence the Judge refused to grant the demand of the ranchers that an order issue closing the Washoe smeltery. The Judge, however, did say that there had been small damage to vegetation from the alleged poisonous gases floating through the air down into the Deer Lodge valley, which he asked the company to remedy. The ranchers appealed.

One of the leading officials of the Anaconda company was recently asked in a joking way why the big company always

tried to litigate away from its smaller competitors any rich bodies of ore which the smaller companies were able to uncover on their claims and was cited the cases of the Tuolumne and Butte & Ballaklava companies. "We had a good idea of what ore was in those claims, long before the companies were ever formed, and if there had been any rich orebodies we would surely have purchased the claims long ago," was the response.

Salt Lake City

Oct. 16—The tunnel of the Utah Metal Mining and Milling Company on Oct. 7 was in 3600 ft., instead of 4000 ft. as has been erroneously stated. Oct. 3, three shifts were put on and an average of 10 ft. a day has been made. The face is in hard quartzite, and is being driven directly against the edges of the beds which lie horizontal and make the ground hard to break. The flow of water from the tunnel is 500 gal. per min. A weir has been placed at the entrance so that exact measurements can be made. The total available power developed by this water and water from the springs in Middle cañon is between 800 and 1000 h.p. Of this only about 200 h.p. is being used at present to drive the compressor and the dynamos for the electric haulage and lighting systems. The mouth of the tunnel affords a good location for a large concentrating plant. There is an abundance of water, with ample dumping room.

The International Smelting and Refining Company is now an active competitor of the American Smelting and Refining Company in Utah. The company has two engineers in the field investigating ore conditions and securing custom business. At present this is only for copper ores, though if enough lead ore can be secured in the future, it is probable a lead stack will be added at Tooele. All construction was completed Oct. 1, and 170 men on the construction forces were laid off. The number of men will soon be cut down to the regular operating forces, which will vary from 225 to 300 men. Four reverberatory furnaces were blown in. At the present, three are handling the tonnage, while the fourth is in reserve. A fifth furnace has been built. Three shifts are operated on the roasters and furnaces. The crushers and converters are worked only during the day. The furnaces have not been operated to their full capacity, but the amount of ore handled is being increased. Between 600 and 700 tons are smelted every 24 hours.

During the early part of September the Utah Consolidated was sending approximately 300 tons of ore to the International daily. This amount has been increased as the new tramway was brought into shape, and is now between 800 and 900 tons per day. As much as 1000 tons in 8 hours has been sent over. The Utah Consolidated ore is a heavy sulphide, and each bucket of 8 cu.ft. capacity carries an approximate load of 1150 lb. There are 212 buckets. When the line is working at full capacity of 100 tons per hour, the speed is 600 ft. a minute. The tramway is operated in three sections in order to equalize the tension in the traction cable. The first two sections are motor driven, 20 h.p. being required. These sections are coupled by two grip-sheaves keyed to the shaft at control station No. 1. Section No. 3 operates by gravity generating 75 h.p., which is returned to the main power line. The cost of transportation is between 8c. and 10c. per ton, while the railroad rates are around 50 cents.

Beside the Utah Consolidated ore, from four to five cars of concentrates per week are being received from the South Utah, and also various custom gold ore. Should this prove satisfactory, it is probable a considerable tonnage will be received from this mine. Several hundred tons of blister copper have been shipped to Raritan, New Jersey.

Grading on the railroad between the Utah Copper property and Garfield is under way, and it is expected that most of the grading will be finished up to within $3\frac{1}{2}$ miles of the mine by the middle of November. By the time snow makes outdoor work impracticable the men will be put underground on the various tunnels. The bridges and trestles are yet to be built. The Bingham & Garfield railroad has had a number of condemnation suits for right of way through property at Bingham. Some of these have been strenuously fought owing to filling in on mining ground, which would in certain cases prevent the ground being worked to advantage on account of lack of dumping room, and difficulty of access. The North Utah Mining Company is the defendant at present in a suit for right of way through five of its claims. If a right of way is condemned through its property, the company asks \$5000 for the ground, and \$30,000 as damages.

Indianapolis

Oct. 18—David Ingle, owner of the Ayershire coal mines in Pike county, objected to the drilling of land in search of oil and appealed to W. H. Blatchley State geologist, who in turn asked Attorney General Bingham who held that the owner of a lease for all the coal under a given piece of land cannot prevent the leasing of oil or gas rights under the

coal, and cannot prevent the holders of such oil or gas leases from going through the coal beds covered by the coal lease, to get the oil or gas. The opinion further holds that the owner of the coal lease can take out the coal up to the pipes leading to the oil or gas provided the pipes are properly cased. In each case the attorney general says that neither party involved shall do any material injury to the property of the other.

The Anderson Artificial Coal Company formed at Anderson, Madison county, to try and make fuel from clay and chemicals, has failed and a receiver is in charge.

Birmingham, Ala.

Oct. 17—The Southern Iron and Steel Company has purchased the mills of the Weller Rolling Mills Company, at Gadsden, and a rearrangement of the plant is proposed so that fabricated steel can be produced. The Southern company has the greater number of the departments at the Gadsden steel mills in operation and finding a good demand for the products.

The Birmingham Rail and Locomotive Works has just completed improvements which have cost nearly \$100,000, and the new works will shortly be put on full operation. The plant now has a complete electrical system, and it is believed that there will be plenty of work for the industry.

Cobalt

Oct. 17—Since the plant of the Cobalt Hydraulic Company commenced operating, much difficulty has been experienced on account of the insufficiency of water in the Montreal river, and it was feared that the low water during the winter would seriously curtail the power. In order to remedy this the company is building two dams on Lake Temagami, which will raise the level of the water $2\frac{1}{2}$ ft., and will direct all the flow into the Montreal river.

The steamboat companies operating between Latchford and Elk Lake, are also building a dam on the Montreal, below the former place. When this is completed some time next spring, the boats will be able to run the mountain chutes, without making a portage. This will mean only one portage instead of three, as formerly, and will mean a saving on freight.

For some time the Crown Reserve and Kerr Lake mines have considered the draining of Kerr Lake, but heretofore their negotiations amounted to nothing on account of the attitude taken by the Drummond mines. These objections have been overcome, and the matter has been definitely decided upon, and the water will be pumped into Cross lake, a short distance away, and at a lower elevation. When this work is completed, these mines will be able to stope the

ore under the lake. It is stated that the marl in the bottom is suitable for making cement, and if this is subsequently found to be the case, the Crown Reserve may erect a cement plant.

The litigation between the Cobalt Central mines and the Thomas Nevins and Sons, of New York, has come to an end, and the High Court of Justice has decided that the whole of the company's properties and effects is to be sold by public auction, at the office of the liquidator, E. R. C. Clarkson, Toronto, Dec. 28. The property comprises 240 acres and is equipped with a 100-ton concentrator. It is stipulated that all the ore on hand is to remain the property of the liquidator, and that the purchaser must undertake to concentrate the ore, if required, for \$2.75 per ton.

Toronto

Oct. 17—Dr. D. B. Dowling, of the Canadian Geological Survey, who has been exploring the eastern slope of the Rocky mountains, states that no extensive or valuable deposit of minerals will be found there. The geological formation is not of a mineral character, but chiefly limestone and sandstone, and in his opinion the true mineral formation is to be found in the inner ranges of the Rockies, which display lower strata of rock in which minerals have been deposited.

Lieut.-Col. Tweedie and others, of Chatham and Newcastle, have secured an area on the Miramichi river, New Brunswick, which is reported to be rich in copper. They have had it examined lately by an expert from the mining department at Ottawa.

Mexico City

Oct. 15—The activity of American and other foreign capital in mining in the northwest States—Sonora, Chihuahua, Sinaloa and Durango—has decidedly increased during recent months and there is prospect of a continued increase as the companies get their properties developed and equipped, this stimulating district activity. The construction of new railroads has much to do with this revival but it is also attributed to the successful outcome of several large companies in the region in the past few years. The results at Sta. Eulalia and Naica have aroused new interest in all the ore-bearing limestone camps and the installation of large cyanide plants at Parral and elsewhere has established the possibilities of many camps heretofore restricted because of freight and transportation charges. The inauguration of extensive hydroelectric plants insuring cheap power is a large factor in the revival, particularly in western Chihuahua and in parts of Sonora. There is prospect of a continued increase of mining activities in these northwestern States.



THE MINING NEWS

Reports of New Enterprises, New Machinery,
Installations, Development Work and Property
Transfers The Current History of Mining

Alaska

Claims in the Rainy Hollow district, back of Haines, have been bonded by John Rosene and associates, who are figuring on constructing a railroad from the mines to Haines.

Esther Creek's famous "lost pay-streak," after six years' search that cost prospectors thousands of dollars, has been tapped, and a pay channel of coarse gold was penetrated by a drill on No. 6 below discovery.

Rush & Brown—This mine, Ketchikan district, has been unwatered and is being operated under the management of U. S. Rush. The ore is sent to Tacoma.

Penn-Alaska—A 700-ft. tunnel has just been completed on this property on Taku harbor. Jesse Blakely has charge.

Arizona

COCHISE COUNTY

Denn-Arizona—Men are engaged in prospecting and development. The sinking of the shaft is rapidly progressing, and on Oct. 1, a depth of 1574 ft. had been attained. It is the intention to drift on the 1600-ft. level to get under a large leached and oxidized area on the 1250- and 1350-levels. The water, which for a time greatly handicapped the Denn operations, has been under control since the installation of a new pumping plant.

GILA COUNTY

National Mining Exploration—The trustees in bankruptcy of the company have reached an agreement with N. L. Amster regarding the \$100,000 note—secured by \$250,000 of the company's first mortgage bonds. By the arrangement made, Mr. Amster will retain the collateral which he holds, pending a reorganization, and litigation will be avoided. The property of the company will be sold at auction and purchased by the protective committee, and Mr. Amster's note will be paid from the proceeds of the sale. The committee is at work on a plan of reorganization which will probably call for an assessment of 20c. per share.

Arizona-Cananea Mines Corporation—A merger with the Boston-Miami Copper Company has been effected. The consideration paid by the Arizona-Cananea to the Boston-Miami and the interests controlling the Montezuma claims, which adjoin the property of the Boston-Miami, and which are made a part of this merger, is \$1,000,000 par value of its capital stock. The capitalization of the Arizona-Cananea has not been increased. The

property of the Boston-Miami adjoins the Live Oak mine on the west and south, and lies southwest of Miami, Inspiration and Keystone mines. The Arizona-Cananea properties adjoining the Greene-Cananea consist of about 4000 acres. In addition, the Arizona-Cananea owns silver mines, the San Antonio and San Antonio Extension, south of its Cananea properties. H. F. Fay, of Boston, and James Gardner, of Montreal, will represent the Boston-Miami interests on the board.

Cactus—C. W. Pritchett, consulting engineer reports as follows: "Drilling with two churn drills has been pushed during the summer toward the north and east of the Hamilton shaft with the hope of extending the ore zone, especially toward the north, as indications pointed to the probability that the orebody had faulted toward the south and that a continuation might be found north of the reverse fault. Efforts in this direction have so far been disappointing, as no ore of any consequence has been found either north or east of the faults encountered from the Hamilton shaft. The evidence indicates that the altered schist is shallow. What may have been a large ore deposit originally has been eroded until a very small portion remains. Whether sufficient remains to make a mine will be determined by the next two or three months' drilling. The only encouraging feature is that the stratification of the schist seems to dip toward the west from the Pinto shaft and the possibility that this schist was protected to a greater extent from erosion than portions of the area further east."

Barney—The management has abandoned the idea of shaft sinking on the eastern end of the property and will use churn drills. The first holes will be on the line between the Barney and Live Oak properties. A shaft in the middle of the Barney property is down 400 ft. and one of the first holes drilled will be in the bottom of this shaft.

Inspiration—An official notice from H. F. J. Knobloch, secretary, is as follows: "The board of directors have succeeded in having all the preferred stock of the company converted into common stock and the preferred canceled. The company has received \$2,022,920 for the remaining 202,292 shares of common stock in the treasury, which is at the rate of \$10 per share. Of this treasury stock, 100,000 shares were under option which expired Sept. 18, and 102,212 under option which did not expire until Jan. 18,

1911. The conversion of the preferred stock and the sale of the common stock leaves the company with 1,000,000 shares of common stock and no preferred shares or bonded indebtedness outstanding. On Oct. 1, 1910, the mine management reported approximately 10,000,000 tons of ore blocked out, averaging better than 2 per cent. copper. This tonnage does not include partially developed or indicated ore. It is the intention to immediately proceed with the erection of a concentrating plant, the daily capacity of which will probably be 5000 tons."

Gila Cañon—A copper company comprised of local men has just been organized to develop seven claims in the Copper Reef district 25 miles south of San Carlos. The proposed line of the Arizona Eastern railroad from Christmas to San Carlos runs over the property. A tunnel is being driven.

PINAL COUNTY

Ray Central—It is understood that the General Development Company will decide not to exercise its option on the remaining \$1,900,000 of the \$2,000,000 bond issue. A new plan for financing the company is being formed.

Ray Consolidated—The company will put out \$2,000,000 of bonds convertible at \$20 per share, which will be offered to stockholders. This will complete the financing of the company.

California

AMADOR COUNTY

Central Eureka—A new body of medium-grade ore has been found on the 2500 level of this mine at Sutter creek. The mill is being repaired and is closed down for the present.

South Eureka—The new steel gallows frame is about finished and the shaft is to be repaired.

Kennedy—In this mine, at Jackson, they have recently had the unusual experience of a strong flow of water on the 2700 level. The same thing has occurred in the Bunker Hill, at Amador City, on the 1950 level.

BUTTE COUNTY

Miller—This quartz mine, south of Forbestown, has been purchased by M. J. Cooney and F. J. Storr. The mine is equipped with a 20-stamp mill, and water-power hoist. Work has begun.

CALAVERAS COUNTY

Lightner—An option has been given on this mine at Angels, and work started. The mine was closed last year owing to

shifting and settling of the ground. The hoisting works will be rebuilt and a three-compartment shaft has been started, which is to be sunk 2000 ft. When 500 ft. is reached the mill will be started. Alexander Chalmers will continue as superintendent.

FRESNO COUNTY

White Cross—Coalinga capital is backing this property at Dunlap, and work will be continued all winter.

KERN COUNTY

The Houser Brothers and Frederick Williams have sold under bond and lease five claims in the Stringer district, near Randsburg, where there is more activity than there has been for years. Development also is being done in deep placer mining.

NEVADA COUNTY

Prudential—This property, at Grass Valley, including the Slate Ledge and Perrin claims, has levied an assessment to pay off certain claims and furnish funds for work. The mine is being pumped out.

Omega—It is expected that orders will be given to reopen this mine at Maybert, and make surface improvements.

PLUMAS COUNTY

Bear Creek—This company, owning the Golden Ancient Channel property, near Quincy, has attacked the gravel through a shaft, through the lava cap into a small gravel channel and then through another deposit of lava into the main gravel channel. C. C. Smith, of San Jose, is the principal stockholder.

Gold Mountain—This company has applied for permission to work the Hydraulic King mine, near Buck, by hydraulic process.

Franklin—E. P. Vandercook is preparing to unwater this gravel mine at Nelson Point. The shaft was sunk 30 years ago, by Parke & Lacy, for the Plumas Blue Gravel Company, but the pumps in use failed to handle the water.

SHASTA COUNTY

Victor—The mill of this company, at Harrison Gulch, is completed, and the compressor and drills ready.

Afterthought—This property, at Ingot, owned by the Great Western company, has been reopened. In addition to the large known orebody, a new one was lately found on the 500 level. S. E. Bretherton is manager.

SIERRA COUNTY

Peter Carmichael has sold his gravel mine, at Howland flat, to M. Duval, of Poker flat, and operations have begun on it.

Young America—Examinations have been made of this mine, at Forest, and it is expected that it will be sold by J. W. Morrell, the business differences of the partners having been adjusted.

Kate Hardy—This mine, at Forest, has been placed under bond to Denver capitalists. In case the sale is concluded the mine will be equipped with a mill. J. D. Beggs is superintendent.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

American Sisters—This property, on Columbia mountain, is to be developed by the driving ahead of the Princess of India tunnel, which is already in 1200 ft., and will intersect the American Sisters in 1000 ft. additional.

Seven-Thirty—The discovery of rich ore made last week by Charles Lerchen, W. Alkire and J. Wilson is said to be 3 to 5 in. of grey copper, galena and carbonate of zinc, carrying silver as high as 2000 oz. per ton, and 1.10 oz. gold. The work is being done through the Hercules level, 1400 ft. from the portal.

Scott—At the 300 level of this mine, on Republican mountain, 8-in. ore is being stoped that runs 65 per cent. lead and 40 oz. silver.

Waldorf—A fine body of copper ore, carrying gold, has been opened in the Paymaster vein, near its junction with the Commonwealth. It is shipped direct to the smeltery.

LAKE COUNTY—LEADVILLE

The search for carbonate of zinc in the Leadville old mine workings and dumps continues, and the assayers are working three shifts on the samples that are brought to them daily. A number of old shafts have been found to contain the calamine, and the miners are applying for leases. It now appears as though Leadville will be one of the largest zinc camps in the United States.

Long & Derry—Work has been resumed in this early-day producer of a big tonnage; drifts are being cleaned out, and shaft retimbered. The lessees will erect a chlorination mill. S. G. Collins is manager.

Clear Grit—This group is being developed, and a new shaft sunk. The property is under the management of Charles J. Moore.

Sugar Loaf—Buildings have been erected, and winter supplies stored, at the portal of a tunnel on the McMahon property, and which tunnel will be driven into the hill all winter. E. McGee is manager.

Dinero—In the first week of this month 15 carloads of ore were shipped. It came from the main orebody near the breast of the tunnel, and is widening. Last month 500 tons were shipped, the first class running \$140, and the second \$40 per ton.

Bob—In this mine, on Breece hill, a good body of 2 oz. gold ore has been opened up, and shipping will be commenced shortly. It is under lease to Judge Harrison and John McKeegan.

Waterloo—Charles Cramer & Co., leasers on this Carbonate Hill mine, are shipping about 200 tons per diem of iron and carbonate ore.

Hayden—It is stated that the Hayden shaft, Fryer hill, where the carbonate of zinc in paying quantities was first discovered, is in shape to send out 30 tons daily, averaging nearly 40 per cent. zinc. The shaft, 500 ft. deep, is being unwatered.

TELLER COUNTY—CRIPPLE CREEK

The churn drill from the El Paso shaft to the deep-drainage tunnel is making 4 ft. a day, and it is predicted that the El Paso will be draining into the tunnel by Nov. 1.

Stratton Estate—From the Lucky Gus lease of Moore & MacDonald, on No. 2 shaft, 5 cars of gold ore were shipped last month, which averaged \$30 per ton. Udick & Co., from the joint shaft, 300-ft. level, shipped 5 cars last month averaging \$40 per ton.

American Eagles—This mine, under lease to the Colorado Mines Investment Company, in September shipped 12 cars of ore, averaging gold \$55 per ton.

Doctor-Jack Pot—In the suit involving extralateral rights to veins worked through the Little Clara, the Doctor-Jack Pot has for the second time been successful over the Work company, as on Oct. 5, it won its case in the United States Circuit Court, on an appeal from the district court.

Cresson—The September output of this mine was 2500 tons of 1-oz. gold ore.

Pinto—About 4 carloads per week are being shipped from the 450-ft. level of the Pinto shaft, by the Altman Leasing Company, the output last month being 17 cars.

Vindicator—The September output of this Bull Hill mine was 2900 tons, of an average value of about \$30 per ton in gold.

Gold Sovereign—The Clements Leasing Company, operating this mine, sent out 23 carloads of good average-grade ore in September.

Tribby—Twenty carloads of good average-grade gold ore were shipped in September by Olson & Van Tilborg, leasers.

Idaho

COUER D'ALENE DISTRICT

Four lead-silver companies of the Coeur d'Alene district, paid over \$360,000 in dividends in September. The Federal paid its holders of preferred stock \$210,000, the Bunker Hill & Sullivan paid \$98,100, the Hercules probably \$40,000 and the Hecla \$20,000.

There is much activity at smaller properties in the Burke section. The Orlander, which adjoins the Idaho-Montana, has let a 150-ft. contract. At the Idaho-Montana two shifts are employed and work will be kept up all winter. The Hennessy-Burns

has rebuilt the cabins destroyed by fire. At the Full Moon operations are under way with a two-drill compressor, at the Moonlight a compressor will be installed. The lower tunnel of the Trade Dollar will be driven 1600 ft. to get under the ore in the Moonlight ground at 800 ft. depth. Eight men are employed on the Great Western and work will keep up through the winter. The tunnel has been driven 1600 ft. and another 400 ft. will reach the orebody. The Ajax Mining company is planning to install machinery. Electric power from Spokane will be used.

Snow Storm—This mine has stopped production and laid off all but 10 men because of the refusal of the Anaconda smeltery to accept more ore for fluxing, the smeltery being able to obtain the ore needed in Butte.

Hecla—J. F. McCarthy, of Wallace, has been selected president to succeed Frank Upman, of Chicago, who takes the vice-presidency. Mr. Upman was the successor as president of J. R. Smith, of Chicago, deceased. Mr. McCarthy remains manager and treasurer of the company. L. E. Hanley, of Wallace, is the secretary. The directorate now consists of Frank Upman, Mrs. J. R. Smith, of Chicago, Carl Landsee and F. J. Kipp, of Milwaukee, John A. Finch, of Spokane, W. J. C. Wakefield, of Spokane and J. F. McCarthy.

Illinois

Peabody Coal Company—This company is preparing to open two new mines near Taylorville in Christian county. The company also proposes to build a large power house at Kincaid, near the mines, and to arrange for the transmission of electric power to other points.

Indiana

CLAY COUNTY

C. Ehrlich Coal Company—This company at Turner has two forces of drillers testing the coal lands on which it has an option near Staunton with a purpose of opening the coalfield. The company has options on 1000 acres and is making the drillings to determine the strength of the hard-pan stratum over the coal, to learn if the coal can be mined without too great expense.

WAYNE COUNTY

David J. Roberts, president and engineer of the Short Creek Oil and Gas Company, is opening and operating the oilfields south of Richmond. The company has acquired leases on 1000 acres near Short Creek.

Kansas

The production of the Kansas camps for September was 3,741,150 lb. of blende, 49,040 lb. of calamine and 1,075,600 lb. of lead concentrates with a total value of \$102,860.

Beacon Hill—This company has acquired a 10 per cent. lease on the Southside 80-acre tract at Galena and will develop it. This tract has been a wonderful producer in the upper levels and the lower runs will be developed while the upper levels are subleased. Franklin Playter, of Joplin, is manager.

Michigan COPPER

Isle Royale—The company has resumed sinking at No. 5 shaft and has remodeled its rock house toward a more efficient method of rock handling. Sinking and development was suspended in the three southern shafts about a year ago and all work was confined to stoping, with the result that a much better yield was obtained and the property was able to meet expenses. A small amount of drifting was done during the past few months.

Mass—This company is meeting with improved conditions in its "C" shaft, especially in the west drift of the seventh level, where a rich run of ground has been encountered. This company is shipping about 250 tons of rock daily.

Adventure—The new vertical shaft at this property is down about 900 ft., or about 50 ft. from the point where it is calculated that the first of the series of lodes will be cut. It is likely that sinking will continue without interruption to the second of the series, which lies 1000 ft. deeper, depending on the condition of the first lode when cut, for the drill cores taken near the shaft showed the second lode better mineralized.

Keweenaw—The company has secured six cores from the Ashbed lode, all showing copper in commercial quality and the lode 50 ft. wide. The drilling has been done at intervals along 3600 ft. and the lode revealed at a depth of from 200 to 300 feet.

Indiana—The company has cleared a site for the proposed new shaft and it is likely that sinking will be started soon. The site is ½ mile from the main line of the Copper Range railroad.

Hancock—No. 2 vertical shaft is down 2560 ft. and has passed through the series of lodes known as Nos. 1, 2 and 3 Hancock, No. 3 being the only one showing commercial copper at the intersection. The shaft will be continued to cut the Quincy-Pewabic lode at 3500 ft. Openings on No. 3 lode from the 10th to the 18th level inclusive, continue yielding high-grade stamp rock. The surface equipment will be ready to go into actual service about Jan. 1.

IRON

The Colby and Ironton mines at Bessemer on the Gogebic range belonging to Corrigan McKinney & Co. have suspended operations for a time.

Cleveland-Cliffs—The company has decided to reconstruct the shaft at the Maas

mine at Negaunee, from surface to the ore, a distance of 175 ft., using concrete instead of timber. The contract has been awarded to the Foundation Company. It is planned to begin the work about Dec. 1. It is expected that it will take about five months to complete the shaft.

Minnesota

Pioneer—Shipments from this Oliver mine at Ely have practically ceased for this season. The vertical shaft is being sunk 200 ft. below the 1400 level. Charles Trezona is general superintendent.

Section Thirty Mining—Shipments this season were 52,000 tons, the first ore from this Vermilion Range mine under the present management. The new power plant has been in operation two weeks. Cottages have been built, and a post-office established under the name of Section Thirty.

Alpena—This mine adjoins the old Sauntry mine near Virginia. Steam shovels are stripping about 40 acres. First shipments of ore were made this year. Complete power plant and two steel headframes have been erected for the underground mining on a portion of this property. M. S. Hawkins, Virginia, is general superintendent.

Chandler—A company has been organized to reopen this old mine at Ely. The headframe and shaft have been repaired and a small quantity of ore is being stocked.

Pabst—The new compressor plant at this Oliver company mine, Ironwood, was started last week. This plant will furnish air of the adjoining Aurora mine.

Aurora—The steel headframe is nearly completed. Hoisting equipment is being installed. D. E. Sutherland, Ironwood, is superintendent.

Section 16—Concrete foundations are being placed at the old shaft, preparatory to erecting a modern steel headframe and ore bins. W. H. Johnston, Ishpeming, is superintendent.

Missouri

The production for September in the Missouri camps was 37,392,000 lb. of blende, 4,920,460 lb. of calamine and 5,212,070 lb. of lead concentrates with a total value of \$1,018,378.

Wilcox—This company has completed the mill at the John Jackson mine, Chitwood.

John Wells & Co.—This company has made a strike of mineral on the Isherwood land west of Lehigh. Twenty ft. of 10 to 15 per cent. ore has been struck at 140 ft. deep.

Eastern—This company has been prospecting a tract at Lawton northwest of Joplin and has ore in 36 drill holes. A shaft has been sunk and a mill will be erected. Walter Ragland of Webb City is manager.

Falls City—This company will erect a 400-ton mill on the lease in the West Joplin sheet-ground district. The power will be derived from a gas engine. W. S. Watson, of Joplin, is secretary. The mills now built or being built in this district and operating on the sheet ground are the Hercules, Hackett, Muskingum, Samson, Kitty Mack, Cambria, Hero and Empire.

Montana

BUTTE DISTRICT

Butte & London—The directors have called a special meeting for Nov. 8, to consider the mortgaging of the property to raise \$10,000, with which to pay a judgment recently secured by M. A. Beeler.

Davis-Daly—At the annual meeting, in Portland, Me., the stockholders reelected W. C. Shaw and Maurice Levy as directors. The financial statement of June 30, 1910, shows assets of \$6,808,250; cash on hand, \$702,136, and surplus or working capital, \$544,888.

Tuolumne—Development is being done to prove the continuity of the vein which the North Butte company claims. An incline shaft has been sunk from surface 135 ft. on the footwall.

BEAVERHEAD COUNTY

Copper Queen—Lynch & Bennett have obtained a lease on the mine, 30 miles south of Dillon. A boiler, compressor and drills will be bought. The mine has been idle.

FERGUS COUNTY

Japan Coal Company—The company has been organized by Meagher and Fergus county business men; capital, \$100,000; B. T. Stevens, of Harlowton, president. The properties are at the new town of Japan, between Musselshell and Milstone, in the Carpenter Creek coal district. The company plans operations at once.

GRANITE COUNTY

Stringle & Waters have finished for this season's work on their placer claims, at Sapphire gulch. The work has consisted mainly of building reservoirs and ditches, but they got in a bedrock flume and cleared up a considerable quantity of sapphires and some rubies and diamonds. Next season the hydraulic system will be ready.

JEFFERSON COUNTY

King Solomon Mining Company—Prof. F. T. Havard, of Madison, Wis., has finished making an examination of the property in the Clancy district. He estimates that there is \$300,000 of ore above the 500-ft. level, and from \$500,000 to \$1,000,000 below that level.

LINCOLN COUNTY

Shaughnessy Hill Group—The new buildings, replacing those destroyed by the forest fires, have been completed and operations resumed.

POWELL COUNTY

Peter Sharrenbroich and John P. Brusewitz have recently located two quartz claims near the Bald Butte mine, called the Senator and Clark. The vein, at 10 ft., is 15 in. wide and gold bearing.

Nevada

ESMERALDA COUNTY

Florence—The timbering of the new three-compartment shaft is complete from the 530-ft. level to the surface, and with the hanging of the big 3-ton skips the Florence will have one of the best equipped shafts in the State. Sinking will be started from the 530 level and exploration of the lower ground commenced.

Combination Fraction—Steady production of 50 tons daily is keeping the leased mine of the Nevada-Goldfield Reduction Company in operation.

Goldfield Consolidated—The mill has been working at maximum capacity for the last month, treating 900 tons daily. The orebody on the 1000-ft. level of the Clermont is holding up splendidly under development.

Black Butte—It is reported that the legal complications growing out of the recent election of officers when the company was reorganized, will soon be settled, and operations started.

HUMBOLDT COUNTY

National—The recent strike on the Butler, Prout & Hyde lease at 500 ft. north of the company workings is thought to be a new opening on the old vein rather than the discovery of another lode.

Seven Troughs-Caesar—A gold-silver strike has been made 550 ft. from the portal of the development tunnel.

LINCOLN COUNTY

Prairie Flower—A car a week of ore, carrying 60 to 70 per cent. lead, is being shipped by J. Will Knight.

Alunite—This company has elected Prof. Robert T. Hill president. Mr. Hill is now in Nevada arranging to resume operations.

LYON COUNTY

Nevada - Douglas—General Manager Duncan McVichie has issued a report showing what can be expected from the property upon the completion of the Mason Valley smeltery. The company owns the Copper Belt railroad and this, it is believed, will realize \$200,000 annually. The general average of the ore is given as 56 per cent. copper, and a 4c. profit is estimated on a 13c. market, with an annual production of 12,750,000 pounds. It is reported that definite negotiations for the sale of the property to the Cole-Ryan interests are in progress.

NYE COUNTY

Tonopah Extension—The record for September shows almost 140 tons treated daily, with an extraction between 92 and 93 per cent. in the 30-stamp mill.

Keane-Wonder—Developments in the mine justify general expansion throughout the property, according to General Manager Wilson. A Sullivan compressor with a steam engine and machine drills has been purchased. The capacity of the reduction works will soon be doubled.

WHITE PINE COUNTY

Nevada Consolidated—The company is taking advantage of the curtailment to remove overburden at the pit at Copper Flat. Six shovels are at work, the largest number employed there at one time since the pit was opened. One shovel is at the Liberty pit stripping. Efforts have been made to reach an agreement between the management and the miners' union by which the Veteran mine of the Cumberland-Ely could be reopened. The mine was closed in July, 1909, on account of labor troubles.

New Mexico

DONA ANA COUNTY

In the Organ Mountain district the discovery of nickel by Messrs. Davis and Clark on the San Augustine claims, is reported. The Doña Dora company will continue its 150-ft. tunnel. The Mormon Gold Company is sinking the shaft, now 150 ft. deep. On the Chippewa, Paul Davis is sinking and crosscutting at the 150-ft. level to reach the Excelsior ore-shoot. George Martin has opened up his copper claims between the Bennett-Stephenson and the Modoc. Robert Martin, of Salem, Va., is doing work on property near the Bennett-Stephenson.

Bennett-Stephenson—This company has bought the Stephenson-Bennett property and arrangements are about completed to commence active operations with M. J. Dailey as general manager. The latter, in company with C. E. Head, of McAlester, Okla., and J. I. McCullough, has recently made an examination of the properties of the Organ district on the west side of the mountains.

GRANT COUNTY

The Empire Zinc Company is shipping zinc carbonates from the Hanover district to Mineral Point, Wis. A. S. Dickie is shipping zinc ore to Altoona, Kan., from claims adjoining the Hanover Copper Company.

American Exploration and Mining Company—This Boston company has installed a hoist and compressor and is sinking at the National Bank mine, near Steplerock. The shaft is 120 ft. deep. As soon as sufficient development has been accomplished a cyanide mill will be constructed. W. Franklin Burnham, of Boston, is managing director and John A. Rice, of El Paso, consulting engineer.

Pennsylvania

Philadelphia & Reading Coal and Iron Company—The financial statement for the two months of the fiscal year from July 1 to Aug. 31 shows gross earnings, \$3,399,769; expenses, \$3,755,428; deficit, \$355,659. As compared with last year there was an increase of \$22,510 in gross earnings, and an increase of \$199,494 in the deficit.

Oklahoma

The production for September from the Oklahoma camps amounted to 2,020,200 lb. of blende and 680,160 lb. of lead concentrates with a total value of \$51,143.

Utah

BEAVER COUNTY

Moscow—Suit has been brought by the Moscow Bonanza Mining Company against the Moscow Mining Company. The suit arises from the fact that some years ago the Moscow sunk a shaft near the lines of the Moscow Bonanza claims. The exact location of the boundary is in dispute. Within the past year good ore has been mined from this shaft. The Bonanza company claims that some of this ore has been extracted from its ground, and has brought suit.

Utah Mining and Milling—The shaft on the Lady Bryan claims has been sunk to the 300-ft. level, a station made, and crosscutting started for the vein. On the 200 the orebody has been opened for over 100 ft. east and west, and is said to be up to 40 ft. wide. Ore carrying copper and silver has been found in the cave which was recently encountered. The cave is 60 ft. long by 20 ft. in width. A new hoist of larger capacity than the one now in use will be installed.

South Utah—The annual meeting will be held at Augusta, Me., Oct. 17. It is reported that E. P. Earle will hereafter market the output of the South Utah. With the rounding out of milling operations the working forces are being increased. Twenty machine men have left Salt Lake City for the property.

JUAB COUNTY

Yankee Consolidated—A notice of assessment No. 3, calling for 2c. a share has been mailed. The statement says that assessments No. 1 and No. 2 were levied the payment of an overdraft of \$25,000, and to provide for new hoisting equipment capable of sinking to 2500 ft. A 225-h.p. double-drum electric hoist with 2800 ft. of 1½-in. steel cable was installed at an approximate cost of \$10,000, and a contract was given for sinking from the 900-ft. level. Prospecting is being done on the upper levels.

Tintic Standard—The objective point of the drilling operations is the contact of limestone and quartzite, which is expected to be reached soon. The cores for the last 50 ft. have shown mineralized

quartz, carrying gold and silver. A distance of 275 ft. from the shaft has been obtained.

Eagle & Blue Bell—At the annual meeting, Oct. 8, the following directors were elected: J. P. Graves, H. M. Sweet, F. H. Williams, G. E. Davis, I. Pett, D. Mac Vichie, and F. R. Sands. Control of the Eagle & Blue Bell is held by the Bingham Mines Company, the successor to the former Bingham Consolidated Mines and Smelting Company. The most important development during the past year was the discovery of a large orebody from the 1000-ft. level, to work which properly the company determined to sink a new shaft. Connections between the shaft and raise from the 1000-ft. level were made Oct. 10. The two workings connected perfectly.

SALT LAKE COUNTY

A merger has been proposed involving several properties in Alta, among which are the South Hecla, Continental Alta, City Rocks and South Columbus. Boston and Michigan interests are said to be connected with this move. Should the consolidation be brought about, it is planned to drive a drain and operating tunnel over a mile long.

Utah Copper—The main stope of the Boston Consolidated sulphide mine caved a few weeks ago, and operations have been suspended in this part of the property. It is intended to reopen this ground.

Montana Bingham—The property of Bingham Butte Consolidated has been transferred to this company. The Montana company assumes the debts of the old company. Stockholders of the Bingham Butte can exchange their stock share for share in the new company if exchanged before Oct. 18, otherwise stock which is being held for exchange will be used for treasury purposes. An assessment of 2c. a share has been levied on the new stock. W. E. Hubbard is president.

Washington

FERRY COUNTY

Tenderfoot—Operations at this property have been resumed by William O'Brien.

SPOKANE COUNTY

The Washington Steel and Iron Company, of Spokane, will erect a 20-ton furnace at Leavenworth, for the treatment of magnetic iron ore from the property near Blewett. E. H. Rothert is manager.

Wyoming

The first car assignment of asbestos has been shipped to Denver from the new mill of the International Asbestos Mills and Power Company, at Casper. It was sold to the Denver Asbestos Covering Company. Five other cars of fiber, of 25 to 30 tons each, are being loaded for shipment.

Canada

ONTARIO

Shipments from Cobalt for the week ended Oct. 8 were: Buffalo, 56,100 lb.; Chambers-Ferland, 58,800; Cobalt Townsite, 88,000; Coniagas, 138,300; Crown Reserve, 58,740; Kerr Lake, 303,280; La Rose, 238,530; McKinley-Darragh, 108,820; Nipissing, 440,780, O'Brien, 58,800; total, 1,550,150 pounds.

Crown Reserve—The directors have issued a report for the nine months ended Sept. 30, showing receipts \$1,150,303; operating expenses, \$184,128; royalty paid to government, \$108,889; leaving net profits of \$857,286. Dividends were paid amounting to \$795,966, leaving a balance of \$61,320, which brings the total surplus up to \$610,595.

Temiskaming—The payment of dividends at 3 per cent. per quarter has been resumed. The mill is making \$1000 per day over expenses from low-grade ore from the dumps raised in development.

Mount Royal—At the annual meeting in Montreal, Oct. 13, it was decided to defer work on the mine until next year and to secure funds by placing 200,000 shares on the London market.

Savage—A new vein carrying silver has been found on the 80-ft. level of this Cobalt property. The monthly production is about 60,000 ounces.

Chambers-Ferland—A statement of this Cobalt company's affairs as of Aug. 31 shows assets of about \$130,000 cash and bills receivable and ore reserves estimated at 146,700 ounces.

ONTARIO—PORCUPINE

The Porcupine Mine Owners' Association announces that the Consolidated Goldfields Company, of South Africa, has purchased two claims in the third concession of Tisdale, in the center of the Porcupine district, having an area of 320 acres. On one of these properties a vein showing free gold, 12 to 15 ft. in width has been discovered and traced for about 225 ft. Two shafts are down 20 ft., at which point the showing is equal to that on the surface.

Armstrong-McGibbon—On this group, in North Tisdale, the main vein has been shown at points for a distance of 630 ft. At the eastern end of the vein a shaft has been sunk to 14 ft. At the bottom of the shaft free gold shows in five places. One hundred and forty feet to the west a test pit on the vein shows free gold. Four hundred and ninety feet to the west of the test pit a space 20 by 60 ft. shows free gold. Orders have been given to strip the vein for the entire distance and to sink two shafts, one at the eastern end and one at the western end of the outcrop. Frank C. Armstrong has returned to New York from the property.

Mexico
CHIHUAHUA

The production of the Parral camp for September was about 50,000 tons, two-thirds of which was locally milled. This is a substantial increase over preceding months and is explained in part by the increased mining of silicious ores. The milling tonnage will show marked increase with the early operation of the Palmilla and Veta Colorado mills.

Princessa—Half payment of 100,000 pesos was lately made on this property in the Cusihiuriachic camp by the Exploration Company of England & Mexico, and larger scale developments will be inaugurated under the direction of Charles Beresford.

Julieta—This gold property in the Almoloa section is reported sold through Paul Ginther to English capitalists who are to begin extensive work. The property is credited with a production of over \$1,000,000 and with large bodies of cyaniding ore available. The new owners will probably erect a large amalgamation-cyanidation plant soon.

Calabacillas—The operators of this old gold-silver mine reached from Fuerte, Sinaloa, are planning on the early erection of a 100-ton cyanide plant. The property is developed to 800 feet.

San Ygnacio—This mine, about 85 miles south of El Paso has been purchased from Lewis Vidal and Tom Johnson by W. Franklin Burnham and associates, of Boston. The property has produced considerable silver-lead and high-grade silver ore. The dry concentrating mill on the property is being remodeled. John A. Rice, of El Paso, is consulting engineer for the new company, called the San Ygnacio Mining and Milling Company.

Arizona-Parral Mining Company—The properties of the American Zinc Extraction Company in the Parral camp have been transferred to this company. E. E. Swain will continue in charge.

DURANGO

Mexico Consolidated—A plan of reorganization has been adopted and a new company is to be organized known as the Mexico Consolidated Mining and Milling Company, with a capital of \$1,500,000, divided into 300,000 shares of the par value of \$5. Two hundred and forty thousand shares are to be offered to the stockholders of the old company in exchange share for share on payment of \$1 per share in suitable installments; 33,000 at \$5 per share in payment to creditors; and 27,000 shares reserved for treasury purposes. The new company pays the old \$10,000, and assumes its debts amounting to \$326,075, and gives the old stockholders the right to exchange one share of old for one share of new on payment of \$1 per share. The new company settles with creditors as follows: To Stallforths—Cash, \$67,000; stock at par,

\$165,000; to banks, cash, \$83,000; to laborers, etc., cash, \$47,075. To insure the requisite cash a syndicate agrees to take any delinquent stock and pay the assessment. The new company will be free from debt and incumbrances and will have working capital as follows: Minimum, \$32,924; if all exchange, \$42,924.

HIDALGO

In the Pachuca district the Nevada y Anexas company will commence operations on the Analco vein west of Pachuca. The San Felipe de Jesus mine, near the Cabrera, in the Real del Monte section will resume.

A concession has been applied for by Gabriel Mancera to establish an electric generating plant at El Chico. The waters of the Milagro and Tetitlan rivers have been denounced. There is an available fall of 725 ft. In addition to the water obtainable from the two streams, it is also intended to utilize the water which supplies the motive power to the Adjuntas plant, belonging to the Arevalo company, which supplies power and light in the Neptune tunnel. This tunnel is driven more than 2000 m., and right-of-way has been secured to continue the tunnel into the Pachuca district, a total length of 10 kilometers.

JALISCO

Almoloa—This Mexico City company, operating in the Ameca district, is turning out from 2 to 3 tons of concentrates daily. Shipment is made to San Luis Potosi. A tunnel being driven 160 m. to cut the vein 200 ft. below the present workings and 350 ft. below the outcrop will be soon completed. The capacity of the concentrating plant will be then enlarged.

Bolaños—The famous old producers of the Bolaños district, control of which was recently acquired by the Bradbury interests of Los Angeles, Cal., will be unwatered and worked by the Mexican Mines Company, just organized with a capital of \$500,000. Pumping equipment has been shipped from the United States. The old road from Zacatecas to the mines, 165 miles, is being repaired. F. W. Oldfield is in charge.

Zuloaga—This *antigua*, in the San Martin de Bolaños camp, 20 miles south of the old Bolaños mines, has been taken over by St. Paul men represented by C. D. O'Brien, Jr. The mine has been recently the property of Patrick Fitzgerald, manager of the Lupita Mines Company, operating in the Mascota district. The old workings are extensive, and there is much milling ore available. A company will be formed to reopen and work it.

Magistral-Ameca—A new body of 4 per cent. copper ore has been opened in the Magistral mine. A Dunham table has been installed for experimental pur-

poses in the concentrating plant. The Elmore flotation process has been abandoned, because it is reported satisfactory results were obtained only with clean sulphide ore.

MEXICO

El Oro—In September the mills crushed 11,710 tons, yielding bullion, \$129,160. The working expenses were \$38,370 and development \$8,600, leaving profit \$82,190.

Mexico Mines—In September the mill crushed 30,012 tons, yielding bullion, \$199,140. The working expenses were \$88,610, and development \$22,000, leaving profit \$88,530. Profit on railway \$4000.

SINALOA

Butters Copala Syndicate—The limited development in progress since the mill shut down last year has been stopped. G. A. Swanquist, who has been in charge, has left for the Butters mines in Salvador. The work since the shutdown has proved the existence of higher-grade ore, but it will require much development to make it available in sufficient quantities to give a profitable average in combination with the lower-grade ores of the mines. Mr. Butters is expected to arrange for resumption soon.

Panuco—Negotiations for the sale of these mines to London interests have been in progress recently. The price asked is 6,000,000 pesos.

Palmarito—The new cyanide plant, 1 1/2 miles from Casal station, on the Southern Pacific, is in commission. There are 20 stamps and two tube mills. The capacity is 180 tons daily. Philadelphia men compose the company, and C. D. Smith is in charge.

SONORA

Cananea-Boston—Crosscutting has been started on the first level of the initial shaft.

South Tigre—The final payment on the Porvenir claim, amounting to \$28,000, was made last week by William Rynerson in behalf of the company.

Black Mountain—A reorganization for the purpose of securing funds for development is the plan of this company. The ore in sight at present does not run more than \$3 to the ton, and while this is abundant, it is too low to more than pay operating expenses.

Santa Teresa—Prospectors from Cananea claims to have discovered the exact site of this famous old silver mine, which has been lost since the Indian uprising of 1820.

El Triunfo—This company, owning a partially developed gold property near Arizpe, has finished the concentrator and is erecting a smeltery.

San Bernardo—This concern has been operating its 10-stamp mill continuously since Sept. 1.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, Oct. 19—In the West trade is gradually working around to a normal basis. The working mines are all busy, and coal stocks are being made up as fast as transportation facilities will permit. There is some improvement reported in car supply, but it is still below the requirements of the trade.

In the East the bituminous trade shows a welcome improvement. The anthracite trade is quiet and steady.

The long stage of low water in the Ohio was broken last week by a rise. It was not sufficient to help the Pittsburg shippers; but 600,000 bu. were sent out of the Kanawha river to Cincinnati and Louisville.

Western Coal Rates—The Department of Justice at Washington has begun an investigation of the charges filed by the Ohio Coal Operators' Association against the railroads. The charges are that existing railroad rates on coal constitute unfair discrimination in favor of West Virginia coal; and further that favors have been granted to coal companies owned or controlled by the railroad companies. The investigation is directed by Assistant Attorney General Harrison as special agent of the department.

COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, nine months ended Sept. 30, short tons:

	1909.	1910.	Changes.
Anthracite.....	7,924,964	8,039,277	I. 114,313
Bituminous.....	28,232,854	30,320,993	I. 2,088,139
Coke.....	8,153,629	10,192,013	I. 2,038,384
Total.....	44,311,447	48,552,283	I. 4,240,836

The total increase reported this year was 9.6 per cent.

Anthracite-coal tonnage of Baltimore & Ohio railroad, eight months ended Aug. 31, was 500,431 tons in 1909, and 564,672 in 1910; increase, 64,241 tons.

Coastwise shipments of coal from leading Atlantic ports, eight months ended Aug. 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	9,476,807	7,531,427	16,828,234	59.9
Philadelphia	1,304,371	3,135,238	4,439,609	15.8
Baltimore....	162,809	2,424,044	2,586,853	9.2
Newp't News .....	.....	1,955,049	1,955,049	7.0
Norfolk.....	.....	2,266,614	2,266,614	8.1
Total.....	10,943,987	17,132,372	28,076,359	100.0
Total, 1909.	10,903,388	15,741,848	26,645,236	.....

Total increase this year, 1,431,123 tons, or 5.4 per cent. New York includes all the harbor shipping points. Norfolk includes Sewall's Point.

Coal receipts at San Francisco, eight months ended Aug. 31, were 256,390 tons

in 1909, and 203,239 in 1910; decrease, 53,151 tons.

Coal passing Davis Island dam on the Ohio, eight months ended Aug. 31, was 2,360,370 short tons in 1909, and 1,500,145 in 1910; decrease, 860,225 tons.

Coal passing down Great Kanawha river, West Virginia, eight months ended Aug. 31, was 990,372 tons in 1909, and 878,840 in 1910; decrease, 111,532 tons.

Coal passing through the locks on the Monongahela above Pittsburg, eight months ended Aug. 31, was 6,625,007 tons in 1909 and 6,575,690 in 1910; decrease, 49,317 tons.

Coal receipts at St. Louis, eight months ended Aug. 31, were 4,118,563 short tons in 1909, and 5,443,666 in 1910; increase, 1,325,103 tons.

Coal passing through Sault Ste. Marie canals to Lake Superior, season to Oct. 1, short tons:

	1909.	1910.	Changes.
Anthracite.....	916,740	1,209,289	I. 292,549
Bituminous.....	6,122,069	8,896,296	I. 2,774,227
Total.....	7,038,809	10,105,585	I. 3,166,776

The total increase this year was 45 per cent. The gain has been much larger than was expected.

The tonnage carried by the Erie Railroad during the fiscal year ended June 30 last was: Anthracite, 8,707,251; bituminous coal, 8,189,987; coke, 2,231,558; total, 19,128,796 tons. This was 49.4 per cent. of the total tonnage moved.

Coal and coke tonnage of Chesapeake & Ohio railway, two months of fiscal year from July 1 to Aug. 31, short tons:

	Coal.	Coke.	Total.
New River.....	1,293,165	51,460	1,344,625
Kanawha.....	1,289,356	10,399	1,299,755
Kentucky.....	130,667	.....	130,667
Connecting lines.....	14,315	5,710	20,025
Total.....	2,727,503	67,569	2,795,072
Total, 1909.....	2,331,699	69,933	2,401,632

Total increase this year, 393,440 tons, or 16.4 per cent. Deliveries this year to points west of mines, 1,750,842 tons coal and 32,795 coke; points east, 230,102 tons coal and 25,824 coke; tidewater, 744,496 tons coal and 8950 coke; anthracite to line points, 2063 tons.

New York

ANTHRACITE

Oct. 19—A fair trade in the domestic sizes is reported as consumers gradually work up to the point of putting in their winter supplies. The business in steam sizes is good, perhaps a little better than usual.

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

\$2.95@3.25; buckwheat, \$1.15@2.50; No. 2 buckwheat, or rice, \$1.65@2; barley, \$1.35@1.50; all according to quality, f.o.b. New York harbor.

BITUMINOUS

The Seaboard bituminous trade is good; better, in fact, than it has been for months. Inquiries for coal are numerous and sales are large. All-rail trade is as good as the Coastwise business.

Prices are stronger, and are firm at an advance of 5 or 10c. over recent quotations. Gas coals are selling at tide at prices which realize \$1.05@1.10 at mine for ¾-in., 95c.@\$1 for run-of-mine and 70c. for slack. Low-volatile steam coals bring \$2.65@2.70, New York harbor, for the lower grades, and up to \$2.90@3 for better qualities.

Transportation is fair, coal coming through with only slight delays. Car supply is fair on most lines.

In the Coastwise market there is a demand for vessels and rates are firm. Large vessels from Philadelphia are getting 70@75c. to Boston, Salem and Portland; 75@80c. to Portsmouth; 80@85c. to Lynn, Newburyport and Bath; 90@95c. to Saco; 95c. to Bangor; 60@65c. to Providence and the Sound ports.

Birmingham

Oct. 17—Coal operations in the Southern territory are steady, with the production heavy. All the labor that can be found is being given steady employment. A good price is obtained for coal in this district.

It is announced that negotiations are about to be closed for the purchase of thousands of acres of coal lands in Alabama belonging to the Bryan estate, of Richmond, Va., and as soon as the deal is consummated, the new owners of the properties will begin active development. A syndicate of capitalists of New York, West Virginia and Kentucky, headed by A. Maben Hobson, of Birmingham, has purchased a large tract of coal lands in Kentucky.

There is a good demand for coke in this territory and all ovens in condition are in operation.

Chicago

Oct. 18—The coal market is quiet, all kinds being in large supply and the demand slack on account of warm weather and a feeling of security on the part of retailers and consumers. Supplies from the Illinois mines are in such abundance that not even the most gloomy talk

about impending car shortage, indulged in by a few interests, can frighten users of coal into large buying. This condition, in the opinion of those well versed in the trade, will continue until cold weather sets in. Shipments of eastern coals, especially smokeless, should be made cautiously, for the market shows signs of returning to its old-time condition of continued oversupply and cut prices to escape demurrage charges. Both steam and domestic coals—not excepting anthracite—are far from strong, except in the case of a coal like Hocking, shipments of which are very well adjusted to the demand.

Illinois and Indiana bring in car lots \$2.20@3.50 for lump and egg, \$1.90@2.10 for run-of-mine and \$1.50@1.65 for screenings. Smokeless holds to circular quotations of \$3.95 for lump and \$3.30 for run-of-mine, and \$3.40 is paid for Hocking.

Cleveland

Oct. 17—Lake trade continues active, although the returns for September show a large increase in shipments over last year. The large current shipments have made slack over-plentiful. Steam trade is good and domestic business active.

Prices are practically unchanged. Middle district coal brings \$2.15 for large lump, \$1.90 for ¼-in., \$1.80 for run-of-mine and \$1.55 for slack; No. 8 and Cambridge districts, 5 or 10c. higher. Pocahontas, \$3.25 for lump and \$2.60 for run-of-mine.

Car supply is better, though there is still some scarcity.

Indianapolis

Oct. 17—There was a decided improvement in the coal carrying traffic during the past week. The Indiana mines continue to operate at full time and capacity and the railroads are pushed hard, moving more coal than at any previous period. The payroll for the mines Oct. 11 was said to have been the largest in the history of the industry in the State. Prices are steady, and the usual November increase is expected.

Governor Marshall will recommend that the incoming legislature amend the law so as to take the appointment of the State mine inspector out of the hands of the State geologist and place it with the governor.

Pittsburg

Oct. 18—Mines are running full in nearly all cases with a good demand on account of the near approach of the end of the Lake season. There is a fair supply of cars. Prices are moderately well held, the regular quotable market remaining: Mine-run and nut, \$1.20@1.22½; ¼-in., \$1.30@1.32½; domestic 1¼-in., \$1.45@1.47½; slack, 75@82½c. per ton.

Connellsville Coke—The market re-

mains quiet. Production is slightly heavier and consumption is not increased, so that there is a slight increase in the offering of coke loaded on cars which has to be moved. In exceptional cases this can be picked up at \$1.50 for furnace, and usually it can be at \$1.55, while the regular operators' price is \$1.60. Thus the market is fairly quotable at \$1.55@1.60 for prompt furnace, or 5c. less than formerly. Contract furnace coke is purely nominal. There is occasional inquiry for first half but operators are in no hurry to commit themselves and furnaces are perfectly willing to wait. Prompt foundry coke of fairly good grade can usually be picked up at \$2, and ordinarily good grades at \$2.15, and we quote the market at this range, 10c. less than formerly. One or two specially good grades still bring \$2.50 on contract without difficulty and we note one contract at this price in the past week, running to July 1. We quote contract foundry coke at \$2.25@2.50 as formerly.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Oct. 8 at 350,315 tons, an increase of 5000 tons, and shipments at 3762 cars to Pittsburg, 5661 cars to points west and 944 cars to points east, a total of 10,367 cars.

St. Louis

Oct. 18—The weather has been unusually warm all week, which has had the effect of slightly slowing down the domestic demand. While steam demand is heavy users do not seem inclined to pay anything but rock-bottom prices and have driven coal down to a very low point. There is a tremendous tonnage on the St. Louis market at present which has had to be consumed locally. The action of the railroads in placing embargoes has hampered the coal man very much and operators feel much abused at being forced to dispose of their coal in St. Louis locally. Prices are extremely low now and are being forced lower daily by the additional tonnage. Railroads have gone so far as not only to restrict the movement of their own equipment but the movement of the foreign equipment as well. This is an arbitrary movement and one that is causing a great deal of discontent among the operators, who are murmuring loudly and seem to feel that these movements of the railroads are part of a concerted plan to break the market.

High-grade coal is still maintaining itself pretty well though prices are a little off from what they were a couple of weeks ago. Dealers throughout the North and Northwest are absorbing coal freely.

Anthracite—Anthracite is in good shape and demand is a little brisker than it was last week. A good tonnage of all sizes is coming forward and is being absorbed as rapidly as it comes in.

Current prices on the St. Louis market are as follows:

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg.....	\$1.60	\$2.12
2-in. lump.....	1.20	1.60
Mine-run.....	1.00	1.52
Screenings.....	0.50	1.02
Trenton:		
6-in. lump and egg.....	2.50	3.02
3-in. nut.....	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump.....	1.80	1.32
2-in. lump.....	1.75	2.27
Mine-run.....	1.20	1.72
Screenings.....	0.60	1.12
Cartersville:		
6-in. lump or egg.....	2.00	2.67
3-in. nut.....	2.00	2.67
Mine-run.....	1.25	1.92
Screenings.....	0.75	1.42
Pocahontas and New River:		
Lump or egg.....	2.25	4.75
Mine-run.....	1.25	3.75
Pennsylvania Anthracite:		
Nut, stove or egg.....	.....	6.95
Grate.....	.....	6.70
Arkansas Anthracite:		
Egg or Grate.....	2.35	5.35
Coke:		
Connellsville foundry.....	.....	5.40
Gas house.....	.....	4.90
Smithing.....	.....	4.15

Prices at East St. Louis are 20c. per ton below St. Louis quotations.

FOREIGN COAL TRADE

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, eight months ended Aug. 31, long tons:

	1909.	1910.	Changes.
Anthracite.....	1,904,330	1,970,069	I. 65,739
Bituminous.....	5,988,061	6,970,800	I. 982,739
Total exports...	7,892,391	8,940,869	I. 1,048,478
Steamer coal....	4,065,522	4,290,139	I. 224,617
Total.....	11,957,903	13,231,008	I. 1,273,105
Coke.....	616,370	572,238	D. 44,132

Canada took this year 6,688,030 tons of coal, or 74.8 per cent. of the total exports. Cuba took 558,837 tons of coal. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, eight months ended Aug. 31, long tons:

	1909.	1910.	Changes.
Anthracite.....	3,125	162	D. 2,963
Bituminous.....	747,534	1,251,502	I. 503,968
Total coal.....	750,659	1,251,664	I. 501,005
Coke.....	121,494	81,091	D. 40,403

Canada furnished this year 1,061,670 tons of coal and nearly all the coke; Australia, 131,846 tons of coal; Japan, 50,992 tons of coal. Imports are chiefly on the Pacific Coast and in the far north-western States.

IRON TRADE REVIEW

New York, Oct. 19—The iron market shows no material change from recent reports. The volume of business is good, but it is below the capacity of the mills and furnaces, and there is still a tendency on the part of buyers to hold off as long as possible and to wait developments. Buying is mainly for immediate needs and few contracts run far ahead. October is going on record as a quiet

month; it may be that activity will develop before the end of the year comes, with its usual quiet spell.

In pig iron, however, some good orders are reported. Eastern territory has taken more iron, pipe foundries being the biggest customers. On 1911 contracts buyers are still holding off, but sellers seem more disposed than they were to accept current prices for first-quarter deliveries. In the Central West more business has been done in basic pig. There have also been some sales of basic in the East, and it is understood that such iron has sold at \$14.50@14.75, seaboard delivery.

In finished material structural steel is still the leader, with many small orders and some larger ones. Some orders for railroad equipment are noted, but the railroads generally are not active buyers. Bars have been in good demand, but there is considerable competition for orders. It is said that contracts have been taken at 1.40c., seaboard delivery, for common and 1.45c. for refined iron.

The president's address at the meeting of the American Iron and Steel Institute is taken as indicating a policy of maintaining prices on the part of the leading interests in the trade.

Tinplate Production—The American Iron and Steel Association reports the production of black plates or sheets for tinning in 1909 at 606,844 long tons, an increase of 93,043 tons over 1908. The production of tinplates in 1909 was: Terne plates, 190,930,000 lb.; tinplates, 1,182,081,000 lb.; total, 1,373,011,000 lb., an increase of 169,936,000 lb. over 1908, and the largest production ever reported.

Baltimore

Oct. 17—Exports for the week included 1,417,090 lb. spelter and 5,748,300 lb. steel billets to Great Britain. Imports included 6700 tons manganese ore from Bombay, India; 24,100 tons iron ore from Cuba.

Birmingham

Oct. 17—While pig iron selling in the Southern territory is in small lots, the aggregate is not bad, and there is hope that better conditions will soon come on. The quotations continue \$11@11.50 per ton, No. 2 foundry. Some sales are being made in this section of the country at \$11.50, delivery during the first three months of next year. Iron manufacturers in this part of the country are still receiving inquiries for iron for delivery during the first half of 1911, but beyond the first quarter there has been but little business booked as yet.

There is a steady reduction of accumulated stocks of iron in Southern territory. Cast-iron pipe makers are working their plants on full time and are using a large quantity of iron. It is stated that those interests have made arrangements for iron covering quite a period.

Other interests have purchased iron for immediate needs.

Chicago

Oct. 18—The iron market seems to be strengthening all around; sales of basic pig iron have been large, the demand for foundry grades has increased notably, on first-quarter and first-half deliveries, and iron and steel products are much more active. Furnace agents still hold to slight premiums over the standard standard quotations for last-quarter and first-quarter prices, on deliveries extending over the first half, and melters appear to have concluded that these will be minimum prices, at which it is well to buy. On last-quarter deliveries Southern brings \$15.35@15.85, Chicago (\$11@11.50, Birmingham), and Northern \$16@16.50, for No. 2 in both cases. Little business is being done in iron for last-quarter delivery, most melters being well supplied for that period. The disposition among melters is to contract ahead more freely. The coke market is firm at \$4.90 for the best Connellsville.

Cleveland

Oct. 18—Iron-ore receipts are falling off, as was expected. There is little doubt, however, that the season total will be up to that of last year.

Pig Iron—Locally the market is dull. There is still a deadlock on 1911 orders, makers holding on to their demand for 50c. over current quotations, while sellers do not see the reasons for such an advance.

Finished Material—Buyers are still studying over the new sheet and pipe cards. Some small structural contracts are being closed. Wire is active and sales have been good. There is also good business in tinplates, and some fair sales of bars.

Philadelphia

Oct. 19—Inactivity prevails in all lines of pig iron excepting in iron for pipe foundries, in which large purchases have recently been made, including one or two options for Southern iron.

A large quantity of pig iron has been purchased for the Altoona shops, in which deliveries will be scattered over several months. The only new inquiries are for small quantities of malleable and charcoal irons for November delivery. Neither large nor small consumers will purchase iron on a large scale at this time and the offerings made by Southern furnaces, which show slight reductions, have not brought out any definite orders. Basic is quoted at \$15; gray forge at \$14.50 and the little No. 2X foundry that has been sold went at \$16, or a little under.

Steel Billets—The billet consumers have bought sufficient to clean up work in hand and have declined offers of sup-

plies to run them through the first quarter of next year.

Bars—The postponed September demand for bars is manifesting itself in a sharp demand for supplies from mill and stores. The outlook has suddenly improved and stores report a good distribution.

Sheets—After several weeks of apathy a sharp demand has sprung up, mostly of a retail character.

Tubes—Tubes are more active in large lots. The tone of the market is decidedly better than a week ago.

Plates—Scarcely any business of importance has been booked. Small orders are numerous enough; but the tone of the market is weak.

Structural Material—Orders are coming in on former contracts but no heavy orders have been placed; there is the usual run of small orders.

Steel Rails—Small orders for mine rails and two or three good-sized lots for trolley lines are reported.

Scrap—The scrap market is more active for the lower grades, such as turnings and borings; a few sales of No. 1 yard scrap. Prices are weak as there is a large supply and yard men are anxious to turn scrap into money.

Pittsburg

Oct. 18—The tone of the iron and steel market is decidedly improved, and in some quarters it is held that the improvement in sentiment bears more marks of having a general basis than has been the case at any time hitherto this year. The improvement in tone is attributed largely to the better showing in Wall Street. The impression is abroad that the railroads will get at least half the rate advances they are asking, and that they have asked for more than they expected. The settlement of the rate controversy is expected by Feb. 1 and large orders from the railroads are expected immediately thereafter.

Orders for rails, plates, shapes and line pipe continue extremely light, so that shipments in these lines, which continue fairly heavy, represent almost a dead loss in the amount of unfilled orders on books. In sheets, tinplates, wire products and merchant pipe buying continues fairly good. Tinplate has done better since the first of the month than was expected, as despite the large decline in the cognate product, sheets, tinplate buyers are showing considerable confidence and are buying tinplate at the existing price for next year's delivery.

Pig Iron—The event of the week, so far as sentimental influence is concerned, was the sale by two interests of a total of 6000 tons of malleable iron to the Pittsburg Malleable Iron Company at \$14.90, delivered, for equal deliveries over the year 1911. Reports agree that

a part at least of the tonnage was taken by a Valley furnace, which would mean \$14 at furnace, while it is strongly rumored that a portion was taken by a Cleveland furnace, which would mean only \$13.40 at furnace for that iron. The relative cost of assembling coke and ore at Cleveland and in the Valleys almost exactly covers the difference of 60c. in freight to Pittsburg, so that such transactions are in line with costs, but surprise is expressed over lake-front furnaces giving away their advantage over the Valleys. Still more surprise is felt that furnaces would be willing to sell for deliveries over the whole of next year at practically the present market, which has lately been regarded as made under stress of large stocks and need of realizing cash. The familiar explanation of the taking of "backlog" business is not applicable, since furnaces selling a small fraction of their output over a long period are surrendering the opportunity of remaining idle. Basic iron is understood to have sold again at \$13, Valley, for early delivery. There are rumors of bessemer being available at as low as \$14.50, Valley, but these are not confirmed sufficiently to warrant quoting other than the \$15 price which has recently ruled. Foundry iron is still quotable at \$14, Valley, but it is possible that the price can be shaded by close buyers. The Standard Sanitary Manufacturing Company has bought 1000 tons of Southern iron at \$11, Birmingham, for fourth-quarter delivery to its Louisville plant, and is about to close on its present inquiry for 1000 tons of Northern iron for its Allegheny and New Brighton plants for the same delivery.

Ferromanganese—The market has become still softer and we quote \$38.50, Baltimore, freight to Pittsburg being \$1.95 per ton.

Steel—The market is quiet, with prices held at least nominally, as follows: Bessemer billets, \$24; sheet bars, \$25; open-hearth billets, \$25@25.50; sheet bars, \$25.50@26; rods, \$28.50@29, all Pittsburg.

Sheets—Demand for sheets continues fairly good and mills are better employed than formerly. Regular quoting prices are 2.20c. on black, 3.20c. on galvanized, 1.65c. on blue annealed, \$1.60 on painted corrugated roofing and \$2.80 on galvanized corrugated roofing, but occasionally these prices are shaded 5c. per 100 lb. on flat sheets and per square on corrugated material.

St. Louis

Oct. 17—The iron market is a little more active than last week and a number of small orders have been received. All of the trading has been in stuff for immediate shipment. Some inquiries for fair-sized lots have been received and several large inquiries for first-quarter

delivery. Current prices remain unchanged at \$11.50 per ton, f.o.b. Birmingham, or \$15.25 per ton, f.o.b. St. Louis, for No. 2 foundry.

Sault Ste. Marie Canal

The total freight passing through the Sault Ste. Marie canals for the season to Oct. 1 was, in short tons:

	1909.	1910.	Changes.
East-bound.....	30,967,325	37,507,279	I. 6,549,954
West-bound.....	8,082,123	11,329,895	I. 3,247,772
Total.....	39,049,448	48,837,174	I. 9,787,726

The number of vessel passages this year was 16,115, giving an average cargo of 3031 tons. The mineral freights included above were as follows, in short tons, except salt, which is in barrels:

	1909.	1910.	Changes.
Coal.....	7,038,798	10,105,585	I. 3,066,787
Iron ore.....	28,120,830	34,282,282	I. 6,161,452
Pig and mfd. iron.....	345,361	311,930	D. 33,431
Copper.....	79,891	95,653	I. 15,762
Building stone.....	1,129	8,365	I. 7,236
Salt, bbl.....	483,967	427,248	D. 56,719

Iron ore was 70.2 per cent. of the total freight this year, and coal, 20.7 per cent.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports the make of pig iron in Germany in August was 1,262,804 metric tons, being 34,488 tons more than in July. For the eight months ended Aug. 31, the production was, in metric tons:

	1909.	1910.	Changes.
Foundry iron....	1,592,409	1,901,450	I. 309,041
Forge iron.....	460,189	435,878	D. 24,311
Steel pig.....	716,835	885,915	I. 169,080
Bessemer pig.....	273,473	326,579	I. 53,106
Thomas(basic)pig	5,397,786	6,143,330	I. 745,544
Total.....	8,440,692	9,693,152	I. 1,252,460

The total increase this year was 14.8 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

German Foreign Trade—Exports and imports of iron and steel and of machinery in the German Empire, six months ended June 30, metric tons:

	Exports.	Imports.	Excess.
Iron and steel....	2,373,763	261,966	Exp. 2,111,797
Machinery.....	181,384	40,749	Exp. 140,635
Total.....	2,555,147	302,715	Exp. 2,252,432
Total, 1909.....	2,028,507	251,429	Exp. 1,777,078

Imports of iron ore this year, 4,640,642 tons; exports, 1,433,415 tons. Imports of manganese are 249,373 tons; exports, 1993 tons.

METAL MARKETS

New York, Oct. 19—A little more activity is manifest in the metal markets generally. Business in some lines has been better, but price changes have been small.

Gold—While Germany and Egypt are still taking gold, there was no change on the open market in London, prices remaining at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin.

Platinum—The market is very strong, demand continuing good, especially from the jewelry trade. Prices have again

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1910..	\$3,150,423	\$12,818,606	Imp. \$ 9,668,183
" 1909..	9,230,273	5,348,757	Exp. 3,881,516
Year 1910..	53,495,605	42,489,786	" 11,005,819
" 1909..	89,726,392	28,764,235	" 60,972,157
Silver:			
Aug. 1910..	4,755,708	4,119,362	Exp. 636,346
" 1909..	4,494,552	3,190,988	" 1,303,564
Year 1910..	36,934,397	29,815,770	" 7,118,627
" 1909..	38,903,584	29,979,133	" 8,924,451

Exports from the port of New York, week ended Oct. 15: Gold, \$1685; silver, \$511,215, to London and Paris. Imports: Gold, \$124,418, chiefly from Central America and Japan; silver, \$107,794, from South America and Mexico.

been advanced, and dealers now ask \$38 per oz. for refined platinum and \$43.50@44 for hard metal.

Silver—A variety of causes have contributed to an advance in silver. Chief among these, of course, is the excellent crop condition in India. Speculative operations also have been managed to assist the rise. The attitude or reported attitude of the India Specie Bank in declining to sell at prices current the last few weeks, together with the improvements in the China exchanges, have given an almost buoyant tone to the market during the past week.

SILVER AND STERLING EXCHANGE

Oct.	13	14	15	17	18	19
New York....	55%	55%	56	56%	56%	56%
London.....	25 1/4	25%	25 1/2	26	26%	26 1/4
Sterling Ex..	4.8590	4.8600	4.8600	4.8610	4.8610	4.8625

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, as reported by Pixley & Abell, period from Jan. 1 to Oct. 6:

	1909.	1910.	Changes.
India.....	£4,675,400	£5,253,500	I. £ 578,100
China.....	1,555,200	1,118,500	D. 436,700
Straits.....	82,800	.....	D. 82,800
Total.....	£6,313,400	£6,372,000	I. £ 58,600

India Council bills in London brought an average of 16.08d. per rupee for the week.

Movement of gold and silver through the port of San Francisco, eight months ended Aug. 31:

	Exports.	Imports.	Excess.
Gold.....	\$1,970,208	\$1,973,238	Im. \$ 3,030
Silver.....	4,072,600	1,413,938	Exp. 2,658,662

All of the gold exported and all of the silver except \$6000, were in the form of bullion. Of the imports \$377,386 gold and \$706,332 silver were in coin, the rest in bullion.

Gold and silver movement in France, eight months ended Aug. 31:

	Imports.	Exports.	Excess.
Gold .Fr.	187,584,000	Fr.139,712,000	Imp.Fr. 47,872,000
1909..	326,182,000	32,759,000	Imp. 293,423,000
Silver.	104,744,000	137,795,000	Exp. 33,051,000
1909..	98,711,000	89,963,000	Imp. 8,748,000

Imports of copper and nickel coins this year, 35,000 fr.; exports, 469,000 franc.

Copper, Tin, Lead and Zinc

NEW YORK							
Oct.	Copper.		Tin.	Lead.		Zinc.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
13	12 3/4 @ 12 3/4	12.50 @ 12.60	36 1/2	4.40	4.25 @ 4.27 1/2	5.52 1/2 @ 5.55	5.37 1/2 @ 5.40
14	12 3/4 @ 12 3/4	12.50 @ 12.60	36 1/2	4.40	4.25 @ 4.27 1/2	5.52 1/2 @ 5.55	5.37 1/2 @ 5.40
15	12 3/4 @ 12 3/4	12.50 @ 12.60	36 1/2	4.40	4.25 @ 4.27 1/2	5.52 1/2 @ 5.55	5.37 1/2 @ 5.40
17	12 3/4 @ 12 3/4	12.50 @ 12.60	36 1/2	4.40	4.25 @ 4.30	5.52 1/2 @ 5.57 1/2	5.37 1/2 @ 5.42 1/2
18	12 3/4 @ 12 3/4	12.50 @ 12.60	36 1/2	4.40	4.25 @ 4.30	5.52 1/2 @ 5.57 1/2	5.37 1/2 @ 5.42 1/2
19	12 3/4 @ 12 3/4	12.50 @ 12.60	37 1/4	4.40	4.25 @ 4.30	5.32 1/2 @ 5.57 1/2	5.37 1/2 @ 5.42 1/2

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON							
Oct.	Copper.			Tin.		Lead, Span- ish.	Zinc, Ordinar- ies.
	Spot.	3 Mos.	Best Sel't'd	Spot.	3 Mos.		
13	57	57 1/8	61	165 1/2	160	12 1/8	23 3/4
14	57 1/8	57 1/8	61	165 1/2	160	12 1/8	23 3/4
15	.....	.....	.....	.....	.....	.....	.....
17	57 3/8	58 1/8	61 1/4	164 1/2	159 3/4	13 1/8	23 3/4
18	57 3/8	58 3/8	61 1/4	165 1/2	161 1/2	13 3/8	24 1/4
19	57	57 1/8	61 1/4	169	166	13 3/8	24

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17 1/2 c.; £12 = 2.61 c.; £23 = 5 c.; £60 = 13.04 c. ± £1 = ± 0.21 3/4 c.

Copper—The improvement in the copper market made further progress during the week. European buyers continued their purchases on an increasing scale and domestic consumers also took hold at a fair rate. However, prices have not yet greatly improved, inasmuch as the demand has been readily met by the leading sellers. The bulk of the business of the week was done at 12 3/4 c., delivered, 30 days, and £58 10s., c.i.f. Europe, corresponding to 12.50@12.60c., net cash, New York. Some of the agencies have now raised their asking price to 12 7/8 c. delivered, but so far they have been unable to obtain business at that price, except perhaps, upon occasional contracts for far-distant delivery.

The close is firm at 12 3/4 @ 12 7/8 c. for Lake copper, and 12.50 @ 12.60c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12 3/8 @ 12 1/2 cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

Stimulated by an active speculation, the standard market in London advanced about £1, but as the refined sorts have not followed suit in proportion, the close is somewhat lower, being cabled at £57 for spot, and £57 18s. 9d. for three months.

Exports of copper from New York for the week were 7001 long tons. Our special correspondent gives the exports from Baltimore for the week at 2606 tons.

Visible stocks of copper in England and France on Oct. 15—including 12,330 tons afloat from Chile and Australia—were 92,170 long tons; a decrease of 2150 tons from the Oct. 1 report.

Aron Hirsch & Sohn, of Halberstadt, Germany, have secured a contract, running from Jan. 1, 1911, for the refining and sale of the output of the Mt. Lyell company in Tasmania. The American Smelters Securities Company now refines the product of the Mt. Lyell at its Baltimore refinery, and the firm of Beer, Sondheimer & Co., has the selling of the copper. The Hirsch firm is represented here by L. Vogelstein & Co., New York.

The Rio Tinto company has officially stated that its curtailment of production is at the rate of 4,480,000 lb. per annum.

The production of copper in Russia for the half-year ended June 30, is reported at 704,815 poods, or 11,357 long tons.

Tin—The London market retained its firm undertone throughout the week. Up to Oct. 18 fluctuations were moderate, but on Oct. 19 quotations jumped over £4 for spot and £6 for three months. No special reason is given for this extraordinary advance, and it seems to be due simply to successful maneuvering on the part of the bulls. The market closes at £169 for spot, and £166 for three months.

Large shipments *en route* to this market and the willingness of the principal holders of the metal to sell at reasonable prices alleviated the spot position considerably. Premiums declined to about 1/2 c. Business, however, was in retail lots only, and the closing quotations are 37 1/2 c. for spot, and 37 1/4 c. for October.

Messrs. Robertson & Bense reports receipts of Bolivian tin concentrates at Hamburg, Germany, in September at 1151 metric tons.

Tin output for the Federated Malay States in September was 3113 long tons; for the nine months ended Sept. 30 it was 32,058 tons, a decrease of 3428 tons from last year.

Lead—The market is steady at 4.40c. New York. There has been a little more business in the West and prices are slightly higher at 4.25@4.30c. St. Louis.

Europe reports a very large business from all industries consuming lead, and

prices have again advanced, the close being cabled at £13 5s. for Spanish lead, and £13 7s. 6d. for English lead.

Spelter—The demand has been somewhat better and prices show signs of stiffening. The close is firm at 5.37 1/2 @ 5.42 1/2 c. St. Louis, and 5.52 1/2 @ 5.57 1/2 c. New York.

The London market continues firm due to an excellent consumption of the metal, as a result of which stocks which were on hand the earlier part of the year have now been entirely absorbed. The close is strong at £24 for good ordinaries, and £24 5s. for specials.

Base price of zinc sheets is \$7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The United States Zinc Company, of Pueblo, Colo., is now making zinc dust as a regular product.

Other Metals

Aluminum—Sales continue light and the market is dull. The quotations remain nominally at 21 1/2 @ 22c. for No. 1 ingots, New York.

Antimony—There is no change in the market, and business remains on a retail basis. Prices are nominally unchanged at 8 1/4 @ 8 3/8 c. per lb. for Cookson's; 7 7/8 @ 8c. for U. S., and 7 1/4 @ 7 3/8 c. for outside brands.

Quicksilver—Business is fair and there is no change in prices. New York quotations are \$46 per flask of 75 lb. for large lots; \$47 @ 48 for jobbing orders. San Francisco, \$45.50 for domestic orders and \$2 less for export. The London price is £8 7s. 6d. per flask, with £8 5s. named by second hands.

Nickel—Large lots, contract business, 40 @ 45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Cadmium—Current quotations are 60 @ 70c. per lb. in 100-lb. lots, f.o.b. New York, according to quantity of metal.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 15—The highest price paid for zinc sulphide ore was \$47 per ton, the base being \$41 @ 44.50 per ton of 60 per cent. zinc. Zinc silicate ore sold on a base of \$22 @ 26 per ton of 40 per cent. zinc. The average price, all grades of zinc ore was \$40 per ton. The highest price paid for lead ore was \$54 and the average price, all grades, was \$53.58 per ton.

The zinc-ore market this week was a duplicate of last week, the prices being

the same and the shipment only 99 tons more. There were fewer lots sold on the high base this week but the average price was a few cents higher on account of less silicate shipped. The lead market was off \$1 from the previous week for the high price and considerable ore sold on a \$53 and some on a \$52 base.

SHIPMENTS, WEEK ENDED OCT. 15.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,367,160	685,450	\$110,217
Joplin	2,134,200	239,490	51,164
Alba-Neck	766,540	.....	17,630
Duenweg	649,630	93,690	15,229
Galena	625,350	78,720	15,218
Miami	592,050	63,580	9,971
Spurgeon	391,090	78,680	6,409
Aurora	361,990	.....	5,945
Granby	292,520	4,570	4,675
Carl Junction	181,250	.....	3,987
Quapaw	138,820	16,350	3,062
Carthage	124,870	.....	2,747
Badger	127,660	.....	2,553
Sarcois	100,240	.....	2,105
Oronogo	54,330	.....	1,065
Totals	10,907,700	1,260,530	\$251,977

42 weeks.....469,251,070 68,517,410 \$11,008,221
 Zinc value, the week, \$218,197; 42 weeks, \$9,234,214
 Lead value, the week, 33,780; 42 weeks, 1,774,007

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	\$41.25	\$47.31	\$38.46	\$45.16	\$52.17	\$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	40.20	40.35	37.83	57.52	48.80
July	43.06	39.63	41.11	36.80	53.74	48.59
August	48.25	40.13	44.54	37.32	57.60	49.75
September	47.70	43.45	44.87	39.96	56.11	54.73
October	49.50	.....	45.75	.....	55.02	.....
November	51.31	.....	48.29	.....	53.94	.....
December	49.45	.....	47.57	.....	55.26	.....
Year	\$43.98	.....	\$41.20	.....	\$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 15—The base (and also the highest) price paid this week for 60 per cent. zinc ore was \$43. The base price paid for 80 per cent. lead ore was \$52 per ton.

SHIPMENTS, WEEK ENDED OCT. 15.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	2,389,220	.....	.....
Benton	549,830	.....	.....
Highland	508,900	88,300	.....
Platteville	408,510	59,090	.....
Galena	262,260	60,000	.....
Cuba City	224,720	.....	.....
Harker	158,170	.....	.....
Shullsburg	62,700	.....	.....
Dodgeville	.....	58,000	.....
Montfort	.....	65,000	.....
Total	4,564,310	330,390	.....
Year to date	83,372,084	8,002,034	21,144,530

Shipped during the week to separating plants, 3,482,850 lb. zinc ore.

CHEMICALS

New York, Oct. 19—The general market is still rather quiet, but some improvement in tone is evident, and dealers look forward to a better business.

Copper Sulphate—Business is steady and prices unchanged at \$4 per 100 lb. for carload lots and \$4.25 per 100 lb. for smaller orders.

Arsenic—The market has been better, with more sales. Prices are a shade firmer, \$2.25@2.50 per lb. being quoted for white arsenic.

Sulphur—Messrs. Parsons & Pettit, New York, report the importation by them on Oct. 11 of 868 tons of crude Sicilian brimstone in bulk.

Nitrate of Soda—Business continues rather quiet, and quotations are unchanged at 2.10@2.12½c. per lb. for spot sales, and 2.12½@2.15c. for futures.

Petroleum

Exports of mineral oils from the United States, nine months ended Sept. 30, in gallons:

	1909.	1910.
Crude petroleum	99,464,298	81,946,118
Naphthas	47,396,995	60,382,242
Illuminating oil	781,697,734	700,668,582
Lubricating and paraffin	109,258,012	120,042,702
Residuum	81,599,572	83,277,283
Total	1,119,398,611	1,046,336,927

The total decrease this year, as compared with 1909, was 73,061,684 gal., or 6.5 per cent.

California Oil Sales—A contract between the Associated Oil Company of Los Angeles and the Independent Agency-Union Oil Company was signed Oct. 5, placing, it is said, practically all the oil produced in California outside of that handled by the Standard Oil Company in the hands of one marketing agency for the next three years.

MINING STOCKS

New York, Oct. 19—The upward movement started last week in the general stock market has continued and there has been a decided improvement in quotations all around, with a much greater volume of business done. There have been some halts for profit taking, but the general indications are those of a bull market.

On the Curb the copper stocks were strong and active, nearly all making gains during the week. Chino, Ray Consolidated and Inspiration led in the advances. Cobalt shares were rather quiet but firm.

A sale of Homestake of South Dakota was reported, 200 shares at \$85 per share.

Boston, Oct. 18—Public interest has been greatly stimulated in copper shares by the recent strength and activity in that department of the Stock Exchange. The market has broadened materially and the daily large attendance in brokerage offices attests to the fact that the public is becoming interested in the market. With the proper leadership coppers would

do better, as prices do not reflect outside conditions.

North Butte has been slightly reactionary, due to profit taking on stock bought at the low figures. Lake had a period of activity and strength due to favorable reports on conditions at depth.

Most everything in the copper-share

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	July.	August.	September.
Anaconda	2,910,000	2,620,000	2,200,000
Arizona, Ltd.	1,100,000	.....	2,672,000
Balakhala	2,272,600	2,089,520	2,061,300
Boleo (Mexico)	8,771,735	7,796,559	6,933,759
Copper Queen	2,705,000	2,560,000	2,535,000
Cananea (Mexico)	4,500,000	3,626,000	3,565,000
Detroit	1,800,000	2,100,000	2,128,000
East Butte	.....	.....	790,000
Imperial	800,000	400,000	.....
Mammoth	.....	.....	.....
Moctezuma (Mex.)	1,958,637	1,630,204	2,211,435
Nevada Con.	6,896,429	5,800,000	5,270,000
Old Dominion	2,000,000	2,693,000	2,262,000
Shannon	2,207,000	1,546,000	1,418,000
Superior & Pitts.	2,224,000	2,520,000	2,125,000
Utah Copper Co.	8,677,000	7,440,035	7,100,000
Butte District	23,750,000	23,750,000	.....
Lake Superior	19,000,000	18,800,000	16,700,000
Total production.	90,804,411	85,221,318	.....
Imports, bars, etc.	17,714,034	13,324,788	.....
Total blister	108,518,445	98,546,106	.....
Deduct Can. & Mex.	6,458,637	5,156,204	.....
Net blister rep.	102,059,808	93,389,902	.....
Imp. in ore & matte	6,637,836	13,031,254	.....
Total	108,697,644	106,421,156	.....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report includes the output of the Boston mill. Butte district production for September is given under Anaconda and East Butte.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries Domestic.	Deliveries for Export.
X, 1909	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,061,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,344,818	40,585,767
IV	117,477,639	67,985,951	31,332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,456

VISIBLE STOCKS.

	United States.	Europe.	Total.
X, 1909	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	96,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,817
VIII	170,640,678	222,320,000	392,960,678
IX	168,881,245	218,444,800	387,326,045
X	148,793,714	211,276,800	360,070,514

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

list has moved up from two to five or more points. Amalgamated is closely watched in the New York market and its movements are reflected in the local list to a large extent.

The advent of Hayden-Stone interests in Inspiration, a porphyry property, gave that stock a boost on the Curb. Chino is also at its top. The Curb market has brought out quite a few features aside from those just mentioned. Prominent has been Nevada-Utah, which is up to \$1.37 1/2. Today it was announced that the Hooley-Learnard crowd had been deposed from the management, which also means that Lawson is not a factor in this property now. Mazatlan Copper and Gold, a Mexican property, is the latest adjunct to the Curb, selling at \$2.50@2.75 per share.

Assessments

Table with columns: Company, Delinq., Sale, Amt. Lists assessments for various companies like American Commander, Aurora-Sampson, etc.

Monthly Average Prices of Metals SILVER

Table showing monthly average prices of silver in New York and London from January to December 1909 and 1910.

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

Table showing monthly average prices of copper in New York (Electrolytic and Lake) and London from January to December 1909 and 1910.

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Table showing tin prices at New York from January to December 1909 and 1910.

Prices are in cents per pound.

LEAD

Table showing lead prices in New York, St. Louis, and London from January to December 1909 and 1910.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Table showing spelter prices in New York, St. Louis, and London from January to December 1909 and 1910.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

Table showing prices of pig iron at Pittsburgh in Bessemer, Basic, and No. 2 Foundry from January to December 1909 and 1910.

STOCK QUOTATIONS

Table of stock quotations for Colorado Springs and Salt Lake from October 18 and 19, 1910.

SAN FRANCISCO. Oct. 18.

Table of stock quotations in San Francisco, listing names of companies and their bid prices.

N. Y. EXCH. Oct. 18

Table of New York Exchange stock quotations for various companies like Amalgamated, Am. Agri. Chem., etc.

BOSTON EXCH. Oct. 18

Table of Boston Exchange stock quotations for various companies like Adventure, Algomah, etc.

N. Y. CURB Oct. 18

Table of New York Curb stock quotations for various companies like Ariz.-Cananea, Barnes King, etc.

BOSTON CURB Oct. 18

Table of Boston Curb stock quotations for various companies like Ahmeek, Bingham Mines, etc.

LONDON Oct. 19

Table of London stock quotations for various companies like Dolores, Stratton's Ind., etc.