THE ENGINEERING AND MINING JOURNAL
PUBLISHED WEEKLY

By the Hill Publishing Company, 505 Pearl Street, New York ~ John A. Hill, president; Robert McKean, secretary ~ London Office, 6 Bouverie Street, London, E. C., German Office, Unter den Linden 71, Berlin, Cable: Engminjour, N. Y. ~ Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada ~ To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs ~ Notice to discontinue should be written to the New York Office in every instance ~ Advertising copy should reach New York Office by Thursday of week before date of issue ~ Entered at New York Post Office as mail matter of the second class.

VOL. 90 AUGUST 27, 1910. NO. 9

CIRCULATION STATEMENT

During 1909 *we printed and circulated* 534,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for July, 1910, *was* 45,000 *copies.*

August 6	11,000
August 13	9,500
August 20	9,500
August 27	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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The Smelting Reports

The appearance of the annual reports of the American Smelting and Refining Company and its affiliated concern is always an event of interest, these two companies representing the larger part of the business of smelting silver-lead ore in the United States, while both have also an important business in the smelting of copper ore. The reports cover fiscal years ended April 30 and May 31 respectively.

The last reports of these concerns are, like all of their former reports, characterized by scantiness of detail. Each comprises a brief, nonilluminating statement by the president, and a single page of figures reporting assets and liabilities, and income account. The compilation of these figures appeals to the imagination rather than to the spirit of critical analysis. It is regrettable that concerns of such importance, which are so largely owned by the public, should choose to leave their stockholders so much in the dark. If these companies should add merely the amount of ore smelted and the amount of blister copper purchased from outsiders, or refined on toll, we should have some means of judging the status of their business from year to year. There is no possible harm in the communication of such data, and stockholders are entitled to it.

The report of the Smelting and Refining Company shows that in the last year total earnings decreased by $258,599. Net income decreased by $296,772. After paying the dividends on the preferred stock and 4 per cent. on the common, the surplus for the year was $1,546,278.

All things considered, this is a favorable statement. In 1909-10, owing partly to the relatively low prices for silver, lead and copper, general mining in some of the Western States was unprosperous. Particularly was this the case in Colorado, where mining has sunk to a low ebb. This seriously affected the Smelting and Refining Company by giving it less ore to smelt. The Colorado plants of that company, which for many years have treated about 1,000,000 tons of ore per year, in 1909 treated but little more than 600,000 tons. In Utah also there probably was a decrease. However, the profit realized per ton of ore from the Colorado plants is less than the general average of the company, and apparently the falling off in revenue from them was nearly made good by increases in other districts. It is one of the strong features of this company that its operations are so widely scattered that adversity, from competition, or otherwise, in one district may be offset by improvement in another. Increase in unsold stocks of lead and copper and abolition by the Payne-Aldrich tariff of what used to be known as "exempt" lead also tended to reduce profits in 1909-10.

During the 11 years of the history of this company, competition has not been a serious factor, and does not seem likely to become so in the general custom business, for the reason, among others, that the profit per ton of ore smelted is not sufficiently large to excite a systematic scheme of rivalry. The establishment of independent smelting works is likely to afford capacity for new ore supplies, rather than to cut into the business that the Smelting and Refining Company

already possesses. The concerted effort that is now being made to rejuvenate the mining industry of Colorado will be to the advantage not only of the miners, but also of the smelters, whose interests, broadly speaking, go hand in hand.

The chief elements of doubt in the statement of the Smelting and Refining Company are the position of the metals account, about which nothing is explained, and the amount appropriated for new construction and improvements, which is the form taken by amortization as practiced by this company. Out of total earnings are deducted (properly) ordinary repairs and betterments before net earnings are reported. During the nine years ended April 30, 1910, $7,656,979, an average of about $850,000 per annum, has been spent for this purpose. This should have been sufficient to keep the works of the company in good repair. During the same period $5,076,618 has been spent on new construction and improvements, an average of about $564,000 per annum. This has covered among other things the erection of new plants at Salt Lake and at Chihuahua, and practically the reconstruction of Leadville and El Paso, besides a large addition to the copper refinery at Perth Amboy. In part this new construction has taken the place of old plants abandoned, but in part it has provided additional capacity. The actual capacity of the company, both for smelting and refining, is larger now than it was 10 years ago, when the Guggenheim plants were absorbed. This indicates that the capital account of the company in this respect has been preserved; yet in looking toward the future it seems to us that the allowance for amortization has scarcely been sufficient. But with its large surplus the company is hardly likely to find itself in straitened circumstances.

The present smelting capacity is 4,465,000 tons of ore per annum, which is upward of 25 per cent. in excess of what is used at present. It appears, however, that 1,600,000 tons of this capacity is in Colorado, where the present use is probably not over 50 per cent., and before long some more of the Colorado smelting capacity will probably be abandoned.

The report of the Securities Company for the last year is certainly good, total earnings having increased by $1,783,409, while net income increased by $612,403, the small ratio of this increase as compared with total earnings being due to the appropriation of $1,016,825 for revaluation of metals and investments. After paying the dividends on the two classes of preferred stock there remained a surplus for the year of $1,133,445, making the total surplus of the company $1,688,197. The magnitude of the business of this company is now approaching closely to that of the Smelting and Refining Company. Starting with two smelting works—Selby and Tacoma—for which very high prices were paid, the company has itself built Federal, Velardeña and Garfield, besides acquiring extensive mining interests and the Baltimore copper refinery (not yet fully paid for). It looks as if this company were now well established, but it will need much more cash to carry the large stock of ores and metals that is necessary, and for this reason it will probably be several years to come before dividends will be paid upon the common stock, although the latter is rapidly becoming an asset of value.

Among investors much misconception exists respecting the business of these companies. They both have mining interests, but in the case of the Securities Company these are of an importance inferior to the smelting, while in the case of the Smelting and Refining Company they are almost insignificant, its mining interests consisting only of some silver-lead mines at Sierra Mojada, Santa Eulalia and Asientos in Mexico, which produce about 165,000 tons of ore per annum. The profit of the Smelting and Refining Company is derived principally from the margin between its purchases of ores and sales of metals, less the cost of smelting, etc. The company has for a long time adopted the policy of selling each day the metals that it takes in, and consequently it is not normally affected in any great way by low prices for the metals, except insofar as they increase or reduce the tonnage of ore offered for smelting.

On April 30, 1910, the Smelting and Refining Company had assets of $18,069,229 in metals, $1,278,097 in material, $11,620,400 in cash and demand loans, and $2,058,388 in investments (stock of the United States Zinc Company and preferred B stock of American Smelters' Securities Company) a total of $33,026,114. Liabilities comprised $121,000 of bonds, $431,551 of "net current liabilities," and $2,521,688 of unearned treatment charges, a total of $3,074,238. The excess of the above assets over liabilities was therefore about $30,000,000. The smelteries, refineries, land and other assets of the company must be physically worth somewhere between $15,000,000 and $20,000,000. In the last report of the Securities Company, President Guggenheim says, under date of Aug. 15, 1910, that it has been thought wise to recompute the metal stocks of that company "upon the same conservative low valuation established by the American Smelting and Refining Company many years since," and "the various metals in process of smelting and refining are now inventoried well below even the low market values." Accepting this statement, the cash and physical assets of the Smelting and Refining Company must be worth $50,000,000, equal to the preferred stock of the company at par. The common stock represents good will, organization and earning capacity, and the ownership of 177,510 shares of the common stock of the Securities Company not yet reckoned as an asset in the accounts. It must be recognized that in spite of the points upon which the American Smelting and Refining Company is open to criticism, financially and strategically it occupies a sound position.

Guesses as to the production and deliveries of copper in August will soon be in order. For our own part we do not venture to hazard any estimate. We may, however, indicate that the average daily rate of production is apt to be larger than in July. The falling off in that month was due in part to the natural curtailment of smelters' production two or three months earlier, but was chiefly ascribable to adverse conditions at the refineries. These conditions may have been overcome in August, and some of the refiners, at least, being well stocked with furnace material, a larger output in August is not improbable. If it should turn out that there is an increase in the stock at the end of the month, this should be no cause for disappointment. It is too soon for the curtailment inaugurated at the smelteries early in August to make itself felt in the refinery statistics.

It does not appear that the recent fires in the Cœur d'Alene will affect the mining industry of that district.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Electric Reheater

The description of the electric reheater fitted up for the Bully Hill Copper Mining and Smelting Company, published in the JOURNAL of June 11, 1910, recalls to my mind an early experiment in the reheating of compressed air that I carried out at a coal mine in the United Kingdom.

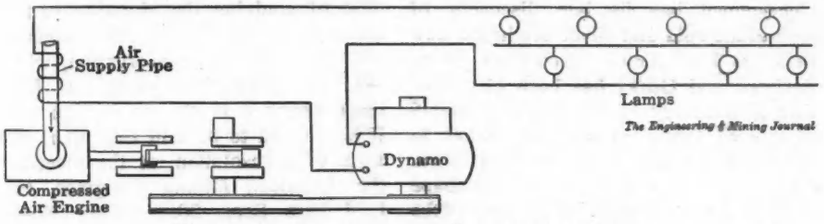
It was in the early days of electric lighting, before the advent of the compound machine, before the law of the dynamo was understood, and when the only available machine for lighting was the series-wound generator. Electric lighting of mines was then distinctly in the experimental stage. I was a pioneer of electric lighting in mines on this side and had fitted up several installations of arc lamps in collieries in South Wales, and in the county of Durham; one at Harris' Navigation Colliery, Glamorganshire, then one of the deepest mines in the Kingdom.

The manager at the Harris colliery was anxious to try some incandescent lamps underground. The depth of the mine, 2295 ft., practically forbade carrying cables down the shaft; for apart from the heavy cost of fixing shaft cables, the shaft itself was quite wet, indeed it practically rained on one as he descended in the cage. The power required for the lights underground was only from 4 to 5 h.p., and there was plenty of compressed air available, compressed air being used for the haulage and other plants. A small engine was fixed near the pit bottom, driving an "A" series-wound, Gramme machine. Forty lamps of 20 c.-p., as they were listed in those days, were fixed in two parallels, as shown in the figure, the two parallels being in series. Incidentally I may mention that we had great trouble with the installation, owing to the liability of some of the lamps on one parallel burning out, and the remainder having to carry the whole of the current that passed through the lamps on the other parallel. It frequently happened that if one or two lamps of a parallel failed, some others that were rather near their failing point also failed, and then the whole parallel went, and all lights were extinguished.

ENGINE FROZE UP

As is usual we experienced trouble from the formation of ice in the exhaust ports of the compressed air engine that drove the dynamo. It occurred to me that if I could reheat the air entering the cylinder, this difficulty would be avoided. To accomplish this, I wound a length of cotton-covered insulated wire upon the compressed-air supply pipe to the engine. The current for the lamps first passed through the wire surrounding this pipe and, the wire being comparatively small, a considerable amount of heat was liberated. This reheating sufficed to correct the tendency to the formation of ice.

I never made any measurements as to what it was costing to reheat the air. In those days there were no instruments available for taking accurate electrical measurements. Besides the great aim was to enable the engine to continue working. The additional consumption of a fraction of a horsepower did not seriously affect the cost of running the lights although, of course, the dynamo had to run a little faster to furnish the additional pressure required to overcome the resistance offered by the heating wire.



WIRING ARRANGEMENT FOR ELECTRIC REHEATING

SYDNEY F. WALKER.

Bloomfield Crescent, Bath, Eng., July 1, 1910.

Prices in Catalogs

I think there is need for an article about catalogs sent to Mexico and other countries from the United States. Such publications almost always come without prices. The few catalogs with prices get the business very often, for, even though the discounts make published prices misleading, the latter are a great help in estimating cost of a proposed plant. I have seen hundreds of "priceless" catalogs burnt in Mexico. One Texas drygoods house made a success by publishing a catalog with prices in Mexican currency, everything delivered at any express office in Mexico. I do not suggest that a similar catalog could be used for machinery, but prices in gold, f.o.b. the factory, should be printed in the list, and discount sheets sent to *bona fide* inquirers.

On one occasion I had three different quotations from as many officials of a certain machinery house, and discovered a system of "rakeoffs" that would astonish you.

A great deal of poor machinery gets into Mexico and it looks as if some houses ship us any old thing to get the money. It is rather rough luck to have new machinery fail in some far-away spot with no machine shop and no railway communication.

It would be too much to hope for catalogs in Spanish with prices in Mexican money, and a house behind them to ship goods as represented, and packed so as to survive the trip. Of course, most of us who are in charge of mines here are American or English, but many Mexican companies buy European machinery. "There's a reason."

HUGH G. ELWES.

Papantla, Veracruz, Mex., Aug. 10, 1910.

QUESTIONS and ANSWERS

USES FOR ANTIMONY?

Can any reader of the JOURNAL state for what purposes and to what extent antimony could be used as an alloy or otherwise, provided that a large supply of the metal were available at $48 per long ton? A. P.

CUTTING JADE, ETC.

(1) Do you know of any machinery for cutting such stone as jade?

(2) What is used for making incandescent burners for gas mantles and where can it be obtained?

(3) Where would you get machinery to prepare asbestos having a very long fiber? G. A. M.

(1) Jade is usually cut by the ordinary lapidary wheel which consists of a thin iron wheel edged with diamond splinters or dust. William Dixon, Inc., 39 John street, New York, handles such equipment.

(2) Incandescent mantles are made[1] of selected cotton fiber, purified to remove all possible traces of mineral matter. The knitted fiber is saturated with lighting fluid, composed of one part of a mixture of approximately 99 per cent.

[1] "The Mineral Industry," Vol. XVII, p. 654.

thorium nitrate with 1 per cent. cerium nitrate, and three parts distilled water. It is then dried and ignited. After this the mantles are shaped, fire-tempered and tested. Then, after covering with collodion, they are ready for the market. Thorium is one of the constituent elements in monazite, which is found in North and South Carolina in placer deposits. The greater part of the world's supply of monazite comes from Brazil.

(3) Machinery for preparing asbestos is sold by Earle C. Bacon, New York, and possibly other manufacturers of mining and milling machinery.

INCREASING CAPACITY OF SUCTION DREDGE

We sometimes have to dredge sand and gravel from considerable depths and when the depth is over 60 ft. and material coarse, the percentage that it is possible to raise by suction is quite small, due to the weight of the solution.

I have wondered what would be the result of introducing a jet of water under pressure into the pipe near the suction end. Our suction pipe is 22 in. in diameter, and the velocity of flow is about 12 ft. per sec.; the quantity of water or solution, say, 14,000 gal. per min. What would be the result of a stream of water of 500 gal. per min. at a pressure of 200 lb. per sq.in., directed into the pipe at an angle of, say, 10 deg. from parallel with the pipe? Owing to the solid bodies passing through the pipe the end of the nozzle must not protrude much inside the edge of the pipe.

I figure that if the stream were projected into the pipe parallel with the pipe it would theoretically produce a difference in head of about 16 ft. Is that correct? What would be the practical result? What would be the result if the flow through the pipe was reduced to 6 ft. per second or if it was stopped entirely as it is often under present circumstances, owing to too large a percentage of material being drawn in, or to quantities of mud or clay falling around the suction pipe. This applies to plain suction dredging where no cutter or agitator is used. E. L.

The introduction of additional water, no matter under what head, into the suction pipe, will put extra load on the pump on the suction line. Thus, no advantage will be gained. To make this plain, consider the case when an amount of water equal to that already being drawn is introduced. It is evident that no sucking will be done, as the pump will be taxed to capacity to handle the "injected" water alone. If a greater quantity be introduced a back current will be created out of the suction pipe.

In the case in question the water to be introduced is small in comparison with that sucked, but the reasoning holds. To increase the sucking ability of the dredge, a larger pump should be put on the suction pipe or more power applied.

Good Reports from Colorado Camps

DENVER CORRESPONDENCE

In old established mining camps, an "even tenor of its way" is not productive of good results. Miners, prospectors and capitalists get listless, whereas a new strike of rich ore in an old mine, or the discovery of a new one, brings inspiration to the community, and draws out dormant capital. By a singular concatenation of circumstances this is now happening in nearly every camp in Colorado, and is what more than all else that is responsible for the present revival of mining industry throughout the State.

DRAINAGE TUNNELS TO MAKE RICH TERRITORY ACCESSIBLE

In Gilpin county the Newhouse tunnel is now close to completion and about to unwater the Gunnell and other historic gold mines, which in early days produced their millions. In Cripple Creek, the Roosevelt tunnel will soon be opened, and there will be a similar unwatering of the deep mines and about 750 ft. of virgin ground. Strikes of rich ore are of weekly occurrence, and the extraordinary reduction of treatment costs assists further in promoting extended operations. Georgetown has its late discovery of high-grade gold and silver ore in the new field on Bard creek, known as Camp Beshear, and Ouray has been electrified with a discovery in the Bright Diamond of one of those extraordinary caves in the upper quartzite a mile north of town. Twenty-six-ounce gold ore, in the shape of a red dirt, was found on the floor of the cave, which is similar to those which occurred in the same formation in the American Nettie, and produced millions. This camp also has the steady flow of gold bullion from the Camp Bird to point to. Silverton has its late discovery of high-grade gold ore in the Iowa-Tiger, hitherto a producer of silver-lead ore.

DREDGES REPORTED PROFITABLE

At the Breckenridge placers, the dredges are operating at capacity, and the French Gulch Gold Mining Company has just sent an $11,000 gold brick to the Denver mint. The Reliance dredge is reported to be making big "clean-ups," and the Colorado Gold Dredging Company, on the Swan river, is reported to have paid a 20 per cent. dividend last year, and to be working gravel this summer that averages 26c. per cu.yd. The dredge capacity is 2100 cu.yd. per 24 hours.

LEADVILLE A PRODUCER OF HIGH-GRADE GOLD ORE

Leadville, which opened its marvellous career as a silver-lead camp, is now one of our largest gold producers, and though not generally known, a great producer of big nuggets, Breece hill having given up most of them. In the Ibex mine, chunks of gold are often found and the company is said to have made special provision for their melting, and in a few years past to have so converted into bullion $500,000 worth of nuggets, those of 10 lb. weight being of frequent occurrence. Recently a mass of high-grade quartz ore weighing 66 lb. and containing gold to the value of $4500, was found in this mine. In the Vinnie, a mass of gold weighing 30 lb. was found, and the Cleveland mine is almost entirely a producer of gold, having shipped to date, it is said, ore amounting to nearly one million dollars. Telluride has to its credit for July 145 cars of ore of 25 tons each, and regularly $26,000 per month profit from the Tomboy.

California Oil Operators Meeting

LOS ANGELES CORRESPONDENCE

A general call has been issued to the oil operators of California to be present at a meeting to be held at Los Angeles Aug. 18. Fearing the enactment of a law by the United States Government, in line with its policy of conservation, that may be inimical to the oil interests, this meeting has been called for the purpose of studying the situation and formulating a plan that, while consistent with the policy of conservation, will insure fair competitive conditions for all those engaged in the production of oil. It is planned to present this plan, in the form of a resolution, at the meeting of the American Mining Congress, to be held here Sept. 26. Sidney Norman, chairman of the convention committee, has received a telegram from Gifford Pinchot, advising that he will arrive at Bakersfield, on Sept. 11 or 12, for a trip through the oilfields. Mr. Pinchot will study conditions in the oilfields and will then proceed to Los Angeles to be present at the meeting of the mining congress. The committee has received notification from many prominent men of their intention to attend the meeting, and indications are that this will be the most representative convention ever held by the congress.

The danger of overproduction in the California oilfields is not so imminent as appears from the reports that are in circulation regarding the various gushers. True, oil is being spouted from several gushers and many steady producers, but in the report of the gushers no account is taken of the time that the well may lose from sanding or other causes, and this often amounts to a great deal. A glance at the official statements of some of the companies shows that in some cases reports circulated indicate a production of from 25 to 50 per cent. more than is actually

being produced. The two largest gushers are the Lakeview of the Union Oil Company, flowing from 20,000 to 24,000 bbl. per day and gradually decreasing, and well No. 79 of the American Oilfields, flowing about 16,000 bbl. The last report from the latter was that it had sanded. Both of these wells are in the Midway field. There are 15 or more wells flowing from 500 to 2000 bbl. per day, and others of lesser capacity. Although there are no signs of a great improvement in conditions, it seems to be the general feeling that the danger of overproduction is small and that the situation will continue to improve slowly.

Increase in Gold Receipts at San Francisco Mint

SAN FRANCISCO CORRESPONDENCE

An unusual amount of gold is being received at the San Francisco mint for this time of the year. Much of it is coming from the gold mines of Alaska and Nevada, but a larger proportion is derived from California gold mines. There is also some coming from the Orient and Mexico.

It is estimated by the superintendent of the mint that the local gold receipts this year will amount to $50,000,000. He attributes the increase in California receipts to the operations of gold-dredging companies and copper properties. This latter conclusion seems odd in view of the fact that several of the largest productive copper smelting plants have been entirely or partially closed down owing to litigation about the fume question. The last available official statistics are those of the calendar year, 1908, when the amount of gold derived from copper smelting operations in this State was shown to be $473,000. This gold was, in truth, mainly derived from the silicious ores used as a flux in the copper smelting, and by far the larger proportion came from the mines in Shasta county, where the largest copper smelteries were operated. During this year some of the smelteries have been restricted in their output and others have had to stop work entirely for a time, owing to the complaints of damage from fumes. It hardly seems possible, in view of this, that much of an increase in gold receipts came from this source.

In 1908, the source of gold production in California was $8,231,187 from placers of various kinds; $10,050,853 from silicious ores and $6427 from lead ores. The total was $18,761,559. Of the placer gold output, the dredging industry was responsible for $6,536,189 and this was an increase of $1,470,752 over the yield from the same source in the previous year. It is probable that the dredgers are largely increasing their annual output, since a number of new dredges of large capacity have been put in operation since these figures were compiled by the U. S. Geological Survey. This will hardly account, however, for the great increase in gold receipts at the local mint. Many other mines in the State must be doing very well indeed to send in so much more gold than usually comes to the mint at this season.

Forest Fires in the Northwest

Widespread and disastrous forest fires have recently done great damage in the States of Washington, Oregon, Montana and Idaho. Mining towns have been endangered and some partially destroyed. At Wallace and Burke, Ida., great loss is reported. In the Saltese district much damage has been done. As yet no definite news of loss to the many important mining properties is at hand, but directly and indirectly the fires have undoubtedly greatly damaged some mining companies. Some prospectors who were in the mountains of this region have probably perished.

COEUR D'ALENE PRODUCTION NOT AFFECTED

Some fear has been expressed that the fires in the Cœur d'Alene would affect the lead production of that district. A correspondent in the district reports to us under date of Aug. 23 that the greatest danger is now over. None of the producing properties has yet lost any portion of its plant. The Northern Pacific railway has lost a number of bridges on its line through the Bitter Root mountains, but the Union Pacific is open and can take care of all the business. There is therefore no reason why the Cœur d'Alene production should be affected to any degree.

The United Mine Workers Face a Serious Problem

SPECIAL CORRESPONDENCE

It was nearly daylight Sunday morning when the special National Convention of Miners in Indianapolis, Ind., adjourned amid scenes of wildest disorder. The efforts of the insurgents through a plan presented by William Green, of Ohio, to shift the responsibility of financing the present strikes to President Lewis and the national executive board, were defeated, and the convention voted to assess all working members a dollar per week to support the strikers.

There is no doubt but that it will be difficult to collect such an assessment, and it is probable that the ranks of the union will be sadly depleted through the members failing to meet the strike levy. The situation at present is such that Green and his supporters will be responsible if the heavy levy wrecks the organization, and not Lewis and the executive board. Mr. Green tried also to have a provision passed that ordered the discharge of all national organizers, but this move was unsuccessful.

PRESIDENT LEWIS DICTATES STATEMENT

After the meeting closed, President Lewis dictated the following statement: "The convention which just adjourned was similar in many respects to the annual convention which was held in Pittsburg in 1899. On that occasion a special train brought a delegation from Illinois to Pittsburg and those who attended that convention will remember that it was one of the most sensational ever held in the history of the organization. The real work of the special convention which has just adjourned is confined to the indorsement of the strikes in the various districts and the levying of an assessment of $1 per week per member on each and every member who is employed.

"In addition to this the declaration is made in the substitute adopted by the convention that the international executive board violated no law of the organization in their endeavor to bring about a settlement in Illinois, which carried with it the highest wages and best conditions of employment that ever existed in the State. During the proceedings of the convention we were told by the former international president that there were some points in both propositions that he was not in favor of, but we never learned what those points were. When men criticize proposition policies or the work of other men, the most common courtesy requires that the criticizers should at least endeavor to offer some suggestions that they believe would be an improvement."

President Lewis, while making an argument before the convention, predicted that the assessment of $1 per week would put 80,000 of the membership on the delinquent list, which would mean the weakening of the organization to that extent. The international executive board was to hold a meeting Monday, Aug. 22. and will probably be in session several days. Its members have confronting them a depleted treasury, the organization heavily in debt for money borrowed and with the refusal of many thousands to pay the assessment quick relief seems remote.

CONVENTION COST $1 PER MINUTE

This has been the most remarkable convention ever held by the United Mine Workers of America, or any other big labor organization. It has been remarkable in that it has cost about $1 a minute to hold the convention while it was in session on an eight-hour basis. Approximately it cost $5000 a day to keep it going. When it is taken into consideration that there are 100,000 miners on strike throughout the country, and that with the treasury depleted there are many suffering wives and children, which was so often referred to during the deliberations, it brings out a fact staggering and pathetic.

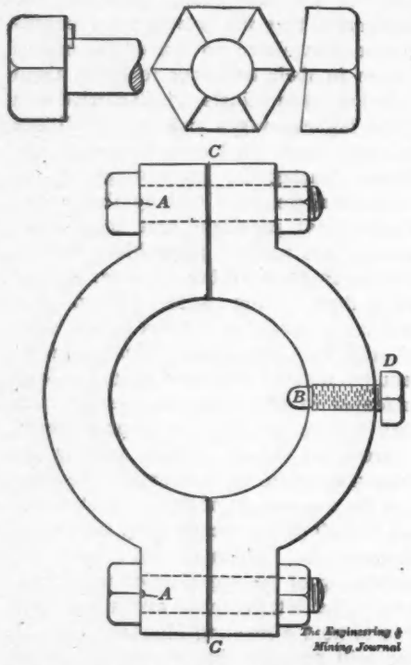
DETAILS of PRACTICAL MINING

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

Cam Shaft Collar

BY J. H. OATES*

The accompanying sketch shows a cam-shaft collar which does not loosen on the shaft. It was designed by Charles Harbottle, of Guanajuato, Mex., and has proved to be far superior to the collars that have to be shrunk on the shaft. As shown, it is a split collar made of 2x2-in. iron, turned



NONSLIPPING COLLAR FOR CAM SHAFT

out to the exact size of the shaft. In machining the collar a shim ⅛ in. thick is bolted between the two halves at *C*; this gives ⅛-in. to be taken up when the collar is in place.

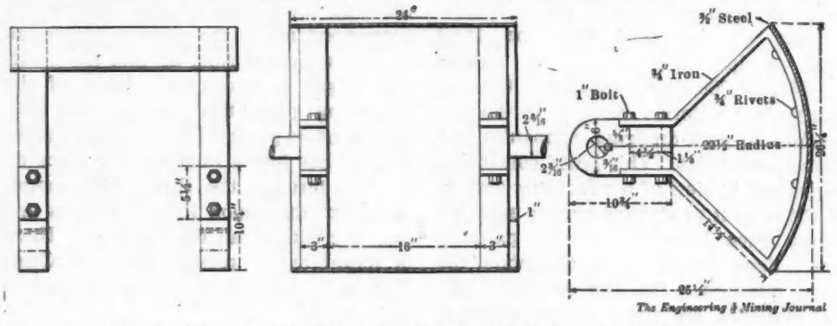
The bolt shown at *D* is 2¾ in. long, with ¾ in. at the lower end turned as shown to ⅝-in. diameter. This end enters a hole that must be drilled in the shaft with a ratchet. The nuts are made of case-hardened tool steel. The teeth shown must be cut before hardening. Bolts have the ordinary 1-in. hexagonal head. A small hole is drilled through each bolt just under the head, as shown at *A*. A pin inserted through this hole and a corresponding groove cut in the collar keeps the bolt from turning. To take the collar off it is best to cut off the head from the bolts as it requires some time to turn the nuts backward. The side of the collar that comes in contact with the cam-shaft bearing is faced.

*Apartado 55, Guanajuato, Mex.

Steel Arc Chute Gate

A strong and durable arc chute gate of simple pattern is used on the flat-raise ore pocket in the Pittsburg-Silver Peak mine, near Blair, Esmeralda county, Nev. The entire output of the mine, about 500 tons per day, is handled through these chutes; hence gates sufficiently strong to withstand the wear, and with a positive action, must be used. The type shown in the accompanying drawing has given satisfaction.

The frame of the gate is made of two pieces of ¾x3-in. iron bent on an arc with a radius of 22½ in. and turned back



STEEL ARC CHUTE GATE AT PITTSBURG-SILVER PEAK MINE

at either end, and bolted with 1-in. bolts, to the hub of the gate. These pieces of ¾-in. iron are spaced 1 in. from the edge of the gate and fastened to the ⅜-in. sheet steel that forms the arc of the gate, with four ¾-in. rivets. By using single pieces of heavy iron to fasten the arc to the hub and extending entirely across either end of the gate segment added stiffness is obtained. The hubs are 3 in. thick, 6 in. wide, 10¾ in. long and bored for a 2 3/16-in. axle.

One of the chief advantages of this type of gate is in the few parts required for its construction, and hence the simplicity of setting it up. There are only five pieces to the gate and for putting them together, four bolts and eight rivets are required. The components of the gate are a piece of ⅜-in. sheet steel, 34x26¼ in., to form the arc segment of the gate, two ¾x3-in. iron bars, 33¼ in. long, for the frame or spokes, two cast-iron hubs of the pattern shown in the drawing, eight ¾-in. rivets, and four 1-in. bolts.

The Health Aspect of Sand Filling*

Some interesting experiments have been carried out at the Village Main Reef lately with the coöperation of Doctor Moir, chemist to the Mines Department, with the object of testing the alleged poisonous character of the sands which it is proposed to send underground. Since it is intended to send down old tailings through the Village Main Reef into the Village Deep workings, it was necessary to make sure of their innocuous condition.

TESTING FOR HYDROCYANIC ACID

A large disused boiler was filled, by means of a launder carrying mine water with as much material as it would hold, the conditions being practically the same as will prevail when the sand-filling operation actually commences. After standing for a day the opening was closed, and for a couple of days more the mixture of mine water and accumulated tailings was left to generate hydrocyanic acid. The cover was removed in the presence of Doctor Moir and others. A filter paper saturated with a newly-discovered test solution was held in the interior of the boiler for about five minutes by Doctor Moir, and on being withdrawn showed no trace of hydrocyanic acid. The test was a severe one, because abundant time was afforded for the generation of the acid, and the temperature of the interior was decidedly warm at the time of the examination. The opening into the boiler was purposely made as small as possible in order that the outside air should have no disturbing effect.

To show the sensitiveness of Doctor Moir's test paper, it may be mentioned that the solution employed detected hydrocyanic

*South African Min. Journ., April 30, 1910.

acid vapor almost instantly in a fresh mixture of current tailings and mine water.

How to Erect Three-Leg Shears

By A. Livingstone Oke*

The accompanying sketch shows a correct way to erect three-leg shears, using a tackle and rope from a hand or power winch. The three legs are laid out first on the ground, as shown in the plan, two of them being placed with the butt ends at the distance *A* which is to be the spread of the shears when erected. On these two legs a cross piece is secured, either by lashing or by pegging down, as shown in Fig. 1. One end of the tackle is attached to the cross piece and the other end to the single leg. It is necessary to lift the center off the ground two or three feet, before applying the power. The hauling line from the tackle should come from the single leg as this is the one that slides.

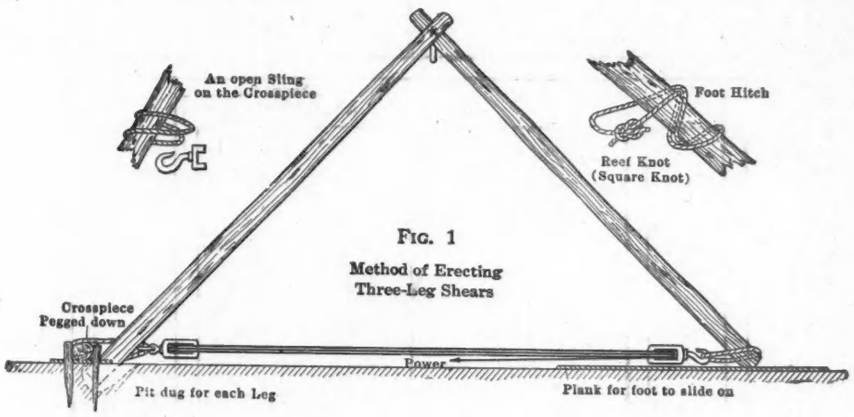


Fig. 1
Method of Erecting Three-Leg Shears

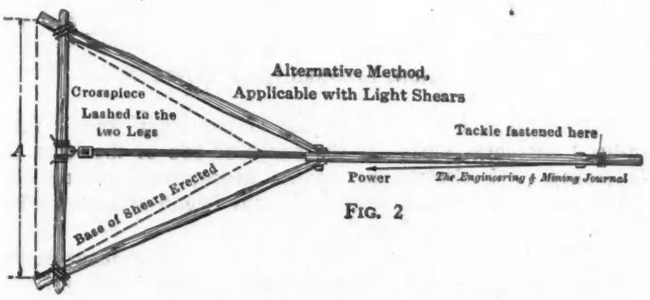


Fig. 2

Plan and Elevation of Three-leg Sheaves

Proper Hitches

While on a little job of this kind the young engineer might just as well use the proper kind of hitches and these are shown in the smaller detail sketches. Putting this up in a workmanlike way impresses the onlookers a great deal more than the most fluent flow of forcible language after making a false start. The latter usually happens nine cases out of ten.

It may be worth while pointing out that boring the holes for passing the pin should be done by laying out the three legs, as shown in the plan, with the spread *A* equal to the proposed base when erected. In this way there is no risk of the pin being bent, as the angle between these two legs remains constant and cannot be altered without bending the pin. The hight of the shears may be altered by moving the middle leg nearer or further from the other two.

*Mining engineer, Argentine & General Exploration Company, Rodeo, San Juan, Argentine.

Illumination of Cross Hairs in a Mining Transit

The ordinary reflector as applied to the telescope of a mining transit is at best an awkward attachment. The lamp can be held on one side of the telescope only and this may be inconvenient. A useful, convenient and effective "kink," is the following:

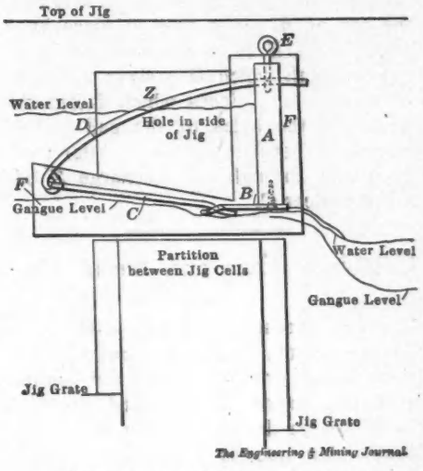
Drop a little molten candle grease on the center of the object glass. Let it cool and carefully pare it thin with a pen-knife, so that a transparent circular film of candle grease about ¼ in. in diameter is left on the center of the objective. This film of wax disperses the light so effectively that a lamp held almost anywhere in front of the telescope will illuminate the cross hairs perfectly. The source of light may be held on either side and above or below the axis of the telescope.

The small circular patch of candle grease at the center of the objective has no perceptible effect on the optical qualities of the telescope. This device is incomparably more handy than the reflector ordinarily used. Any surveyor who has ever used this method is not likely to return to the use of the reflector.

Device to Reduce Top Water on Jigs

By James L. Bruce*

In the Joplin district the crushed unsized ore is partially concentrated on five- or six-cell rougher jigs and this concentrate is then cleaned on a six- or seven-cell cleaner jig. In this practice the water added to the plunger compartment of each cell increases the top water of the following cell and toward the tail end of the jig there is a race of top water. This, in addition to carrying away large quantities of ore without giving it time to settle, disturbs the pulsion of the plunger water and interferes with the proper settling of the concentrate and the bedding of the jig cell.



Dewatering Device for Jigs

At the Continental Zinc Company's plant the jigging action has been much improved by dewatering the lower cells of the jig with a simple, inexpensive arrangement. In principle it is an adjustable slicer which removes the top layer of water as it goes over the partition between the cells of the jig and allows the gangue and remaining ore to run under it to the next cell.

Only the finest slimes are carried off with the water, and this is conveyed to settling tanks, whence it goes to the tables. The cell ahead of the dewatering device as well as those following are benefited, those following by the decrease in "top water" while the backwater on the cell ahead reduces the surface cur-

*Manager, Continental Zinc Company, Joplin, Mo.

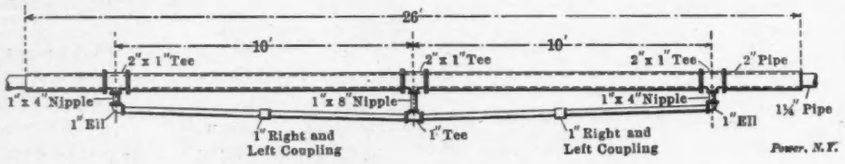
rents and provides a steadier discharge which disturbs the bed less. The top water is removed through a hole *Z* cut in the side of the jig at the end of the partition between cells and from there carried to the settling tanks which feed the concentrating tables.

DETAILS OF CONSTRUCTION

The accompanying sketch shows a cross-section of this device from the plunger side of the jig. There are seven parts: *A* is the dam which holds the water back, causing it to flow through the opening *Z* and is made of a piece of pine ⅝x6 in., with a length equal to the width of the cell; *B* is the rigid part of the slicer made of No. 10 or No. 12 sheet steel about two inches wide, fastened with screws to the under side of *A* and of the same length; *C* is the adjustable part of the slicer and can be set to remove as much or as little of the top water as desired. It is made of No. 10 or No. 12 sheet steel, about four inches wide, and the same length as *A* and *B*, with two or three lugs, which project from one side and through slots in *B* for hinges; *D* is a heavy wire for adjusting *C* and passing through a hole near the top of *A*. It is held in place by a nail or pin *E* in a hole alongside the hole through which *D* passes; *F* is one of the two end pieces which fasten the device to the sides of the cell and is cut with a bevel to keep any water from going out through the discharge *Z* below the slicer *C*.

Combined Truss and Steam Pipe

It was necessary to run a 1¼-in. steam line to a small two-story building, 24 ft. from the main building, for heating purposes. If run underground, the pipe could not be drained, as the top of the sewer pipe was flush with the surface of the yard. The space between the buildings is used as a driveway for high-top loaded trucks, so that the pipe had to go overhead, at an elevation of not less than 16 ft. The accompanying sketch from *Power* shows a combination including a sort of truss and outdoor steam-pipe covering assembled from the material on hand to meet these requirements.



COMBINED TRUSS AND STEAM PIPE

The Southern Pacific extension is completed to the Santiago river, 1004 km. from Guaymas, and regular train service will be soon inaugurated.

Pump Station at Leonard Mine, Butte

The pumps for handling all of the water from the Boston & Montana company's mines, and from some of the mines of the Butte Coalition company, are stationed on the 1200-ft. level of the Leonard mine. The new pump station is situated about 150 ft. to the south of the No. 1 Leonard shaft, the old pump station being close to the shaft.

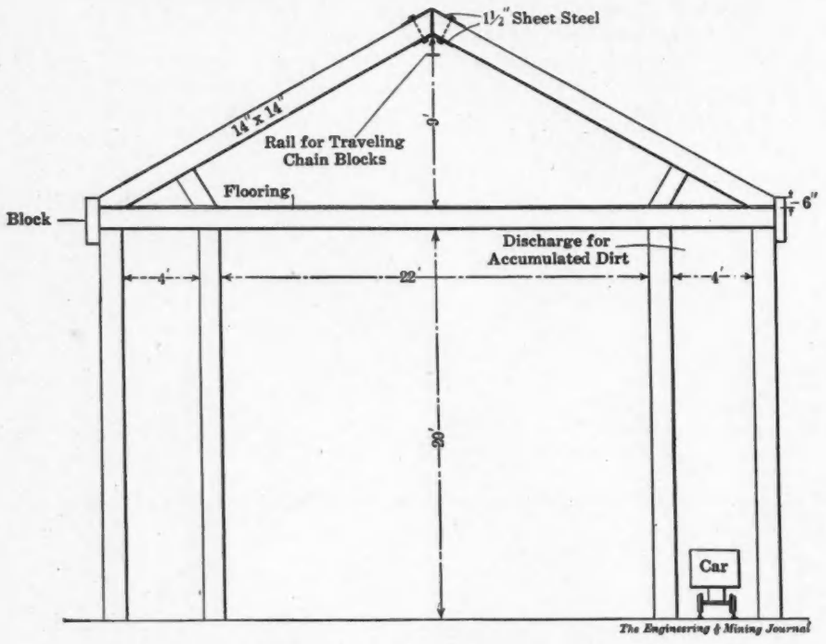
The No. 1 Leonard shaft serves as an airway and through one compartment are run a 10-in. wood-lined drain column, 8- and 11-in. lead-lined, discharge pipes from the electric pumps, and electric cables, etc. A double-deck cage is used to handle waste and supplies in case of emergencies. Between the No. 1 and the No. 2 shafts, the latter of which is the main hoisting shaft of the mine at the present time, separate parallel drifts are run for haulage-ways and for carrying the air, steam and water lines, and electric cables.

PUMPING EQUIPMENT

The pumping equipment in the new station comprises three 600-gal., five-throw, electrically driven pumps, one of which is of Aldrich and two of Nordberg build. The pumps are 7x12-in. size and are each driven at 60 strokes per minute by two 150-h.p., 440-volt, 180-amp. motors run at 495 r.p.m. In the old station there is a 1500-gal. auxiliary, steam pump and a smaller one with a capacity of about 600 gal. per minute.

TIMBERING OF STATION

The construction and timbering of the station is particularly interesting. It is built with an idea of providing ample space and in such a manner as to assure permanence. Provision against the crushing of timbers and caving of the roof was especially necessary, for as stated, the pumps in this station handle practically all of the water from a number of the mines of two of the large Butte companies, hence, the stopping of the pumps for any length of time would entail a large loss.



TIMBER SET IN PUMP STATION, LEONARD MINE, BUTTE, MONT.

The station is cut out about 35x75 ft. and 30 ft. high in the clear. An accompanying sketch shows the scheme of timbering employed. The caps reach entirely across the station and are supported at their ends by posts and also at points 4 ft. from the ends by auxiliary posts. Thus along each side of the station there are two rows of posts. Angle braces are used above the inner row to give added support to the roof of the station, which is trussed, the peak being 9 ft. above the center of the caps (Above pumps, caps are cut out and horizontal angle braces used) At the point of their butting, the caps are held firmly in place by bolts through cover plates of 1½-in. sheet steel. The plate over the joint of the roof members extends 16 in. down each side. The station sets are constructed throughout of 14x14-in. Oregon fir timber; sets are 5 ft. center to center.

By giving the station a peaked roof considerable extra excavation is necessitated and additional timber is required. The added cost this entails, is, however, more than counterbalanced by the safety from caving that is assured by the additional strength given to the timber framing. In a similar station with a flat roof it was necessary to clear out the caved material above the caps each year. The station described has already stood for three years and it has not yet been necessary to clear away any débris. flooring is, however, built over the caps to catch any material that caves, and an opening is left between the rows of posts along one side for the discharge of any caved material. Tracks are laid along this aisle for cars to handle the dirt.

ARRANGEMENT OF TANK

Under the floor of the station is built a small concrete-lined tank, 3x20 ft. and 8 ft. deep, about which the pumps are grouped. The pump plungers all draw directly from this small sump, and a feeder 20 in. wide and 8 ft. deep connects this to the main tank, which is excavated in the solid rock to one side of the station and has a capacity of 25,000 gal. The concrete lining of this larger tank is 2 ft. thick. A great saving in noncorrodible piping is effected by having the pump plungers draw directly from the small sump tank and at the same time the pumps are seated upon firm foundations. It is figured that the additional cost necessitated by building the station as described will be more than overbalanced by the saving effected in its upkeep.

Cyanide Treatment of Concentrates with Mill Tailings

BY R. E. TREMEROUX *

At the North Star mine, Nevada county, Cal., the concentrates are ground in an Abbe tube mill and run in with the tailings from one of the two 40-stamp mills. The object in doing this is to reduce the amount of fine grinding otherwise entailed. The concentrates only, are ground. The stamp-mill tailings, along with the concentrates, are classified in Merrill classifiers, about 55 per cent. going to the sand tanks and 45 per cent. to the slime settlers.

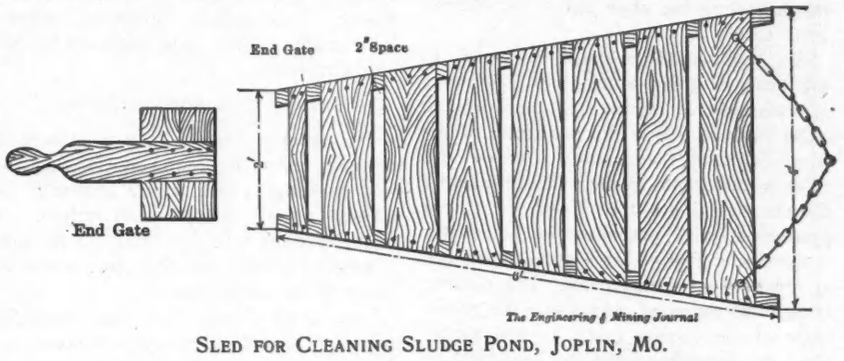
The slimes are agitated in 0.03 per cent. cyanide solution, and the solution extracted by Oliver slime filters. The sands are leached in 120-ton tanks. Forty tons of 0.1 per cent. solution are run through; then 125 tons of filter solution (from the slime filter); then barren solution from the Merrill leaf precipitate presses until the effluent solution shows only a trace of gold. The strong solution is run into one gold tank and the wash solution into two other gold tanks. The precipitation is done in Merrill leaf presses. Two presses are used, having a capacity of 200 tons each in 24 hours.

The value of the concentrates averages $40 per ton; stamp-mill tailings, $1.80 per ton. After the concentrates are added, the slimes have a value of $4 and the sands $2.90 per ton. The tailings from the cyanide plant average about $0.30 a ton, showing an extraction of over 90 per cent. During 24 hours, 130 tons of mill tailings and five tons of concentrates are used. In precipitating, 40 lb. of zinc dust are used per day. The cleanup from the presses averages 400 to 500 lb. of dry precipitate per month, valued at $20 to $30 per pound.

*Mikado mine, Kenora, Ont.

Cleaning a Sludge Pond

The cleaning of a sludge pond is a problem that sooner or later confronts every millman. In the Joplin, Mo., district, this was formerly done by making a sled in form of an "A" and hitching a team to the wide end and dragging it through the pond. As a collector and remover of sludge, this worked very well, but as it had to be raised at the back in order to dump, it was neither an easy nor a clean job.



SLED FOR CLEANING SLUDGE POND, JOPLIN, MO.

The sled shown in the illustration is an improvement on the former method. It is built of 2x8-in. plank, spaced about 2 in. apart. The runners are of the same material and are 4 ft. apart at the wide end and 2 ft. at the other end. The sled is 6 ft. long. The narrow end is closed by a gate. The team is hitched at the wide end and the driver mounts the sled and drives through the pond. Upon arriving at the dumping ground, he removes the end gate, which allows the sludge to slide out.

Hydraulic Monitors on Dredge

The No. 6 Folsom dredge of the Natomas Consolidated of California is operating on high ground on the southern flank of the American river valley. The ground is hard and very tight and it is necessary for the boat to carry a high bank. In undercutting this bank disastrous caves sometimes occurred and it was often difficult for the boat to step forward when the cheeks of the digging tumbler were stopped against the overhanging face of gravel.

To overcome this trouble 12-in. monitors fitted with 4-in. nozzles and supplied with water under 140-ft. head have been placed on the forward deck of the dredge, one on either side of the digging well. Water for the hydraulic giants is furnished by a 3-step volute pump, built by the Unied Iron Works, Oakland, Cal., and driven by a 150-h.p. Westinghouse variable-speed 2000-volt, Type F motor run at 580 r.p.m. Two motors are connected to the pump so that one is available in case of accident of the other.

When digging in particularly tight ground where trouble is experienced with a high, overhanging bank the stream from one of the giants is directed against the bank at a point behind where the buckets are digging. The bank is thus caved as the boat swings instead of waiting until a large overhang has been formed, which might cave suddenly, possibly wrecking the digging ladder or smashing in the deck of the boat. When advisable one monitor is used to loosen up the ground in advance of the buckets. By this hydraulicking as the boat swings, the bank is loosened and broken away gradually all the way to the top so that when the next cut is made the ground may be easily dug, and no huge masses drop off and roll into the pond, being lost back of where the buckets are digging.

Such an installation as that described is quite expensive and the operation of the giants entails considerable expense for power. However, under such conditions and difficulties as No. 6 must contend with the use of the hydraulic monitors proves economical as the safe operation of this boat is insured, less gravel is lost and the dredge is enabled to dig faster.

On the Rand, 163 tube mills were at work in April, 1910 (*South African Min. Journ.*), against 125 during the corresponding month of last year.

Ore Deposits of Cananea Mining District, Mex.

Three Types of Ore Deposits: Contact-Metamorphic, Hydrothermal and Igneous-Contact. Capote Basin the Principal Producer of Sulphide Ore

BY S. F. EMMONS*

The relative position of the mines in the Cananea district may be seen on the accompanying map. Beginning at the northwest, they are:

1. The Puertocitos mines, in the limestone ridge that forms the northwestern extremity of the uplift and overlooks the broad basin of Cuitaca creek to the west and north, which is carved out of granite or grano-diorite. Other mines have been opened in the same body of limestone, along Elenita creek and around Elenita mountain, south of Puertocitos, but are not actively worked.

2. The next important mine is the Henrietta, with the orebody in the contact of diorite and quartz porphyry, situated where Pinal creek emerges from the hills into the open valley of Puertocitos creek.

3. Next south is the Elisa mine, at the head of Elisa gulch, with orebodies in limestone along the foot-wall of the Elisa fault, which is the one great structural fault of the district. Across the ridge to the south, in the northern part of Capote basin, are the Sierra de Cobre properties, with orebodies in limestone.

4. The mines of the Capote basin are at the base of Chiva peak. The Capote mine is at the west, and along the south slope of the Capote basin are the Oversight, the Esperanza and the Veta Grande mines. In the eastern part of the basin, beneath the bed of the creek, is the Democrata mine.

5. East of the Democrata mine, on the low ridge that separates the steep mountain slopes from the mesa, are the Kirk mines, and south of them, the Republic mine, while southeast of the Kirk mine, along the major strike of the orebody are successively:

6. The Cobre Grande, America, Bonanza and Cananea-Duluth mine, all in the mesa country. The most important of these is the Cananea-Duluth.

General Geology

The Cananea mountains are made up largely of altered eruptive rock and it is difficult to decipher their geological history. The few sedimentary beds that do occur are quite barren of recognizable remains of ancient life, so that it is only by analogy and lithological resemblance with the nearest known beds that their age can be determined.

The greater part of the surface is occupied by igneous rocks, mostly intrusive, of which a number of different varieties have been recognized and designated by specific names. It is assumed that these were erupted in early Tertiary times.

Formations in Chronological Order

The following are the subdivisions of the rock formations given in chronological order, as far as their relative ages could be determined: Cananea granite, Capote quartzite, Puertocitos limestone, Mariquita diabase, Huacalote rhyolite, mesa tuffs and agglomerate, San Pedro andesite, El Torre syenite, Elenita syenite porphyry, Henrietta diorite porphyry, Tinaja granite porphyry, Cuitaca grano-diorite, Elisa quartz prophyry, gabbro, later diabase dike, and ordinary gravel and alluvium.

Contact-metamorphic Deposits

The most typical contact-metamorphic deposits are to be found at Cananea, as well as those which would generally be classed as of hydrothermal origin. It seems evident that they may all be considered as products of the after action of the eruptive intrusions.

Puertocitos Mine—The two principal areas of contact-metamorphic deposits are in the limestone belt, inclosing and extending southward from Puertocitos to and including the Elisa mine. The Puertocitos limestone body lies between the Cuitaca grano-diorite on the west and the diorite porphyry on the east, both of which have acted as metamorphosing agents. The limestone is extensively marmorized, silicified and garnetized, and the copper minerals are found associated with the garnet in irregular patches which have no definite structural relation, except that they follow joints and show a tendency to form bodies that dip northeast with the bedding of the limestone. The ore occurs at Puertocitos also in both grano-diorite and diorite porphyry, close to the limestone. It follows fault fissures which are generally parallel with the contact and have a northeast dip. In these deposits chalcopyrite, instead of bornite, is the prevailing copper-bearing ore.

Elisa Mine—The ore at the Elisa mine is of the same general type as the Puertocitos ore, with chalcopyrite as the prevailing copper mineral. The orebodies contain more zinc blende and pyrite. The limestone is marmorized in places, but in connection with the ore it is generally altered to garnet. The orebodies are irregularly spaced, but as a rule lie near and to the south of the Elisa fault.

The orebodies are sometimes several hundred feet long and as much as 40 ft. wide. They have been developed over 700 ft. below the surface, but the oxidized ore extends only to the first level. The Elisa fault is nearly vertical, in the upper part, but assumes a gradually flatter north dip in depth.

The diorite porphyry, which joins the limestone on the northeast, appears to have been the main cause of the contact metamorphism, but the quartz porphyry at a distance of a few hundred feet from the contact, may also have exerted some action.

Democrata Mine—The Democrata orebody is in limestone that lies beneath the bed of Democrata creek. The orebody in question is about 300 ft. north of the shaft and has been opened from the 300-ft. level to the 700-ft. level. It occupies an irregularly-shaped fracture zone in limestone, 50 ft. or more in width, that has a general east-west strike and northerly dip. The ore consists of a coarse breccia of the contact-metamorphic limestone cemented by quartz and metallic sulphides.

Hydrothermal Deposits

The hydrothermal deposits of the Capote basin are, economically, the most important. They present a strong contrast to the contact-metamorphic ore of Puertocitos and Elisa. The hydrothermal deposits include the Capote, Oversight, Esperanza and Veta Grande mines.

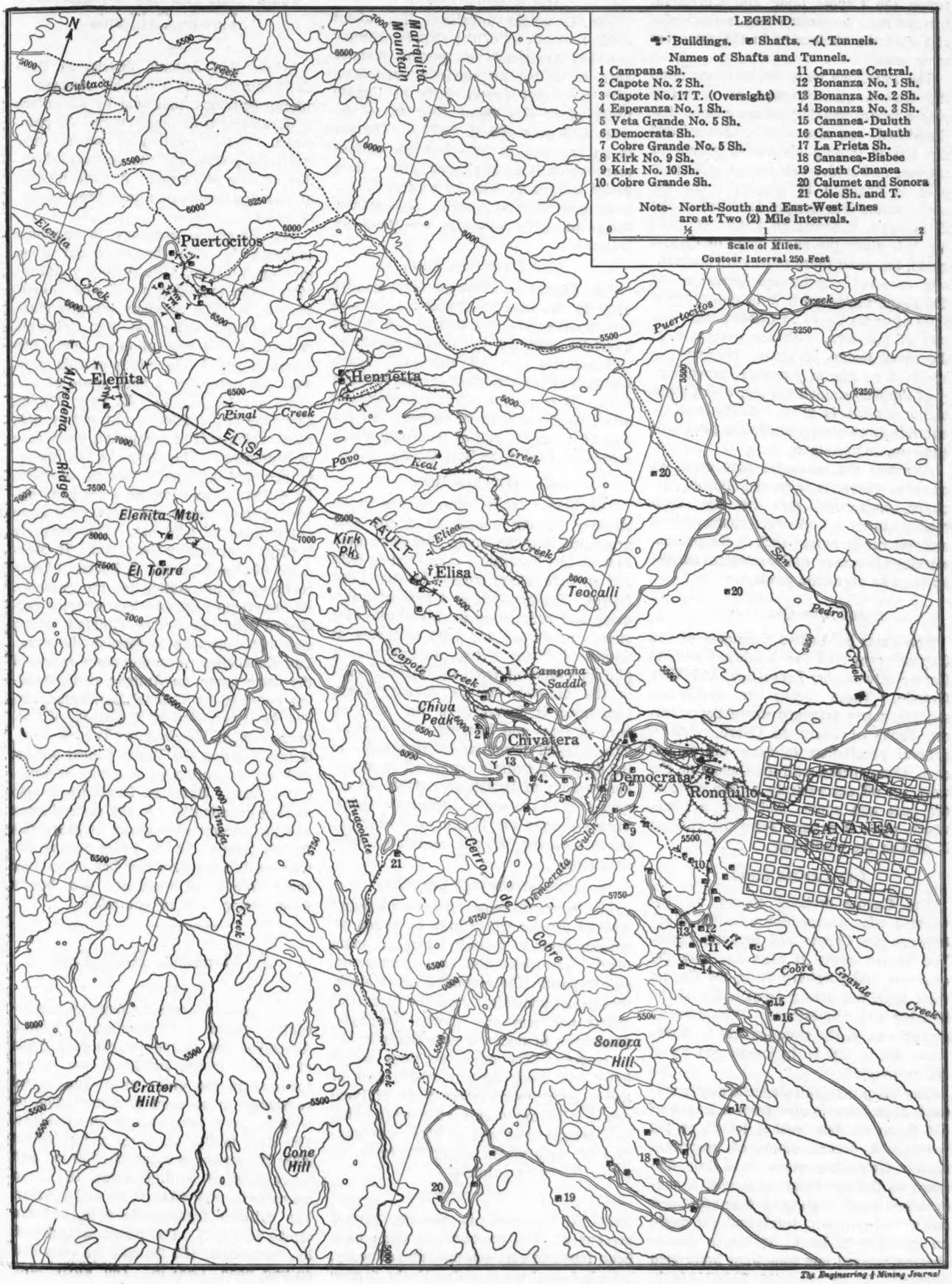
The rocks exposed in the Capote basin are mainly quartzite and limestone, intruded by masses of diorite porphyry and extensively fractured and faulted, with later intrusions of quartz porphyry. The latter rock is in small masses within the basin, but more extensively developed in the bounding ridges; to the north at Campana saddle and to the south along the upper slope of Cerro de Cobre, in each of which localities a contact-breccia phase is developed, where diorite-porphyry fragments are cemented by the quartz-porphyry magma.

The Capote Basin

In the rock distribution, the Capote quartzite is found at the west end of the basin resting on Cananea granite with a generally northeast dip, and, except for a narrow northwest band faulted up be-

*Geologist, U. S. Geological Survey, Washington, D. C.

Note—Excerpts from an article in *Economic Geology*, June, 1910.



CANANEA MINING DISTRICT, SONORA, MEXICO

tween the Capote mine and Chivatera, has not been seen elsewhere in the basin, either on the surface or in the extensive mine drifts.

The limestone rests conformably upon the Capote quartzite and in the few places where bedding planes can be distinguished, has also a general northeast dip. It is largely altered to garnet or marble, and under the gossan at Capote pass is changed to gypsum. On the north, where it is sharply delimited by the Elisa fault, it forms an almost continuous belt along the north slope of Capote gulch, but from there southward is gradually crowded out by the intrusions of diorite porphyry until it is entirely lost sight of under Cerro de Cobre peak. The rest of the area, with the exception of the small bodies of coarse porphyry, is occupied by diorite porphyry, prevailingly of the fine-grained variety, which when highly altered is with difficulty distinguishable from certain alteration phases of quartzite or limestone.

Although the orebodies may cross all of these rocks, it is in the diorite porphyry, apparently, that ore has most readily formed. Actual contact-metamorphic ore in garnet rock in the present workings is rather a mineralogical curiosity than an economic product.

Productive Oreshoots

The great productive oreshoots of the Capote basin thus far developed are the Capote, Oversight, Esperanza, and Veta Grande. These occur in northwest-striking zones arranged along the northern flanks of Cerro de Cobre, with a general parallelism to each other, but each, commencing with the Capote on the west, set off successively a little more to the east and south, and with a pitch, which when it departs from the vertical is also to the southeast.

The Capote Mine

The Capote orebody occurs on the western edge of the down-faulted block between the Capote and Ricketts faults. The gossan above it caps not only the quartzite and porphyry along the Capote fault zone, but also a great width of the hanging-wall limestone. The actually stoped area on the motor-tunnel level was from 300 to 400 ft. in length and up to 165 ft. in width.

This main ore chimney stood nearly vertical, decreasing in size from a length of 475 ft. on the first level to 130 ft. on the fourth. A second shoot of somewhat similar dimensions starts in a little distance to the northeast, and with a general southeast pitch, has been followed down to the 700-ft. level, and cut again on the 1050-ft. level. It lies in closely sheeted, altered and somewhat brecciated porphyry, at or near the Capote fault, which dips to the northeast over a footwall of quartzite.

The Oversight Mine

The Oversight oreshoot lies about 2000 ft. southeast of the Capote chimney and has practically no gossan directly over it. It has no apparent connection with the great gossan body at Capote pass, which lies about 1000 ft. to the west, and only 300 ft. higher. The ore is an enriched pyrite. But the enrichment which is of chalcocite with a little native copper is less concentrated, the shoot consisting of a series of lenticular bodies of richer ore, with low-grade ore between.

The Esperanza Mine

The Esperanza oreshoot is a smaller body to the east of the Oversight and separated from it by 200 to 300 ft. of quartzite intruded by diorite porphyry, which forms part of the fault block brought up to the east of the Ricketts fault. It is of similar composition, but much more irregular in outline. To the east of it lies the belt of limestone which separates it from the Veta Grande mine.

Veta Grande Mine

The Veta Grande oreshoot lies in an easterly dipping tongue of diorite that protrudes into the broad limestone area east of the Esperanza mine and is only 250 ft. wide where crossed by the motor tunnel. The ore follows a zone of fracturing and brecciation in this diorite that strikes northwest and dips northeast at angles of 40 to 80 deg. In this zone it pitches southeast from the highest point in the ore-body at the Massey shaft. Limestone is found near the orebody both in foot- and hanging-wall country. Ore is found in similar fracture zones in the porphyry entirely separated from any known body of limestone, notably on the spur east of the upper Democrata gulch. Such porphyry ore is generally of lower grade than the deposit associated with limestone.

Igneous-contact Deposits

The Henrietta mine represents another type of deposit which may be called an igneous-contact deposit since it more nearly resembles the contact-metamorphic deposit. The orebodies occur along, though not immediately on, the contact of quartz porphyry and diorite porphyry, sometimes in one and sometimes in the other rock. The mine workings which have only been opened within two or three years are on either bank of Pinal creek. The ore occurs as cement filling in a breccia zone and as rock impregnation or replacement along fractures, or filling joints or veinlets.

At El Tajo mill in Sinaloa, battery screens of thin, punched tin plate have been found to cost one-third that of heavy, punched-steel screens, though the former endure only 15 days and the latter wear for 30 days.

The San Antonio District of Lower California

In the San Antonio district of Baja California there is a notable renewal of mining activities, indicated by operations of development on many of the old properties, by the erection of several new treatment plants, and the active exploitation of new properties. A large number of new denouncements have been recently made.

The Progresso company is operating continuously with the treatment plant running full time. The Aurora y Anexas company is installing a mill and cyanide equipment. The company recently made an important strike on the Columbia mine of a rich vein of silver ore. The Roasario and Lucia mines of this company are producing a high grade of oxidized ore for milling. El Valle Mining Company is installing a mill and cyanide plant which will be completed some time in September. The company has recently acquired additional mining territory. La Colpa is the name of a company operating under lease and bond, on a large outcropping of gold ore. This property is being operated by Señor Juan H. Mendoza, who is shipping. A Tucson (Ariz.) company is negotiating for the property. An American company has recently purchased the Esperanza-Trinidad group and will undertake to develop the same. Las Cacachilas, in a mountain range of the same name, an Antigua mine, is being operated by Colonel Barrington, under the supervision of R. Shrack, of Colorado. W. L. Ketchum, of Tucson, Ariz., is investigating the Todos Santos district and has an option on a group of properties there. David H. Lawrence is also making examinations in the same district and has control of a group of properties for his clients. In the Todos Santos district an Arizona company has taken over some free gold properties and has a small stamp mill in operation.

A Mammoth Rock Drill

The Taylor Horsfield Company has recently tested at Bendigo, Victoria, Australia, one of the largest rock drills of its kind in the world. It was manufactured to the order of a Queensland contractor to be used in construction of wharves and other large undertakings. The drill is 9½ ft. long, weighs about 3000 lb., strikes a blow of 8000 lb., and is capable of drilling holes 18 in. in diameter in rock 40 to 50 ft. under water. The cylinder diameter is 8 in. and the stroke is 12 in. The piston weighs 450 lb., the chuck, 150 lb. and the rods and cutting head, 1200 lb. The *Austr. Min. Stand.* reports the drill to have done satisfactory work under test.

American Smelting and Refining Company

The eleventh annual report of the American Smelting and Refining Company, for the year ended April 30, 1910, shows an appropriation from the earnings for repairs, betterments, new construction and improvements, amounting to $1,324,348. This is considerably in excess of similar expenditures for the preceding year.

Although the earnings have remained practically the same as for 1909 and with copper, lead and silver as low, or lower than the prices prevailing during the recent panic, nevertheless the company has been able to pay 4 per cent. on the common stock in addition to the regular 7 per cent. on the preferred stock, and show a surplus of $1,546,278.

Increasing supplies of copper material required an increase during the year in the capacity of the Perth Amboy refinery. The directors also acquired property in Mexico, which will add, probably in the near future, another profit-making unit. The payment required by the terms of the mortgage given by the Omaha & Grant Smelting Company during the year reduced the outstanding bonds to the sum of $121,000. It is stated that the entire balance will mature and be paid during the next fiscal year.

ASSETS AND LIABILITIES OF AMERICAN SMELTING AND REFINING COMPANY.

	April 30, 1910.	Inc. or Dec.
Assets.		
Property	$86,845,670.51	.....
Investments	2,058,388.28	$1,891,569.53*
Metals	18,069,229.22	477,037.18
Material	1,278,097.60	52,676.16*
Net current assets	.....	465,140.64*
Cash and demand loans	†11,620,400.59	4,261,161.49
Total	$119,871,786.20	$2,328,812.34
Liabilities.		
Capital stock	$100,000,000.00	.....
Bonds	121,000.00	$116,000.00*
Net current liabilities	431,551.32	431,551.32
Unearned treatment charges	2,521,687.91	466,982.82
Surplus	16,797,546.97	1,546,278.20
Total	$119,871,786.20	$2,328,812.34

*Decrease. †"Demand Loans" cover advances to affiliated companies.

INCOME ACCOUNT OF AMERICAN SMELTING AND REFINING COMPANY.

	April 30, 1910.	Inc. or Dec.
Total earnings	$8,887,788.41	$258,599.05*
Deduct:		
Taxes and general expense	517,161.27	120,173.64*
Ordinary repairs and betterments	862,710.75	65,637.81
Total deduction	$1,379,872.02	$54,535.83*
Net earnings	7,507,916.39	204,063.22*
Less:		
Employees' profit-sharing fund	.....	47,695.41*
	$7,507,916.39	$156,367.81*
Appropriations for new constructions and improvements	461,638.19	140,404.09
Balance net income	$7,046,278.20	$296,771.90*
Deduct:		
Dividends	5,500,000.00	.....
Surplus for year	$1,546,278.20	$296,771.90*
Surplus from previous year	15,251,268.77	1,843,050.10
Total surplus	$16,797,546.97	$1,546,278.20

*Decrease.

American Smelters' Securities Company

The increasing supplies of copper from the various copper companies whose product is under contract to the works of the American Smelters' Securities Company, accounts largely for the growth of business and earnings of the company, as indicated in the fifth annual report. The net earnings for the year ended May 31, 1910, were $5,202,310. During the present year further additions to the smelting and refining works of the company will be necessary to care for the increasing products of the affiliated companies.

The large amount charged to earnings on account of new construction and improvements is accounted for in the policy of not changing the property account. The directors also decided to carry the metal stocks of the company upon a conservative valuation, as established by the American Smelting and Refining Company. This required a charge of $516,125 to earnings.

Regular quarterly dividends have been paid at the rate of 6 per cent. on the preferred "A" stock and 5 per cent. on the preferred "B" stock, and the surplus earnings, amounting to $1,133,445, have been carried to the credit of the surplus account. Two-thirds of the surplus net earnings, after the payment of these dividends, may be considered an earning of the American Smelting and Refining Company on account of the ownership of the latter of 177,510 shares out of the 300,000 shares of the common stock of the Securities company.

The accompanying balance sheet and income account shows the condition of the company at the close of the fiscal year on May 31, 1910. The item of deferred liabilities represents the amount still due the stockholders of the Baltimore Copper Smelting and Rolling Company referred to in the last annual report and which is being reduced by semi-annual payments in accordance with the contract of sale.

INCOME ACCOUNT OF AMERICAN SMELTERS' SECURITIES COMPANY.

	May 31, 1910.	Inc. or Dec.
Total earnings	$7,213,475.13	$1,783,408.86
Deduct:		
Taxes, general expense and interest	1,211,555.36	99,293.94
Ordinary repairs and betterments	799,609.25	108,230.69
Total	$2,011,164.61	$207,524.63
Net earnings	$5,202,310.52	$1,575,884.23
Appropriation for construction and improvements	$532,039.38	*$53,344.26
Appropriation for revaluation of metals	516,125.59	516,125.59
Appropriation for revaluation of investments	500,700.00	500,700.00
Total appropriations	$1,548,864.97	$963,481.33
Balance net income	$3,653,445.55	$612,402.90
Deduct dividend Pref. "A"	$1,020,000.00	.....
Deduct dividend Pref. "B"	1,500,000.00	.....
Total	$2,520,000.00	.....
Surplus for year	$1,133,445.55	$612,402.90
Surplus from previous year	554,751.97	521,042.65
Total surplus	$1,688,197.52	$1,133,445.55

*Decrease.

ASSETS AND LIABILITIES OF AMERICAN SMELTERS' SECURITIES COMPANY.

	May 31, 1910.	Inc. or Dec.
Assets.		
Property	$77,019,007.12	.....
Investments	4,452,069.79	$2,625,000.00
Metal stocks	9,714,948.43	2,750,855.03
Material	1,099,053.95	114,526.77
Cash	937,999.55	*347,335.04
Total	$93,223,078.84	$5,143,046.76
Liabilities.		
Capital stock	$77,000,000.00	.....
Deferred liabilities	2,163,920.00	*393,440.00
Net current liabilities	†10,816,406.09	4,397,406.79
Unearned treatment charges	1,554,555.23	5,634.42
Surplus	1,688,197.52	1,133,445.55
Total	$93,223,078.84	$5,143,046.76

*Decrease. †Largely advances from American Smelting and Refining Company.

Sierra Consolidated Mines Company

The first annual report of the Sierra Consolidated Mines Company has just been issued. The organization of the company was completed early in September, 1909. This report and the statements submitted are for a period of eight months, from Nov. 1, 1909, to June 30, 1910, and cover the entire period of actual business operation of the company.

Property

Through stock ownership the company owns and controls 76 mining claims at or near Ocampo, district of Rayon, Chihuahua, Mex. The company also owns and controls over 100,000 acres of land in the same district, including all water rights and timber thereon; and in case mineral is discovered the company has the right to denounce the same. The company also owns lots in the town of Ocampo, valuable water rights, mill sites, mining and milling machinery, mining concessions and other personal property, all situated in the district of Rayon. The main office is at Duluth, Minn., the mine office being at Ocampo.

The titles to all of the properties are in a Mexican corporation, called the Sierra

Mining Company, S. A., which is the operating company in Mexico and all the capital stock of which is owned by Sierra Consolidated Mines Company.

Development Work

Thirteen of the mining claims alone cover an area of over four miles long and two miles wide. A number of these have been large producers of gold and silver in the past. Before starting actual development work, the mineral zone was carefully examined for the purpose of determining the first points of attack and laying out a comprehensive scheme of development. During the first few months general reconnaissance work was carried on and a topographical survey was made. A careful geological study of the camp was undertaken and completed.

Principal Operations at the Matulera, Belen and Santa Eduviges

The principal mining operation was confined to the Matulera, Belen and Santa Eduviges mines. In all 2796 ft. of development work have been completed since the commencement of operation. Of this 1815 ft. have been driven in the Matulera, 913 ft. in the Santa Eduviges and 68 ft. in the Belen. This work has not been done with the idea of immediately disclosing the orebody, but with the idea of making a thorough development of the property. On June 30, 1910, the development work had exposed a tonnage in the Matulera mine of between 40,000 and 50,000 tons of ore of an average grade of $10 per ton, United States currency.

The policy of the company is to carry on development work thoroughly and continuously at the rate of not to exceed $10,000 to $15,000 per month. The results from this work should begin to be apparent shortly. On the other hand, some of the work can hardly be expected to be fruitful for about 12 months.

Titles to Properties

It was considered advisable by the management to consolidate under the Mexican law the various mines and mining claims owned by the company. This necessitated a complete survey and the application for new patents. All the contiguous mining claims are thus consolidated into one entire claim. A resurvey has been completed and all the boundary monuments have been constructed by the company in accordance with the new mining law.

Transportation

The Ocampo camp has no railroad facilities, being by trail about 97 miles from Minaca, and by a wagon road 110 miles from Temosachic. The Chihuahua & Northwestern Railway Company is pushing rapidly its railroad connections between Madera and Casas Grandes and expects to have the connecting link finished by the end of this year. This will make a direct line of railroad from El Paso to Temosachic, and in consequence the logging road from Temosachic to Ocampo will become an important artery of traffic.

About 200 Men Employed

During the period covered by this report the average monthly working force has been about 170 men, all Mexican except 17 or 18 Americans. The company's relations with the officials of the State and with the municipal authorities have been most pleasant. The company has had their coöperation in reopening the Ocampo camp and starting the new era of mining operation in that vicinity.

The results of the eight months' work have been all that could be expected. All of the work has been done systematically and economically. Development work from now on will proceed fairly rapidly in ground where the chances are decidedly good for opening up new ore. The company has no indebtedness other than the current month's labor and supply bills.

Assets and Liabilities

The tangible current assets shown by the company's statement are: Advances to the Sierra Mining Company for development work, $136,749; cash on hand, $338,646; bills and accounts receivable, $131,629; investment accounts, $45,000; liabilities, none; assets of $652,224 in excess of liabilities.

Management

Joseph B. Cotton, of Duluth, is president; Richard M. Atwater, Jr., is vice-president and general manager; Robert Linton is general superintendent. Among the directors are Thomas F. Cole, of Duluth, and James H. Kirk and Dr. L. D. Ricketts, of Cananea, Mexico.

Mount Morgan Gold Mining Company, Ltd.

The total revenue of the Mount Morgan Gold Mining Company, Ltd., of Queensland, for the year ended May 31, 1910, was £1,079,914. Of this amount, the gold returns from the sulphide and oxidized ores were £292,842, and copper sales amounted to £786,559. Against this income the total expenditure of £721,722 must be charged, leaving net profits for the year of £358,191. Three dividends amounting to £150,000 were paid.

From the 397,228 tons of ore treated, 7062 tons of fine copper and 178,867 oz. of gold were recovered. The copper contents of the ore smelted, which comprised about 55 per cent. of the total ore treated, averaged 2.98 per cent., while the ore treated by the wet process contained 0.402 per cent. of copper. The gold content of the ore smelted was 9.93 dwt., of the leached ores 9.19 dwt., and of the oxidized gold ore 4.64 dwt. per ton.

Barren Flux to Be Replaced by Basic Ore from Many Peaks Mine

In the smelting operation the percentage of barren flux used in producing one ton of blister copper was 75 and of coke, 9.3 per cent. But this high percentage of barren flux will be greatly reduced upon the completion in July, 1910, of the Boyne Valley Railway to Many Peaks mine, when regular shipments of basic ore will be made to the smeltery. The necessary enlargements at the reduction works to handle this increased tonnage of ore and resulting sulphur fumes, matte and slag were to be finished in July last.

During the year an additional air compressor was installed to provide for the increased demand for air at the mine. It is intended to maintain a six-months coke reserve; the coal strike in New South Wales had entirely depleted the 9000 tons on hand before the strike.

Mine Operations

In the opencut the oxidized ore is about exhausted, so that continuation of this work as well as the development underground is now entirely in sulphides. Satisfactory conditions exist underground in the protection of the workings against creeps, and in the progress of the measures taken to insure an efficient system of ventilation. To this end an upcast shaft is being sunk at the northwestern end of the workings to connect all the levels.

The development for the year comprised 7761 ft. of drifting and 1276 ft. of sinking and raising. In the Many Peaks mine sufficient work has been done in driving tunnels, drifts and other openings to insure an ample supply of ore for the smeltery upon completion of the railway. Already 20,000 tons await shipment to Mount Morgan.

Suit against Butte & Ballaklava

The Anaconda Mining Company has brought suit at Butte, Mont., against the Butte & Ballaklava Copper Mining Company, asking $1,800,000 damages and asserting that ore of that value had been taken from its property through the workings of the Ballaklava. Its complaint, which states seven causes of action, relates to the Mountain Chief and Right Bower claims. The plantiff desires to be judged the owner of the Mountain Chief and Right Bower lode claims. A temporary restraining order has been issued stopping all work on the disputed veins

Ore from the Calera mine, Mexico, is being smelted in bond at Bartlesville, Okla., and the resulting spelter exported to Canada.

Oil Shale Deposits, Blue Mountains, N. S. W.

Shale Similar to the Scotland Deposits; Easily Mined by Long Wall System. Low Specific Gravity Indicative of High Grade Shale

BY H. L. JENE*

The oil shale of Blue mountains, Australia, is closely allied to the Boghead coal or Torbanehill mineral of Scotland. In Scotland its geological position is at the base of the upper coal measures, and in Australia the oil shale is found in the Permo-Carboniferous measures underlying the Hawkesbury sandstones. The gorges of the Blue mountains expose outcrops of the shale measures in many places. Its origin may be accounted for by the accumulation of spores or seeds, and seed cases from plant life growing in the neighborhood of swamps, the shale being formed in lagoons or depressions of Permo-Carboniferous times. Fossil life is fairly abundant in the lower portions of the shale measures.

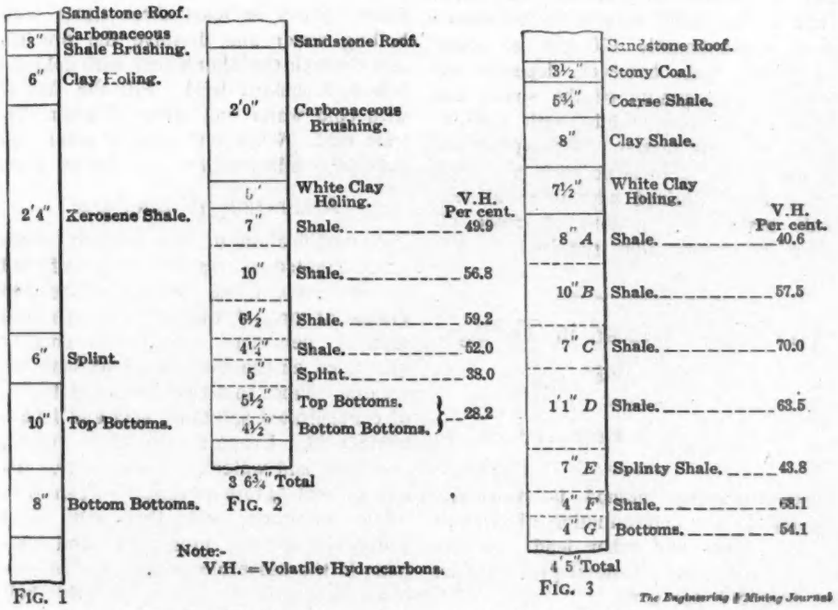


FIG. 1 FIG. 2 FIG. 3

SECTIONS THROUGH OIL SHALE DEPOSITS OF BLUE MOUNTAINS, N. S. W.

SYSTEM OF WORKING

The deposits are worked by the long-wall system. In opening up the seam, a tunnel or adit is driven on the mountain side, where the seam is found usually lying comparatively flat. The adit is driven ahead in the seam, and is afterward used as a main haulage tunnel through which the whole of the output is drawn, this being usually accomplished by a system of endless-rope haulage.

Roadways are driven from the main haulage tunnel, and through these the shale is drawn by wheelers or ponies from the working places to the main haulage for conveyance to the surface.

The working faces are known as "bords" and are 13 yd. from center to center, the shale varying in thickness from 2 ft. to 4 ft. 6 in. Fig. 1 shows a section of the shale seam as exposed in workings at Torbane. Two men usually work together at a "bord," and are paid at the rate of 5s. per ton for a 24-in. seam, and 3s. 6d. for a 45-in. seam and over, and proportional rates for seams of intermediate thickness. When miners are employed on shift work they receive 11s. per eight-hour day. What is locally known as a "cavil" is drawn quarterly, and is simply a ballot for places so that the personnel of the working faces changes four times a year.

MINING WITHOUT EXPLOSIVES

The actual mining of the shale is, in nearly every case, accomplished without the use of explosives. The miners simply pick out the clay holing (Fig. 1), and as this removes the enormous pressure of the superincumbent overlying Hawkesbury series, the shale either flies out or splits up into sections which are easily removed. As a protection to the miners, a stout piece of bark is used, from behind which they work. As the shale is extracted props are erected at the working faces, to support the roof. The workings are well ventilated by means of air shafts and blowers, and are quite free from poisonous and explosive gases.

SAMPLING THE DEPOSITS

The following methods were used by me during the recent examination of several large shale properties in the Blue mountains: On entering a shale mine with a view of sampling the deposit, I have found an acetylene-gas lamp of great value. The necessary outfit consists of a tomahawk, rule, tape, piece of chalk, pocket knife, prismatic compass notebook, pencil and plan of the workings.

For the accurate sampling of these deposits a special method must be resorted to. Having fixed the starting point, the shale is carefully measured at the face, the thickness and number of the "bord" noted. A chalk line is then drawn vertically across the face, and the block of shale removed. If the shale happens to part, the pieces are fitted together, numbered and placed on a car or skip and sent to the surface. After a number of samples have been procured in this way, they are removed to daylight and placed in a row ready for examination.

Samples are taken along the working faces from every "bord," but in other parts of the workings the distances between samples vary considerably, depending chiefly on the tonnage that exists behind the exposed faces, and the variation in the quality of the shale.

CLASSIFICATION OF AUSTRALIAN SHALE

The shale in Australia is divided into two classes: (1) Export or gas shale and (2) oil or retort mineral. The next step is to classify the shale in each block, under these two heads.

The gas shale, which is chiefly exported and used for the enrichment of ordinary illuminating coal gas, must contain 60 per cent. of volatile hydrocarbons. Any shale below this standard is classed as retort mineral, from which crude oil is produced on the spot and subsequently refined.

By means of mineralogical tests in connection with the physical properties of the shale an experienced man can estimate closely the value of the shale.

VARIATION IN QUALITY OF SHALE

The shale varies in quality, not only in the horizontal direction, but more so throughout its thickness vertically. Fig. 2 shows a section of the shale seam in

*Broken Hill, N. S. W.

one part of a mine, and Fig. 3 a section in another part of the same mine. These sections will explain the uselessness of taking one sample over the full width, which would simply give the average value and fail to distinguish between the different qualities of shale in the seam. This irregularity in the quality of the shale necessitates a great deal of labor, and many more samples and assays than would otherwise be required.

Characteristics of Shale

The main factors in the preliminary examination are, in their order of importance: Specific gravity, streak, fracture and luster. Specific gravity varies according to the quality of the shale, the lower the specific gravity the better the shale. It ranges from 1.08 to 1.5.

Splint, which in Australia is classed as retort mineral, yielding about 50 gal. of crude oil per ton, has a much higher specific gravity than true shales.

SPECIFIC GRAVITY TABLE.

True Shales.		Splint and Splinty Shales.	
Sp. Gr.	Vol. Hyd., Per Cent.	Sp. Gr.	Vol. Hyd., Per Cent.
1.080	77.5	1.359	47.0
1.118	70.9	1.367	42.5
1.146	67.7	1.370	38.6
1.181	64.8	1.406	37.6
1.208	59.9	1.417	34.3
1.229	56.9	1.496	32.0

Streak—The streak is produced by running a cut vertically over the surface of the shale. The color of the shale exposed in the cut varies from almost white in the higher grades to dark brown in the inferior qualities.

Fracture—The fracture varies from perfect conchoidal in the good qualities to semi-conchoidal and splintery in the inferior shales. Splint has no fracture, and in addition is easily distinguished from shale by its high specific gravity, black color and black earthy streak.

Luster—The luster varies from highly silky in the good qualities to dull in the inferior ones.

Determination of Samples

Having carefully marked off the different sections on each block in accordance with the physical tests, each section is marked in alphabetical order commencing at the top. See Figs. 2 and 3. Now, with a sharp tomahawk the block is split through at each line, and each section is then split down vertically for the full width, which constitutes the sample. The smallest sample should weigh at least one pound. The samples can then be placed in bags or powder boxes ready for conveyance to the laboratory for further treatment.

The shale, after having been removed from the mine, is found to have increased in thickness, which is mainly due to the relieving of the pressure to which it was formerly subjected. This expansion must be allowed for in marking and cutting the sections. The subsequent treatment of the samples in the laboratory does not come within the scope of this article. The three constituents, which it is necessary to determine, are the volatile hydrocarbons, gallons of crude oil per ton of shale and the percentage of nitrogen, upon which the ammonia and the ammonium sulphate are dependent.

Ratio of Oil to Hydrocarbons

The percentage of volatile hydrocarbons in the shale forms a good guide as to the relative value of the shale, with respect to the gallons of crude oil per ton of shale that can be obtained by destructive distillation. I have found in connection with retorting tests in the laboratory that a useful ratio can be established between these two products, namely, that doubling the percentage of volatile hydrocarbons gives approximately the gallons of crude oil per ton of shale. Thus 60 per cent. volatile hydrocarbons gives approximately 120 gal. of crude oil. This ratio, however, depends entirely on the quality of the shale, and decreases proportionately with the increase of coaly matter. With splint and splinty shales there is no such ratio, this being usually mixed with more or less coaly matter, the gallons of crude oil being far below that required by the ratio.

The Assay of Lead in Tailings and Slags

By Evans W. Buskett *

The following method is especially adapted to the determination of lead in tailings, slags and other lead products where the amount of metal present does not exceed 5 per cent.

The standard solution is prepared by dissolving 14.19 grams of chemically pure ferrous ammonium sulphate in one liter of water. About 10 c.c. of sulphuric acid and a strip of aluminum are added to prevent oxidation. One c.c. of this solution is equivalent to 0.0025 grams of lead. As an indicator, use a solution of potassium ferricyanide, made by dissolving a piece of the salt, the size of a pea, in 25 c.c. of water. A green color is the end point.

The solution used to precipitate the lead is made by adding to a saturated solution of potassium bichromate just enough ammonia to produce a yellow color. The hydrochloric acid used in dissolving the lead chromate from the filter paper is made up of one part acid to three of water.

*Metallurgical engineer, Joplin, Mo.

The ammonium acetate solution is made up of ammonia, 150 c.c.; glacial acetic acid, 250 c.c.; water, 600 c.c. To standardize the solution, 100 mg. of lead are dissolved in 25 c.c. of ammonium acetate solution and the lead precipitated by adding 10 c.c. of potassium bichromate solution. Boil and filter. Wash thoroughly with boiling water and dissolve the precipitate through the filter with cold dilute hydrochloric acid. Fill the filter with cold water and allow to drain. Titrate the filtrate with ferrous ammonium sulphate.

Details of the Assay

Weigh one gram of ore into a casserole and add 10 c.c. of nitric acid. Cover with a watch glass and boil. Evaporate until there is no moisture on the watch glass. Cool and add 25 c.c. of the ammonium acetate solution, boil and filter. Wash once with hot water and allow to drain.

Precipitate the lead in the filtrate with potassium bichromate solution, boil and filter. Wash at least three times with boiling water and dissolve the precipitate through the filter paper with cold dilute hydrochloric acid. Fill the funnel with cold water and allow to drain. Titrate cold. When one gram is taken, divide the reading of the burrette by four.

Adaptation to Zinc Ore

A modification of this method, especially adapted to small quantities of lead in zinc ores, is as follows: Use five grams of ore, if the ore contains less than 1 per cent. lead, and smaller quantities as the percentage of lead increases. Place in a casserole, add 10 c.c. of concentrated sulphuric acid and 10 c.c. nitric acid. Evaporate to white fumes, cool, and add water; boil and filter. Allow to cool before filtering. Wash with dilute sulphuric acid, then with cold water. Place the filter paper and contents in the casserole, add 10 c.c. of ammonia and an excess of acetic acid; boil and filter into a No. 3 beaker and wash all lead acetate through the filter.

To the filtrate add 10 c.c. of a saturated solution of potassium bichromate; boil five minutes and filter. Wash thoroughly with boiling water. Place the filter containing the lead chromate in a beaker and add 50 c.c. of a 10-per cent. solution of hydrochloric acid. When all of the lead chromate is dissolved, add 100 c.c. of manganese sulphate solution, then an excess of the standard solution of ferro-ammonium sulphate; dilute to 500 c.c. and titrate with a standard solution of potassium permanganate. One equivalent of iron is equal to 1.23 of lead.

The Standard Oil Company has completed its pipe line, about 2000 miles long, connecting the Gulf of Mexico and Bayonne, N. J., via Oklahoma.

Cyaniding at the North Star Mines in California

Mill Tailings and Concentrates Cyanided. Sands and Slimes Treated Separately. Use Oliver Continuous Filter. High Extraction Claimed

BY JOHN TYSSOWSKI*

The ore from the famous North Star mines at Grass Valley, Cal., is treated in two mills, the North Star mill being near the collar of the original incline and treating ore from above the 3000 level, while the Central mill is adjacent to the vertical shaft and treats ore from the 3000 to the 5400 level. Each mill comprises 40 stamps with concentrators, and a cyanide plant, though the concentrates are all treated at the Central cyanide plant. The ore is crushed in rock breakers of the Blake type before going to the stamps. In the Central mill the two rock breakers are driven by a water wheel supplied with water under a 600-ft. head and using a ⅝-in. nozzle, the spent water being used in the mill. A 20-h.p., 500-volt direct-current motor is belted to the water wheel and acts as a governor and generates electricity for lighting, etc. When water pressure is low, or extra large rock is being broken, the motor assists the water wheel and keeps the speed constant. When rock breakers are idle or running light, the motor acts as a dynamo and generates power which is transmitted to the same line from which it derives power when acting as motor. At night a saving of 20 h.p. is thus effected.

CENTRAL CYANIDE PLANT, NORTH STAR MINES COMPANY

The stamps weigh 1050 lb. and are dropped 8 in., 96 times per minute. Mortars are equipped with adjustable chuck blocks and a 10-in. discharge is maintained. The 25-mesh screens (19 holes per inch) are needle punched according to the ideas of A. D. Foote, superintendent of the North Star mine. The special feature of these screens is that unpunched bands are left every inch to stiffen them, so that no reinforcing bars are needed and the splitting of the screen is overcome. Screens are 4 ft. by 9 in. and made of thin sheet steel. They last about 21 to 25 days while ordinary needle-punched screens average only seven days.

AMALGAMATION

Inside amalgamation is practised and two-thirds of the amalgam is caught either on chuck blocks or in the battery, one-third outside on the plates. The plates are brushed every 12 hours and cleaned every two weeks. It is the custom at the mills to run the high-grade rock, collected by the specimen bosses, at the end of the month just before clean-up. When running this high-grade rock a larger percentage of amalgam is caught inside the mortars than is usual.

In cleaning up, all the dies are taken out of the mortars. The amalgam plates are 3½x18 ft. and are rolled U-shaped so that there is a narrow projecting edge to go over the frame on either side. Thus corners in which amalgam will accumulate are eliminated. In the Central mill the plate frames are cast iron and sloped the same as the floor upon which they are set. The battery ore bins and mortar blocks in this mill are built of concrete.

STEEL BATTERY FRAMES IN CENTRAL MILL

In the Central mill the battery frame is entirely constructed of steel. One of the interior views shows the steel battery frames, the concrete bins and mortar blocks and the construction of the amalgam plates and frames upon which they rest. Within a week after the mill was started, the head was sheared off of every rivet in the frames. The rivets were replaced by bolts with Columbia lock-nuts which have proved entirely satisfactory and seldom need replacing or tightening. After over five years of uninterrupted running, the steel frame is in splendid condition, and maintenance has been far less than with wood frame. The anchor bolts on the mortars have never been tightened since the mill started and no rubber cushion was used under mortars.

BUDDLE CONCENTRATORS

The mills are each equipped with nine Dodd buddles. These machines do not make a clean concentrate. In the North Star plant middlings are elevated by an air lift to the last buddle. In the Central a spiral pump on each buddle elevates the middlings.

SUMMARY OF STAMP MILL OPERATIONS

A stamp duty of 3.3 tons is maintained though on clean quartz a duty of over 4.5 tons is possible. From 8 to 10 tons of water are consumed in the mill per ton of ore treated, the total consumption being 250 gal. per min. The mill extraction is 86 per cent., 80 per cent. from amalgamating and 6 per cent. in concentrates. The sulphurets usually assay from 2 to 2½ oz. in gold and 2 oz. in silver. Mill heads average about $14, although the rock as milled contains about 60 per cent. waste. This "waste" is not waste in the strict sense of the word, but is principally what is locally called "formation," being more or less silicified wall rock. The ore is quartz containing much free gold, the country rock being diabase, and some granodiorite.

SULPHURETS CYANIDED WITH SLIMES

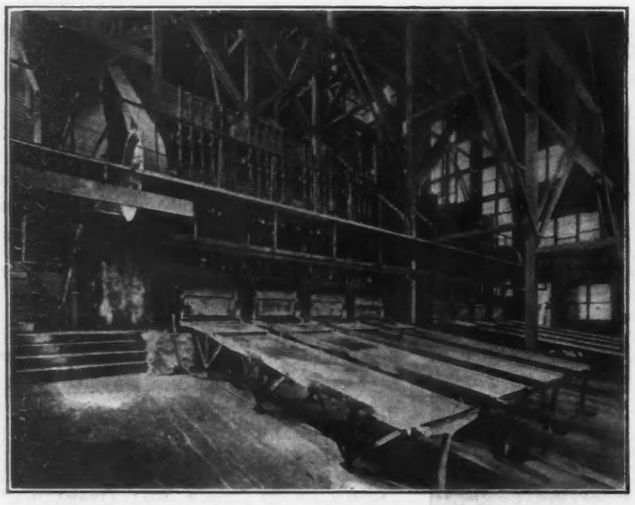
The concentrates which, as stated, are rather sandy, all go to the Central cyanide plant for treatment. They are reground in a tube mill and join the separated slimes for cyanidation.

The pulp from the mill passes by gravity to the cyanide plant where a

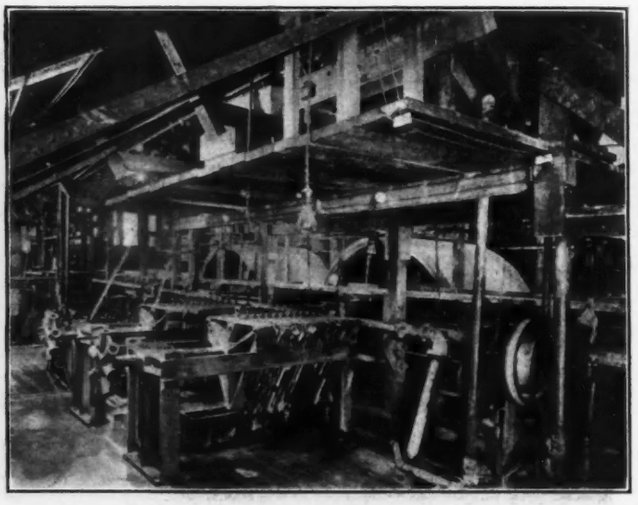
*Mining engineer, editorial staff, ENG. AND MIN. JOURN.

roughing cone, and three 4-ft., hydraulic, Merrill, cone classifiers separate the slimes and sands. At the Central mill the sands constitute about 60 per cent. of the total feed and at the North Star about 55 per cent. Sands go to six, 23x8-ft. tanks, the charge for each of which is 110 tons; a Butters & Mein distributer is used in these tanks.

The cyanide solution is built up to 0.1 per cent. strength in the sump, the tanks being drained almost dry, 10 to 12 per cent. moisture, before the addition of any solution. This draining takes about six hours. One-half barrel of slacked lime is dumped on each tank before percolation commences. Lime is also added, after classification, to the overflow from the classifiers for assisting the settlement of the slimes. The overflow from the slime settlers is pumped to a reservoir which holds 500,000 gal. and is used for sluicing tanks and for classifying. By



BATTERY FLOOR, CENTRAL MILL, SHOWING STEEL FRAMES, CONCRETE MORTAR BLOCKS AND BINS



OLIVER FILTERS AND MERRILL PRECIPITATE PRESSES IN CENTRAL CYANIDE PLANT

using this reservoir water which contains 0.02 per cent. lime for classifying, the sands are given an alkaline wash previous to leaching, without cost or loss of lime. The lime is slacked in a box and ground in a small grinding pan driven by a worm gear connected to a water wheel. The total consumption of lime is about four pounds per ton of ore treated, most of the lime being used for settling the slimes.

SAND TREATMENT REQUIRES 150 HOURS

Each sand tank gets 30 tons of 0.1 per cent. solution, the effluent valve being kept open until the solution tests 0.06 per cent. cyanide (usually for about six hours), then closed and the tank allowed to soak for about 24 hours; 100 to 120 tons unprecipitated solution from the slime filters are then added in 20-ton batches, each batch being allowed to drain. After this from 60 to 80 tons of precipitated barren solution are run on and allowed to percolate. No wash water is used. The tanks are then sluiced out with an automatic sluicer resembling a Butters & Mein distributor with stuffing box in place of hopper so as to admit water under pressure. All solution testing above 0.03 per cent. cyanide goes to the strong-solution gold tank, 5x14 ft., and thence to the Merrill filter presses after zinc dust has been added.

ZINC DUST FED MECHANICALLY

The precipitate presses run most of the time on the weak solution (0.06 per cent. cyanide), the strong solution being put through only once a shift, as the precipitation is more active on this class of material and only about 30 tons per day has to be precipitated. No zinc dust is added while precipitating the strong solution. The zinc-dust feeder is connected to the filter-press pump by a belt and the speed reduced from 22,500 to 1 by two ratchets having 150 teeth. The speed of the belt from which the zinc dust is fed is thus regulated at 7 ft., the length of belt, in 24 hours and the pump is run continuously. This is done instead of having the belts connected to floats in the tanks and pumping alternately from each tank, thus making the process more automatic and continuous and requiring fewer tanks.

At the North Star cyanide plant a plunger pump is belted to a water wheel and a butterfly valve on the water line, is connected to a float in the gold tank. The hight of the solution in the tank thus regulates the speed of the pump by controlling the water wheel. In the Central mill the pump is belted to the line shaft and capacity is regulated by throttling the suction of one cylinder. The press is thus run continuously.

About 800 to 900 lb. of zinc dust are fed per month in each of the two mills. The consumption of zinc per ton of ore treated is ⅕ lb. The weak solution, after passing through the filter press, assays less than 2c. per ton, the strong from 5c. to 20c. when no fresh zinc is added. The filter-press product at the North Star plant is worth about $20 to $25 per lb.; that produced at the Central is of somewhat higher grade, as the pulp treated is richer. The precipitate is cleaned out of presses into iron-lined boxes, fluxed and put in paper bags, being melted while still wet and without acid treatment. In this way the precipitate has a minimum of handling and mechanical losses are slight. The bullion produced is about 580 fine gold 300, and silver 280.

TREATMENT OF SLIMES

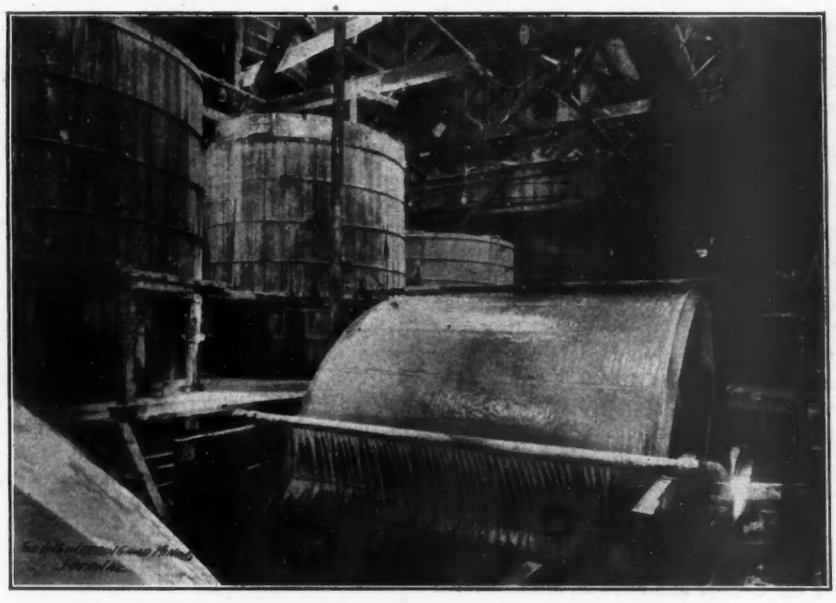
Milk of lime is added to the slimes overflow from the classifying cones, the pulp then passing to six conical settles, 14 ft. in diameter. The bottoms on these settlers are 60 deg. They overflow over the rims, the water being pumped by a 4-in. turbine pump to the large reservoir previously mentioned. This water, which contains 0.02 per cent. lime, is used for sluicing and classifying. The spigot material from the settlers goes through a 4-in. pipe to the slime stock tank, 10x10-ft. in size. Every hour a charge is let out of one settler into the stock tank, from which it is pumped to each of the agitators which are in series. As drawn out, the slimes usually run about 1.25 sp.gr., sometimes, however, attaining a maximum gravity of 1.30.

AIR AGITATION FOR SLIMES

The slimes are agitated in the stock tank with air. Lump cyanide is added in a wire basket until the strength is brought up to 0.035 per cent., additional solution being added to reduce the specific gravity to 1.15 to 1.18. (If 1.30, the extraction is poor and erratic, usually ranging under 80 per cent. Owing to the great amount of impalpable slimes produced from the quantity of waste milled,

difficulty is also experienced in getting the cyanide to dissolve in a pulp of high specific gravity.) Pulp from stock tank is pumped to agitators by an air lift, a float in the agitator regulating the flow by controlling the air to the lift.

There are three agitators, 8 ft. in diameter, with 16-ft. sides and 60-deg. cone bottoms. These have been in use since the summer of 1903. They are of the type which is called the Brown or Pachuca, although in use at the North Star before any in Mexico. Each has an 8-in. central pipe at the bottom of which air under 15-lb. pressure is turned from a ½-in. pipe reduced to ⅛ in. at the nozzle. A splash board is placed above the central pipe to deflect and spread the rising column of pulp. The agitators are connected by an 8-in. pipe at a point about half way down their sides and the third agitator is also connected to a similar tank acting as a reservoir for four or five hours' supply; no agitation is done in this latter tank.



OLIVER FILTER, SHOWING REMOVAL OF CAKED SLIME BY WATER JETS AND SCRAPER

OLIVER CONTINUOUS FILTER USED

After agitation, the slimes are treated by the Oliver continuous filter, which is the invention of Edwin Letts Oliver, until June 1, 1910, metallurgical engineer for the North Star Mines Company. The filter drum revolves once every 5½ min. in a rectangular wood tank, in which the slimes are kept at a constant level by an automatic float valve. A hollow trunnion passes through the filter drum, which is built of wooden staves mounted on cast-iron spiders. An accompanying illustration shows the two Oliver filters the Merrill precipitate presses in the Central cyanide plant.

The cylindrical drum is divided into 24 compartments, each one of which is connected to an automatic valve by two pipes, one for suction and the other for compressed air. The surface of the drum is covered with a specially prepared filter medium, then with a thickness of light canvas and is finally wrapped with hard steel wire. A steel scraper assists in removing the slime cake after filtration is completed. The operation of the scraper is shown in another view. The filter drums are 10 ft. in diameter and have a 7-ft. face.

At the North Star cyanide plant a wet outside-packed, two-cylinder, plunger pump, capable of producing a vacuum of 25 in. of mercury, is used for handling the solution from the filters, while the vacuum is maintained by a water ejector. At the Central plant, besides the wet vacuum pump, an 8x7-in. Rix rotary-valve vacuum pump is used to produce a 23-in. vacuum. A suction of about 22 to 25 in. of mercury is used on the filters, on which a slimes cake ¼ in. thick is formed, adhering to the submerged portions of the cylinders as they rotate in the tank.

The slime cake on the filter drum is washed by jets of water from spray pipes to remove traces of gold- and silver-bearing solution. As the cylinder rotates, at the section opposite the scraper the vacuum is temporarily shut off automatically and at the same time compressed air at 10-lb. pressure is admitted. This causes the coating of slime to detach from the section and slide down the scraper, from which it is removed by spray water, as shown in the illustration. The slime cake contains only about 30 per cent. moisture. The cake leaves the canvas entirely clean and bears the imprint of the canvas and wires on its under side. To operate a 100-ton slime plant, including the power consumed in operating filters, pumps and compressors, only little over 10 h.p. is required.

RESULTS OBTAINED

The North Star and Central filters have a capacity of 40 to 50 tons each and are treating a sticky, clayey slime that is quite free from sand. As stated, the ore treated contains 60 per cent. waste, which makes a great amount of impalpable slime. It is estimated that the total slime treatment at the North Star costs 35c. per ton, including cyanide, supplies, power and labor. The total maintenance for eight months, the average life of a filter cloth, is about $22.50 for 10,000 tons filtered or 0.2c. per ton filtered.

A 90-per cent. extraction is attained in the North Star company's cyanide operations. The cyanide consumption is only 0.5 to 0.6 lb. per ton; that of lime, 4 lb.; lead acetate is only used when solutions become foul from treating old sulphurets in the agitators.

Operations at the North Star are conducted according to uptodate engineering standards. The mine has been worked since 1851, and for a number of years has ranked as the largest gold producer in California. At the date of this writing the company has paid in dividends $2,152,139, since its reorganization in 1899; total dividends since 1884, $2,686,-989. The total production credited to the North Star is $11,250,000. The company generates its own hydroelectric power and the equipment at the mine includes complete machine shops where even machine drills and electric locomotives are built.

A competent technical staff is maintained, a large proportion of the engineers being university men. A. D. Foote is general manager of the North Star Mining Company; A. B. Foote, assistant manager; and until recently E. L. Oliver, was metallurgist, and R. E. Tremeroux, assayer. At the North Star mill Edward Richards is mill foreman and C. B. Schwartz, foreman of the cyanide plant. Frank Provis is foreman for the Central mill and R. Gordon Walker, cyanide foreman.

Silicious Rock for Converter Linings

The metallurgists at the Steptoe smelting plant in Nevada have found a local rock carrying silica in the right proportions to form a satisfactory converter lining. Up to the present time, experiments had been made with rock from various portions of the Robinson district, but no entirely suitable material had been found and the company shipped in most of its converter lining from Dillon, Mont. The rock is hauled about 12 miles from a point on Duck creek.

Placer Mining Operations in Alaska in 1909

Production from Placers $16,322,000; Fairbanks Most Prosperous Camp; Rush to Innoko; Increased Activity in Dredging Operations

BY ALFRED H. BROOKS*

The placer-gold production of Alaska for 1909 is estimated at $16,322,000, as compared with $15,888,000 in 1908. This increase must be credited in great part to districts of the Yukon basin, nearly all of which had a larger production in 1909 than in 1908. On the other hand, the dry weather led to a marked falling off in the placer-gold output in some other districts. The operations in placer mining are treated under the heads of the various geographical divisions of the country.

Activity in Dredging

Perhaps the most significant fact of the year's operations is the continued activity in installing dredging enterprises. Five dredges were operated in Seward peninsula throughout the open season, and six more were completed in time to do some work, making eleven dredges, small and large, which were in use during 1909. The results of these enterprises have encouraged many to take up this form of mining, and plans for several more dredges have been made. Three dredges were operated in the Fortymile district. Plans were also formulated for dredges at Fairbanks. Some examinations have been made for a dredge on Kenai peninsula.

Creditable Cost Records Attained

The results of the dredging operations at Dawson are of interest to the Alaska mines, as they indicate something of the cost of large enterprises in the Yukon basin. The annual report of the Yukon Gold Company[1] contains interesting data on Alaskan dredging operations as follows:

The seven dredges, the last of which was completed late in 1908, started as early as power was available. The last dredge began operation on June 9, 1909. The dredging season for six out of the seven dredges was 132½ days as against a normal season of 140 days. The dredges during the season handled 2,381,880 cu.yd. and produced $1,363,722 worth of gold. The value per cubic yard was 57.24c. and the cost 31.94c. per cubic yard. This cost includes all thawing charges—amounting to 15.45c. per yard—preliminary stripping operations, and depreciation at the rate of $2000 per month per dredge. As an example of what may be expected in ground entirely thawed, the No. 1 dredge handled in the month of August, 100,217 cu.yd. at a cost of 9.28c. per cubic yard. The actual value per cubic yard of material handled exceeded the estimated value based on examination results by 16.8 per cent. The dredges operated 83.5 per cent. of the possible running time.

Only Unfrozen Ground Dredged on Seward Peninsula

Less definite data are available regarding the cost of dredging in other parts of this northern field. On Seward peninsula only unfrozen ground has been dredged, the cost per cubic yard, including overhead charges, being placed at 18c. In a region where fuel is so expensive as in Seward peninsula (coal costs $20 per ton) it is not likely that mining men will be encouraged to attempt the thawing of ground for dredging. In parts of the Yukon basin, with a fair supply of wood and an abundance of lignitic coal, it seems economically possible to dredge frozen ground. Gravels which run less than, say, $2 per yard cannot be mined under present conditions, while such value would be regarded as extraordinarily high in dredging ground.

I—Pacific Coast Region

The placers of the Pacific coast region, including not only the seaboard but also the drainage basins tributary to it, including the Copper and Susitna, are estimated to have had in 1909 an output valued at $490,000, as compared with $450,000 in 1908. In southeastern Alaska placer mining was carried on in the Porcupine district and on Gold creek in the Juneau district. In the former district the Porcupine Gold Mining Company completed a bed-rock flume nearly 2000 ft. long, and installed a trolley lift with buckets of 2½ cu.ft. capacity and with automatic dump. The plant installed provides for the piping of the gravels into the buckets at bed rock and lifting them to a hopper that discharges into the sluice boxes. This plant was not finally completed until late in the season, but was then operated. Some smaller operations also were carried on in the district.

As in previous years there was more or less beach mining along the Pacific shore between Yakutat and Unga island. This is all done by men working with rockers or small string boxes. The recovery of gold is in many places dependent on weather conditions, for the operations are most profitable after a heavy surf has concentrated the gold in the surface layer of sand. The most important center for this form of mining is at Yakataga, near Controller bay. The entire production of the Pacific seaboard is probably not over $25,000 in value.

Activity on Chisna-Copper River Region

The Copper River region includes two placer districts. The Nizina district is in the upper Chitina. The Chistochina district, sometimes known as the Chisna, is in the northern part of the Copper basin. It is one of the most inaccessible of the Alaska placer camps, being reached now only by trail from Valdez, a distance of about 250 miles. Winter freight rates have been about $500 per ton, but the construction of the wagon road to Fairbanks, the route of which passes within 25 miles of the camp has already brought freight rates down to $300 per ton. The building of the Copper River & Northwestern Railway will avoid the cost and delays of hauling freight over the Valdez summit.

It is reported that 24 claims were worked in this district by about 100 men in 1909, and the total production is estimated to have a value of $112,000. Considerable prospecting of bench claims on the lower Chisna was carried on. Some work was also done on a ditch to bring water to these bench claims and on a tunnel intended to tap an old channel on Daisy creek. As in previous years, most of the gold was taken from Slate and Miller creeks.

Output from Sunrise and Cook Inlet Districts Small

The placers of the northern part of Kenai peninsula included in the Sunrise district are being worked, but the gold output is small. Bear, Resurrection and Cañon creeks are the largest producers. This district is rendered easily accessible by the Alaska Northern Railway, supplemented by a wagon road which has been built by the road commission from Trail lake to Sunrise and Hope. In view of these facilities, mining costs should be low. A number of plans are being considered for the installation of hydraulic and dredging plants. Because of the presence of large glacial boulders in many of the gravels, the hydraulic method would appear to commend itself more than dredging and it would seem desirable that careful prospecting with a drill be done

*Geologist, in charge of Alaskan mineral resources, Washington, D. C.

NOTE—Excerpts from an article in *Bull.* 442-A, U. S. Geol. Surv.

[1]ENG. AND MIN. JOURN., Mar. 19, 1910, pp. 602-603.

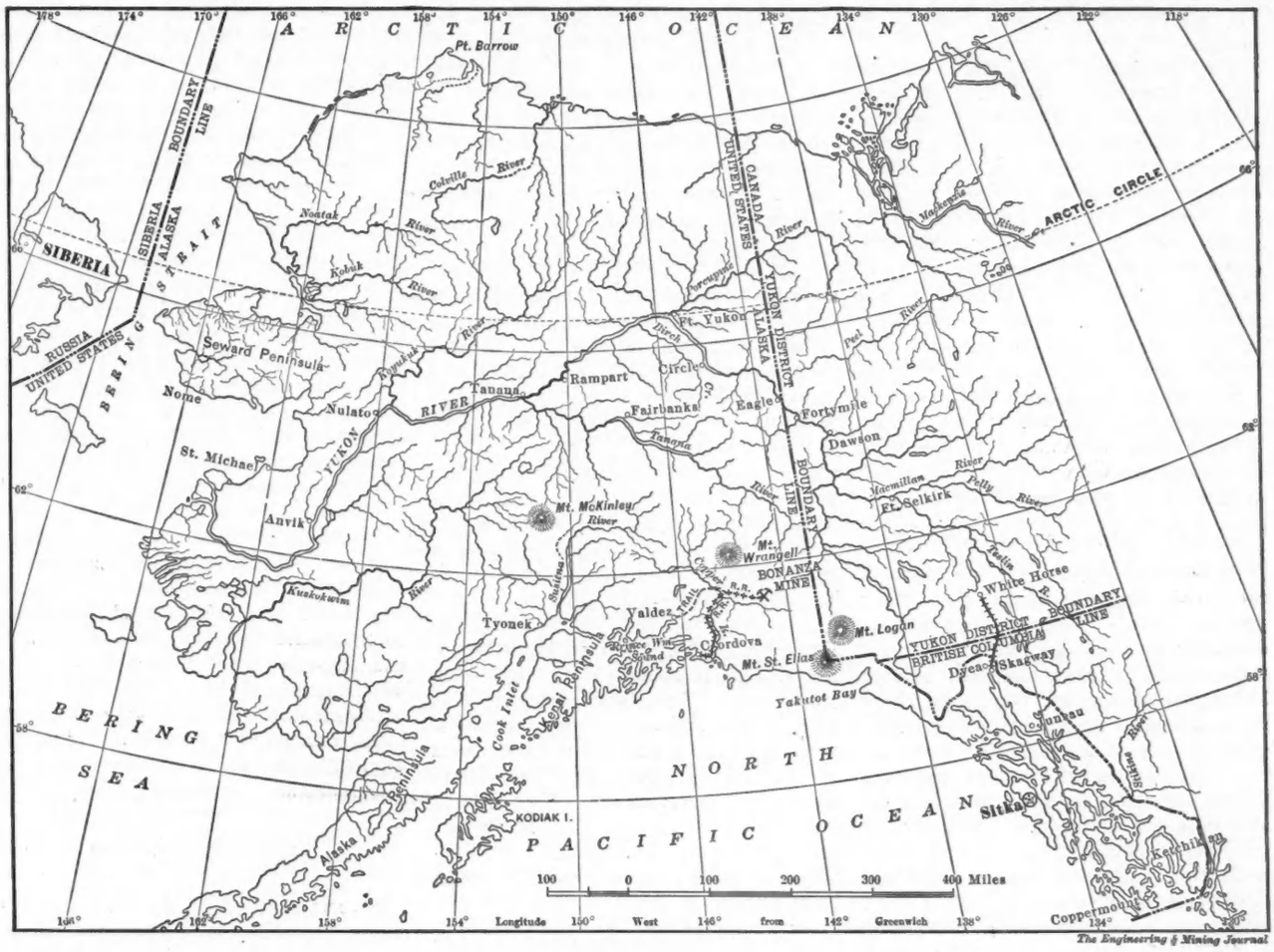
to determine the character of the material before a dredge is installed. So far as known the only prospecting in the Cook inlet region during 1909 was that done on Beluga river. Operations consisted in prospecting for dredging ground. This is one of the fields where large glacial boulders are likely to be found in the alluvium.

Yentna Basin Most Prosperous of Susitna District

The Susitna basin can be divided geographically into three districts; Willow creek, Yentna and Valdez creek. The lode deposits of Willow creek are the center of interest to the miners and prospectors. There was also some placer mining, notably on Grubstake gulch, where the hydraulic plant of the Klondike Boston Mining Company is situated. The water supply, which is reported to have been abnormally low, is said to have permitted the plant to run for only 47 days during the season. One giant is said to have been used. Some prospecting was done on Metal creek, a tributary of Knik river. The results are said to have been encouraging and plans for further development have been made.

Valdez creek is a tributary of the upper Susitna, being about 160 miles by trail from Valdez. Its isolation has made mining costs very high. Winter freight rates are $600 to $700 per ton, while the cost of transportation by pack horse in summer, either from the mouth of Indian creek, which can be reached by boat up the Susitna, or from Gulkana, on the Copper, is $2000 a ton. In 1909 about 100 men were working in this district on about 10 claims, and the gold output has a value between $50,000 and $75,000. The gravels are thawed, which increases the cost of mining.

The Yentna basin is the most prosperous of the Susitna districts. Winter freight rates from Susitna river are about $200 a ton. There were between 120 and 150 miners in this district in 1909, and the gold output is valued at $100,000 to $120,000. The productive placers occur in two districts. One includes Cache and Peters creeks and their tributaries and the other includes Wagner creek and some other tributaries of Lake creek. There is much auriferous gravel in which the values are too low to permit profitable exploitation by hand methods.



Map of Alaska

II—Yukon Basin

The Alaska-Yukon placer districts had in 1909 the most profitable season since mining first began there, nearly a quarter of a century ago. The estimated value of the gold output is $11,580,000, as compared with $10,323,000 in 1908. The gold output of the Klondike, in Canada, which had rapidly declined in the last few years, also showed a decided increase in 1909. While practically all the Alaska-Yukon camps made an increased production in 1909 as compared with the previous year, those of the Tanana valley were the most prosperous. The various districts tributary to the lower Tanana are estimated to have produced gold to the value of over $10,150,000. Of this, Fairbanks made an output estimated at $9,650,000, as compared with $9,200,000 in 1908. The general prosperity is also indicated by the value of the merchandise shipped to the Tanana valley from the United States, which was $2,637,476 during the fiscal year ending June 30, 1909, as compared with a total of $2,040,628 for the previous fiscal year.

Fairbanks at Its Zenith

In spite of this evident prosperity, it cannot be denied that the time is rapidly approaching when the gold production of the Fairbanks district will decline unless some radical changes are made in mining methods. So far as present methods of

exploitation are concerned, many of the richest creeks are nearly worked out. Little appears to have been accomplished in the matter of preparing to mine the gravels of lower gold tenor, though some plans for dredges are under way. Meanwhile, much enterprise has been turned toward the search for auriferous veins, which should yield results assuring permanency to the camp. A lode-mining industry, however, is not likely to develop fast enough to make up for the decreased production of the placers. The Fairbanks miners could well follow the lead of those of the Fortymile district, where three large plants are holding up the gold output in spite of the decrease in small operations.

The Haiditarod excitement has hurt the Fairbanks district by drawing away some of the most enterprising operators and also a large percentage of its mine labor. This may lead to a falling off of the gold output in 1910. Probably the most important feature of the year's mining industry in the Yukon is the general drift to the Innoko region, for there is in every camp a large class of restless prospectors who are ready for a venture in a new field. The continued increase in gold production of the Koyukuk is worthy of note, though the high costs of operating have prevented a proportionately prosperous community. The continued success of the dredges in the Fortymile district has already been mentioned.

Development in Outlying Districts

Considerable more work was done in the Bonnifield district in 1909 than in any previous year. This work in part consisted of mining, but more important were the steps taken to install a large hydraulic plant on Gold King creek, where there is said to be a large body of low-grade auriferous gravels. A winter sled road was cut through from Fairbanks, a distance of about 40 miles, and considerable work accomplished in installation of the plant. There is reported to be ample water for a hydraulic plant. Gold King, Grubstake and Platt creeks are the chief gold producers of the district. The total gold output in 1909 is estimated to have had a value of over $50,000.

There appears to have been little mining in the Kantishna district during 1909. In the Gold Hill district during 1909 there was renewed activity. Productive mining appears to have been confined to Mason and Grant creeks, but good prospects were also reported on other streams. In the fall of 1909 twelve claims were being opened on Grant creek. Placer gold has long been known to occur in this district, but it has never been carefully prospected.

Rush to the Innoko District

A new movement of population into the Innoko district[2] was brought about by the discovery of gold placers on Otter creek, a northerly tributary of Haiditarod river, which drains the southern part of the field. Thousands of prospectors and miners flocked into this field during 1909 from all parts of Alaska as well as from points outside of the Territory. The movement promises to become one of the important ones in the history of Alaska. To judge from the best information available, the discovery on Otter creek does not, in point of either value or extent of deposits, warrant this large influx of prospectors. At the same time it also appears to be true that auriferous gravels are distributed over a considerable area and that gold in quantities sufficient for profitable exploitation has been found in several widely separated localities. It is probably safe to say that although the district may not be able to support the extensive population it has recently acquired, yet it certainly offers a promising field for the prospector.

Transportation Facilities Poor

High freight rates, absence of trails, and lack of established centers of distribution continue to make the cost of mining and prospecting very high. Travel in summer is chiefly by steamer and small boat up the Innoko from the Yukon. Winter travel is from Kaltag on the Yukon, but some have made the long trip from Cook inlet through the Alaska range at Rainy pass, a distance of about 325 miles. The Kuskokwim route has been little used, chiefly because the mouth of the river is uncharted.

It is reported that the discovery on Otter creek consisted in finding a bed of gravel 4 ft. thick and 50 to 60 ft. wide which carried 7 to 10c. to the pan. The gold is said to be fairly fine, of a uniform size, and evenly distributed. Most of the gold in 1909 was taken from Gaines and Ophir creeks. The value of the aggregate output of the year is unknown but is variously estimated at $300,000 to $400,000; that of the 1908 output was less than $100,000.

III—Kuskokwim Basin

The movement of prospectors brought about first by the discovery of the Kantishna and later by that of the Innoko has led to considerable prospecting in the Kuskokwim basin. Though both placer and lode gold have been reported from many localities, so far as known the only productive mining has been on Tuluksak river, a tributary of the lower Kuskokwim. A few claims in this district were operated in 1908, and it is reported that about 20 men were at work on this creek in 1909. Good prospects are also reported on the Takotna, a tributary of the Kuskokwim, which heads against the Innoko. In 1908 some good prospects were found on tributaries of the Hartman river, which forms a part of the drainage of the south fork of the Kuskokwim. It was estimated that the deposits would yield $8 per day to the man, a recovery which, in view of the isolation of the region, hardly justified operations. If a trail were built from Knik to the Innoko, it would pass through this district.

IV—Northwestern Alaska

Northwestern Alaska, as the term is here used, embraces the placers of the Norton Bay region, Seward peninsula, and the Kobuk basin. With the exception of operations on a few productive claims on Bonanza creek (Norton bay) and on some in the Kobuk valley, all the gold mining of northwestern Alaska is confined to Seward peninsula. Productive mining on the peninsula received a setback in 1909 as compared with 1908 but considerable dead work was accomplished preparatory to the installation of dredges. In the development of dredging enterprises the Seward peninsula operators have made more progress than those in any other part of Alaska, and notably so in 1909. The installation of the dredges now planned will make 12 or 15 in all for this region. It is not to be expected that such a dry season as that of 1909 will recur for several years, but the records for four years indicate that low-water conditions are normal and high-water conditions abnormal, and that the methods of mining will have to be adjusted to this fact.

The Kobuk valley continues to support a small placer-mining population. In 1909 claims were worked by 16 men, with a total value of output of about $16,000. Dahl creek was the largest producer and Shingnek creek second; some gold was taken out of Riley creek. The sluicing season in 1909 was very short, as there was no water after the first of August, a fact which materially reduced the production.

Transbaikal Copper

A correspondent of the *Mining Journal* in Transbaikalia, Russia, writing on the mineral resources of that area, says: In various parts of the Yenissei and Irkutsk governments, and also in the province of Transbaikal, many deposits of copper ore that have been discovered lead to the belief that they can be commercially exploited. Such deposits have been long known to exist in the Minusinsk district. At present there is only one copper-smelting works there. But there are many unclaimed deposits, and the industry is only in its infancy. Copper deposits have also been found in the Nizhendinsk district on the River Uda, and also in Irkutsk, on the River Bukson, which falls into the River Oka. Such deposits are also to be found on the River Chilka in the province of Transbaikal; all are awaiting capital.

[2]Maddren, A. G., "The Innoko Gold-placer District, Alaska." *Bull.* U. S. Geol. Surv. No. 410, 1910, pp. 81-83.

Fume Filtration for Production of Pure Spelter

Inert Medium in Filter Separates Heavier Vapors from Zinc. Galvanizers' By-products and Broken Hill Concentrates Treated Successfully

BY JOHN S. G. PRIMROSE*

The theory of fume filtration depends upon the fact that if mixed vapors of different densities be retarded in their rate of flow by passing through an inert medium, the heavier will be sufficiently retarded to effect a more or less complete separation from the lighter, which passes on in an almost pure condition. The original idea of the fume filtration process was to detain the intermingled impurities by some chemical reaction, so that they would combine with a body which had no affinity for the chief constituent of the fume.

Reactions in Fume Filtration

About ten years ago a patent was taken out on these lines to effect the separation of lead and other metals from the vapor issuing from the retorts of the zinc-distilling furnace by passing it through a tube of hot carbon before condensing the zinc. In trying to substantiate the claim that chemical action really took place in the filter tube, it was conclusively proved that this was not the case, but rather that the action was purely mechanical since by the employment of almost any refractory material of convenient size, quite as good if not better results were obtained.

Although lead is only completely vaporized at a temperature of 1560 deg. C., yet it is sensibly volatile much below this point, especially in the presence of excess of a more readily volatile metal such as zinc, which boils at 930 deg. C. Thus the lead seems to pass out of the retort, mechanically carried forward by the zinc in a state of gaseous alloy or solution. The repeated impingement on the surface of the refractory material in the filter (which is much below the boiling point temperature of lead) apparently dissociates the alloy, leaving the lead behind chiefly in the metallic condition, owing to the reducing atmosphere which prevails.

Perfecting the Process

Theoretically, the process is exceedingly simple, but in the working out, more especially with very impure material, there are several difficulties to overcome. This has been accomplished by the Brand's Pure Spelter Company, which started in the spring of 1908 to carry out refining operations at its works in Irvine. This ancient Scotch burgh stands on the eastern shore of the Firth of Clyde, about 30 miles southwest of Glasgow. It is situated on the sand dunes and offers splendid facilities for the numerous factories and works. It is well served with railway conveniences and possesses a harbor recently much improved by the port authorities in conjunction with the Nobel-Dynamite Trust, the Ardeer factory of which is situated on the Garnock water, a tributary of the river Irvine.

Siemens-Belgian Three-tier Furnaces

The two furnaces at present completed are of the three-tier Siemens-Belgian, or double reversible regenerative type, constructed similarly to that shown in Fig. 1. On each side they have five bays holding 24 pots in the Rhenish fashion, which gives 240 retorts per furnace, and

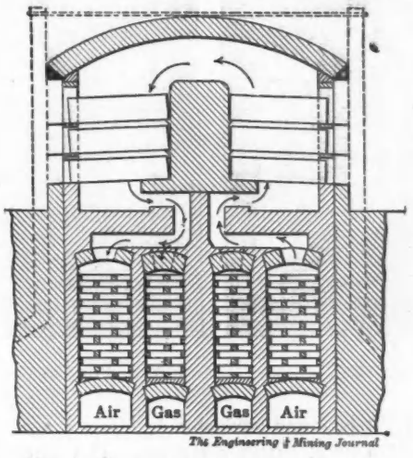


Fig. 1. Three-tier Siemens-Belgian Furnace

these muffles are each capable of holding a 56-lb. charge. The general side view in Fig. 3 shows No. 2 furnace at work with the condensers and nozzles in position. Both condensers and retorts are made at the works by hand from Stourbridge clay. The retorts, elliptical in cross section, are 12 in. high by 9 in. wide and 50 in. long.

The construction of the reversing valves allows alternating passage of the gas and air into the two regenerators on the one side, as well as throwing over the flow from one side of the partition wall to the other. A 2-ft. flue runs the full length of the furnaces under each regenerator, so that the gas or air enters the chambers by the five ports at equal pressure, no matter whether it is at the end farthest from supply or at the near end. Ascending by converging ducts from the crown of the regenerator arches, the air and gas meet and mix in a "blind" or combustion chamber at the level of the working floor, and easily accessible from the front of the furnace. Thence the flame passes to the retorts through slits four inches wide, left between the floor bricks of the furnace.

The central partition wall, when it reaches the furnace proper, is perforated at intervals with vertical slits to permit the passage of the flame below as well as upon the top of the retorts on the down-flow side. Fig. 2 shows this in the interior view of the furnace. The seven producers at present installed are of the open-, or bar-bottom type and require comparatively little attention to yield all the gas needed. One is kept in reserve.

Treatment of Ashes, Dross and Hards

In view of the large amount of impure zinc cheaply procured from galvanizers in the form of ashes, dross and hards, the furnaces, as slightly modified, were originally started on the refining of these materials. They are often so impure as to contain from 8 to 10 per cent. of iron and from 5 to 8 per cent. of lead, the zinc content ranging from 60 per cent. upward.

It is a good testimonial to the efficiency of the process that from this raw material, spelter of the highest grade is regularly produced. Thus, ashes containing 75 to 80 per cent. of zinc yield a first and second tapping of spelter 99.7 per cent. pure; dross, with from 85 to 90 per cent. zinc, a spelter of 99.8 per cent. purity; while the hards, containing from 90 to 94 per cent. of zinc frequently yield 99.8 per cent. spelter. The grade is chiefly dependent on the purity of the dross, since with finely granulated material of 85 per cent. zinc content and about 5 per cent. of lead, the first tappings lately have been found to assay 99.92 per cent. of zinc in the spelter. Although the ashes treated are frequently mixed with flue dust and scrapings, the charge is dense and requires a comparatively large proportion of coke to open it up. From 30 to 35 per cent. by weight of "breeze" (coke-oven riddlings, which pass through a ½-in. mesh) is used.

On an average about six tons of dross can be treated daily per furnace, and the practice, so far, includes several weeks in which slightly over thirty tons of spelter were produced from No. 1 furnace.

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The Manoeuver

The work is carried out as in ordinary smelter practice. Starting with the morning shift at six, the spent residues are raked out into the chutes to the tunnel, and the fresh charge is put in by hand-shoveling before ten o'clock. By gradually and uniformly raising the temperature from about 850 deg. C. to the full heat of over 1100 deg. C., the distillation proceeds rapidly, so that about 25 per cent. of the yield is secured in the first tapping shortly after four o'clock in the afternoon. The second tap follows about eight at night; the third immediately after midnight, and the final scrapings are collected a little before six o'clock in the morning, when the night shift changes. In spite of the utmost precautions in lining the ladles and coating the scrapers, etc., there is always a trace of iron present in the spelter. But even when cast direct from the hand ladles, the first two tappings yield plates of the highest grade the lead being guaranteed under 0.2 per cent. by the registered trade mark of "Irvo."

The Fume Filter

Between the mouth of the retort and the back of the condenser, there is tightly luted-in the fume filter for effecting the filtration of the fumes of volatilized zinc. This consists essentially of a 10-in. conical fire-clay tube loosely packed with suitably sized refractory material, such as chippings of burnt fire-clay. It is held in position as shown in the sketch, Fig. 4, taken from a recent patent specification.

The fume, in passing through this filter, is sufficiently retarded to entangle the lead, but not the zinc, and thus nearly pure spelter is condensed in the outer chamber while the lead trickles down over the filter medium and collects in the bottom. It can be recovered to a large extent in the metallic form by the simple expedient of inverting the filter tube over a mold on withdrawal from the furnace. The idea is extremely simple and the additional cost to work it is slight.

The tubes themselves even when made by hand, cost only one dollar per hundred, fired and ready for packing. The packing is done by the boys or furnace helpers after the manœuver. The chippings of about hazelnut size are taken from the butchered retorts reclaimed from the dumps. The fixing is also done by the boys who place the filters, small end first, into the condensers, as these are being put up to the retort mouth. The only precaution to be observed is that no dust gets into the tubes. To avoid this, the retorts are not charged close to the outlet end, and in this way the back pressure exerted by the filter is not appreciable and no more vapor is lost through pores or cracks than in ordinary practice.

Often in dealing with impure ashes in which some of the zinc exists as chloride, it is found advisable to insert a second filter to act as a stopper. This filter goes into the outer end of the condenser. It is packed in the same way as the inner tube, but is not luted-in tightly, as its chief service is to retain the objectionable and volatile products which would otherwise escape into the atmosphere. The escaping fume is almost completely free from zinc, as evidenced by the blue color of the flame; much less zinc powder is produced and there is found in the condensers a heavy scum which contains sufficient zinc to be sold to the chemical works for recovery. These stoppers serve to conserve the heat in the condenser, and, as prolongs are not employed, the air is thus prevented from entering the condenser and causing oxidation of the zinc vapor before it condenses.

Experiments on Broken Hill Concentrates

After viewing the refining process carried out at Irvine, I was impressed with the possibility of treating complex double sulphide ores of lead and zinc, such as the Broken Hill concentrates, in order to recover the zinc in a much purer state than hitherto possible and to secure at least part of the lead in the metallic condition.

Although the furnaces were not primarily designed for smelting ores, two series of trials were carried out last summer, and while the short duration classed them in the nature of an experiment, they were sufficiently successful to prove the feasibility of solving the problem of treating plumbiferous zinc ores for the production of high-grade spelter in one operation. The use of the fume filter, slightly enlarged to deal with the heavier duty upon it, acted as a preventive measure, by keeping the lead from contaminating the zinc to a harmful extent. A large percentage (96) of the silver in the ore was also retained in the residues in a condition of alloy with the reduced metallic lead, suitable for easy recovery. The furnaces were constantly under personal supervision during each of the tests and all material was weighed both before and after treatment.

The results are summarized in the accompanying balance sheet and tables, taken from a paper[1] read before the British Institute of Metals.

Results of the Tests

Regarding the losses of zinc in these trials, nearly 30 per cent. may seem somewhat excessive, but when the percentage of sulphur in the only ore which was available is calculated to zinc sulphide, in which form it chiefly existed, it will be seen that almost 1500 pounds of the 4300 pounds of zinc represented as lost can be accounted for in this way. Then by comparison with methods in which the outer stopper and filter were not used, the Brand process showed a

Fig. 2. Interior View of No. 1 Furnace

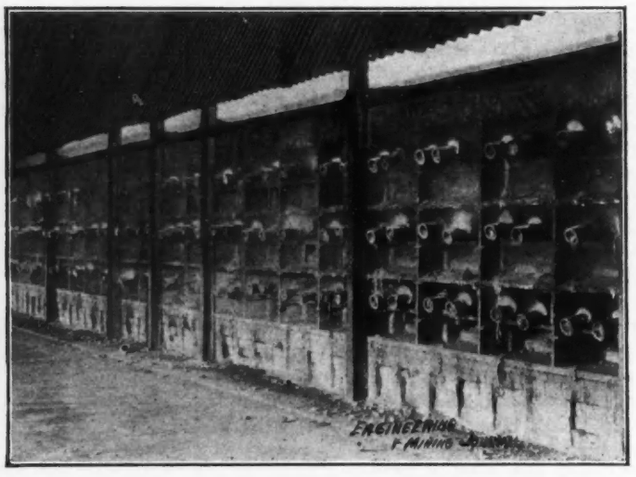

Fig. 3. Furnace at Work with Fume Nozzles Attached

[1] "Notes on the Production of Pure Spelter," by John S. G. Primrose, *Journ.*, British Institute of Metals, Vol. II, 1909.

gain of nearly 10 per cent. more zinc as spelter which was also of a higher purity, amounting to quite 3 per cent. of zinc. The lead in the first tappings assayed not more than 0.5 per cent.

Undoubtedly, the open texture of the hand-made retorts militated against the highest yield being obtained, due in part to the slight back pressure set up by the interposition of the larger filter tube, which was put in the mouth of the retort, as shown in Fig. 5. Also, the yield of metallic lead (3 cwt.) was not quite up to expectation, and it has been disputed if the 92 per cent. of total lead left in the residues as 20 per cent. product (with 6 or 7 per cent. of zinc) can be readily recovered to yield its silver content. There is never likely to be a sufficient quantity of these residues to keep a lead furnace going, but it is obviously quite feasible to mix these with a lead ore for treatment in the blast furnace; there the unconsumed carbon of the coke would be useful for its calorific value.

It was surprising with so much lead in the charge that the wear and tear upon the retorts was not heavier. No more butchering occurred than had previously been encountered in dealing with galvanizers' dross and ashes, which are undoubtedly more severe on the retorts than most ores. By reason, however, of the suitable excess of reducing material above that required to effect the reduction and to maintain a steady current of carbon monoxide throughout the run, it was found possible to reduce the number of cracked and "holed" retorts to about 5 or 6 per cent. This does not much exceed ordinary smelting practice.

This point has already been remarked upon by Sulman and Picard, who made use of a briquetted charge of Broken Hill middlings and coking coal, but they were unable to recover any more than 70 per cent. of the zinc. They also recorded, what was found in these trials, that the greater portion of the lead in the residues existed in the metallic condition. It was finely disseminated through the half-burnt coke, which held it mechanically as in a sponge, in which condition, of course, the lead had a much less deleterious effect on the fire-clay of the retort than if it had existed as oxide or silicate.

BALANCE SHEET OF MATERIALS IN THREE DAY TEST.

Assay No.	Material.	July. Cwt.	July. Zinc, Lb.	July. Lead, Lb.	July. Silver, Oz.	September. Cwt.	September. Zinc, Lb.	September. Lead, Lb.	September. Silver, Oz.
2	Spelter	99¾	11,099	83	...	98½	10,948	67	...
3	Residues	176	1,228	3,475	235	160½	1,160	3,220	251¼
4	Lead	3	.....	326	2	3½	2	380	1¼
5	Lead scrapings	....	.....	.....	...	4¼	54	240	1
Δ	Loss	....	3,718	717	13	....	3,172	284	8¾
1	Middlings	308	16,045	4,601	250	288	15,336	4,191	262¾

TABLE OF ZINC SMELTING LOSSES.

July.	Income. Zinc (Lb.).	Output. Spelter (Lb.).	Loss (Lb.).	Percentage Loss.	Units Lost.
First day	5,730	3,700	2,030	35.4	17.0
Second day	5,210	3,579	1,631	31.3	15.0
Third day	5,105	3,905	1,200	23.5	11.25
Aggregate	16,045	11,184	4,861	30.3	14.5
September.					
First day	5,325	3,553	1,772	33.29	15.82
Second day	5,325	3,780	1,545	29.01	13.79
Third day	4,686	3,687	999	21.32	10.14
Aggregate	15,336	11,020	4,316	28.15	13.39

ASSAYS OF RESULTS OF THE THREE DAY TESTS.

	July Test.	September Test.
	No. 1. Middlings (dry).	
Zinc	47.95 per cent.	47.54 per cent.
Lead	13.75 per cent.	13.06 per cent.
Sulphur	2.05 per cent.	2.26 per cent.
Silver	16¾ oz. per ton of 2240 lb.	18¼ oz. per ton (2240 lb.)
Moisture	3 per cent. in material as used.	0.08 per cent. in material as weighed.

	No. 2. Spelter.					
	1 Day, Per Cent.	2 Day, Per Cent.	3 Day, Per Cent.	1 Day, Per Cent.	2 Day, Per Cent.	3 Day, Per Cent.
First tap:						
Zinc*	99.300	99.336	99.402	99.52	99.48	99.50
Lead	0.683	0.648	0.572	0.46	0.50	0.47
Iron	0.017	0.016	0.026	.....	.....	.....
Weight (cwt.)	14¾	15¼	19¾	17	25	22¼
Second and third taps:						
Zinc	99.135	99.142	99.124	99.11	99.20	99.00
Lead	0.852	0.836	0.852	0.86	0.76	0.96
Iron	0.013	0.022	0.024	.....	.....	.....
Weight (cwt.)	18¼	16¾	15	14¾	8¾	10¾

	No. 3. Residues.					
Lead	19.69	18.18	16.60	19	17.5	17
Zinc	5.88	6.64	6.77	7	6	6.5
Silver (oz. per ton)	29¾	27¼	25¼	32¾	30½	30¾
Average moisture in residues as weighed (per cent.)	.....	2.77	.....	.....	.....	.....
Weight (cwt.)	59¼	57½	57¾	54¾	53½	52

	No. 4. Lead Plates.		No. 5. Lead Scrapings.
Lead	99.5 per cent.	99.0 per cent.	52.0 per cent.
Zinc	0.6 per cent.	0.7 per cent.	8.5 per cent.
Silver	12 oz. per ton (2240 lb.)	10.75 oz. per ton	20.75 oz. per ton (2240 lb.)
Tin	.....	0.3 per cent.	.....

*The first tappings all contained about 0.1 per cent. of cadmium.

Flow of Vapor Must Be Carefully Adjusted

It has been advanced by the users of carbonaceous packing material for the filter tubes and nozzles that a reducing atmosphere is maintained in the condenser and less zinc powder is thereby produced. But apart from the extra cost of this combustible material (which is really refractory at the temperatures obtaining) it is quite immaterial what packing is used, provided it is of suitable size and contained in a vessel of the proper dimensions.

The apertures are of carefully adjusted size for the work in hand, and it is to the correctly adjusted flow of vapor through these as the furnace is uniformly heated up that the whole success of the process depends. Too slow a rise gives trouble through formation of a "spider's web" of zinc oxide and dust over the hole, and too rapid a temperature increment gives too quick a passage of the fume through the filter to effect satisfactory separation of the lead. The chief

disadvantage that I have found in the use of coke as a filtering medium is its uncertainty; either it swells and chokes the passage or it burns out at the end of the run and crumbles to the bottom of the tube, thus leaving a free passage for the fume just at the time when most lead is coming over in the vapor.

It has been further stated that the products now obtained by the application of the Elmore oil vacuum process to the Broken Hill ores and tailings, will leave no raw material available for the operation of the fume-filtration method of zinc smelting. The final zinc concentrate with 46.5 per cent. of zinc and only 7.25 per cent. of lead is even more admirably suited for the production of a high-grade spelter than were the "middlings" available at the time of the Irvine trials, provided, of course, that it is smelted in conjunction with the patented fume filter.

Summary

The advantages arising from the use of this method of fume filtration should be readily apparent to all practical zinc smelters, and especially to those who are troubled with the lead in their ores low-

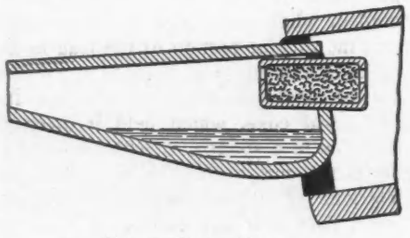

Fig. 4. Fume Filter

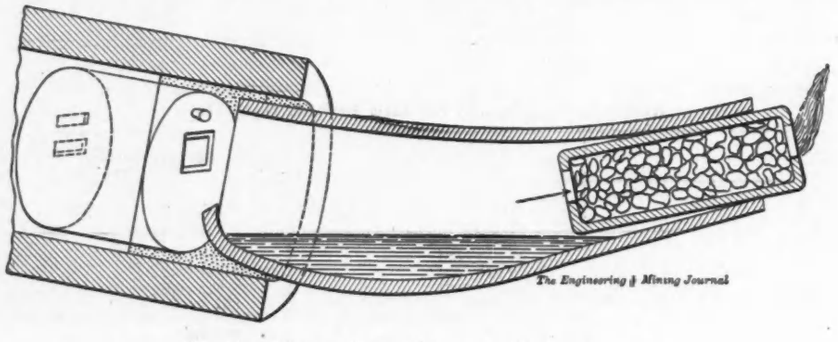

Fig. 5. Using a Fume Filter as Stopper

ering the market value of the spelter produced, since the higher grades often command as much as $10 per ton more than the ordinary run. The modification in the usual method of smelting is slight and the filters can be made to fit any form of retort and condenser in use. The greatest simplicity is found in working, once the correct distillation temperature is secured and maintained by the aid of pyrometers, and by the use of machine-made retorts, no greater smelting loss is sustained; in fact, with the outer stopper in place an increase of yield is obtained.

Secondary considerations are the decrease in zinc dust produced and lessened fume escaping into the atmosphere, as well as the fact that lower grade ores can be made to yield the highest grade spelter. The extra cost of production is low, amounting only to a few cents per ton, and the services of one helper for two hours at each furnace to hand the filter tubes to the charger, who naturally needs about one-half minute longer per retort to get the tube luted in position.

I am indebted to Brand's Pure Spelter Company for its courteous permission to visit its pioneer work, and for numerous facilities accorded in the preparation of this paper; also to J. A. C. Edmiston, its chief works-chemist, for checking the assay figures.

Segregation of Gold in Copper

By Donald M. Liddell*

There is an apparent impression that in molten gold-copper alloys no segregation of gold takes place on cooling, if both the gold and copper are pure. The following experiments seem to contradict this, at least when the gold content is low. Electrolytic copper, fine silver and fine gold were taken and melted together with a salt and charcoal cover, stirred well and the crucible allowed to cool gradually inside the furnace. The copper block was then broken out of the crucible, cleaned and divided into three zones, top, middle and bottom.

The zones assayed as shown in the accompanying table.

There was, however, the chance that the segregation of the silver had effected the gold, and also that the difference in the specific gravities of copper, silver and gold had influenced the result.

	Ag. Oz. per Ton.	Au. Oz. per Ton.
Top	53.14	5.86
Edge of middle	53.08	5.82
Center of middle	59.92	6.18
Bottom	69.58	6.72

Therefore, a mixture of electrolytic copper and fine gold only was made up and melted. The influence of specific gravity was discounted by removing the crucible from the furnace and setting it on a cold plate which would tend to chill the bottom more quickly than the top. The block was divided as before, and the assays were as follows: Top, 9.89 oz. gold per ton; middle, 9.93; edge of center, 9.85; and bottom, 9.65 oz. One may, therefore, conclude that there is a certain amount of segregation in gold-copper alloys prepared with the best commercial copper. It is still undetermined what would be the case with a copper from which the 0.05 to 0.07 per cent. of oxygen had been removed, which is normally present in commercial copper.

*Grasselli, Ind.

Selenium Gold Ore

At the 222d meeting of the Geological Society of Washington, 1909, Waldemar Lindgren offered an informal communication regarding the discovery of a selenium mineral in the gold-quartz ores of the Republic district, Washington. The veins, which have yielded several million dollars in gold, are contained in Tertiary andesitic rocks and tuffs. The vein matter is quartz, chalcedony and opal deposited in concentric crusts. "Adularia, in considerable amount, also occurs in the gangue." Ore minerals and particularly native gold are rarely visible in the gangue and the ores have proved very difficult to treat. In rich ores slight black streaks indicate the presence of metallic minerals and in a few places, in the Republic mine, a well defined black or dark-gray mineral forms crusts a few millimeters in thickness. This material is exceedingly rich in gold, but contains no free metal. It consists mainly of an antimonial tetrahedrite associated with specks of chalcopyrite. A partial analysis by Dr. Palmer, of the U. S. Geological Survey, showed no tellurium, but the presence of about 1 per cent. of selenium, which in all probability is combined with the gold. This interesting result places the Republic veins in the rare class of Tertiary selenide veins, of which Tonopah is the only known representative in the United States. "From descriptions, one of the few deposits of this kind, outside of the United States, is that of Redjang-Lebong in Sumatra." No doubt the difficulties which have been experienced in the treatment of these ores are attributable to the presence of selenium compounds.

Gold placer and lode mining in Alaska, according to a press bulletin of the U. S. Geological Survey, yielded in 1909 about $20,463,000, an increase of about 6 per cent. over the output of 1908 and the largest year's yield since 1906, the year of greatest production.

Refuge Chambers in Coal Mines

The Average Cost of One District Refuge Chamber Is Estimated at $500. Total Expenditure for an Average Mine Is Less Than $10,000

BY GEORGE S. RICE*

The recovery of 20 living men from an improvised refuge chamber in the Cherry mine, Illinois, one week after entombment (November 13, 1909) awakened general interest in the systematic establishment of equipped refuge chambers in coal mines.

The employment of such chambers is by no means new. There have been a few well equipped refuge chambers established for years in certain mines abroad, and in at least one case in France, have been of value in saving life. The great number of mine disasters in this country, as well as the large percentage of such accidents to the number of men employed in the mines, makes the question of refuge chambers a most important one for us to consider.

In a majority of the mine disasters that have occurred in this country since 1907, there have been men in certain portions of the afflicted mine who have not been killed outright and who, in some instances, have lived for a considerable time, even hours after the explosion. This was notably the case in the recent Primero (Colo.) mine explosion. At this mine, a branch explosive wave entered the first working entry on the left for about 1800 ft. and then died away. Fifteen miners in their working places beyond this limit of the explosion were not injured by violence or flame. One of them was ultimately rescued about 12 hours after the explosion. He stated they wandered about for some hours trying to get out. In the last attempt they were overcome by the afterdamp and all but one died. It was evident that if they had remained in their working places all in this party would have escaped.

Had there been a refuge chamber in this vicinity with telephone connection to the outside, there is little doubt that these men would have gone there, and with good air and provisions, and encouragement by word from the outside, would have stayed in perfect safety. The rescue party would have had a definite place to work toward, and if necessary, have employed oxygen helmets to reach the entombed men.

Windber, Johnstown, Wehrum and Herrin can be cited among recent explosions, in which some of the victims were lost by afterdamp. While the proposition hardly needs demonstration to those who have had the misfortune to encounter mine disasters and have observed the considerable proportion of victims overcome by afterdamp, it may be of interest to retell briefly the experiences at the Cherry mine to indicate what can be done when there is knowledge of the whereabouts of entombed men, and to show the power of endurance of human beings under the fearful conditions that prevailed in their improvised refuge chamber.

The Cherry Disaster

On Saturday afternoon, Nov. 13, 1909, a pit car of hay at the second vein landing of the air shaft of the Cherry mine was set on fire by a torch. The downcasting current fanned the fire, which in turn ignited the timbering, and then the flame was driven rapidly toward the main bottom. Owing to opening of ventilating doors, the smoke was short-circuited so that only a relatively small amount was blown around the mine workings until some time had elapsed and the ventilating fan doors burned out. I will not attempt to review the whole history of the fire, but confine the story to men who were ultimately saved.

A group of miners who had met at the entrance of the second west entry in the second vein had attempted to get out to the shafts, but were prevented by smoke. Waite and Eddy, who had been around to warn the men, took the leadership. As the smoke became worse, the party was gradually driven back up the second west entry. One of them was lost in a futile endeavor to get out. The others finally retreated to the head of the entry, and on Monday erected barricades of dirt and old powder cans across the two entries immediately outside of pairs of stub entries respectively turned off the second west and the aircourse. After the barricades had been finished on Monday, their oil lamps would burn no longer, due to the blackdamp present, although they had plenty of oil and matches. The party had acetylene lamps, which will burn in an atmosphere containing a lower percentage of oxygen than will support combustion of oil lamps, but these went out on the day following the erection of the barricades.

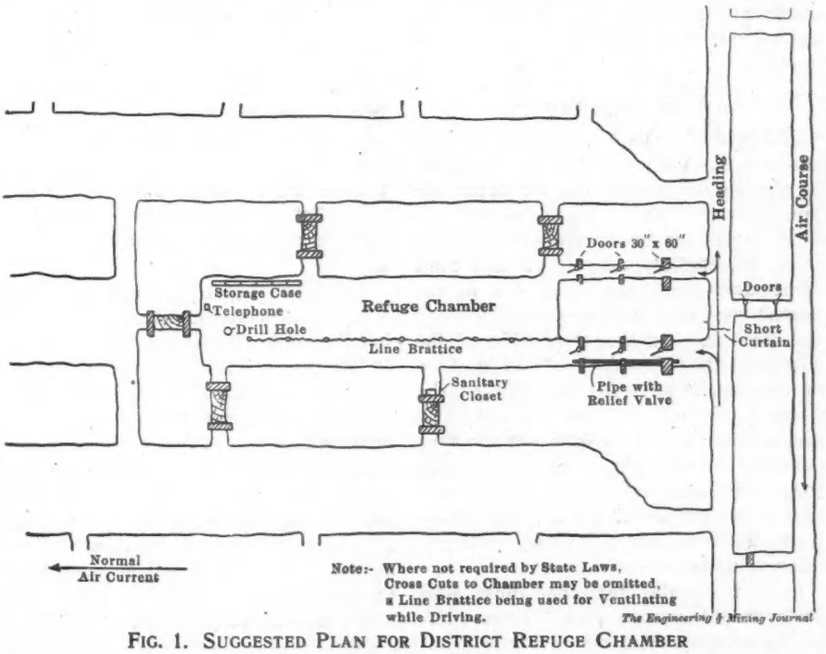

FIG. 1. SUGGESTED PLAN FOR DISTRICT REFUGE CHAMBER

All of you probably read in the newspapers of the struggle for existence that these men had until the following Saturday. Then, becoming desperate, they decided to make an attempt to reach one of the shafts and obtain water at least. They made holes through each of the barricades. Brown and a companion went through the barricade in the second west to get some pails they remembered leaving immediately outside the barricade. They were overcome, but later revived

NOTE—Paper prepared for the Bluefield meeting of the West Virginia Coal Mining Institute, June 7, 1910, by permission of the Director of the United States Geological Survey.

*Mining engineer with Technologic Branch, U. S. Geol. Surv., Pittsburg, Penn.

enough to crawl back inside the barricade. The decision of those who started under the leadership of Waite and Eddy was to go out on the first west entry to a crosscut five or six hundred feet outbye. Most of the entombed men were not strong enough to go; there were 8 who made up the "forlorn hope" party. They managed to make their way in the darkness until they reached the crosscut where they were to whistle if the air was better. They whistled, but the other men did not feel sufficiently strong to start. The eight continued their journey past trips of cars and dead mules in the dark until they reached the mouth of the entry, a distance of half a mile. Here they encountered one of the mine officials.

The mine had been opened on Thursday night, but the exploration had proceeded in a different direction, one pair of entries at a time being cleared of blackdamp and explored. The eight men were taken to the surface immediately. They were very weak and were at once put in charge of doctors and nurses. The leaders, Waite and Eddy, gave information as to there being 12 more men behind the barricades. A rescue party was made up at once, including myself, and taking five rescue helmets, went into the mine.

A Notable Rescue

We pushed on as far as we could without the helmets and established a base at the mouth of the seventh south entry. Beyond this point, all but electric lights would go out instantly. The men were successively despatched and after some delay, enlarged the hole in the second west barricade, so that they could get through. On the other side of the barricade they found the 12 men more or less scattered. All but one of the rescued men were able to walk out when assisted by the helmet men. When they reached the base, they were given oxygen treatment. One was so far gone that he had to be taken out on a stretcher by R. Y. Williams, of the Survey, and another volunteer.

It is a singular fact that those who made up this rescue party, when without helmets, could not breathe the local air without getting "knocked out," although the men who had been rescued appeared to be able to breathe it with impunity. Their systems had apparently become accustomed to the blackdamp, which must have constituted over 4 per cent. of the atmosphere when brattices were built up, and undoubtedly this percentage of blackdamp had been increased by the breathing of 20 men entombed.

All but one of these men lived, although some of them were a long time in completely recovering. Had there been telephone communication with the outside, it is certain that these entombed men would have been rescued as soon as the mine had been entered, two days earlier. If they had not been admirably led, it is quite probable that the delay would have caused their death.

It will be generally conceded that had there been equipped refuge chambers in other parts of the Cherry mine, and in certain other mines in which disasters have occurred, many lives would have been saved.

The mine operator frequently says in truth, should not prevention of accidents be the objective? Moreover, granting the usefulness of safety chambers in case of disaster, provided the chambers happen to be so located as to be available, is it practicable to locate the chambers with any certainty that they can be reached by men cut off from escaping outside; second, will it not require so many chambers, and the cost be so great as to be prohibitive?

Undoubtedly, prevention of disasters should receive the first consideration, but the facts are that disasters have occurred in well planned and in generally well administered mines, though some weak point undetected by the management, or through the failure of one man to understand or to do his duty.

Location for Refuge Chambers

The majority of mine disasters are due to explosions, and most of them in this country have their origin at the working faces. Usually the main explosive wave rushes along the haulage road that provides its fuel—coal dust—until it reaches the exits into the open air.

There are frequently branch explosive waves that traverse some of the cross headings or entries. More particularly is this true when the rooms are connected through from heading to heading and provide an abundant supply of fresh, dry coal dust.

In exceptional cases, notably at Marianna, Penn., and recently at Mulga and Palos, Ala., the flame of the explosion penetrated throughout the mine. In these mines there was a small amount of methane given off in the working faces, which undoubtedly tended to widen the explosion in each case. In a typical coal-dust explosion where there are some wet stretches of passageways, wet from either natural or artificial causes, there are likely to be some roads and districts unpenetrated by flame. This suggests the value of a refuge chamber in each district and a complete separation of one district from another by continuous pillar, where the room-and-pillar system is used. The entrance and exit for haulage and ventilation of each district should be located at one point and the entrance and exits protected by special zones which are kept free from dust, or the dust thoroughly wetted or covered by rock dust.

Such information as we have at present leads to the belief that these zones can be made impenetrable to an external dust explosion when uncomplicated by the previous presence of methane in the air passing through the zones. The latter would be an exceptional condition. An explosion within a given district would probably traverse its respective protection zone and possibly reach the nearest exit to the open air, but the explosive wave should not enter the other districts if the inert zones are properly arranged and protected.

Suppose, then, there be a refuge chamber in each isolated district, the miners acquainted as they should be with the location of the chamber, rush to it on hearing the explosion or being notified of it if in a distant district.

In an inclosed district, the afterdamp would come in only slowly at the entrance until the explosion doors at the fan had been replaced, so that in most cases in a carefully planned district the men would have ample opportunity of reaching the refuge chamber before the blackdamp drifted or was blown in.

Such a chamber should be connected by a protected telephone line with the surface, preferably coming down a drill hole direct into the chamber. This drill hole could also be used for supplying fresh air under pressure. Under such circumstances, the imprisoned men, encouraged by communication with the outside and supplied with stored food and water, could live for weeks, if necessary, until safely reached by rescuers.

Size of Districts

The maximum size of a district to be supplied by a refuge chamber depends somewhat on the geological and other physical conditions presented by the seam and the system of working same. It would seem desirable to have it bear some relation to the maximum number of men employed in a district ventilated by a separate split of air. We will assume that the maximum number of men is one hundred, a not uncommon maximum allowed for a single split of air. As there will be new districts or panels forming while others are being worked out, the average number of men we will figure at 50. A medium-sized mine has about 200 men employed on the day shift, and a large mine about 500. Accepting the average of 50 men in a district, there would be from 4 to 10 live districts in a medium- to large-sized mine, and as many refuge chambers under the system proposed.

To establish these refuge chambers may appear to be a serious task, but my idea is that if these chambers are planned for in laying out the mine, the cost per ton would be insignificant. Nearly all modern coal developments, as a matter of good engineering, are, or should be preceded by thorough prospecting, both to know the continuity of the seams and to properly plan the mine.

Furthermore, in gassy seams, according to Fred Keighley, as reported in his paper delivered before the Mining Institute of Western Pennsylvania, 1899, drill holes are of great value in draining off the gas contained in the seam. If the prospect drill holes are cased and protected from injury at the surface, they will serve as the most valuable feature of a refuge chamber, providing means for communication to the outer world.

It is true that while such drill holes are preferably large, the ordinary prospect hole drilled by a core-drill which may be cased with 2-in. pipe will accomplish all that is strictly necessary, provided there is an air compressor available. The telephone wires to pass down this casing through which air is forced. By a recently developed system of boring holes, that of Brejoha's, which has been employed abroad, the hole is coated with cement, thus dispensing with casing and giving a larger internal diameter. (*Colliery Guardian*, 1908, Vol. xcvi, page 502.)

The oxygen rescue apparatus supply 2 liters of oxygen per minute, more than sufficient for a man at rest. In rough figures, 10 liters of free air per minute will be sufficient per man, or assuming a maximum of 100 men in the chamber, 1000 liters of free air at atmospheric pressure per minute will be required. This is equivalent in round numbers to 350 cu.ft. at atmospheric pressure per minute. Compressing to six atmospheres, this would mean only 60 cu.ft. of air per minute compressed to 80 lb. per square inch—which could easily be delivered through even a one-inch pipe to depths of over 1000 ft. The exhaled and surplus air would be discharged into the mine. If the drill hole be made large enough, it has been suggested that a hand-driven suction fan could be placed at the bottom of the hole in the chamber, so that the refugees would be independent of external machinery to get air. In putting in such a fan it would be advisable to offset same by a tee from the foot of the hole and insert valves so the hole can be used in other ways.

Size of Chamber

Allowing room for each man to stretch out on the ground, say 12 sq.ft. each, it would require 1200 sq.ft. of area in the chamber for the maximum number of 100 men. If the chamber is 18 ft. wide, the length needed would be 66 ft.—we will say 75 ft. in length—although there would be no objection to much greater length. The chamber may therefore be an ordinary working room and driven as such, though for sake of speed in preparation in each given district, it may be advisable to limit the length to 100 feet.

Shape of Chamber

The chief features to be observed are (1) to make the room neck or necks of great length; (2) to make the pillars on either side of good thickness, and make the crosscuts to adjoining rooms or entries in the process of driving the room as narrow as possible, so as to lessen the difficulty and expense of building tight masonry or concrete stoppings in same on completion of the chamber. Where the State laws do not require crosscuts nearer than 80 to 100 ft., the refuge chamber could be driven up without crosscuts, using instead a line brattice to carry ventilation to the face.

Entrance to Chamber

The entrance to the chamber, after the crosscuts have been securely and strongly sealed, should be at the heading or entry only. There should be two entrances at the heading where practicable. The reason for two is to provide for ventilation under ordinary conditions, and in case there should be a fall of roof on the entry, blocking one of them, the other entrance would be available.

The entrance used in driving the chamber would have to be wide enough to admit a mine car, though this width should subsequently be reduced by heavy masonry securely keyed into the ribs to keep down the width of the doors to about 30 in. The other entrance could be driven narrow by pick. Normal ventilation would be established by placing a curtain across the entry or heading, and if necessary, carrying a line brattice up the room.

Opposite one of these entrances there should be a crosscut, with doors, through the pillar to the parallel heading or entry to allow the men to enter from that side. The entrance into the chamber should each be guarded by at least three strongly built doors with frames recessed into the rib or masonry. It does not seem essential that these be made of iron. It is rare that fires resulting from explosions are started in the interior of the mine, without immediate extinguishment by the afterdamp. When fires result from an explosion it is usually near the entrance, where the fresh air has come in before the coked dust has cooled off.

There is no objection whatever to iron doors, but it is better to keep down the expense of installation and have frequent refuge chambers instead of one or two very expensive ones.

The doors should open inward to the chamber and normally be kept open by a button, though self-closing. This applies to district chambers in the interior of the mine and not to a special fireproofed chamber, such as has been proposed for instalment at an escape shaft, and in which it may be better to keep the doors closed.

The first men entering the district would shut the doors. The doors should be carefully hung and fit tight, but no extra or unusual tightness would be required if there was a cased drill hole from the surface, down which air could be forced under pressure. It might, in fact, be found necessary to provide a pipe recessed along the rib behind the door casings with an automatic relief valve in same to prevent excessive air pressure on the men, should the doors seal very tightly.

Equipment of Refuge Chambers

The equipment of the district refuge chambers should be protected and should be relatively simple. The vital feature is the drill hole for ventilation and for carrying down telephone lines, and, in case of prolonged entombment, for running down water or liquid food.

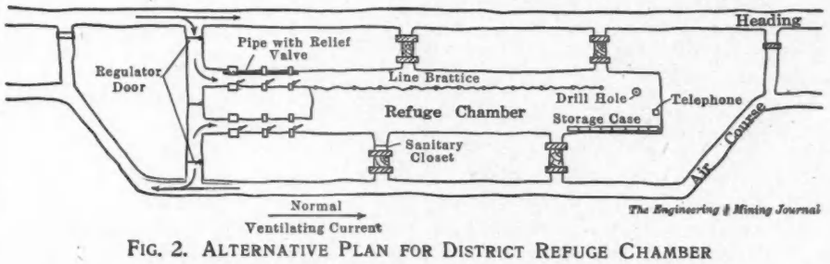

FIG. 2. ALTERNATIVE PLAN FOR DISTRICT REFUGE CHAMBER

The telephone itself should be of the iron-incased type and would be useful in the regular administration of the mine. Its use in this way would tend to insure its being in order when needed. In a rib hole or in one of the sealed crosscuts, there should be a privy provided with sand and disinfectants. The chamber should be whitewashed throughout and the floor kept swept.

Drinking water should be kept in covered casks and renewed from time to time. Food in cans and tins should be stored in wall cases with glass fronts, the latter to be broken when necessary. A dozen or more dry-cell electric lights should be placed in the wall cases, also two or three safety lamps with match relighters.

One oxygen resuscitation box with an extra oxygen cylinder would be most desirable. Two or more oxygen rescue apparatus might also be of advantage for exploration toward the shafts or for fighting local fires. Light, portable self-rescue apparatus, like that designed by my colleague, Clarence Hall, might be of great service. Two or more portable chemical fire extinguishers would be excellent for regular protection of the dis-

trict, rather than for the more remote contingency of fighting fires produced by an explosion. There should be a roll of canvas or brattice cloth for special emergencies.

Disinfectants, simple medicines, and a box containing "first-aid" remedies and implements would manifestly be of advantage. The list can be added to indefinitely, but the main thing is to have the apparatus and supplies kept in such a way and so maintained as to always be instantly available. In a well-administered mine this should not be difficult, and, if severe penalties are inflicted on those who take away or damage the equipment in ordinary times, the cost of maintenance should not be great.

The surface arrangements in reference to the air supply depend so much on the topography of the surface, ownership of same, and the regular mine equipment, it is difficult to generalize.

Manifestly, the most satisfactory arrangement would be to connect the top of each hole of a refuge chamber by a compressed-air line to a central compression plant. If the mine does not have an air-compressing plant, but does have an electric plant, power lines can be taken to the top of each hole and a small motor-driven compressor used, or in case the drill hole is large enough and not too deep, a high-speed blower would be sufficient.

The telephone lines should run to the central plant or office. These would be used in transacting the regular business of the mine.

It is possible to obtain nearly the same results by carrying the pipe lines and telephone lines through the mine and omit the drill holes, but to render them secure against explosion or fire would require burying or recessing, so that the cost would probably be greater than the drill-hole arrangement, and the latter would certainly be much surer.

Refuge Chamber Near Shaft

In shaft mines, one chamber near the escape shaft would be advisable. Such a chamber should be fireproofed and have iron doors. It would be of great value to men who might be able to reach the bottom after any explosion before the hoisting arrangements, if injured, had been repaired. It would also be of advantage as a hospital and as a base for rescue parties.

The arrangements at the foot of shafts are so varied it is impossible to specify as to the size or shape. The general equipment would be the same as for the district chambers.

If a mine is equipped with refuge chambers, it is manifest that signs and directions should be placed along the headings leading to same. Each new employee should be taken to the several chambers and the equipment carefully explained to him in his own language. Nothing should be taken for granted.

Estimate of Cost of an Average District Refuge Chamber

In this estimate, the room is not considered an added expense, except for the extra length of room neck. The cost of drilling the hole is considered part of the cost of prospecting; the cost of its casing for an assumed depth of 500 ft. is alone considered. The telephone is not regarded as an extra cost.

COST OF REFUGE CHAMBER.

500	ft. 2-in. common-pipe casing, in place, say	$50
50	ft. of excess room neck yardage and special entrance, say	50
5	room crosscuts, say, 100 ft. of yardage	50
5	Masonry stoppings, at $10	50
6	Masonry door frames, at $5	30
6	Doors and frames, at $6	36
	Sanitary closet and fixtures	15
	Wall cases with glass fronts	20
	Casks, pails and miscellaneous fittings	10
	Food in tins and cans, say	25
6	Dry cell electric lights, say $5 each	30
2	Safety lamps, at $5	10
1	Oxygen resuscitating box, with two cylinders	45
	First aid box, medicines and disinfectants	25
	Miscellaneous, say	54
	Total	$500

The foregoing provides for a good equipment; other apparatus mentioned previously should be considered as part of the mine equipment.

If a mine had 6 such stations, the cost underground would be $3000. On the surface the special equipment would vary widely with the physical conditions and regular equipment. If a mine used compressed air, the only additional cost for the stations would be the outside pipe lines. These pipe lines need not be large, as economy of operation would not enter into the calculations. It is probable that all such lines to drill holes of six refuge chambers could be supplied at from $1500 to $2000, under ordinary conditions.

When the mine has an electric plant but not a compressor plant, the additional surface equipment would be the cost of the power lines to the various drill holes and the cost of the small motor-driven fans or compressors. Each drill hole surface instalment could probably be put in at a cost not exceeding $500.

When a mine had neither compressed-air nor electric plant, the cost of instalment would, of course, be much greater, as it would involve a small central plant. However, it may be pointed out that such a plant would be extremely useful, and no doubt pay for instalment on other grounds.

Let us assume that the average total cost of instalment of district refuge chambers figures as much as $10,000, or let us say 5 per cent. of the total cost of the mine investment, the possibility of saving a considerable number of lives, if disaster comes, makes it seem a good investment.

British Government and Rescue Work

Special Correspondence

On June 8, a representative body from the Mining Association of Great Britain discussed with the Home Secretary the use of rescue apparatus in mines. Mr. Churchill pointed out that several foreign countries had already legislated on the subject, and he would be prepared to introduce legislation at a suitable opportunity. He was most anxious that they should go forward hand in hand, that the voluntary adoption of apparatus should not be delayed for a single day, and that the general opinion of coal owners all over the country should support any statutory measure which might be passed.

He earnestly pressed upon them to inform him as soon as they possibly could what steps could be taken swiftly to obtain a wide extension of the movement. The Home Office did not want anything that would impose a heavy burden or a great deal of difficulty, but the whole subject had to be pressed and Mr. Churchill hoped he might rely upon their effective coöperation in carrying it forward at once.

The Home Secretary also impressed upon the deputation the view that it was essential that they should have men who knew how to use apparatus. The men ought to be selected from those engaged in each shift, so that all of them should not be underground at the same time. They should be divided into squads of five men, accustomed to work together. The number of men in the brigade should not be less than 5 per cent. of the underground workers. Further than this, the Home Office thought there ought to be a rescue station at every colliery, or within half an hour's drive of a colliery, and at which there should be an apparatus and trained men. Mr. Churchill congratulated British coalmasters upon the steps which they had already voluntarily taken, but said those steps were not complete and adequate; the time had come when they had to see that the apparatus and rescue provisions were brought into general use throughout the whole country.

Rescue Apparatus Should Be Immediately Available

As a kind of addendum, R. A. S. Redmayne, chief inspector of mines, remarked that up to the present time, when colliery disasters had occurred, the rescue apparatus had to be obtained from a considerable distance. Very often a district might be cut off by a danger zone and in a safe place beyond that zone men had been known to live for more than a day, and in other cases he was convinced that if rescue apparatus had been

immediately available many lives could have been saved.

On behalf of the Mining Association of Great Britain, the secretary, T. Ratcliffe Ellis, said that before the adoption of measures, they should be carefully considered to see how far they were really suitable for the purpose for which they were to be applied. His association was entirely in agreement that there should be men trained in rescue work at each colliery, and that stations should be established. The association intended to send the proposals which had been made, to the colliery owners and invite them to do what they could to carry out the recommendations of the Royal Commission. It was desirable that progress should go on voluntarily rather than that any legislation should be enacted.

Annual Convention of Anthracite Mine Workers

SCRANTON CORRESPONDENCE

The twelfth annual convention of the first anthracite district of the United Mine Workers of America was held recently in Scranton. There were about 120 delegates present from the various locals of the district, which extends from Forest City to Nanticoke. Although the delegates were a week in deliberation, very little of a practical character was accomplished. The entire proceedings were devoted almost exclusively to criminations and recriminations. There were resolutions offered in all seriousness, which would not only put the conciliation board out of business, but which, if they were adopted, would abrogate the plenary jurisdiction of the union itself. Speaking with the utmost impartiality, the convention disclosed naked and unabashed a great labor organization in the process of dissolution.

LESS THAN ONE MINER IN TEN BELONGS TO UNION

The secretary reported that the first district had an average membership during the year of 7000 members. There are about 150,000 miners in the anthracite regions eligible to full and unqualified membership in the union. Probably one-half of these men work in the first district. This is to assume that out of some 75,000 members in the first district, less than one in every ten is a member of the union in good standing. In connection with this specification, it should be borne in mind that the first district contains by far the largest proportion of English-speaking miners and by far the most intelligent.

President Benjamin McEnaney did not allude to the membership of the district in his report. The reason he did not do so was, he said, because a very large number of the miners who were recently on strike in the Pennsylvania coal companies' collieries have joined the union, and this is quite true. The company never prohibited its men from joining the union in the past, although it has been alleged that if they did so before the present agreement came into existence between the company and its men, that the miners would have been discriminated against palpably. However that may be, the inclusion of the predominately large Italian element that has been infused into the roster of the first district will not make for peace and may lead, according to present indications, to untoward results in the future.

ONE RESOLUTION DENOUNCED

A case in point: One of the delegates of the newly organized union included in the Pennsylvania Coal Company's territory, who said that he represented 500 men, moved a resolution to the effect that no disputes should be submitted to the conciliation board, or even subjected to arbitration. This resolution was not only voted down, but it was denounced heartily by many of the delegates present. President McEnaney, in his rough-shod but eloquent way, characterized the motion as anarchical and refused to put it from the chair. It is not the resolution itself, nor the acrimonious debate which it engendered, that is of consequence, but the temperament which it indicates of the miners who have so recently joined the union.

A curious fact in relation to the spirit of disintegration that is at work in the union is the attitude of individual locals to the district and national executives as revealed at the convention. It appears that some time ago a number of committees were inaugurated, called "ways and means" committees. The purpose of these committees in the beginning was to increase the membership of the union and to watch over its interests in any given locality. But these committees have drifted away from their original intention and have become in fact executively independent of the district executive, or at least so it was claimed emphatically at the convention. They have gone into what is known as mining politics; that is, they have become small but influential coteries, whose purpose it is to antagonize the officials of the district and to bring forward candidates of their own for official offices. An amendment to the rules was proposed and carried that in the future no local meetings can be held without the consent of the executive officers, that is, meetings that have for their aim to deal with the general policy of the union and its officers.

LOCAL STRIKE NOT SANCTIONED BY EXECUTIVE BOARD

Although there were a considerable number of local strikes during the year, President McEnaney in his report declared that not one of these had received the sanction of the executive board of the first district, which is theoretically a necessary preliminary to the declaration of a strike. With the exception of the strike at the collieries of the Pennsylvania Coal Company, the strikes during the year in the first district were few and far between, and none of them were of a serious character. Matters in dispute were cheerfully submitted to the board of conciliation, and its decisions were accepted without reservation.

Another resolution was adopted which may have the effect of mitigating still further the tendency to unauthorized strikes. This resolution, which was carried unanimously, declares that no strike shall be declared without the approbation of the executive officers of the first district, and that in the spirit of the constitution of the national organization all proper means should be adopted to bring about a settlement of the matters in dispute before a resort be made to a strike. Will the miners live up to it? They have not done so in the past, but their combative spirit is to a considerable extent ameliorated, and the resolution at any rate is a step in the right direction, whatever may be the future destiny of the union in the anthracite region.

UNION IS FEEBLE

The feebleness of the union at the present moment does not lie either in its irrational demands or its pugnacity face to face with the economical position of the operators, but in its numerical feebleness and in the demoralization that is the measure and consequence of it. The burden of sustaining the union is laid upon 7000 men out of a possible membership of 75,000 in one district out of the three. The men who are submitting to this imposition, have submitted so long, without any relief in sight, that they are becoming disheartened. The monthly meetings of the locals are frequently so poorly attended that a quorum of three or four can be seldom brought together; while mass meetings called to stimulate the enthusiasm of members in good standing and bring into the fold wandering sheep are almost equally inconsequential.

Coal Production in Michigan in 1909

The output of coal in Michigan during 1909 was about the same as in 1908, totaling 1,758,020 tons in 1909. There were 31 producing mines, employing 2960 men. The average number of hours worked per day was 7.8, and the average daily earnings of each employee was $2.93. It is estimated that 67,412 kegs of powder were used. The aggregate cost of the total output was $2,905,573, or about $1.65 per ton.

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COAL AND COKE

COAL-DRILL SUPPORT. Richard Secrist, Hemlock, Ohio. (U. S. No. 965,024; July 19, 1910.)

COKE RETORT OVEN. Victor Dominique Fernand Fieschi, Douai, France. (U. S. No. 964,635; July 19, 1910.)

COAL TAR—Apparatus for Removing Tar from Coal Gases. Ernest Solvay, Brussels, Belgium. (U. S. No. 963,401; July 5, 1910.)

GAS—A Method for the Removal of Carbonic Acid Gas from Mines or Other Spaces. Caradoc Owens, Manchester, Eng. (Brit. No. 17,318 of 1909.)

PEAT-PREPARING APPARATUS. William H. Bradley, Chicago, Ill. (U. S. No. 962,120; June 21, 1910.)

PEAT-PREPARING PROCESS. William H. Bradley, Chicago, Ill. (U. S. No. 962,119; June 21, 1910.)

PEAT MACHINE. Philip Heseltine, Detroit, Mich. (U. S. No. 962,349; June 21, 1910.)

PEAT—Separator. William H. Bradley, Chicago, Ill. (U. S. No. 962,117; June 21, 1910.)

PEAT—Improvements in the Production of Gas and Ammonia from Peat in a Gas Producer. Arthur Henry Lymn, Bromley, Eng. (Brit. No. 17,074 of 1909.)

SAFETY LAMPS—Improvements in or Relating to Miners' Safety Lamps. Ernest A. Hailwood, Leeds, Eng. (Brit. No. 14,914 of 1909.)

SAFETY LAMPS—An Improved Apparatus for Igniting Miners' and Like Safety Lamps. David Lewis, Gwaun-cae-Gurwen, Eng. (Brit. No. 23,144 of 1909.)

COPPER

COPPER—Method of Handling Matte. William D. Kilbourn, Murray, Utah. (U. S. No. 964,275; July 12, 1910.)

COPPER—Process of Separating Nickel and Copper from Mattes. Darius P. Shuler, Sudbury, Ontario, Canada. (U. S. No. 967,072; August 9, 1910.)

GOLD AND SILVER

CYANIDING—Improvements in or Connected with Discharge Aperture Fittings of Cyanide and Other Tanks. Henry Mechan, Glasgow, Scotland. (Brit. No. 15,931 of 1909.)

GOLD-SAVING APPARATUS. William H. Hackney, National Soldiers Home, Cal. (U. S. No. 962,636; June 28, 1910.)

IRON AND STEEL

CHARGING APPARATUS—Improvements in Charging Apparatus for Blast Furnaces. Edgar Richards and Thomas Lewis, Glengarnock, Scotland. (Brit. No. 7018 of 1909.)

MANUFACTURE — Improvements in the Manufacture and Treatment of Steel. Harold Ashton Richardson, London, Eng. (Brit. No. 13,218 of 1909.)

MANUFACTURE OF STEEL. Alleyne Reynolds, London, England. (U. S. No. 963,652; July 5, 1910.)

OPEN-HEARTH PROCESS—An Improved Iron Product and Open-hearth Process of Manufacturing Same. International Metal Products Co., Newark, N. J., and Middletown, Ohio. (Brit. No. 27,301 of 1909.)

ORE TREATMENT—Process for Cleaning Iron Ores. Edward F. Goltra, St. Louis, Mo. (U. S. No. 961,121; June 14, 1910.)

SLAG CEMENT — Improvements in the Manufacture of Cements from Slag and in Apparatus Therefor. Thomas H. Lodge, Cleveland, Eng. (Brit. No. 13,183 of 1909.)

SLAG CEMENT—Improvements in the Manufacture of Slag Cement. John G. A. Rhodin, Muswell Hill, England. (Brit. No. 2628 of 1910.)

SLAG—Apparatus for Treating Slag. Rocky C. Gangewere, Selma, Ala. (U. S. No. 961,602; June 14, 1910.)

TUNGSTEN STEEL—Manufacture of Steel. Charles Morris Johnson, Avalon, Penn., assignor to Crucible Steel Company of America, Pittsburg, Penn. (U. S. No. 964,869; July 19, 1910.)

LEAD, ZINC AND OTHER METALS

ALUMINUM—Method of Making Aluminum Fluosilicate. Edward F. Kern, Knoxville, Tenn., assignor of one-half to Percy S. Brown, New York, N. Y. (U. S. No. 963,156; July 5, 1910.)

ALUMINUM—Manufacture of Aluminum and Its Alloys. Heinrich F. D. Schwahn, Belleville, Ill. (U. S. No. 964,566; July 19, 1910.)

TIN—Improvements in and Relating to the Extraction of Tin and Like Metals Capable of Oxidization from Ores and Slags and in Furnaces Therefor. John H. Robertson, Penang, Straits Settlements. (Brit. No. 22,140 of 1909.)

TIN—Method of Cleaning Old Tinned Sheet-Iron Boxes and Other Tinned Articles to Render the Same Suitable for Being Detinned. Karl Goldschmidt and Josef Weber, Essen-on-the-Ruhr, Germany, assignors, by mesne assignments, to Goldschmidt Detinning Company, Jersey City, N. J. (U. S. No. 13,123, reissue; June 28, 1910.)

TUNGSTEN—Treatment of Ores. Charles Morris Johnson, Avalon, Penn., assignor to Crucible Steel Company of America, Pittsburg, Penn. (U. S. No. 964,870; July 19, 1910.)

ZINC—Obtaining Zinc Oxide from Zinc Ores and Products. Woldemar Hommel and Henry Livingstone Sulman, London, England, assignors to the Metals Extraction Corporation, Ltd., London, Eng. (U. S. No. 966,209; August 2, 1910.)

MINING—GENERAL

BLASTING — Improvements in Electric Fuses and Detonators for Blasting and the Like. Henry J. Robinson, Handsworth, Kynock, Ltd., Birmingham, England. (Brit. No. 28,532 of 1909.)

BLASTING—Improvements in or Relating to Blasting Fuses. Charles F. Spery and Edward F. O'Brien, Chicago, Ill. (Brit. No. 7556 of 1910.)

DRILLS—Improvements in Valves Applicable for Rock Drills and Other Engines or Machines. James Garvie, Cleveland, Transvaal. (Brit. No. 13,838 of 1909.)

DRILLING MACHINE. Charles B. Richards, Cleveland, Ohio, assignor, by mesne assignments, to the Cleveland Rock Drill Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 966,600; August 9, 1910.)

ROCK DRILLS—Improvements in and Relating to Rock Drills. Lewis Lawrence Scott, Joplin, Mo. (Brit. No. 27,932 of 1909.)

ROCK DRILLS—Improvements in or Relating to the Working of Power Stamps, Hammers, Rock Drills, Pile Drivers and the Like. Frank Robinson and Jacob A. Fredrichs, Johannesburg, Transvaal. (Brit. No. 12,144 of 1909.)

ROCK DRILLS—Improvements in and Relating to Rock Drills. Hyla William Burgess and Joseph Hepworth, of Albion, Ida. (Brit. No. 24,291 of 1909.)

ROCK DRILLS—Improvements in Chucks for Rock Drills. The Mining Engineering Company, Ltd., and Charles Christiansen, Sheffield, Eng. (Brit. No. 26,810 of 1909.)

ROCK DRILLS—Feeding Mechanism for Rock Drills and the Like. George R. Bennett, Denver, Colo. (U. S. No. 964,605; July 19, 1910.)

ROCK DRILL EXTRACTOR. William Edgar Weekes, Salt Lake City, Utah. (U. S. No. 965,054; July 13, 1910.)

ROPE HAULAGE—An Improved Grip for Rope Haulage in Mines and Other Places. William G. Farmer, Pelsall, near Walsall, England. (Brit. No. 2517 of 1910.)

SHAFT SINKING—Improvements in and Connected with Guards for Use in Mining or Pit Sinking. Charles Walker, Gresford, No. Wales. (Brit. No. 12,989 of 1909.)

ORE DRESSING—GENERAL

CONCENTRATING—Improvements in and Relating to Concentrating Apparatus for Separating Metals, Ores and Other Substances in Wet Recovery Processes. Agnes Kate Cox, London, Eng. (Brit. No. 11,044 of 1909.)

CONCENTRATING—Improvements in Ore Concentrating and Separating Apparatus. Francais Dallemagne and Henri Dallemagne, Pasages, Spain. (Brit. No. 4334 of 1910.)

CONCENTRATOR—Hydraulic Ore Concentrator. John G. Kirksey, Milwaukee, Wis. (U. S. No. 964,652; July 19, 1910.)

CONCENTRATOR—Ore Concentrator. John F. Isbell, Salt Lake City, Utah. (U. S. No. 964,425; July 12, 1910.)

CRUSHING—An Improved Crushing and Rolling Mill. John C. Wright, Stratford, London, Eng. (Brit. No. 28,939 of 1909.)

CRUSHING—Improvements in and Relating to Crushing or Grinding Machines. Geo. A. Mowers and Frederick Williams, London, Eng. (Brit. No. 4401 of 1910.)

CRUSHING—Ore, Mineral and Coal Breaker. Isaac Christ, Tamaqua, and Henry K. Christ, Mahanoy City, Penn. (U. S. No. 962,998; June 28, 1910.)

DRYING—Improved Machine or Apparatus for Drying Bricks, Briquets of Peat, Coal or Materials, Salt, Chemicals, Sand and Other Analogous Wet or Moist Materials. Allison B. Lennox, Newcastle-on-Tyne, Eng. (Brit. No. 12,465 of 1909.)

JIG. Frank L. Buchanan, St. Louis, Mo. (U. S. No. 962,618; June 28, 1910.)

ORE CLEANER. Alexander McDougall, Duluth, Minn. (U. S. No. 963,721; July 5, 1910.)

ORE CONCENTRATOR. George W. Burnhart, Ward, Colo. (U. S. No. 966,521; August 9, 1910.)

ORE DRESSING—Improvements in the Treatment of Ores. Elizabeth Barnston Parnell, Carshalton, Surrey, Eng. (Brit. No. 14,372 of 1909.)

ORE SCREEN. Frank Franz, Burke, Idaho. (U. S. No. 967,008; August 9, 1910.)

PULVERIZING MILL. William H. Lieber, Milwaukee, Wis., assignor to Allis-Chalmers Company, Milwaukee, Wis. (U. S. No. 966,843; August 9, 1910.)

SEPARATION—Improved Process and Apparatus for the Separation of Ores and the Like. Frank Wynne, Surrey, England. (Brit. No. 12,266 of 1909.)

SEPARATION—An Improved Process for Separating Complex Ores and Their Concentrates. Wm. M. Martin, Redruth, Cornwall, Eng. (Brit. No. 9300 of 1909.)

METALLURGY—GENERAL

ALKALINE METALS — Improvements in Apparatus for Carrying Out the Electrolytic Production of Alkaline Metals. Société d'Electrochimie, Paris, and Paul Leon Hulin, Grenoble (Isere), France. (Brit. No. 6063 of 1910.)

CHARGING APPARATUS—Apparatus for Automatically Charging Gas Generators, Blast Furnaces and the Like. Theodor de Fontaine, Hanover, Germany. (Brit. No. 24,610 of 1909.)

CRUCIBLE FURNACES—Improvements in or Relating to Crucible Furnaces. Regnier Eickworth, Witten-Ruhr, Germany. (Brit. No. 5709 of 1909.)

ELECTRIC FURNACE for Metallurgical Purposes. Heinrich F. D. Schwahn, Belleville, Ill. (U. S. No. 962,532; June 28, 1910.)

FURNACE—Combined Reduction and Crucible Furnace. William Jenkins Shaw, Toronto, Ontario, Canada, assigned to International Tool Steel Company, Ltd., Toronto, Canada, a Corporation. (U. S. No. 967,069; August 9, 1910.)

REFINING—Improved Process of Refining Metals and Alloys. Albert Edwards Greene, Chicago, Ill. (Brit. No. 9508 of 1909.)

SOLUTION OF METALS—Improvements in Apparatus for Dissolving Metals and Other Substances. A. L. Landau, Gold Coast, West Africa. (Brit. No. 16,546 of 1909.)

PERSONAL

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

John D. Ryan is making a western trip after some weeks in Europe.

John M. Nicol, mining engineer, Mexico, D. F., was in New York recently.

F. Augustus Heinze arrived in New York on Aug. 20, after several weeks abroad.

E. S. Mendels, agent of the New York Curb, has returned from a vacation trip in Europe.

Mason T. Adams, of Denver, was in the Portland Canal district, B. C., for a few weeks in August.

T. E. Otis has been elected president of the Arizona-Cananea Mining Company, succeeding David Miller.

Francis L. Robbins, of Pittsburg, has been elected president of the Alabama Cement and Coal Company.

Alfred H. Brooks, of the U. S. Geological Survey, left Seattle, Wash., on Aug. 8, by S.S. "Alameda" for Alaska.

J. W. Astley has resigned as the consulting engineer of the Peterson Lake Mining Company of Cobalt.

A. A. Hassan has returned to New York from the Porcupine district, but will go to Ontario again in September.

J. Cleveland Haas, of Spokane, was in Victoria, B. C., recently for the Tyee-Swayne Copper Mines Company.

J. W. Corrigan, of Cleveland, O., is inspecting his mining interests at Terrazas and Cocheño in Chihuahua, Mexico.

Louis M. Ogden has been elected president of the Union Copper Mines Company to succeed Walter George Newman.

T. N. Perkins has been elected a director of the La Salle Copper Company, to succeed Alexander Agassiz, deceased.

Charles A. Gibbons has accepted a position on the engineering staff of the Ray Central Mining Company in Arizona.

Thomas Bennetts has been appointed superintendent of the Algomah property under General Manager R. M. Edwards.

W. C. Tracy, of Denver, is in the Sturgeon Lake district, Ont., looking after mining properties in which he is interested.

F. N. Simonds, of Simonds & Burns, mining engineers, New York, sailed on the "Lusitania," Aug. 17, for a few weeks' trip abroad.

Herbert Haas, of San Francisco, has been appointed superintendent of the MacNamara Mining Company, at Tonopah, Nevada.

Rodolphe L. Agassiz has been elected president of the Calumet & Hecla Mining Company to succeed Thomas L. Livermore, resigned.

N. A. Carle has been examining gold-quartz properties in Sheep Creek camp of the Nelson mining division, British Columbia, for M. Robert Guggenheim.

Sir Alfred Mond, of the British firm of Brunner, Mond & Co., will shortly arrive in Canada for an inspection of the their nickel-mining interests at Sudbury.

A. E. Place, of Place & Elton, consulting engineers, Oaxaca, has returned from an extensive professional trip to various camps around Totolapam, Oaxaca, Mexico.

R. H. Flaherty, of Port Arthur, Ont., has returned from a northern exploration trip to within 70 miles of James bay, where a number of iron-ore claims have been located.

H. B. Maufe, of the Geological Survey of Great Britain, has been appointed director of the Geological Survey of southern Rhodesia, lately instituted by the Chartered company.

W. N. Sullivan, of Birmingham, has resigned as general superintendent of coal mines of the Alabama Consolidated Coal and Iron Company. His successor has not yet been appointed.

W. W. Miller, vice-president of the Southern Iron and Steel Company, of Birmingham, Ala., has resigned and will sail shortly for Europe. He is succeeded as vice-president by James Bowron.

Rudolph Erickson, chief engineer, Pittsburg & Lake Angeline Iron Company, has resigned to accept a position as superintendent for the New York State Steel Company, Iron River, Michigan.

W. H. Trewartha-James, general manager of the Tyee Copper Company, Victoria, B. C., has gone on a trip to the Ketchikan district, Alaska. Returning, he will visit the Stewart camp in the Portland Canal district.

W. Weston, of Denver, having resigned his position at the head of the industrial and mineral department of the Denver, Northwestern & Pacific railway, has resumed the practice of his profession as consulting railway, industrial and mining engineer.

J. W. Bryant recently left Victoria, B. C., on his return to England, after having been for three years with the Tyee Copper Company. For some time he was superintendent of the Tyee mine, on Vancouver island; but for two years he has been engaged in examining Pacific Coast mining properties.

Frank Koester, of New York, in a paper presented before the recent convention of the Society for the Promotion of Engineering Education, held at Madison, Wis., discussed in detail the educational system of the German technical universities, also analyzing the standing of the German engineer as compared with the American.

Ivan E. Goodner has accepted a position in the new concentrates cyaniding plant of the Alaska-Treadwell Gold Mining Company, Treadwell, Alaska. He is succeeded at the Bogardus Testing Laboratories in Seattle by C. C. O'Loughlin, who was formerly at Kennett, Cal., with the Mammoth Copper Mining Company.

OBITUARY

Manuel Aguilera, an extensive mine owner and operator in northern Mexico, died Aug. 13 at Parral.

David Mackie, Sr., of Scammen, Mo., died Aug. 9. He was for 27 years in charge of the Keith & Perry mines and the Central coal mine.

Charles R. Davis, of Duquoin, Ill., manager of the Davis coal mine, died on Aug. 13, of burns accidentally received at the mine from a faulty steam valve.

Gustav A. Rist, Jr., an American mining engineer, native of Bloomfield, N. J., was reported murdered in Bolivia, June 11. He was employed at a gold mine near the Peru-Bolivia boundary. The U. S. State department is investigating the circumstances of the case.

SOCIETIES and TECHNICAL SCHOOLS

Iron and Steel Institute—A notification has been received by the secretary that King George V has been pleased to become patron of the institute. King Edward was patron during his reign, and King George became an honorary member of the institute in 1905 when Prince of Wales.

National Association of Cement Users—The seventh annual convention of this association will be held in Madison Square Garden, New York, Dec. 12-23, 1910, in connection with the first annual cement show, the latter being under the auspices of the Cement Products Exhibition Company. The list of papers to be presented will be announced later.

American Society of Engineering Contractors—This society, of which D. E. Baxter, of 27 William street, New York, is president, and Daniel J. Hauer secretary, will hold its annual convention in St. Louis, Sept. 27-29, in the Coliseum. The local committee of arrangements is E. H. Abaide, chairman, J. L. Westlake, W. C. Swartout and L. C. F. Metzger. Papers will be delivered by J. B. Goldsborough and Edward Wegmann, both of New York, on "Dam Construction for City Water Supplies," and by George C. Warren, of Boston, on "Work Preliminary to Street Paving and Road Work." A banquet will be held, and several sight-seeing trips will be made to important engineering work in and around St. Louis. The society has about 800 members.

EDITORIAL CORRESPONDENCE

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

San Francisco

Aug. 20—The hydraulic camp of Smartsville, Yuba county, which, before restrictions were placed upon gravel mining, was very prosperous, and many large operations carried on, is showing renewed life and activity. The Tarr Mining Company, which is working the old Blue Point mine, idle for many years, has cleaned out and rebuilt its extensive ditches to bring in the water, and the claim is to be worked on a new system which will not conflict with the laws. Other claims long considered of little value are being now looked after by investors. Numbers of prospectors are at work in the vicinity, and much surface placer mining is being carried on in the bed of the Yuba river. The waters are lower this season than has been the case for 40 years, thus giving a good chance for the pan and rocker miners. There are large bodies of auriferous gravel in that section which have been as yet untouched, and if the plans of the Tarr company are successful, these may be mined in a few years.

Exceptionally rich ore is being taken out of the tunnel of the Black Bear mine in Moore's Flat district, Nevada county. The ore is as rich as that coming from some of the notable claims in the Alleghany district of Sierra county, which is only a few miles away, across the river. The shoot intersected in the lower tunnel seems an extensive one. Some of the knowing ones have decleared that the rich Alleghany mineral zone did not extend south of the Middle Yuba into Nevada county. But this recent discovery seems to disprove this theory. In this connection it may be stated that a prominent Sacramento attorney was interested in this mine until two weeks ago, when, after putting up $10,000 to prospect the claim, he decided that he had enough of it and would put up no more money. His partner continued work on his own capital and shortly after struck the shoot of rich ore referred to.

Los Angeles

Aug. 21—Mining in the Southwest of late has not been characterized by great activity. There are two causes for this. In many desert districts the great heat has brought about a cessation of activity. Reports of a renewal of operations in September come from many sources. However, the recent slight improvement in copper conditions has brought hope to some of those who have new companies in the field.

The Young Construction Company, of Los Angeles, has completed the installation of a mill for the Cicero-Smith Mining Company, 18 miles from Wilcox, Cochise county, Arizona. The mill has a capacity of 35 tons in 24 hours and consists of ten 1000-lb. stamps, two Deister No. 2 tables, and one 4-ft. Frue vanner. Three gasolene engines, 60, 20, and 15 h.p. respectively, will furnish the power. The Young company is engaged also on the construction and remodeling of the 100-stamp mill and cyanide plant of the United Mines Company, at Ogleby, Imperial county, California. The property was formerly known as the Golden Cross. The mill will be increased to 500 stamps. Next week the Young company will begin the work of remodeling the old stamp mill at the property of the Ruth Gold Mines Company, in the San Francisco mountains, Mohave county, Arizona. This mine is near the Gold Road mine and has been acquired by former business men of Jacksonville, Fla. The capacity of the mill will be increased and a cyanide plant installed.

The Desert Power and Water Company, of Kingman, Ariz., now supplying 700 h.p. to the Gold Road and Tom Reed mines, is increasing its equipment, and will be supplying about 1000 h.p. to these two mines within 60 days. Anticipating an increasing demand for power from mines in the vicinity during the next three years, the power company has made plans to double its present capacity, and the necessary equipment has been ordered.

R. Lanka, of Los Angeles, and J. R. Clark, of Salt Lake City, have some splendid specimens of talc, obtained from a group of claims located by them in the Death Valley country, about seven miles westerly from Zabriskie, Inyo county. Some of the specimens have been ground and tested and have proved to be of fine grade. Development work will be prosecuted in the fall.

Denver

Aug. 23—The strike of the coal miners in the Northern field is still unsettled, and violence has been resorted to by them. A week ago a man and a woman were seriously injured, and Aug. 16 one of the operator's officials was shot through the shoulder by a deputy sheriff. The operators have asked the Governor for troops, stating that they cannot get proper aid from the sheriff. The Northern Coal and Coke Company and 8 other companies, representing the operators, have notified the county commissioners of Boulder county that the sheriff of that county is either unable or unwilling to preserve peace, and notify them that failing to do so, they will be held responsible for any losses.

It is stated that the product of these mines, known as northern lignite, will be raised in price in September from $4.50 to $5 per ton. Consumers cannot lay in a stock of this coal in summer, when it is cheap, for the reason that it would slack.

There is a market in Denver and to Missouri river points for 5000 tons *per diem* of the fine bituminous stocking coals of the Yampa coalfield, with as yet only about 500 tons *per diem* being produced by the four working mines in the Oak creek district, on the Moffat road. As the freight rate on this coal to Denver is $1.65 per ton, and it can be put f.o.b. cars for from 75c. to $1 per ton, it will be seen what an opportunity there is here for capital, combined with good management, to open up a big producing coal mine. Anthracite is selling here at $8.50 per ton, and the anthracite of the Yampa field should be laid down in Denver for an excess over the cost of the bituminous of not more than $1.50 per ton. But the railway is yet 18 miles from the anthracite and none of the mines have been opened.

The Ophelia, which in the early days of Cripple Creek was known as the Moffat-Bush tunnel, is to be sold at auction, Sept. 22, to satisfy a debt of $371,580. The tunnel is 1½ miles long, and penetrates Gold and Raven hills. This illustrates the history of most of the long transportation tunnels in the State. Most of them have proved of enormous benefit to the owners of the mines on the surface, but nearly all of them have been a loss to those whose money first built them.

This has happened on a very large scale in another district, where the tunnel is draining all the mines, and where, as no contracts were made with the mines before the tunnel was built, providing for payment of drainage charges, the miners, as in the other case, go on working from the surface and decline to pay charges for unwatering. This tunnel is paying running expenses, but those who originally built it are not likely to see the color of their money again. The only way in which such transportation or drainage tunnels should be built, as a rule, is on the coöperative system, by the mine own-

ers themselves, similar to that of the Deep Drainage tunnel at Cripple Creek.

Salt Lake City

Aug. 22—Utah capital is becoming more largely interested than heretofore in oil lands. The San Juan, Wayne, Virgin and Uintah fields of Utah, and the Spring Valley and Big Horn Basin fields of Wyoming are especially receiving attention. Active work is being done, though extended or systematic development has not yet been undertaken. At present there are 16 rigs in the San Juan field, and 8 are in operation. The companies now drilling include the Arcola, Galloway, London-San Juan, Redwood, Utah, Monumental, Connecticut and Navajo. The following rigs are being used: Standard, Star No. 27, Keystone No. 5, American Well Supply Company, Columbia No. 5. The Chicago Exploration Company has two drills on the way, a special Star No. 28 and a No. 5 Cyclone—the former to be used for deep drilling and the latter for annual assessment work. It is expected that these will reach the ground by Sept. 1. The Ogden-San Juan Oil Company has also ordered a No. 5 Cyclone drill.

Oil claims have been located on the San Rafael swell in Emery county, and near the Cainville wash in Wayne county, also in the northeast corner of Wayne county about 50 miles south of Greenriver, on the Denver & Rio Grande. A Standard and a Star rig are now on the way to this field. Work is to be done in Blue valley, Wayne county, in the vicinity of Giles. On the Dirty Devil river in Blue valley, the seepage of oil is pronounced. Prospecting is being done 12 miles west of Vernal in Uintah county, also near Virgin City in Washington county. Some drilling is being done between Fairview and Mt. Pleasant in San Pete county on leased land.

The Utah-Wyoming Consolidated Oil Company, operating in the Byron oilfield, Wyoming, is drilling its fifth well. The company is composed largely of Salt Lake men. A casing has been put in the new well to the 1300-ft. point. This well is through shale, and has encountered oil of good quality. A sample tested by Professor Pack, of the University of Utah, proved to be 44 deg. Baumé, The oil is nearly colorless. A strong flow of gas was encountered at 1035 ft. It is expected that the oil will increase in quantity when the sands are reached.

Goldfield

Aug. 20—A deal, which, if carried out, will mean another consolidation approaching the Goldfield Consolidated in the extent of its property, is considered as more than a possibility by those in a position to know. The supposed plan is to consolidate the Jumbo Extension, Merger Mines and Red Top Extension properties.

The Goldfield chlorination mill has recently resumed operations. The mill handles concentrates as well as ore, the latter preferably of fairly high grade. A new roaster, burning crude oil, has been installed and the plant remodeled in other departments. The chlorine is obtained as required by the electrolysis of a brine solution and effects an extraction of above 90 per cent.

Wallace, Idaho

Aug. 20—The majority of the mining properties, big and little, in the Cœur d'Alene district obtain electric power from the Washington Water Power Company, of Spokane. This company obtains much of its power from its Post Falls dam against which ranchers are fighting in the courts. The ranchers seek to have the dam lowered or removed on the ground that it has caused the river water to overflow their lands. Agents of the water-power company assert that the lowering of the dam would doubtless result in an increase in the rate for power charged the mining companies. The rate now is about $30 per month. Lowering the dam would result in the necessity of generating power by steam.

Judge Dietrich in the Federal court at Moscow, Ida., has ruled that mining companies operating in the Cœur d'Alene district have the right to dump tailings into streams. Unless reversed by the court of appeals the question is settled. Cases against various mining companies have been pending six years. The suit upon which the decision was rendered was instituted by Elmer Doty, a rancher on the Cœur d'Alene river. There were 65 cases, but all of them involved the same principle, the damages claimed amounting to $1,223,000. Doty alleged that by dumping the tailings in the river the mining companies caused the river to rise and overflow the lands along the river. The case on trial was against the Bunker Hill & Sullivan company and testimony was heard in nine of the cases. The mining companies did not introduce any evidence. Judge Dietrich said there was not enough evidence to warrant giving the cases to the jury, but instructed that a verdict be returned giving the nine plaintiffs the sum of $1 in all. The other cases against the Bunker Hill & Sullivan company were thrown out of court. The cases against the Federal and the Larson & Greenough companies were continued until fall.

Indianapolis

Aug. 22—The Secretary of the Interior has notified Evansville that he has authorized the establishment of a rescue station in that city and that its force will be available for duty in the mining districts of southern Indiana and northern Kentucky. The establishment of still another station for eastern Illinois and western Indiana is under consideration. This movement is in pursuance of a broad plan to establish in the coal region throughout the country rescue stations in which trained experts will be ready at all times to respond in cases of mine disasters. It will be the duty of the superintendent in charge of the station to train mine foremen, fire bosses, miners and others in the use of artificial breathing apparatus for the purpose of assisting in rescue work after mine disasters, and to aid in exploring and restoring the mines thereafter.

Pittsburg

Aug. 22—A number of independent oil producers in western Pennsylvania and West Virginia met in Pittsburg and formulated plans to organize a $10,000,000 corporation, to be known as the High Grade Oil Refining Company. The object of the proposed company is to control the marketing of oil produced by independent operators. One-half of the stock of the proposed company is to be preferred, and sold for cash. The other half common stock, and will be distributed in return for production of crude oil. Attorney Joseph A. Schofield, of Warren, Penn., an independent producer, laid the plan before the operators present. No definite action was taken, but another meeting will be held in Butler, Penn., at which an effort will be made to get together representatives of all independent producers in Pennsylvania, West Virginia and eastern Ohio fields.

London

Aug. 15—In contrast to conditions at several West Australian mines, on the Kalgoorlie goldfield, where unsatisfactory methods used in estimating and reporting ore reserves have resulted in disappointment to officials and shareholders it is a pleasure to consider a case of opposite character, the mine referred to being that worked by the Ashanti Goldfields Corporation, Ltd., on the West Coast of Africa.

In December, 1908, the chairman, drawing his figures from the report of the consulting engineer, said that the output would increase in definite steps from £13,000 per month to about £16,000 early in 1909 and to £19,000 six months later, and to £24,000 in the early part of 1910. The consulting engineer stated in his next yearly report that the output would reach about £39,000 in the month of June, 1910. The output for June, 1910, was £38,497.

It is true that in this case matters were considerably facilitated by a fortunate improvement in the results from development of the mine. Nevertheless, the realization of the predictions is remarkable and gives a feeling of confidence that the further step to an output of over £40,000 per month will eventually be realized.

THE MINING NEWS

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

Alaska

Frank P. Skeen, John Lechner and L. F. Shaw have bonded their quartz properties on Falls creek to John A. Nelson.

J. W. Bishop has taken a 90-day option on all of the placer claims on Mills creek in the Sunrise district, and proposes to work the ground by hydraulicking.

Peterson—Work on the property is being pushed by A. T. Holman, who has charge. It is controlled by the Alaska Consolidated Mines Company of Denver.

Hillside—This group in the Prairie basin has been bonded to an Eastern syndicate for $100,000. J. G. Oliver is representative.

Alaska United—For the month ended July 15 the returns for the Ready Bullion and "700" mill respectively are: Tons crushed, 19,540 and 15,650; total production, $45,561 and $38,287; net operating profit, $20,200 and $13,519; yield per ton milled, $2.33 and $2.44.

Arizona

Cochise County

Shattuck-Arizona—L. C. Shattuck, president, is authority for the statement that the company will consider plans for the erection of its own smeltery (350 tons) to treat ores now going to the Copper Queen. The company owns a site at Douglas.

Gila County

National—Work at the property is under full sway, due to the order received from Boston to crosscut as speedily as possible to the Black Hawk vein on the new level, 778 ft. from the collar of the Williams shaft. Supt. H. W. Woodward now has the entire force at work cutting out a station on the north side of the shaft. The crosscut will be 50 ft. in length before it strikes the vein. Should the new exploitation show up nothing but the heavily iron-stained vein matter as above, the work will in all probability be continued in sinking the shaft to a greater depth and the establishment of a new level 100 or 150 ft. lower down.

Superior & Boston—Development is still being carried on in the McGaw shaft, the weekly progress amounting to 20 ft.; the depth is about 825 ft. The formation in the bottom of the shaft is a shattered, silicious limestone. Shipments of 40 tons of 10 per cent. copper ore are being made to the Old Dominion.

Arizona Commercial—The balance sheet of June 30, 1910, which was filed in connection with the listing of the $1,000,000 6 per cent. convertible bonds, shows a surplus of cash and accounts receivable of $324,000, in addition to which the company has on hand supplies to the amount of $70,003.

Live Oak—The underground workings at this property were mostly on the third level of the vertical shaft, 290 ft. deep, when the present management began work, but were not connected with the surface tunnel, by about 200 ft. This connection was afterward made and several other drifts and cross drifts run. There is at present in the neighborhood of 4000 ft. of development work on this level.

Maricopa County

Desert—This mill, erected about 14 months ago, near Phoenix, but never operated, will be started Oct. 1 with 10 stamps, by Benjamin F. Hall, of New York, and associates.

Pima County

Imperial—The reported sale to the Phelps-Dodge interests of the Imperial properties and the projected railroad to the Gulf of California, controlled by the Development Company of America, is not confirmed at the New York offices of either company. The Imperial smelting plant is temporarily closed owing to the low price of copper.

Yavapai County

On Aug. 4, rich copper sulphide ore, carrying silver and gold, was encountered at 413 ft. in the east crosscut on the 700-ft. level. Work at this mine is being confined chiefly to the 700 level, where two headings are driving toward the north and west faults. The mine is at Jerome.

Yuma County

Clara Consolidated—Shaft No. 5, at Swansea, is down 170 ft., and is being sunk at the rate of 5 ft. per day. This shaft is being sunk on a drill hole that encountered ore at 250 ft. Drill hole No. 7 is now being sunk. Underground development consists chiefly in blocking out ore for stoping. A steam-hoisting plant of 175-horsepower capacity is being erected over shaft No. 5. Work on surface consists of erecting a 300-ton sampler.

Mudersbaugh—Work is being rushed on this property, 8 miles south of Bouse, and shipments of 15 to 20 tons of copper ore are daily being made to Swansea. This property was purchased by George Mitchell about two weeks ago. Development consists chiefly of two shafts, 110 and 85 ft.

California

Amador County

Gold King—This company has purchased the Climax mine at Pine Grove. Development will be done. P. B. Aiken is superintendent.

Climax—Eastern men have become interested in this mine near Pine Grove and will sink to 1000 feet.

Dane & Mitchell—Operations on this mine near Pine Grove have been temporarily stopped until more money is furnished.

Butte County

Butte King—G. W. Braden and Z. G. Graham have commenced development on this mine, 17 miles from Stirling, where they have uncovered a large body of cement gravel.

Hazleton—Work will be resumed on this property at Forbestown, and the new tunnel extended.

Mammoth Channel—Machinery is being installed at this mine near Magalia.

Tunnel—A contract has been let by W. E. Oddie of Oroville for a 200-ft. tunnel at Horseshoe Bend on Middle fork of Feather river. By turning the water through this, 1380 ft. of river bed will be bared so the gravel may be mined.

Calaveras County

Chaparral Hill—In this mine on Carson hill at Irvine, F. G. Stevenot, manager, a wide vein has been cut, 5 ft. of which shows free gold. The property is owned by M. C. Meeker. Exploration has been going on for four years.

Lightner—This company at Angels, which has been closed for nine months, has applied for permission to use a portion of Main street for a main shaft and machinery.

Eldorado County

Pocahontas and La Moyle—These old mines at Logtown have been consolidated and bonded. The ore from the Pocahontas will be milled at the La Moyle mill. F. H. Staples is superintendent.

Lady Edner—L. S. Woodberry is running a 900-ft. tunnel at Grizzly Flat to work cement gravel in the deep channel. The tunnel will reach the Borealis claim, which is also to be worked.

Union—This mine, at Eldorado, has been started up. Work will be done through the Springfield shaft.

Encinal—In this claim, near Grizzly Flat, a body of pay gravel has been cut.

Fresno County

Fresno Magnesite Company—The com-

pany is installing a 400-ton rock crusher, 45-horsepower gas engine, dynamo, motors and erecting two new bins having 300 tons capacity. A tunnel, 300 ft. in length, is being driven to open the orebodies at a lower level in addition to the magnesite quarry now operated. The Santa Fe railroad is building a branch to the mine from Reedly, 19 miles distant. F. S. Bochler is manager. Other mines in the Kingsriver district will be stimulated from the new railroad. Much activity is noticeable in the Hughes Creek, Pineflat and Eagle Peak mining districts.

INYO COUNTY

More activity is predicted for the Bishop district through the efforts of C. P. Watson. A diamond drill will be used in prospecting that section.

MARIPOSA COUNTY

Frank McMasters and Daniel Buckley have taken out a pocket of $5000 from ground leased from the Mariposa Commercial and Mining Company. The claim is near the Josephine mine, not far from Bagby.

Mother Lode—Active operations have commenced by this company six miles west of Coulterville between the Peñon Blanco and the McAlpine mines.

MONO COUNTY

Helseley—This group of claims, six miles from Oasis, are being developed, and surveys are being made for power on Cottonwood creek for a 10-stamp mill which will be built.

NEVADA COUNTY

Prudential—A gasolene engine has been purchased as there is a scarcity of water for power. The lower workings will be unwatered.

Gaston—This mine, formerly known as the California, at Gaston, is being reopened and the old works are being pumped out.

Wisconsin—This abandoned mine at Graniteville is about to be pumped out and reopened. Manager Fred Medlin is putting in new machinery and erecting buildings.

PLUMAS COUNTY

Haskell Peak—At this mine, Clio, at the end of the 700-ft. tunnel the men are working in pay gravel.

Consolidated—This company has taken under bond the five claims of Joseph Peppin and the Caldwell group of six claims owned by J. A. Hall, at Granite Basin.

Colorado

LAKE COUNTY—LEADVILLE

Yak—Word has just been received that 600 ft. below the tunnel, and in the Cambrian quartzite, the Silver Cord oreshoot has been opened, in a body of ore in some places 30 ft. wide, yielding $50 per ton. This was at 1300 ft. below the surface.

Lovejoy—Lessees of this property are shipping about 400 tons of ore per month, yielding high in gold.

SAGUACHE COUNTY

Kortright—This company, Dr. A. E. Kortright, manager, has completed a 25-ton ore-dressing plant at Bonanza.

SAN JUAN DISTRICT

San Antonio—Word comes from the Red Mountain district, between Ouray and Silverton, that the company has made a strike in its Carbon Lake claim, Ouray county, of 600-oz. silver-copper ore. The property is worked from the Kohler 2800-ft. tunnel, at a depth of 500 ft. below the surface. The company is shipping regularly to Durango.

TELLER COUNTY—CRIPPLE CREEK

Midget-Bonanza—Aug. 13, the cyanide mill was struck by lightning and entirely deshroyed, the loss being about $150,000, with no insurance. The plant was in the saddle between Mineral and Carbonate hills.

Cripple Creek Homestake—The smaller of the two mills erected by this defunct concern is being examined, and if found satisfactory, will be purchased and reopened as a custom mill. Its capacity is rated at 100 tons per day.

Blue Bird—The shipments for August were the heaviest for many months, and it is stated that the Keegan lease is shipping 5-oz. gold ore.

Idaho

COEUR D'ALENE DISTRICT

A smeltery built to use soft coal instead of coke has made a test run at Enaville, near Wallace.

Hercules—A new electric hoist of 100-h.p. and having a lifting capacity of 1000 ft. will be installed to supplant the present air-driven hoist. The new hoist is of the double-drum type.

Gold Hunter—The company will install a $7000 electric hoist to be used in sinking the shaft. The shaft is down 200 ft. from the main tunnel and will ultimately be carried to the 1000-ft. level.

Indiana

BLACKFORD COUNTY

Indiana oilfields for the week show a perceptible decline in completed wells, but in new production there is a satisfactory increase. There were nine wells completed with only one dry hole.

CLAY COUNTY

Several acres of ground, including a number of dwellings, went down in a recent cave at the Bogle mine, near Brazil.

GIBSON COUNTY

The miners of the Peacock Coal and Mining Company, at Wassey mines, are on a strike over the price paid for removing draw slate that is above the coal.

VERMILION COUNTY

The advent of the Steel Corporation into this field is regarded as promising much for the development of the field.

Kentucky

Southern Onyx Company—This company, of Boston, F. D. Gallupe, manager, will operate an onyx quarry near Glasgow Junction.

Kansas

Eureka—This company is sinking its shaft and installing a new pump to furnish water for the plant.

Peacock Valley—This company has entirely suspended operations at Peacock on account of the cave. All the mills were thrown out of line and one had to be removed entirely. The plan is to rebuild one mill to the south of the workings and mill all the ore from the mines on that plant. The pumps are down and what work is done in the future will be largely opencut work.

Maryland

Linganore—This company is developing a copper property near Monrovia, Frederick county. Thomas A. Dunshee is in charge. The property will be equipped with drills and a mill.

Michigan

COPPER

Interest is again reviving in the Bear Lake section, six miles north of Hancock. This section lies to the northwest of what is popularly regarded as the limit of mineralization, but exploratory work has been carried on intermittently there for 10 or 15 years and some fine specimens of copper rock have been found. Options have been taken on a large acreage there, and it is possible that diamond drilling may begin next spring, or even this fall.

Superior—No. 1 shaft is at the 15th level and a crosscut will soon be started. No. 2 shaft is sinking below 750 ft. and at the 600-ft. level drifting is under way.

Algomah—The mine has encountered native copper with the ore in the bottom of its shaft at 35 ft. Diamond drilling will be started.

Wolverine—The company has uncovered the Osceola lode in its surface trenching and it is very likely a shaft will be started to open this formation. This company has 70 acres traversed by this lode and a depth of 1500 ft. can be reached before the boundary lines are reached.

Arcadian—This company has exposed by trenching the lode recently revealed by drill cores on section 17 and for the distance opened it shows good mineralization. A drill is going down to cut the Arcadian lode at 2000 feet.

Keweenaw—The shaft on the Kearsarge lode is down 350 ft. and is entirely in the lode.

Wyandot—The company continues driving the crosscut from the 700-ft. level of its exploratory shaft. Another copper-bearing lode was encountered showing a small amount of copper on the hanging-wall side. It is not likely that any opening will be done on this formation at the present and the crosscut will continue on its way and is now in proximity to where the Baltic may be expected to lie.

IRON

Newport—The Bonnie shaft has been shut down pending improvements in timbering, etc., which will take three or four months. At the "D" shaft a record hoist was recently made; 622 skips, containing in all 5421 tons, being hoisted in the two 10-hour shifts. The majority of this hoist was from a depth of more than 2000 ft. The total of this shaft alone for a week was in excess of 25,000 tons.

Missouri

The Webb City lead smeltery being built at a cost of about $75,000 will be in operation Nov. 1. George W. Moore, of Webb City, is president.

Herald—It is reported that W. L. Kramer has bought this property and that he will sink a vertical two-compartment shaft to take the place of the incline and build a 500-ton mill.

Jackson—This company from Jackson, Mich., is building a 300-ton mill on the lease on the Mattes Brothers' land southeast of Joplin. Charles Hart, of Joplin, is manager.

Mattes Brothers—This company is now furnishing dirt to the mill from four shafts. Two new shafts have been connected with the mill with trams.

Ohio—This company has bought the fee of the Cardinal forty east of Joplin from the Conqueror Trust Company for $17,500, and the fee of a large tract of land south of Joplin for $20,000. The company is incorporated for $100,000, and the main stockholders are S. A. McManigal and Dr. W. J. Means, of Columbus, O. Fred W. Kelsey, of Joplin, is local manager.

Minnesota

Hudson—The first train load of ore has just been shipped from this Aurora mine. This is an open-pit mine. McArthur Brothers are at work on the stripping contract.

Kennedy—The Rogers Brown Ore Company will soon ship from the stock pile at this mine at Deerwood.

Shenango Furnace Company—The company has recently let the contract for a large fireproof drier to be built at the Webb mine. Improvements in the way of machinery will also be added.

Montana

BUTTE DISTRICT

Anaconda—While the company now owns all of the mines of the various operating companies of the Amalgamated, the names of the old companies are retained and constitute the several departments of the Anaconda company. At the Tramway mine a sump is being sunk below the 2000-ft. station. Mining is being carried on only in one place in the Rarus mine and the ore mined there does not exceed a few tons daily.

BROADWATER COUNTY

Black Friday—From the 500-ft. level considerable ore, averaging $50 a ton, is being shipped, while the lower grade is being held for concentration. The orebody is 6 ft. wide.

Etta and Ena—The shaft is down 300 ft. and a car is now ready for shipment at this property in the Radersburg district.

JEFFERSON COUNTY

Amazon-Montana—At a depth of 250 ft. the management states that a 4-ft. orebody has been opened up carrying $27 a ton gold, silver and lead. The vein will be drifted on its entire length and crosscuts run.

Corbin Metal—The management states that on the 500-ft. level the crosscut to the lead has cut 2½ ft. of ore carrying 32 per cent. lead, 17 per cent. copper, $1.40 in gold and 17 oz. silver to the ton.

LEWIS & CLARK COUNTY

On Thomas Cruse's East London mine, three miles south of Helena, the shaft is down 140 ft. and a crosscut is being run. Difficulty has been experienced with water. R. H. Kleinschmidt and others have commenced a tunnel to tap the Dorothy and Pyrrhotite claims in the Oro Fino gulch.

C. C. Cline and others have recently acquired 160 acres of placer at the mouth of Magpie gulch and a dredge is now being installed at a cost of $100,000. The ground has been prospected.

LINCOLN COUNTY

Clark & Elliott are drifting on the vein on the Buzz Saw mine, at Shaughnessy hill and have just completed a wagon road to the property. In the same district John H. Town intends to drift another 100 ft. on the lead in the White Fan mine. The vein is from 35 to 40 ft. in width and contains 5 ft. of shipping ore, the remainder being of concentrating. At Sylvanite the Lincoln Gold Mining Company is hauling concentrates to Leonia from the mill, which is running with three shifts.

MADISON COUNTY

Germania—James Miller and Isaac Hanson have sold this property, two miles southeast of Rochester, to English and San Francisco capitalists. The mine contains low-grade gold values. A 200-ton shipment was recently made to Washoe for test. E. M. Hand is in charge.

MISSOULA COUNTY

Buffalo—At the annual meeting, the following were elected directors: O. H. Linn, S. H. Linn, M. H. Linn, Paul Gerber, J. Flemming, George Dunham, George Craddock and P. J. Conroy. The property is in the Saltese district.

Triangle—The company will build a 100-ton concentrator at Clinton which, if business justifies it, will be enlarged to treat the custom ore of the district. During the past year, a 700-ft. crosscut tunnel has been run in the Clinton mine and a large body of low-grade ore disclosed.

Nevada

ESMERALDA COUNTY

Florence—After two years, during which the company has been cleaning up the old lease workings almost entirely above the 350-ft. level, an era of active development and production from depth is being inaugurated. The 150-ton mill, which has been grinding away on miscellaneous rock averaging not more than $15, will be operated on a higher grade of ore taken from practically untouched stopes in the upper levels until ore can be blocked out in the lower levels. Indications point to the same persistence of values in depth as has been experienced by the Consolidated company. The main shaft is widened to three full-sized compartments almost to the surface, and stations with two 100-ton ore pockets have been cut so that ore can be loaded directly into 2-ton skips and automatically dumped immediately into the mill bins.

NYE COUNTY

Tonopah ore shipments for the week ended Aug. 14 were: Tonopah, 3500 tons; Tonopah-Belmont, 1865; Montana-Tonopah, 1050; Tonopah Extension, 840; West End, 325; MacNamara, 120; Midway, 50; total, 7750 tons.

Tonopah—The July report shows 14,780 tons milled; average value $21.30; bullion shipped 21,400 lb.; concentrates shipped 125 tons; net earnings $170,000.

MacNamara—The installation of a powerful exhaust fan and necessary pipe connections has enabled the company to resume work in the raise from the 800-ft. level.

Tonopah-Belmont—Ore shipments are growing each month and it is announced that increased milling facilities will be required to handle the output when the main shaft is completed. The company has a 60-stamp mill at Millers, but it is intimated that another of equal capacity will be erected at the mine at Tonopah.

Montgomery - Shoshone — Bullion amounting to $14,000 resulted from sec-

ond cleanup for July. Treatment costs are being reduced.

Tecopa—The exodus of miners and the cancelation of orders for cars indicates thi cessation of activities at the Tecopa Consolidated.

Tonopah Extension—The completion of the west footwall drift, after running 950 ft. to connect with the westerly workings, means good ventilation and the resumption of operations in that part of the mine.

Belmont—The main shaft is now widened to three compartments to within 175 ft. of the surface.

Bonnie Clare—The Las Vegas & Tonopah railroad has begun construction on a one-mile spur from its main line to the Bonnie Clare mill ore bins.

WHITE PINE COUNTY

At the tungsten mines, 40 miles southeast of Ely, excavations are being made and timber sawed for concentrating mill. The machinery for a small concentrating mill has been ordered. E. L. Fletcher is manager. The ore is mainly hübnerite.

Oklahoma

Omaha-Petersburg—The 1000-ton mill of this company will be completed in November.

Oregon

BAKER COUNTY

Ibex—This mine is being examined by E. N. Brigg and G. N. Start, and if results are favorable will be reopened.

Iron Dyke—Preparations are being made for the installation of a large concentrating plant on this property on Snake river. Frank E. Pearce is manager.

Oroville—This gold dredging company has secured a bond on a number of claims in the Sumpter valley, and have commenced work to test them. C. W. Bigelow has charge.

LANE COUNTY

Mayflower—A force of men has been employed repairing roads into the camp. The work will soon be finished when operations at the mine will be resumed. There is a 10-stamp mill on this property.

Sunset—M. F. Wyatt reports finding a rich vein of ore 8 ft. wide, with a 2-ft. pay streak, containing gold, copper, lead and silver.

Utah

BEAVER COUNTY

South Utah Mines and Smelters—Arrangements are being made for a better railroad rate on ore and concentrates with the Salt Lake road. It is understood that mining and milling operations will be resumed the first week in September. The concentrates will be shipped to the International smeltery. The mine is reported to be in good condition, and to have some 3 per cent. ore blocked out. The mill capacity will be from 1000 to 1200 tons per day.

Red Warrior—Ore has been followed from the surface to below the 400-ft. level, and crosscutting is being done for the orebody on the 500. The vein is 4 ft. and upward in thickness, and has been opened for 150 ft. on the strike. It is silver-lead carbonate, mostly of shipping grade. Some spots carrying copper have recently been encountered. A new ore shoot has been cut on the 400-ft. level south of the shaft. Heretofore all the ore developed has been north of the shaft. The company shipped 93 cars of ore, averaging 40 tons, in a little over a year. This is given as netting approximately $20 per ton, or $74,400 total net smeltery returns.

St. Mary—The compressor is in operation, and drifting is being done. The property is in the Star district.

King of the Hills—Ore running high in silver is reported to have been opened at this property in the West mountains.

IRON COUNTY

Gold Springs—The first cleanup of amalgam at the Jennie mill is expected shortly. Three furnaces for assaying and melting gold bullion are being built, and this has delayed the making of gold bricks. A pump has been installed to send back the water from the last settling reservior. The vein has been opened on the 200-ft. level north of the shaft and carries 5 ft. of good ore. It has not been cut yet on the 400. The mill is handling between 60 and 80 tons a day.

SALT LAKE COUNTY

Ohio Copper—The June output was about 1200 tons of concentrates, which are said to have averaged 28 per cent. copper. The returns for July, probably, will be in excess of those for June.

Wasatch-Utah—A new tunnel is being driven to cut a vein of low-grade gold ore. Stoping is being done on a vein of better grade, 6 in. to 1 ft. wide. The two-stamp mill is now running two shifts and handling about seven tons of ore a day.

TOOELE COUNTY

Dry Cañon Leasing—This company has shipped a car of ore.

Consolidated Mercur—The damage to the water system, caused by a recent cloud burst, has been repaired.

UTAH COUNTY

There is considerable activity in the American Fork district. Several new properties are shipping.

Comstock—The tunnel is in about 50 ft., and has cut stringers of carbonate ore, carrying lead and silver. William Greenwood is superintendent.

Yankee—Leasers are loading their third car for shipment Returns from those shipped are given as between $1400 and $1500 per car. Besides lead, the ore carries gold and silver. A number of large boulders of ore weighing 5 to 10 tons each have been marketed.

Pacific—A number of sacks of lead-zinc ore are being mined each shift, also some second class. It is proposed to put in a crusher and jigs to separate the lead and zinc.

Pittsburg Consolidated—The adverse claim and protest of the Mountain Lake Extension company for title to Pittsburg No. 2 and five other lode claims, on which the Pittsburg company had applied for patent, has been upheld by the Secretary of the Interior, confirming the local land office.

Bay State—The streak of silver-lead ore encountered in the tunnel has opened into a vein 14 in. wide. The ore is of good quality.

Mountain Dell—Ore has been opened in five places from the tunnel level. The company received net smeltery returns of $57.11 per ton on a car of ore shipped recently.

Miller—This property is operated by leasers. The Jones-Erickson lease is mining 3½ tons of ore a shift. A 50-ton car has just been shipped.

Eudora-Bell—Quit claim deeds to this company have been filed with the county recorder at Provo for the following claims in American Fork Cañon: Silver Bell, Red Cloud, Eudora, First Chance, Mono and Henrietta; also for the Silver Bell and Moana mill sites. Development has been started.

Washington

FERRY COUNTY

Copper-Butte—A contract has been let for the driving of a 100-ft. crosscut on the Toulon property.

SNOHOMISH COUNTY

Chelan Consolidated Copper—This company will install a diamond drill on the Red Mountain property. J. A. Goulden of New York is president.

STEVENS COUNTY

Napoleon—Operations at this mine, near Marcus, have been resumed after two years. Machinery is being installed. This property is controlled by the British Columbia Copper Company.

Guarantee—Preparations are being made for development on this property owned by Spokane capital. Frank Earnest is president.

Wyoming

ALBANY COUNTY

Topeka—The company is opening a gold-copper orebody in the tunnel and will ship soon. William Benton is manager.

Canada

British Columbia

Arrangements are being made for putting in at Nelson a 10-ton Murex magnetic concentration plant. Ernest Levy, Rossland, is acting in this matter for Alexander Hill & Stewart, London representatives of the Murex Magnetic Company.

Tyee—During July the plant treated 4400 tons, valued at $45,000.

Granby—Aug. 12, fire destroyed the surface works at No. 3 tunnel, the equipment of which handled all ore mined between No. 2 and 3 levels. Shipping connections of No. 3 were with the Great Northern railway. There remain two distinct units on the Knob Hill-Ironsides part of the big property, namely No. 2 tunnel and Victoria shaft; the former ships over the Canadian Pacific railway only, but both railways connect with the latter. There is another unit for shipment of ore from the Gold Drop mine side of the mountain, served by the Canadian Pacific, so that shipment of ore to the smeltery will be interfered with only in part. It will be practicable to continue shipping about 2000 tons of ore daily, which will supply four blast furnaces regularly. For some time past ore production has been approximately 3000 tons a day. Beside crusher house and plant, shipping bins and covered approaches from mine to crusher building, the fire loss includes machine and blacksmith shops erected last year and the residence of Supt. O. B. Smith. Preliminary estimates place loss at $100,000, but insurance will cover part.

Ontario

Shipments from Cobalt for the week ended Aug. 12 were: Buffalo, 57,120 lb.; Chambers-Ferland, 64,000; Crown Reserve, 148,000; Kerr Lake, 179,953; La Rose, 258,580; McKinley-Darragh, 157,200; Nipissing, 428,170; Temiskaming, 60,030; T. & H. B., 62,900; Townsite, 64,000; total, 1,480,043 pounds.

Temiskaming & Hudson Bay—The Ontario government has made an important concession to this company in the matter of royalties. It will continue to receive 15 per cent. on low-grade and concentrating ore, but will allow a reduction of $3.50 per ton for treatment charges on all ore treated at the mill.

Millerett—In this Gowganda mine a depth of 200 ft. has been reached and shipments of ore this season down the Montreal river amount to 304 tons. Two cars of ore are ready but will be held until they can be sent over the winter roads to Charlton.

Leroy Lake—In this Gowganda mine the shaft is down 90 ft., at which point ore containing fair silver contents is being taken out. Some drifting has been done at the 50-ft. level with satisfactory results.

Reeves-Dobie—The discovery of a 10-in. vein showing high-grade ore is reported in this Gowganda mine. Foundations are being prepared for the installation of a concentrating plant with a capacity of 50 tons per day, the machinery for which has been shipped.

Foster—A complete plant has been ordered for this Porcupine mine. A 20-ft. dolomite vein is shot through with quartz stringers containing free gold. Gold is also found in the wall rock.

Porcupine Gold Mines Company—The stockholders have authorized the erection of a stamp mill at Porcupine. The company has about 10 tons of ore in hand, reported to be of very high grade.

Mexico

The Southern Pacific track on the West Coast has been laid to the first tunnel up the Santiago river, which is 13 km. from Yago, Tepic, the present operating terminus. Between the end of the track and the crossing of the Santa Rosa river, a distance of 15 km., there are 15 construction camps.

Chihuahua

The Mexico Northwestern railway has commenced grading on its branch from San Antonio, on the main line of the Chihuahua division to the silver mining district of Cusihuiriachic. This line will be about 24 km. long and it is expected it will be completed Jan. 1, 1911.

Jalisco

Magistral—Operations at the Elmore plant are delayed because of difficulties with the equipment for the primary concentration.

Mexico

Esperanza—In July the mill crushed 20,075 tons, yielding $184,915; the working and other expenses were $102,172, leaving net $75,722.

Oaxaca

The supreme court of Mexico, at Mexico City, has handed down a decision in favor of the San Juan Mining Company in the case brought against it by Juan Baigts, and orders the title, now in Mr. Baigts' name, transferred with the physical property to the San Juan Mining Company. The decision of the supreme court also gives the San Juan Mining Company the right to proceed civilly against Mr. Baigts for damages sustained while he was in possession of the mine and extracting therefrom its ores. It is alleged that Mr. Baigts took from the mine ore to the value of 1,024,000 pesos. He was in possession of the properties for three years. The case grew out of the deal for the purchase of the mine made by C. A. Hamilton, at the inception of the Taviche boom in 1905.

San Fernando—A. P. Ennis and associates have made a payment toward the purchase of these silver-lead mines in San Fernando, district of Zimatlan. There are numerous old Spanish workings, some of them with extensive stopes. This is the first American company to work in this section of the state.

Soledad—The machinery for the Soledad mill in the Totolapam district is being moved from Totolapam to the site. The company had to build a wagon road from the river to the mine for this purpose. Freshets have caused much damage to all miners in this section.

Santa Sofia and Catarina—In the Santa Catarina camp of the gold belt, the mountain on which these two mines are situated has suffered a land slide, carrying with it the entire outside workings of both mines, and dumping thousands of tons of good milling ore into the barranca 600 ft. below. As both mines were temporarily closed pending reorganization, there were no casualties.

Victoria-Tapada—This custom mill is being rapidly completed. The two batteries of 1200-lb. stamps, the tube mill, Pachuca tanks, Dorr classifier and pulp thickeners, and the motive plant are complete. The foundation for the Butters filters is also ready to receive the frames. The company has just completed its saw mill. In view of the difficulties encountered in getting the heavy machinery to the mill site, Manager Brill deserves great credit.

San Luis Potosi

Candelaria and Filosofal—These lead-silver-gold mines at Catorce are reported sold to Pablo de las Santos, of Monterey, for 125,000 pesos.

Sinaloa

Culiacan Development Company—This company has been incorporated in Douglas, Ariz., to work by cyaniding 200,000 tons of tailings on old dumps at Culiacan. H. L. Roper, of El Paso, Texas, and Senor Martinez del Castro, with New York capital, are behind the project. The tailings average $6 per ton.

Sonora

John Slaughter is beginning development on a gold vein 18 miles east of Douglas, on the Mexican border, on the San Bernardino ranch.

Silver Seal Development— C. E. Wenzel, of Los Angeles, is negotiating the sale of the Silver Seal mine, Moctezuma district, to Duluth capitalists. The price is $55,000. Fred Colson has had a lease on the Silver Seal and has shipped to Douglas $48,000 this year.

El Temblor and Antigua—Edmund Steindler, of New York, is negotiating for these properties with English interests. The mines are owned by the Steindlers and Henry C. Carr, of New York. They were purchased last December. They are in the Moctezuma district.

THE MARKETS

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

Coal Trade Review

New York, Aug. 24—There is a slightly increased activity in most of the coal-market centers, arising from preliminary purchases and inquiries for autumn needs. The Eastern market, however, still continues quiet. The Western and Southern markets are more active; some sizes are in strong demand, and there is a greater tendency to replenish stock piles for future needs, especially as no settlement is in sight in the Illinois field.

Strike Conditions—The situation with reference to the striking miners in Illinois is practically unchanged. At the special national convention in Indianapolis the Illinois miners did not succeed in having their action officially approved by the national organization, but their representation was strong enough to control the convention to the extent of levying an assessment of $1 per week for each member of the national body for the support of the Illinois miners. The effect of this assessment remains to be seen. It is predicted in some quarters that many will not pay the assessment, preferring to resign from the national organization. It is also within the bounds of possibilities that the Illinois miners will formally secede. Thus the section of the country usually supplied by Illinois production must continue to depend mainly upon the Indiana mines, and while this is ample for the present there will doubtless be a stringency as soon as cold weather ensues.

Coal-traffic Notes

Coal and coke tonnage originating on the lines of the Pennsylvania Railroad Company east of Pittsburg and Erie for July and the seven months ended July 31 were, short tons:

	July, 1910.	Change.	Seven Months, 1910.	Change.
Anthracite coal.....	623,250	D. 18,809	6,391,011	D. 33,838
Bituminous coal.....	3,140,417	D.190,291	23,358,512	I.1,947,037
Coke.....	1,008,270	I. 85,768	8,278,953	I.2,308,173
Total.....	**4,771,937**	**D.123,332**	**38,028,476**	**I.4,221,372**

New York

Anthracite

Aug. 24—The autumn and winter trade is beginning to show a slight increase. The market is fair and quotations are as follows:

Schedule prices for domestic sizes are $4.65 for broken and $4.90 for egg, stove and chestnut, f.o.b. New York harbor points. For steam sizes, current quotations are: Pea, $2.95@3.25; buckwheat, $2.15@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 Coal

The Atlantic Seaboard soft-coal trade still continues in a poor condition, the demand hardly taking care of the supply, and low prices prevail. The better grades of coal seem to be suffering more than the lower grades. Low-volatile steam coals can be purchased at $2.40@2.80, according to quality, f.o.b., New York harbor shipping point. There is some demand for slack coal, but there is no demurrage coal around to help out this situation. The Western situation with reference to high-volatile coals continues good. The strikes make a shortage of coal in that territory. Prices are strong with reliable coals hard to purchase. Fairmount ¾-in. coal is quoted at $1 to $1.10; slack at 50c. to 55c., f.o.b., mines.

Transportation from the mines to destination is a little slower than schedule. There has been a slight car shortage on the Baltimore & Ohio railroad, but that was only temporary, normal conditions again prevailing. On the other roads the car supply is equal to the demand.

For coastwise traffic vessels are in good supply and freights low. New York harbor quotations are from 50c. to 55c. around Cape Cod, and 70c. from Philadelphia. All-rail trade seems to be in a slightly better condition than tidewater business.

Birmingham

Aug. 22—New contracts for coal are being received by Alabama coal operators every other day or so. There are orders for coal in hand that will warrant a steady operation of mines for some time to come, beyond this year. There has been some talk of a car shortage in the Birmingham district but railroad officials say they are prepared for any and all business. There will have to be greater shipments of coal than at present to bring about a car shortage that will be felt. Orders for coal are being placed in this district by some of the larger railroad systems of the South and Southwest. Confidence is expressed in the ability of the operators in this district keeping up a steady output of coal, no labor troubles being anticipated. The union miners have but little strength in this district and no effort is being made by the leaders of the United Mine Workers to organize here. The production for the year will be large.

Palos mines, in which an explosion occurred May 5, causing the deaths of 90 men, are again in operation. Improvements suggested by the State mine inspectors have been made, the ventilation developed, two fans now being in operation, and other work done about the mines, making them as safe as they possibly can be. The company has received applications from a large amount of labor and no trouble is being experienced in getting a full complement of help. The coal mined at this place has always been in strong demand and it is believed that every demand will be met right along.

Indianapolis

Aug. 20—The mining of coal in this State shows little or no diminution. The mines are all being operated at full time and capacity. There has been but little idleness due to labor troubles. The recent increase in the price of coal made by the retail and wholesale dealers and the announcement of the additional increase on Sept. 1 of from 10@15c. per ton, as a forerunner of other advances to follow, had a tendency to double the usual number of orders for coal at the mines during the last week. The unsatisfactory conditions in other States continue to make an excellent market for Indiana coal. There is some complaint on account of car shortage; the railroads say that the crop movement has set in and will curtail the number of cars for coal for a short time. Mining conditions in Indiana were never better. The operators say their output is heavier than it has been for several years at this time.

Chicago

Aug. 22—The current demand for steam coals is strong and is mainly supplied as heretofore from Indiana, although there is something of an increase in the sales of smokeless owing to the expectation that prices will advance, on Sept. 1. On current sales prices remain about as last week, Indiana coals being quoted on cars at $2@2.15 for lump; $1.90@2 for run-of-mine and $1.90@2.15 for screenings. The continued high price of screenings seems another indication of the fact that this size is to be permanently in greater demand in the future. Smokeless coals hold firmly to the list prices of $3.55 for lump and $3.15 for run-of-mine, Youghiogheny remains at

$3.22 for ¾-in. lump and Hocking is in good demand and is strong at $3.15.

Without a resumption of shipments from the Illinois mines soon there doubtless will be a general movement to obtain storage supplies from other mines, but the situation is yet one of doubt and many users of coal are willing to hold off placing their contracts as long as possible because of the expectation that there will be a drop in the sizes of coal most commonly used as soon as the Illinois mines are again producing. No storage piles of bituminous coals are to be found now, but as long as transportation holds good and Indiana mines are worked to their present limit they will not be thought needed by many consumers. The number of consumers who are seeking to contract for large future supplies is, however, increasing.

Pittsburg

Aug. 23—The decreased demand for coal already noted, together with some slackening in Lake shipments, has resulted in cutting of prices by a number of interests, and this week mine-run and 1¼-in. are both 5c. per ton lower, slack being in good demand at former prices. The trade is somewhat in the dark as to the future of the market, owing to doubt as to the outcome of various labor matters, and doubt also as to probable consumption in view of lessened activity this midsummer in industrial circles. We quote: Mine-run and nut, $1.15@1.20; ¾-in., $1.30; domestic 1¼-in. lump, $1.45@1.50; slack, 70@80c. per ton.

Connellsville Coke—It is not believed that there has been any great curtailment in coke output by reason of the reported five-day running of many of the plants and it is possible that some reports of weekly production unduly accentuate the reduction which has occurred. The idea in the trade seems to be that production has been reduced by perhaps 5 per cent., but not more, in the last few weeks.

The market has been quiet, and just a shade easier, as sales of prompt and September furnace coke have been made at $1.60, 5c. less than the minimum price quoted in the last couple weeks. There have been sales of prompt furnace coke aggregating perhaps 75 or 100 cars, at $1.60 and $1.65, while Corrigan, McKinney & Co., have bought a portion of their September requirements. They were in the market for about 20,000 tons monthly, September to December inclusive, but will probably cover only for September at this time.

Standard grades of Connellsville furnace coke are quoted as follows, per net ton at ovens: Prompt furnace, $1.60@1.65; contract furnace (nominal) $1.75@1.85; prompt foundry, $2.15@2.25; contract foundry, $2.25@2.50.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Aug. 13 at 367,273 tons, a decrease of 39,000 tons, and shipments at 3781 cars to Pittsburg, 5381 cars to points west and 898 cars to points east of Connellsville, a decrease of 239 cars.

St. Louis

Aug. 22—Coal is scarce and practically all the available tonnage is being gobbled up by the railroads. There is beginning to be a heavy demand from dealers throughout the country, but it remains unsatisfied owing to the scarcity of coal. Domestic sizes particularly are almost impossible to obtain owing to the fact that railroads are willing to take mine-run at a good price and make the business attractive by paying almost cash, consequently operators are deaf to the call for prepared sizes.

Owing to the fact that so many mines are running mine-run, screening is scarce and the price advancing to $1.10 per ton, f.o.b., mines. All this season screening has been bringing a better price in Chicago than in St. Louis; today, however, the market seems to be reversed, screening being slightly higher than in Chicago.

Reports from the Indianapolis and various other union centers are not at all encouraging. There seems to be little chance of any settlement being reached during the next 30 days. It is the opinion of a great many that a desperate effort will be made to reach an agreement on Sept. 1. At this time the country will begin to suffer for coal and unless an agreement is signed some time in September it is hard to say what steps will have to be taken in order to supply the demand.

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

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg	$1.80	$2.32
2-in. lump	1.45	1.97
Mine-run	1.35	1.87
Screenings	1.10	1.62
Trenton:		
Nut	1.40	1.92
6-in. lump and egg	2.25	2.77
3-in. nut	1.75	2.27
Staunton or Mt. Olive:		
6-in. lump	1.70	2.22
2-in. nut	1.60	2.12
Mine-run	1.50	2.02
Screenings	1.50	2.02
Carterville:		
6-in. lump or egg	1.90	2.57
3-in. nut	1.50	2.17
Mine-run	1.50	1.97
Screenings	1.25	1.92
Pocahontas and New River:		
Lump or egg	1.75	4.25
Mine-run	1.50	4.00
Pennsylvania Anthracite:		
Nut, stove or egg	.....	6.85
Grate	.....	6.60
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	.....	5.40
Gas house	.....	4.90
Smithing	.....	4.15

East St. Louis, Ill., prices are 20c. per ton less than St. Louis prices on soft coal.

The anthracite market has improved a great deal and for the first time this year all sizes are in strong demand. The demand for chestnut is strong, both locally and in the country. The late buyers are now beginning to be heard from and dealers report that they have all the business they can comfortably attend to now. The amount of coal in the hands of consumers is unusually low for this time of the year. A big rush is anticipated during the next 60 days. While dealers, of course, expect to be extremely busy during these two months, yet everyone looks for an unusual rush this season and it is anticipated that the average dealer will find himself swamped next month.

FOREIGN·COAL·TRADE

Coal in India—The production of coal in India in 1909 was 11,870,064 tons, a decrease of 899,571 tons from 1908. Of the total last year, 10,660,844 tons were mined in Bengal. Exports were 912,184 tons; imports, 483,972 tons. The coal consumed by railways was 3,689,093 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on Aug. 13: Best Welsh steam, $3.96; seconds, $3.78; thirds, $3.60; dry coals, $3.60; best Monmouthshire, $3.54; seconds, $3.42; best steam smalls, $2.16; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Aug. 24—While actual trading is not much improved, there is a decidedly better tone at many of the iron and steel centers. The market has undoubtedly strengthened in finished-steel products, though no large bookings have occurred. Prices of finished-steel products are for the most part unchanged, and while there have been no indications of advances at any points, there are no distinct evidences of impending declines and on the whole the market is holding up well.

Pig iron for prompt delivery has been shaded somewhat, but there were inquiries at Pittsburg for much more iron than at any period in several months. At other centers, the market is decidedly soft and only iron for current needs is being ordered.

There is a moderate demand for sheet bars, but the finished-material market lacks snap and prices are being shaded on both flat and corrugated sheets.

Iron-ore shipments which have arrived at Philadelphia during the seven months ended July 31, amounted to 912,345 tons. The shipments show an increase of 348,995 tons over the corresponding period

of last year and 543,635 tons over the total of 1908.

Lake Superior Iron Ore—Shipments of Lake iron ore by ports, season to Aug. 1, reported by Cleveland *Iron Trade Review*, in long tons:

Port.	1909.	1910.	Changes.
Escanaba.....	2,016,505	2,464,859	I. 448,354
Marquette.....	870,961	1,723,877	I. 852,916
Ashland.....	1,061,187	2,233,864	I. 1,172,677
Superior.....	2,576,110	3,895,303	I. 1,319,193
Duluth.....	5,434,135	7,441,488	I. 2,007,353
Two Harbors.....	3,436,452	4,104,158	I. 667,706
Total.....	15,395,350	21,863,549	I. 6,468,199

Ore shipments during July were 6,945,289 tons, a gain of 252,264 tons over July, 1909, but a loss of 371,303 tons compared with June of the present year.

Baltimore

Aug. 22—Receipts of iron ore from Cuba for the week were 22,200 tons. From Bombay 7000 tons of manganese ore were received; also 550 tons from Antwerp and 44 casks from Hamburg, from which port 1329 blooms and 13,315 bars of iron were also received. Imports from Middlesboro, via S.S. "Venango," were ferromanganese, 1350 tons; ferrosilicon, 25 tons; silicospiegel, 50 tons. On Aug. 15, 2446 tons of finished iron and steel products were taken by S.S. "Otta," clearing for Cristobal, Canal Zone.

Birmingham

Aug. 22—A better feeling has come over the Southern pig-iron market. There is an improvement noted in the inquiry for the product and a few sales are being made that indicate that the customers are likely to get into the market before long. The quotations are still weak, $11.50 per ton for No. 2 foundry being given as the minimum by the manufacturers and brokers while rumors prevail that $11 to $11.50 will be accepted.

The statement is again made in this section of the country that the manufacturers could dispose of a large quantity of iron were they willing to accept $11 per ton for iron or even accept business for next year's delivery at the present quotations.

The cast-iron pipe makers are again said to be sounding the market with an occasional order being placed for a few hundred tons. Cast-iron pipe makers lose no time in the operation of their plants and new business is coming in at all times.

The make in this section is not being changed one way or the other. A furnace or two were blown in a few days since in this territory but it is announced that a similar number will be blown out for repairs.

Announcement was proclaimed in this section a few days ago that the turning point in the pig-iron market conditions had been reached and much cheerfulness was felt. It was given out that several sales of more than car lots, which had been the rule prior to this, had been made and that the inquiry that was coming gave signs of meaning something before long. The month still has promise of going out with conditions changed. The railroads are moving iron promptly in this district and statisticians report that there is a slight reduction of accumulated stocks.

The steel situation shows no change, the make continuing about as it has been for the last four weeks. It will probably be late in September before the steel plant at Gadsden will resume operations.

Charcoal iron is in brisk demand again and sells at $22.50@23 per ton. There is not much accumulated charcoal iron in this district.

Chicago

Aug. 22—Buying of pig iron and iron and steel products is very light. The pig-iron business continues to be almost wholly in small lots for the needs of 30 to 90 days ahead, and prices remain as previously at $11@11.50, Birmingham, for No. 2 Southern, or $15.35@15.85, Chicago; and $16.50@17 for Northern No. 2. The situation is perhaps a trifle better than it was last week, for inquiries have increased, but the record of actual sales is not encouraging. Users of pig iron seem to be generally of the opinion that overproduction is continuing, notwithstanding published reports of curtailment by the furnaces, and that prices are bound to fall. Furnacemen, on the other hand, profess confidence that the decrease in production will soon bring about an upward movement of the market. That the needs of the local melters will be large for at least the next six months is taken for granted. For iron and steel materials there is no activity except in wire goods, structural material and railroad supplies. Coke is in fairly good demand and the best Connellsville brings $4.85 per ton.

Philadelphia

Aug. 24—The only activity observable in the pig-iron market is in pipe iron. Orders for good-sized lots are hanging fire, pipemakers claiming that pipe iron is relatively higher than forge, foundry or basic. Forge is nominally $15.25 for Northern and $14.75 for Southern. Basic has weakened 25c. according to today's quotations, and no definite transactions are reported. No. 24 foundry is lifeless at $16. Soft No. 2 Southern foundry is offered at $14.75 but the better grades are preferred. The general tone of the market is weak, though work is active in the manufacturing plants in this vicinity.

Steel Billets—Deliveries on old orders are being made, but scarcely any new business is apparent.

Steel Rails—Outside of a large Mexican order no business of moment has been closed.

Merchant Iron—The struggle for autumn business has developed a little further shaving for carload lots for which inquiry has been made.

Sheet Iron—A large order or two which are virtually the renewing of old contracts have gone to the mills on withheld terms. Further shadings are probable.

Pipes and Tubes—Orders for small quantities of pipe for quick delivery have been placed. Water pipe for small towns in this territory is wanted before cold weather. Tubes are quiet, with no orders reported.

Plates—A liberal tonnage from car builders will be placed early in September at July quotations.

Structural Materials—Apart from suspended inquiries of early July no business of importance has been closed.

Scrap—There is an abundance of unsalable scrap.

Pittsburg

Aug. 23—A decided improvement in actual inquiry and buying is reported this week in several quarters in the iron and steel market. A steel concern, whose experience is presumably typical, reports that its daily bookings so far this month show a decided improvement over the average for the corresponding days of last month.

Pig Iron—Inquiries have been made for a total of over 50,000 tons of iron, the largest total asked for at any time for months. There are inquiries for 10,000 tons of basic for a Chicago consumer, delivery over the balance of the year, and for 10,000 or 20,000 tons for a St. Louis consumer, deliveries running well into next year. There is an inquiry from South Bend, Ind., which calls for 10,000 tons of basic, 7500 tons of malleable and 5000 tons of bessemer, delivery September to December, inclusive.

A manufacturer of sanitary ware north of Pittsburg has bought 2500 tons of foundry iron for delivery to Jan. 1, on the basis of $15, delivered, for No. 2 iron, a small portion coming from the Valley furnaces with a 90c. rate and the major part from furnaces having 80 and 85c. rates.

For prompt delivery foundry iron is quoted at $14, Valley, 25c. less than hitherto quoted. The market on basic is not clearly established. A sale has been reported of 1000 tons at $14, delivered promptly to a steel works down the Ohio river from Pittsburg, which takes a 60c. rate from the Valley furnaces and a 45c. rate from a nearby furnace, but the delivered price has not been absolutely confirmed. Apart from this, however, it is well understood that $14 can be shaded on small lots for early delivery, as considerable iron is being held upon bank loans which it is difficult to renew, and we quote basic 25c. less than hitherto.

A sale of 5000 tons of forge, delivery to the end of the year, has been made at the relatively low price of $13.35, Valley, 40c. below previous quotations. Revised quotations are as follows, the higher price being for later delivery: No. 2 foundry, $14@14.25; forge, $13.35; malleable, $14.50; basic, $13.75@14; bessemer, $15.25, all at Valley furnaces, 90c. higher delivered Pittsburg.

Ferromanganese—The market is dull, with quotable prices unchanged at $39@39.50 for prompt and $39.50@40 for forward, f.o.b. Baltimore, freight to Pittsburg being $1.95.

Steel—The market has been quiet, with occasional buying of sheet bars. Prices are not quotably changed, remaining at $24.50 for bessemer billets, and $26 for bessemer sheet bars; $26 for open-hearth billets; $26.50@27 for open-hearth sheet bars and $28@29 for rods, all f.o.b. maker's mill, Pittsburg or Youngstown.

Sheets—There is a moderate demand for sheets. Prices are only moderately steady, at $3 per ton off on black, and $5 per ton off on galvanized, as regards both flat sheets and corrugated material, nominal prices on these being: Black, 2.40c.; galvanized, 3.50c.; painted corrugated, $1.70 per square; galvanized, $3. Blue annealed sheets stand at about $1.70c. for No. 10 gage, the nominal price being 1.75 cents.

METAL MARKETS

New York, Aug. 3—Spelter has been the chief feature of interest during the last week, a substantial, unmanipulated rise having occurred in this metal. Lead has been rather dull. Copper has been a trifle weaker on business transacted, but apparently this reflects nothing but temporary dullness, the basic conditions remaining strong.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1910..	$ 828,451	$10,282,649	Imp.$ 9,454,198
" 1909..	16,661,782	3,269,886	Exp. 13,391,896
Year 1910..	50,345,182	29,671,180	" 20,674,002
" 1909..	80,496,119	23,405,478	" 57,090,641
Silver:			
July 1910..	5,124,471	3,794,888	Exp. 1,329,583
" 1909..	5,049,366	3,916,117	" 1,133,249
Year 1910..	32,178,689	25,696,408	" 6,482,281
" 1909..	34,409,032	26,788,145	" 7,620,887

Exports from the port of New York, week ended Aug. 20: Gold, $50,000, to Bolivia; silver, $449,331, chiefly to London. Imports: Gold, $4,215,406, almost all from London; silver, $55,841, from Central America, Spain and Mexico.

Gold—There was a good demand for gold in London, with prices for bars at 77s. 9d. per oz. as usual, and 76s. 5d. for American coin; exportation was checked by the sharp rise in sterling exchange rates.

Platinum—The market for this metal remains quiet and prices are unchanged at $33 per oz. for refined platinum and $37.50@38 per oz. for hard metal.

Silver—The market is without any new feature, the price having been sustained the last few days by China buying. Shipments to London during the last fortnight have shown considerable decrease.

SILVER AND STERLING EXCHANGE

Aug.	18	19	20	22	23	24
New York....	53	53	52⅞	52⅞	52⅞	52⅞
London	24⅛	24 7/16	24⅜	24⅜	24⅜	24⅜
Sterling Ex..	4.8620	4.8635	4.8665	4.8665	4.8670	4.8670

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 from Jan. 1 to Aug. 11, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.....	£3,841,800	£3,842,100	I. £ 300
China.....	1,465,700	1,113,500	D. 352,200
Straits.....	82,800	.....	D. 82,800
Total.....	£5,390,300	£4,955,600	D. £ 434,700

Copper, Tin, Lead and Zinc

Aug.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
18	12⅜ @12⅜	12.50 @12.55	56¼	33 1/16	4.40	4.27½ @4.30	5.12½ @5.17½
19	12⅜ @12⅜	12.50 @12.55	56 3/16	33¾	4.40	4.27½ @4.30	5.15 @5.20
20	12⅜ @12⅜	12.50 @12.55	....	34	4.40	4.27½ @4.30	5.17½ @5.22½
22	12⅜ @12⅜	12.50 @12.55	55 13/16	34¼	4.40	4.27½ @4.30	5.20 @5.25
23	12⅜ @12⅜	12.50 @12.55	55 9/16	34⅜	4.40	4.27½ @4.30	5.20 @5.25
24	12⅜ @12⅜	12.50 @12.55	55 7/16	34½	4.40	4.27½ @4.30	5.22½ @5.27½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week of Aug. 18-24, the market has been quiet, especially in domestic business. However, some moderate sales for European delivery have been made from day to day, and these orders have been taken at slight concessions, especially for early shipments. The halt in the buying for domestic delivery is apparently due to the fact that consumers purchased heavily during the first half of the month and covered their requirements for the immediate future, and the markets being generally reactionary this week they have paused before making further contracts. European buyers acted in a similar fashion, but they are by no means as well covered as the American. The asking price for electrolytic, by most of the agencies, remains at 12¾c., delivered, 30 days, for domestic business, and at £58 10s. c.i.f. for foreign business, corresponding to about 12.60@12.55c. cash, New York, and if any important demand should develop this price would doubtless have to be paid. Producers' books are now well filled and in consequence thereof there has been no pressure to sell. Business in Lake copper has been rather small and has been about on the basis of 12¾c., cash, New York, slightly higher prices having been paid in some transactions in fancy brands. At the close Lake copper is quoted at 12⅝@12⅞c. and electrolytic in cakes, ingots and wirebars at 12.50@12.55c. Casting copper is quoted nominally at 12¼@12½c. for the week.

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.

In the London standard market there has been some realization on the part of speculative holders, which resulted in a gradual decline to £55 8s. 9d. for spot, and £56 5s. for three months. Refined and manufactured sorts we quote: English tough, £58 5s.; best selected, £59 15s. @£60 5s.; strong sheets, £67 15s.@£68 15s.

It is reported that the Rothschilds have ordered curtailment of 15 per cent. in the production of Rio Tinto, Boleo and other copper mines controlled by them.

Exports of copper from New York for the week were 5287 long tons. Our special correspondent gives the exports from Baltimore for the week at 1440 tons.

Tin—In the London market the bull party is having it all its own way. Transactions during the last few days were larger than for a long time past and quotations advanced easily. The strength of the market is ascribed entirely to manipulation. No support is forthcoming from here as far as orders from consumers are concerned. The latter are fighting shy and are buying only when they are compelled to cover their requirements. Up to the beginning of the week, they were able to do so at below the importation point, but since then tin in this market is quoted on the parity of London figures. That the intrinsic position of the market is not a very strong one is evidenced by the fact that the backwardation for three months' tin, in comparison with spot, is becoming ever larger. The market abroad closes at £157 7s. 6d. for spot, and £156 2s. 6d. for three months. In New York, tin for September delivery can be purchased at about 34⅜@34½ cents.

Lead—There has been more activity, but the market continues uninteresting. At New York the price remains at 4.40c., and at St. Louis at 4.27@4.30 cents.

In London, Spanish lead is firm at £12 11s. 3d., and English at £12 13s. 9d.

Spelter—There has been a better demand for this metal, and some substantial sales to consumers have been effected. As stocks in the hands of smelters are small the market has become strong and is advancing. It closes firmly at 5.22½@5.27½c., St. Louis, and 5.37½@5.42½c., New York.

In London, good ordinaries are quoted at £22 15s., and specials at £23.

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 Zinc and Smelting Company has ceased smelting at Iola, Kan., but is still receiving ore, roasting it for operation of the sulphuric-acid plant, and delivering the roasted ore to the Prime Western Spelter Company.

Other Metals

Aluminum—There has been no change in the quotations for this metal, the price for No. 1 ingots being 22½ cents.

Antimony—This metal is quiet and no sales are reported. The price remains the same as previously, i. e., 8¼@8⅜c. for Cookson's, 7⅞@8c. for U. S. and 7¼@7⅜c. for outside brands.

Quicksilver—The market is steady, large lots being quoted at $46 per flask of 75 lb., and jobbing lots at $47. The London price remains at £8 12s. 6d. per flask.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 20—The base price for 60 per cent. zinc ore is $39@40 per ton; no premiums were paid. Lead ore is strong at $51@52 for 80 per cent. ore.

SHIPMENTS, WEEK ENDED AUG. 20.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	1,046,540	50,570	382,800
Galena	778,470	.....	.....
Mineral Point	485,100	.....	.....
Highland	215,000	.....	.....
Benton	190,400	.....	.....
Shullsburg	63,000	71,000	.....
Cuba City	42,400	85,500	412,315
Rewey	.....	50,800	....
Linden	.....	.....	65,330
Total	2,820,910	257,870	860,445
Year to date	57,851,456	5,796,354	15,246,510

In addition to the above, 2,407,382 lb. of zinc concentrates were shipped to the separating plants.

Joplin, Mo., Aug. 20—The high price for zinc-sulphide ore was $44 per ton, and the high-assay price for best grades was $41, with ores heavy in iron selling on a base of $41.50, and low-base offering at $38 per ton of 60 per cent. zinc. Zinc silicate sold at $20@24 per ton of 40 per cent. zinc. The average price, all grades of zinc ore, was $37.54 per ton.

Lead buyers were busy this week, 95 per cent. of the shipment of the week selling at $50 per ton, with a few carloads at $51 and a small amount of low-grade ore under $50. The average price, all grades of lead, was $49.88 per ton.

Today extensive purchases of lead ore were made for next week's delivery at $51 per ton by one purchasing agent, and the chances are favorable for a further advance before the end of next week.

SHIPMENTS, WEEK ENDED AUG. 20.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	5,649,560	664,700	$126,780
Joplin	1,985,000	404,050	50,297
Duenweg	866 250	255,830	22,438
Galena	871,840	86,230	19,154
Alba-Neck	817,250	3,740	17,569
Oronogo	573,000	2,130	10,988
Granby	806,800	23,900	10,875
Badger	391,390	34,490	8,884
Spurgeon	400,490	30,180	6,543
Aurora	235,880	59,560	5,483
Miami	437,030	.....	4,583
Carthage	163,550	.....	3,434
Carl Junction	145,200	.....	3,049
Quapaw	64,810	7,180	1,337
Wentworth	40,100	.....	400
Totals	13,448,150	1,571,990	$291,817
34 weeks	373,486,960	55,523,200	$8,755,521
Zinc value, the week, $252,610; 34 weeks, $7,334,292			
Lead value, the week, 39,207; 34 weeks, 1,421,229			

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. 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	.....	44.54	.....	57.60	.....
September	47.70	.....	44.87	.....	56.11	.....
October	49.50	.....	45.75	.....	55.02	.....
November	51.31	.....	48.29	.....	53.94	.....
December	49.45	.....	47.57	.....	55.26	.....
Year	$43.98	.....	$41.20	.....	$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, Aug. 24—The general market continues dull but is growing firmer in some specialties.

Copper Sulphate—There has been no change in prices, the quotations remaining at $4 per 100 lb. for car-load lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—The price for white arsenic is $2.25 per 100 lb. Few sales of any size are reported and the market is dull.

Nitrate of Soda—On a fair market prices are 2.10c. per lb. for spot, with futures at 2.12½@2.15c. Sales are not as good as they were last year at this time.

Sulphur—Messrs. Parsons & Petit report the importation by them of 850 tons of crude brimstone, arriving at New York by steamship "Fert."

MINING·STOCKS $

New York, Aug. 24—The market for the stocks of good standing is improving with intervals of recession as the "traders" are driven to come into the market. Chino and Inspiration were stronger and Ohio Copper felt the uplift of F. Augustus Heinze's return from Europe. Cobalts are mostly unchanged with some losses. On the whole, the market is sounder than any time for a month.

Boston, Aug. 23—Copper stocks have weakened slightly as a result of profes-

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company.	May.	June.	July.
Arizona, Ltd.	2,610,000	2,802,000	2,910,000
Balaklala	1,148,762	1,226,000	1,100,000
Boleo (Mexico)	2,735,680	2,115,314	2,272,600
Copper Queen	10,283,855	10,219,687	10,730,372
Calumet & Ariz.	1,778,000	2,490,000	2,705,000
Cananea (Mexico)	4,300,000	4,280,000	4,500,000
Detroit	2,035,639	2,017,000	1,800,000
Imperial	700,000	800,000	.....
Nevada Con	6.164,493	6,186,832	6,896,429
Old Dominion	2,174,000	2,092,000	.....
Shannon	1,326,000	1,528,000	2,207,000
Superior & Pitts.	2,276,000	2,245,000	2,224,000
Utah Copper Co.	8,862,913	8,358,496	8,677,000
Butte District	24,850,000	23,750,000	.....
Lake Superior	19,250,000	18,000,000	19,000,000
Total production.	90,495,342	88,130,329	.....
Imports, bars, etc.	24,850,919	20,817,978	.....
Imp. in ore & matte	6,487,243	5,579,618	.....
Total	121,833,504	114,527,915	.....

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.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
VIII, 1909	120,597,234	59,614,207	48,382,704
IX	118,923,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
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

	Visible Stocks. United States.	Europe.	Total.
VIII, 1909	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	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

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.

sional liquidation. Nevertheless, the market bears a good tone with no outside pressure to sell. On the other hand, there is very little commission-house buying. Indiana had a sharp upward movement on expected favorable mine developments. This stock is about the strongest of the Boston list. Butte & Ballaklava declined and touched $8 today, due to the suit brought by Amalgamated. Many of the Lake Superior stocks have shown fair advances, particularly Osceola, Tamarack and Wolverine. Lake Copper has ceased to be the daily market feature, holding around $38.

The strength of Indiana imparted a degree of strength to some of the Curb prospects, particularly Algomah, Bohemia and South Lake. Chino, Calaveras and Inspiration have held well.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.	July 30	Aug. 24	$0.05
Best & Belcher, Nev	July 31	Aug. 24	0.10
Bullion, Nev.	Aug. 11	Sept. 12	0.05
Challenge, Nev.	Sept. 7	Sept. 28	0.10
Con. Imperial, Nev.	July 31	Aug. 25	0.01
Con. Virginia, Nev.	Aug. 1	Aug. 26	0.25
Hale & Norcross, Nev.	Aug. 2	Aug. 26	0.10
Hancock Con., Mich.	Au.Oct.	.....	3.00
Julia, Nev.	Aug. 6	Sept. 6	0.03
Live Oak, Ariz.	Oct. 1	.....	3.00
Lower Mammoth, Utah.	Aug. 15	.....	0.05
Montana-Bingham, Utah.	Aug. 10	.....	0.02
New York, Utah.	Aug. 15	.....	0.02
Opex, Utah.	Aug. 29	.....	0.03
Potosi G. & S. Min, Nev.	Sept. 6	Sept. 28	0.10
Raven, Mich.	Aug. 15	.....	0.10
Scorpion, Nev.	Aug. 11	Sept. 6	0.02
Scottish Chief, Utah.	Aug. 10	.....	0.01
Seg. Belcher & Midas Con., N.	Sept. 6	Sept. 27	0.05
Tintic Central, Utah.	Aug. 10	.....	0.00½
Utah, Nev.	Sept. 6	Sept. 27	0.05
Winona, Mich.	Aug. 9	.....	1.00

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	53.462	24.166	24.651
July	51.043	54.150	23.519	25.034
August	51.125	.....	23.588	.....
September	51.440	.....	23.743	.....
October	50.923	.....	23.502	.....
November	50.703	.....	23.351	.....
December	52.226	.....	24.030	.....
Total	51.502	.....	23.706	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56½	12.733	12.93⅞	13.091	57.363	57.238
May	12.893	12.550	13.238	12.885	59.338	56.313
June	13.214	12.404	13.548	12.798	59.627	55.310
July	12.880	12.215	13.363	12.570	58.556	54.194
August	13.007	.....	13.296	.....	59.393	.....
September	12.870	.....	13.210	.....	59.021	.....
October	12.700	.....	13.030	.....	57.551	.....
November	13.125	.....	13.354	.....	58.917	.....
December	13.298	.....	13.647	.....	59.906	.....
Year	12.982	.....	13.335	.....	58.732	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	32.695
February	28.290	32.920	August	29.966	.....
March	28.727	32.403	September	30.293	.....
April	29.445	32.976	October	30.475	.....
May	29.225	33.125	November	30.859	.....
June	29.322	32.769	December	32.913	.....
			Av. Year	29.725	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	4.343	4.291	4.207	13.031	12.688
July	4.321	4.404	4.188	4.291	12.563	12.531
August	4.363	.....	4.227	.....	12.475	.....
September	4.342	.....	4.215	.....	12.781	.....
October	4.341	.....	4.215	.....	13.175	.....
November	4.370	.....	4.252	.....	13.047	.....
December	4.560	.....	4.459	.....	13.125	.....
Year	4.273	.....	4.153	.....	13.049	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	5.128	5.252	4.978	22.000	22.219
July	5.402	5.152	5.252	5.002	21.969	22.406
August	5.729	.....	5.579	.....	22.125	.....
September	5.796	.....	5.646	.....	22.906	.....
October	6.199	.....	6.043	.....	23.200	.....
November	6.381	.....	6.231	.....	23.188	.....
December	6.249	.....	6.099	.....	23.094	.....
Year	5.503	.....	5.352	.....	22.201	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.10	15.02	15.94	15.08	16.18
June	16.13	16.52	15.84	15.60	15.63	15.53
July	16.40	16.40	15.90	15.40	15.96	15.40
August	17.16	.....	16.17	.....	16.20	.....
September	18.44	.....	16.80	.....	17.03	.....
October	19.75	.....	17.84	.....	18.02	.....
November	19.90	.....	18.37	.....	18.09	.....
December	19.90	.....	18.15	.....	17.90	.....
Year	$17.46	.....	$16.46	.....	$16.40	.....

STOCK QUOTATIONS

COLO. SPRINGS Aug. 23

Name of Comp.	Bid.
Listed:	
Acacia	.05½
Cripple Cr'k Con.	.02½
C. K. & N.	.18½
Doctor Jack Pot	.10
Elkton Con.	.75½
El Paso	.85
Fannie Rawlins	.05½
Findlay	.09
Gold Dollar	.14½
Gold Sovereign	.03½
Isabella	.18½
Mary McKinney	.53
Pharmacist	.02½
Portland	1.18
Vindicator	.92
Work	.03½
Unlisted:	
Golden Cycle	‡1.00
United Gold Mines	.07½

SALT LAKE Aug. 23

Name of Comp.	Clg.
Carisa	.19
Colorado Mining	.42
Columbus Con.	.80
Daly Judge	4.30
Grand Central	1.17½
Iron Blossom	.87
Little Bell	1.10
Little Chief	‡.22
Lower Mammoth	.15
Mason Valley	7.60
Maj. Mines	.53
May Day	.03½
Nevada Hills	2.30
New York	.13
Prince Con	.68
Red Warrior	‡6.00
Silver King Coal'n	2.07½
Sioux Con.	.23½
Uncle Sam	.14
Victoria	‡1.07½

LONDON Aug. 24

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 8 3
Esperanza	2 15 0
Tomboy	0 16 3
El Oro	1 6 9
Oroville	‡0 5 9
Mexico Mines	8 17 6

SAN FRANCISCO. Aug. 23.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.11
Belcher	.60
Best & Belcher	.48
Caledonia	.52
Challenge Con.	.18
Chollar	.21
Confidence	.70
Con. Cal. & Va.	1.45
Crown Point	.54
Exchequer	.17
Gould & Curry	.27
Hale & Norcross	.37
Mexican	1.35
Ophir	1.47
Overman	.80
Potosi	.35
Savage	.21
Sierra Nevada	.33
Union Con.	.43
Yellow Jacket	.55
MISC. NEVADA	
Belmont	3.87
Daisy	.05
Jim Butler	.25
MacNamara	.27
Midway	.24
North Star	.08
West End Con.	.60
Atlanta	.14
Booth	.13
C.O.D. Con.	.09
Columbia Mt.	.07
Comb. Frac.	.49
Great Bend	.03
Jumbo Extension	.62
Oro	.09
Red Hill	.05
Sandstorm	.04
Silver Pick	.09
St. Ives	.18
Tramps Con.	.03

N. Y. EXCH. Aug. 23

Name of Comp.	Clg.
Amalgamated	64⅞
Am. Agri. Chem.	‡44
Am.Sm.&Ref.,com	67⅛
Am. Sm. & Ref., pf.	103¾
Anaconda	39⅞
Bethlehem Steel	27½
Col. & Hock. C. & I.	6
Colo. Fuel & Iron.	30½
Du Pont P'd'r, pf.	84¾
Federal M. & S.	55
Great Nor., orectf.	54
Nat'nalLead,com.	‡52
National Lead, pf.	100½
Nev. Consol	‡21
Pittsburg Coal	‡16¼
RepublicI&S,com.	31
Republic I & S, pf.	94
SlossSheffi'd,com.	57
Sloss Sheffield, pf.	103
Tennessee Copper	24½
Utah Copper	45¾
U. S. Steel, com.	70¼
U. S. Steel, pf.	116¾
Va. Car. Chem.	57¼

N. Y. CURB Aug. 23

Name of Comp.	Clg.
Bonanza Creek	‡3
Boston Copper	‡18
Braden Copper	3⅝
B. C. Copper	4⅞
Buffalo Mines	‡2½
Butte Coalition	19½
Caledonia	⅝
Chino	14⅝
Cobalt Central	8½
Cobalt Prov.	‡59
Con. Ariz. Sm.	2⅛
Cumberland Ely	‡9
Davis-Daly	1⅝
Dominion Cop.	‡7
Ely Con	.32
El Rayo	3⅝
Florence	2
Gila Copper	‡5
Giroux	6⅝
Gold Hill	¼
Goldfield Con.	8½
Greene Cananea	7½
Guanajuato	‡1⅞
Guggen. Exp.	180
Kerr Lake	6⅝
La Rose	4
McKinley-Dar-Sa.	1.05
Miami Copper	19⅞
Mines Co. of Am.	56
Mont. Shoshone	‡.37½
Mont.-Tonopah	‡.98
Nev. Utah M. & S.	¾
New Baltic	5
Newhouse M. & S.	‡3½
Nipissing Mines	10⅞
Ohio Copper	2⅛
Pacific Sm. & M.	⅞
Ray Central	2⅛
Ray Con	18¼
Silver Queen	‡.35
Standard Oil	600
Stewart	¼
Tonopah	8⅝
Tonopah Ex.	.93
Tri-Bullion	‡⅝
W. Va. Wyo. Cop.	‡2⅛
Yukon Gold	3⅛

BOSTON EXCH. Aug. 23

Name of Comp.	Clg.
Adventure	6½
Allouez	41
Am. Zinc	25
Arcadian	5½
Arizona Com.	17
Atlantic	6½
Boston Con.	‡15
Butte & Balak.	8⅜
Calumet & Ariz.	62½
Calumet & Hecla.	550
Centennial	18
Con. Mercur	10
Copper Range	66¼
Daly-West	7¾
East Butte	8¼
Franklin	10⅝
Granby	35
Hancock	21½
Helvetia	2½
Indiana	18⅜
Isle Royale	17½
Keweenaw	3¾
Lake	38¾
La Salle	10½
Mass	7½
Michigan	4¾
Mohawk	50
Nevada	20¼
North Butte	29½
North Lake	10⅝
Ojibway	‡6¾
Old Dominion	37½
Osceola	130
Parrot	14¼
Quincy	74
Shannon	10¼
Superior	46¾
Superior & Bost.	8¼
Superior & Pitts.	11½
Tamarack	57
Trinity	6½
U. S. Smg. & Ref.	38¾
U.S.Sm. & Re., pd.	49
Utah Apex	3⅝
Utah Con.	24
Victoria	3
Winona	8¾
Wolverine	130
Wyandotte	1½

BOSTON CURB Aug. 23

Name of Comp.	Clg.
Ahmeek	180
Bingham Mines	‡3
Boston Ely	1⅝
Boswyocolo	.07
Cactus	1¾
Calaveras	11¼
Champion	.05½
Chemung	‡8½
Chief Cons	1⅜
Cons. Ariz.	2⅛
Corbin	5⅞
Crown Reserve	2¾
First Nat. Cop.	4
Inspiration	8¼
Mackinaw	.12
Majestic	.53
Nat'l Mine	.21
Nevada-Douglas	2
Oneco	2¾
Raven Copper	.30
Rhode Island Coal	7
San Antonio	6
Shattuck-Ariz.	21
South Lake	9½
Superior & Globe	.23
Trethewey	1⅞
Tuolumne Copper	2¾
Vulture	9¼
Yuma	.40

‡Last quotation.