

The Engineering and Mining Journal

VOLUME 98

NOVEMBER 7, 1914

NUMBER 19

The Calumet & Hecla Dredge

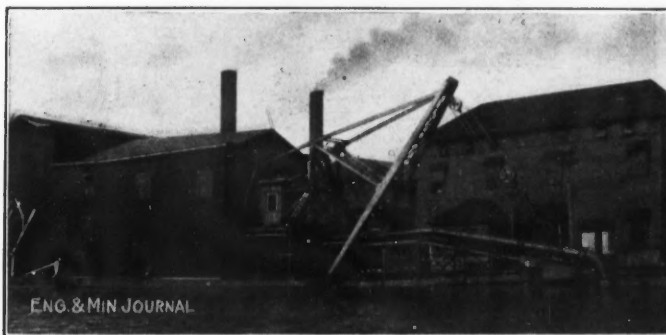
By L. E. IVES*

SYNOPSIS—The Calumet & Hecla company will reclaim the sands in Torch Lake by a suction dredge fitted for the deepest digging yet done by that system. Some of the sand will require screening on the dredge, this screening presenting an interesting problem.

In the JOURNAL for July 18 and Aug. 22, 1914, rather brief mention was made of the fact that the Calumet & Hecla Mining Co. was completing the erection of a large hydraulic dredge, to be used in handling the tailings in Torch Lake, Mich., adjacent to the stamp mills. A more complete and detailed description of this dredge is now available.

For more than 40 years the Calumet & Hecla company has been depositing its mill tailings in this lake, and they were long considered worthless. Improved methods of mining and treatment, leading to lower costs, coupled

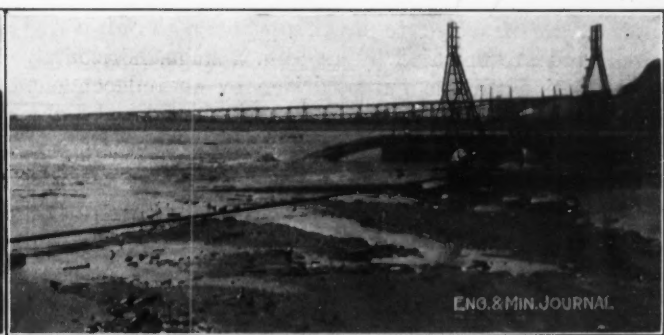
depth of 100 ft. below the surface of the lake, a greater depth than has ever before been attempted by a hydraulic dredge. Up to the present, the maximum depth dredged in this manner has been attained by the sand suckers in Long Island Sound, a depth of 70 ft. Certain conditions that had to be met rendered the design of the dredge a somewhat complex problem. Portions of the tailings piles have been used as a public dump in the past, and consequently contain some foreign matter. This necessitated screening the material thoroughly before delivering it to the plant on shore. But since only a portion of the material requires screening, such an arrangement of the dredge was also necessary as would permit the screen to be cut out when not required. This has led to the use of two pumps and a complicated control. The hull is of steel, 110 ft. long, 56 ft. wide and 9 ft. deep. In addition, the deck has an 8-ft. overhang, making the



THE CALUMET & HECLA DREDGE COMPLETED

with a gradually decreasing copper content as the depth of mining increased, eventually caused serious consideration to be given these deposits. Subsequent experiments indicated a recoverable value and a method. An important part of the problem was an economical means for getting the sands out of the lake and into the treatment plant on shore. The amount of these sands, including those on shore and that portion entirely covered with water, has been estimated to be about 40,000,000 tons. A hydraulic dredge of unusual design was decided upon and this has been under construction during most of the last summer at Lake Linden, Michigan.

The dredge, which was designed and built by the Bucyrus Co., South Milwaukee, Wis., is intended to dig to a



END OF DISCHARGE LINE, SHOWING PONTOONS

extreme width of the hull 72 ft. The digging ladder is 136 ft. long requiring a ladder well 70 ft. long and 10 ft. wide. This unusual length of well demanded an exceedingly heavy overhead truss. There are two centrifugal dredging pumps, each 20 in. in diameter. No. 1 pump is driven by a 750-hp. motor and No. 2 by a motor of 1250 hp. Pump No. 1 delivers the material directly from the lake to the screen on the dredge.

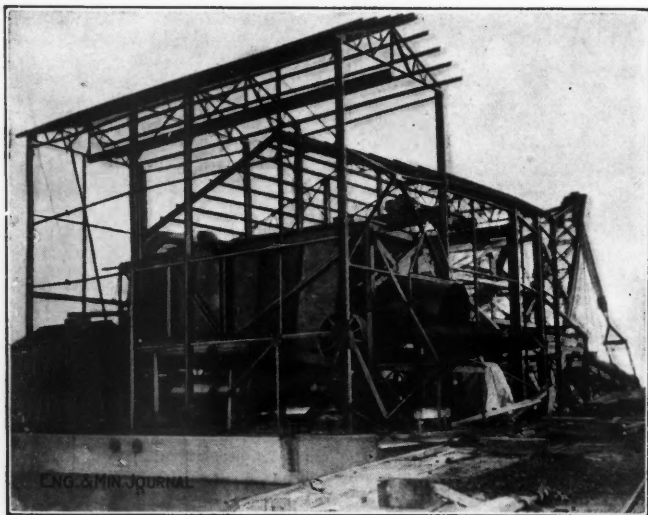
When the screen is disconnected, which is done by changing the pipe connection, this pump delivers the material ashore through a pipe line 800 ft. long, with a maximum elevation of about 30 ft. No. 2 pump delivers ashore from the sump under the screen through a pipe line 2500 to 3000 ft. long, with a maximum elevation of about 10 ft. This pump is designed for connection to the suction pipe to deliver the material directly from

*Chicago editor, "Engineering and Mining Journal."

the bottom of the lake to the shore in place of No. 1 pump. Either pump may be used independently when the screen is not in use, the decision as to which pump should be used depending on the length of the pipe line at the time. It is impossible, of course, to make one pump suffice, as the screen, when in use, breaks the flow. This screen is 7 ft. in diameter, about 45 ft. long, and is made of manganese plates with 1-in. circular perforations. It delivers the refuse to a scow alongside the dredge.

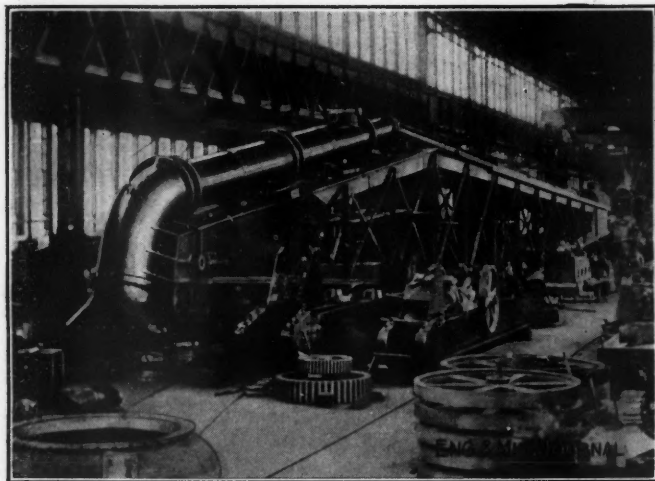
DREDGE WORKS ON HEAD AND SIDE LINES

The sands are of a loose character, having no binder, and the use of a cutterhead is unnecessary. Hydraulic jets,



THE DREDGE DURING CONSTRUCTION

however, are provided to break up the material if required, and are operated by an 8-in. 2-stage, horizontal, double-suction turbine pump, driven by an independent motor. Because of the great depth of the lake and the



LADDER AND SUCTION IN BUCYRUS SHOPS

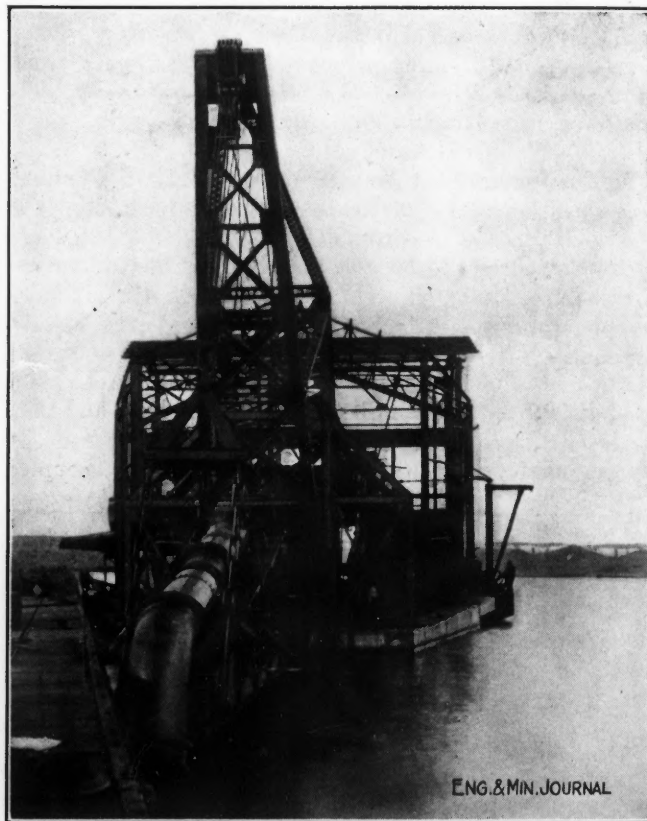
soft nature of the material, the dredge works on head and side lines instead of spuds. It is customary on dredges of this type to have one winch, but the length of the ladder well in this one makes the use of two winches necessary. Each of these winches has four drums, one each for the ladder hoist, two bow swing lines, two ladder

swing lines, two stern swing lines and a tail line. Each is driven by an independent 50-hp. motor.

A compressor furnishes air to operate the air cylinders which control the friction clutches. Provision has been made to seal the swivel joints in the suction pipe, to prevent air leaks, by using a 6-in. service pump of the same type as the jet pump. There is also an overhead crane for serving the machinery. It was necessary to make some provision for heating the dredge, and a 75-hp. boiler has been installed which will also furnish power for driving the capstans and for the electric-light plant when the dredge is being shifted and no electric power is available.

PUMPS ARE BALANCED

The use of two pumps caused some unusual features of control. In the first place, the pumps must be balanced,



BOW END OF DREDGE

so that No. 1 will not deliver more material than No. 2 can take care of. No. 1 works under a constant load, while the load that No. 2 carries varies according to the length of the discharge pipe which is being used. A careful adjusting of the speeds of the pumps was therefore necessary. To accomplish this, a water rheostat has been adopted, and this is said to be the first time it has ever been tried in the United States for large motors. This rheostat gives an infinite number of speed-control points, and is therefore flexible. The speed is governed by the height of the liquid in the rheostat tanks, and the flow is controlled by a pivoted overflow pipe, which is full on when in a vertical position and off when horizontal. The operator controls the position of the pipe. Because of the danger of heating, the liquid must be kept in circulation; it is pumped through cooling coils and returned to a storage tank overhead, from which it flows by gravity into the

rheostat tanks. The flow is controlled by a valve with an automatic solenoid control, and a 3-in. centrifugal pump driven by an independent motor, does the pumping. Another interesting feature is the interlocking electrical control which prevents starting and stopping the pumps in the wrong order. The electrical-control apparatus on the dredge was furnished by the Cutler-Hammer Mfg. Co., Milwaukee, and the motors are from the General Electric Co. The electric power to be used is 2100 volts, 25-cycle, 3-phase.

DISCHARGE LINE

The discharge line and the means used to support it are specially interesting. The great amount of material to be dredged made it desirable to employ unusually durable pipe. Lap-welded steel pipe was finally installed throughout. The line consists approximately of 500 ft. of floating pipe and 1250 ft. of shore line, and is all 20 in. internal diameter. The majority of it is $\frac{1}{2}$ in. thick, but a few lengths of $\frac{3}{4}$ -in. pipe were inserted for experimental purposes as to durability. Most of the floating pipes have oval bands welded on the ends for joining by rubber sleeves, but two flexible joints have been used for comparison with the sleeves. One of these is a Parker joint and the other is a special design of manganese steel with a manganese liner. The floating line is made up of 20-ft. lengths, and the shore line of 30-ft. lengths. The latter has rolled-steel flanges shrunk on the ends for joining the pipes together. When the pipe wears out, these flanges will be cut off, bored out and shrunk on new pipe, permitting the renewal of the line with plain-end pipe, and the indefinite use of the old flanges.

PONTOONS

Twenty-six pontoons carry the floating discharge line. Each pontoon consists of two steel cylinders, 48 in. in internal diameter and 17 ft. 2 in. long, with the necessary structural work. The sides of these cylinders are $\frac{1}{4}$ in. thick, heads $\frac{5}{16}$ in., and they are forge-welded throughout. Rivets were employed only to secure the structural work and cross-bracing between the cylinders, and these rivets were all placed above the water line. An accompanying illustration shows one of these pontoons being erected, and brings out well the structural tower which carries the high-tension wires for operating the dredge. Each tower is provided with a ladder to permit easy access. It is hoped that the use of welded pontoons and an absence of rivets below the water line will result in a longer life for the pontoons, due to the smooth surface and consequent freedom from erosion.

The severity of the winters in the Michigan copper country led to another feature in this installation. It was important that enough material be stored within a small radius, close to the regrinding plant, to insure oper-

ation of the latter through the winter. It is possible to keep the ice broken over only a small area. To accomplish this a portion of the discharge from the 20-in. line from the dredge is carried to the selected area, during the summer, through a Y-valve and a separate line. In the winter, the regrinding plant can get a supply from this storage bank. A structural bridge, swinging over the entire bank, carries the suction line which connects to a centrifugal pump in the regrinding plant. This suction line is made up of 12-in. lap-welded pipe, $\frac{1}{2}$ in. thick, with forge-welded flanges. A special suction head is provided with a manganese cutting blade, swivel joints, flap valves, etc., all made with manganese wearing parts. The pipe line and pontoons were furnished by the M. W. Kellogg Co., Engineers and Contractors, 50 Church St., New York. The dredge will not be operated to full capacity, probably, until next spring.

How a Bureaucracy Runs the Post Office

The Boston *News Bureau* has seen a recent report on postage on second-class mail matter and compensation for the transportation of mail submitted by a congressional joint committee, and says that it is a sweeping arraignment of the "vacillation and inconsistency" of the post-office department. While it is only fair to state that four out of the six members of the committee dissented from the vigorous criticisms of the post-office department, all were agreed that the report correctly states the finding of facts on the subject of railway mail pay. The committee was composed of Jonathan Bourne, Jr. (chairman), Harry A. Richardson, John H. Bankhead, James T. Lloyd, William E. Tuttle, Jr., and John W. Weeks. The following quotations are from this report:

Before closing this report, we deem it our duty to inform Congress that our work has been greatly handicapped by a deplorable lack of definite information in the post-office department regarding its own operations and by the attitude of the representatives of both the post-office department and the railroads.

Notwithstanding numerous concrete instances of departmental vacillation and its lack of comprehension of the essentials of successful business operations, we are confronted with the fact that the present postmaster-general and his predecessor have each furnished an illustration of the greed for additional power innate in humanity by advocating government ownership and operation, under the post-office department, of the telephone and telegraph systems of this country.

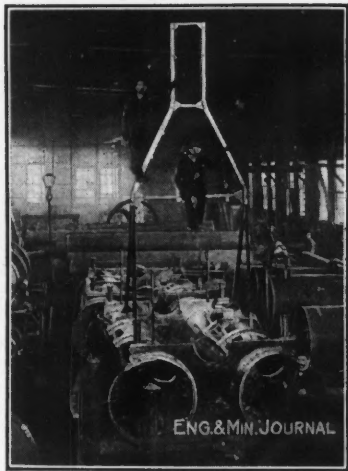
With any reasonable degree of effort, the department should be able to give accurate statistics regarding the extent of its activities, the cost of the service, and the revenue therefrom. The fact is, on the contrary, that the department has not been and is not now so conducted as to be able to do this, although attention has been called to the defects in the accounting system.

While it is an injury to the pride of an American citizen to know that the most important of our governmental institutions is so utterly lacking in knowledge of its own business affairs, as this record has disclosed, we believe it is a duty we owe to the country, to Congress, and to ourselves to state these facts in order that others may not be misled by assuming that departmental statistics are reliable.

This exposé of the inadequacy of departmental statistics and the vacillation and inconsistency of the department is not prompted by partisan feeling. The record has been made in the administration of two political parties.

Possessed of the power the post-office department has requested in the various measures it has proposed and advocated, the postmaster-general might well exclaim in the language of a famous European monarch, "The state! I am the state!"

In view of the evidence showing the inability of the department to procure and present reliable statistics regard-



PONTOON AND TOWER FOR WIRE SUPPORTS

ing its own operations, it is difficult to conceive how the department could imagine itself competent to make an apportionment of expenses between freight and passenger train service and among passengers, express and mail.

Equally difficult is it to comprehend by what course of reasoning the department could bring itself to believe that Congress might enact a law which required the railroads to carry mail and then bestowed upon the postmaster-general the power to fix the rates.

Verily, this is bureaucracy gone mad!

Moving Steel Tanks without Dismantling

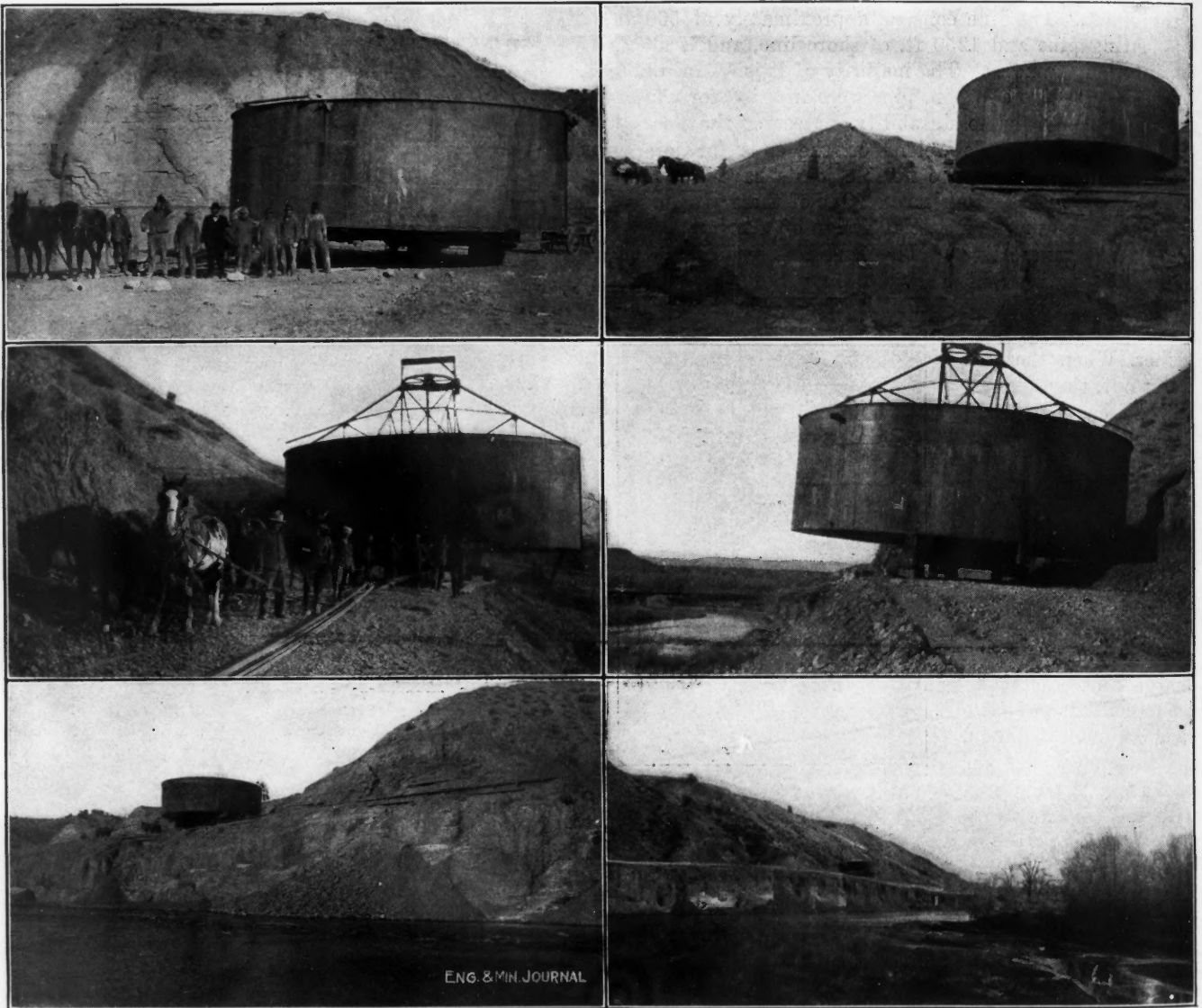
By HENRY EGGERS*

After obtaining a lease on the old Metallic tailings dump, situated about two miles from the once thriving

of a dump which was located at the foot of the hill in the vicinity of the Union mill, this plant consisting of one large tube mill and five steel tanks, 36x13 ft., to handle 500 tons of material daily. These tanks were purchased to form the nucleus of the new plant.

The Metallic dump is located about one mile from the site of the Union plant. In order to place the tanks on the Metallic grounds, it was necessary to construct a road along the hillside on the north bank of the Arkansas River. An old road was already there, but having been abandoned for some time, it was too narrow, so it was widened and brought to an even grade. The road was completed about Jan. 15, 1914.

The equipment used was a set of three house-mover's



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MOVING STEEL TANKS WITHOUT DISMANTLING

Starting on the last section.
Tank with thickener mechanism.
Skirting the river.

Road cribbed to permit passage of tank.
Overhanging the river.
Distant view of tank en route.

mill city of Florence, Colo., it was necessary to secure a plant suitable for the treatment of the tailings by the cyanide process.

The United States Reduction & Refining Co., of Colorado springs, Colo., had just completed the treatment

*Mine & Smelter Supply Co., Denver, Colo.

trucks. The front or forward truck was of four wheels, while the two rear ones had but two. They were set in a triangle, making what is called a three-point load. This system of loading and moving objects keeps them from getting a twist, and was the only way these large tanks could successfully be handled.

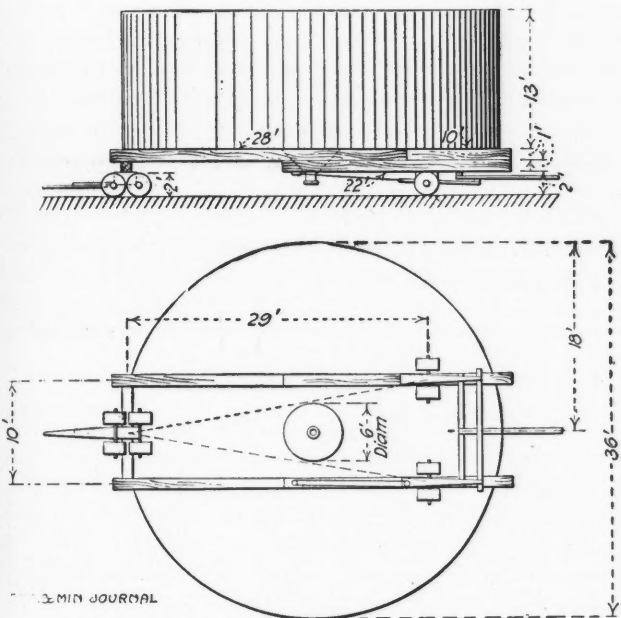
The timbers used under the tanks were 12x12 in. x 38 ft. long. They were spliced, as none were to be had of such great length. Horses were used, one team when the roads were good, but when in bad condition a second was added. Most of the moving was done with one team. The teams pulled on a set of steel blocks, one being a double 12-in. and the other a 12-in. triplex block. They were reaved with 200 ft. of 1 1/4-in. manila rope. Some steel cable was strung out in various places to hitch to; a number of posts were buried along the road convenient to tie to and a 3/4-in. steel cable was carried along, and with it hitches to the blocks were made, the cable being made fast to the posts or deadmen. On the hills, there was danger in lowering the tanks of having them get away, so a 12x12-in. post, about 12 ft. long, was buried 6 ft. in the

bed composed of soft, loamy soil and sand. This section had no bottom at all, so planks had to be used again.

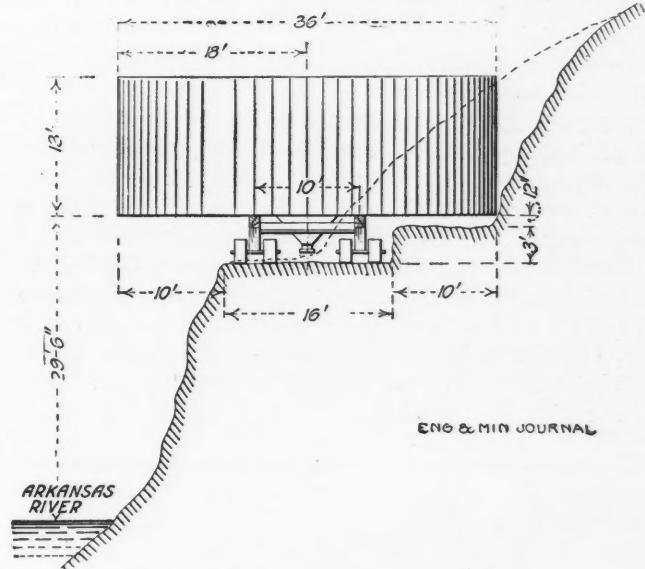
COST OF MOVING TANKS

Cost of trucks f.o.b. Florence	\$279.25
Cost of road construction	460.00
Cost of rope, chains, tools, etc.	197.50
Moving tank No. 1	277.60
Moving tank No. 2	253.00
Moving tank No. 3	228.00
Moving tank No. 4	242.78
Moving tank No. 5	211.00
Total	\$2149.13

The cost of moving the tanks is shown in the table. The prices include all costs of loading, moving, tearing



TRUCKS PLACED UNDER THE TANK



HOW THE ROAD HAD TO BE CUT OUT
Dotted line shows old road.

out old foundations and unloading from trucks to the new foundations.

The work was planned and carried out by Morrison Bros., of Florence, Colo., who deserve great credit for its success. The tanks, when set up in their new situation, were found to be in proper shape, true and tight.

Iron Ore in the Philippines

The Philippine *Journal of Science* reports that H. F. Cameron, department engineer for Mindanao and Sulu, has discovered a deposit of iron ore in Surigao province on the island of Mindanao, which appears to be of large extent, probably covering an area of 40 square miles. The ore is a clayey red limonite, carrying 55 to 60% metallic iron; no sulphur or phosphorus, but traces of chromium. The area over which the deposit extends has been reserved from mineral location, by order of the government, until further information can be obtained as to the extent and value of the deposit, through surveys to be made by the Bureau of Science.

An article on the "Iron Ores of Bulacan Province," by F. A. Dalburg and Wallace E. Pratt, has been published by the *Journal of Science*. The Bulacan ores are hematite and magnetite in intimate mixture with quartz as the typical gangue material. They are found in proximity to limestone usually, and a few veins of the ore occur in limestone. The deposits form detached lenses along the base of Miocene sedimentaries and the underlying older igneous base. The walls are replaced in part by ore and consist of a decomposed green aggregate of complex

ground. An old 1-in. steel cable, 600 ft. long, was used by fastening one end of it to the tank and throwing it around this post. It made a good drag, and the brake difficulty was overcome in what seemed to be the only safe way to get to the bottom without mishap.

The weight of the tanks was approximately 15 tons. They were 36 ft. in diameter, 13 ft. deep and constructed of 3/4-in. steel. The moving crew consisted of four men, one team and driver, and one of the leasers who had the work in charge. The first tank moved was somewhat heavier than the others, since it contained a Dorr thickener and its necessary machinery.

The road was divided into four sections, No. 1, of 1000 ft., having its starting point across the dump made by the plant we were moving. This section was in soft sand, which necessitated using plank under the wheels of the trucks. In this section a power and a telephone line were encountered, which was another hindrance. Section No. 2 was 1320 ft. long and the most treacherous part of the trip, being the dug-way along the bank of the river. The accompanying photographs explain the situation clearly. Section No. 3, 1500 ft., was the part that had the hills and cuts. This section took perhaps more engineering than the others, as the turns, curves and grades were bad. Section No. 4 was 1320 ft. long and was an old river

basic silicate minerals, a material probably somewhat analogous to the "skarn" of the Scandinavian geologists. The Bulacan ores are considered to be the result of contact mineralization following the intrusion of igneous dike rocks; much of the ore appears to be a replacement of limestone and other intruded rocks. There is no development work which affords a basis for estimating the quantity of ore available.

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The Metallurgical Centers of Belgium

The accompanying map shows the situation of the principal lead- and zinc-smelting works of Belgium. Most of these are in the regions that have been devastated by the military operations. Besides the Belgian works, certain adjacent works in France, Holland and Rhenish-Prussia are shown. The names of the places where there are lead- and zinc-smelting works are underlined.

The first zinc smelting in Belgium was done at Liège. One of the principal smelteries of the Vieille Montagne company is still at Angleur, or as is more commonly called now, Chenée, which is a suburb of Liège. The works built later were strung out along the Meuse River. This whole region is in the heart of one of the important coal

Liège and the other smelting works on the Meuse very cheaply.

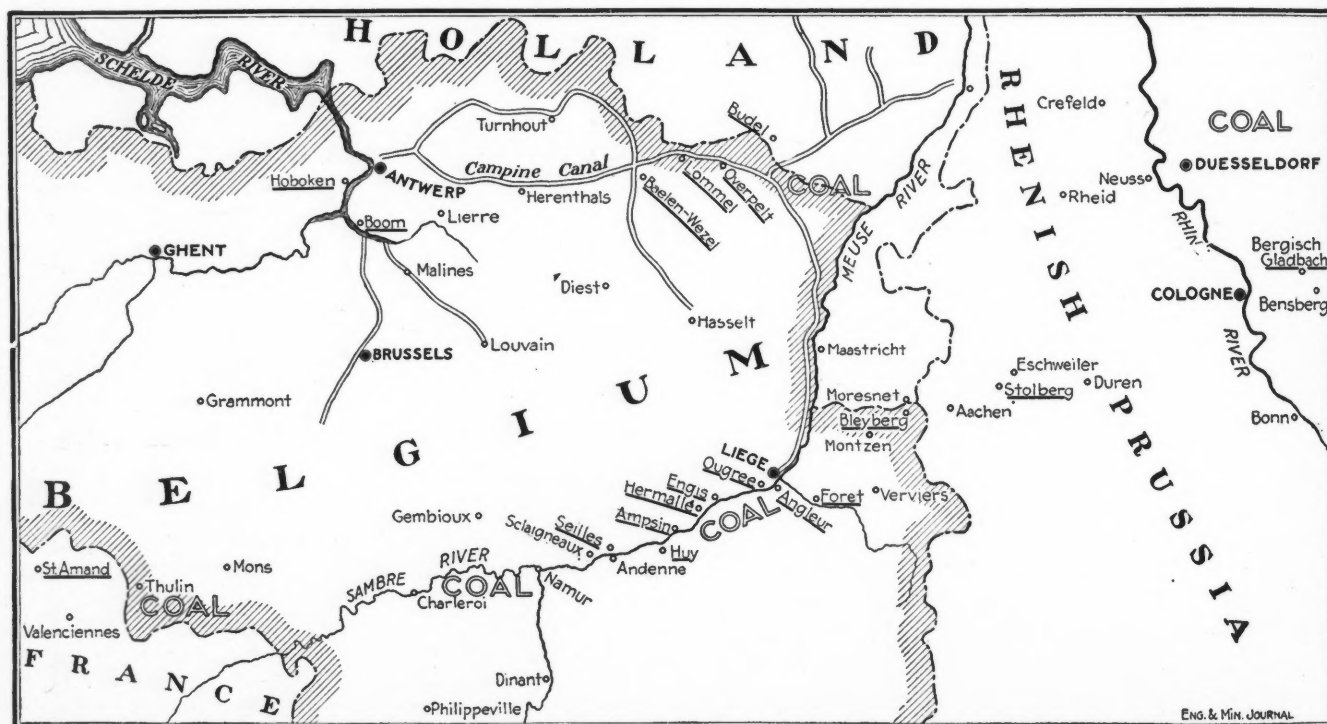
The discovery of coal in the Belgian and Dutch provinces of Limburg, led in late years to the erection of a new group of smelting works north of Liège, in Belgium, just over the line in Holland. These works are situated in a flat sandy country, known as the Campine, where the smoke does no particular harm. There are zinc smelteries at Budel in Holland, and at Overpelt and Lommel, in Belgium. At Baelen-Wezel is the large blende-roasting plant and sulphuric-acid works of the Vieille Montagne company.

Thus it may be seen that there are two main zinc-smelting districts of Belgium, viz., the Liège district and the Campine. There is also a zinc-smelting works at Boom, near Antwerp. At Hoboken, near Antwerp, there is a large and famous lead-refining establishment. Since the war began, we have not received much information about the zinc works on the Meuse, but those in the Campine are known to be intact.

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Bureau of Mines Petroleum Library

The U. S. Bureau of Mines has begun the collection of a general library of petroleum literature, under the direc-



THE LEAD AND ZINC SMELTING WORKS OF BELGIUM

fields of Belgium. The ore supply was derived originally from the famous mines at Moresnet, the little neutral territory that is of so great historic interest. The home supply of ore has been insignificant for a great many years and the immense tonnage smelted in the Belgian works has come from foreign countries. This has chiefly entered Belgium through Antwerp, the Liverpool of Western Europe.

The wonderful canal system of Belgium, especially the famous Campine Canal, has enabled the ore to be taken to

tion of W. A. Williams, chief petroleum technologist. The details of this work have been assigned to Dr. David T. Day, who has recently been transferred from the U. S. Geological Survey as petroleum technologist, and who will also assist in a thoroughly organized research into the chemistry of oils, which is being undertaken by the Bureau of Mines. The importance of such a library is so manifest that it is hoped all technologists will aid in the work by exchanging with the bureau all available books and maps on this subject.

Handling Gold Dust at Fairbanks

BY HUBERT I. ELLIS*

SYNOPSIS—With the discovery of placer gold in the Yukon, gold dust became the usual medium of commercial exchange. It was valued at a fixed amount and dilution was a regular practice. Most of it averaged from \$15 to \$17 an ounce, and \$16 was the value in exchange. Banks competed for its purchase until some were bankrupt, when an assay basis and percentage deduction were made standard. Melting and casting into bricks is now practiced for transportation by mail or express. Special methods of assay are described.

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The first discovery of gold in the Yukon drainage basin was made on the Tanana in the early '70s. In 1886 the Fortymile placers, and in the early '90s the Koyukuk, Rampart, and Birch Creek deposits were found, probably in the order named. But it remained for the discovery of the bonanzas of the Klondike, in 1896, to give mining in the region tributary to the Yukon River its first big impetus. The overflow from the Dawson stampede led indirectly to the discovery of pay at Fairbanks in 1903, and the overflow from Fairbanks led to the finding of important placers in other parts of the American Yukon, notably at Iditarod and Ruby.¹

GOLD DUST AS AN EXCHANGE MEDIUM

This area, including the similar deposits of the adjacent Canadian Yukon, has produced gold to the value of more than \$200,000,000. The development of a mining industry of such magnitude in an isolated region with its new and peculiar conditions naturally involved the introduction of many practices uncommon in other parts of the world. In the absence of coin and banknotes, raw gold dust became the universal medium of exchange, and for years a pair of scales was essential to every commercial transaction, even down to the purchase of a cigar or a drink. With the coming of the banks, currency was exchanged for the miners' gold, and the banks became buyers of gold dust on a large scale. This buying of dust has long been one of the most important lines of activity of the banks of the North, and it is a line unknown under similar conditions to banks in other parts of the world.

Gold dust as a medium of exchange reached its highest and most interesting development at Dawson. That camp was discovered in 1896, and in the course of two or three years the production leaped to a maximum of nearly \$20,000,000 for a single season. Thousands of Argonauts flocked into the Klondike, but since they were seekers of gold, they naturally brought no currency with them. Banks were early established, but the production was so great and the demand for a medium of exchange so insistent that the few millions of currency which they put in circulation annually was but as a drop in the bucket. It was only about 1902, when the exhaustion of the bonanzas had brought in its wake a dwindling of production, that banknotes became sufficiently abundant to supply the needs of the population.

*Fairbanks, Alaska.

¹The writer is indebted to Paul Hopkins, assayer for the American Bank of Alaska for most of the data on which this paper is based and for much assistance in collaboration.

Dawson gold dust circulated at \$16 an ounce flat, but it was worth, on the average, appreciably less than that. The more it was handled, the lower became the grade. Just as it was not regarded as a heinous offense to "high-grade" at Goldfield, so it was considered perfectly fair to dilute a "poke" of gold dust with black sand at Dawson—for did not the succeeding owner save himself from loss by passing it on to someone else? On a few occasions brass filings were also used for purposes of dilution, but this was generally held to be a reprehensible practice bordering on downright dishonesty, and died from the lack of public sanction. The last holder of the dust, the one who sold it on an assay basis, invariably lost money on the transaction, which was probably one reason why gold dust held its popularity so long as a medium of exchange, since nobody wanted to be the "goat."

MANY SWINDLING METHODS

There were other methods of robbery in vogue at Dawson besides diluting the dust. The scales were usually set on a strip of carpet, and sometimes a tub was placed beneath the counter, out of sight of the customers; the few grains of gold carefully spilled each time a weighing was made were thus saved, and in the course of time they made a respectable total. It was considered good form, especially in the saloons, to hand the poke to the cashier and allow him to help himself. Needless to say, the "house" never got the worst of the bargain, especially on occasions when the owner of the poke had reached that psychologically interesting stage in his alcoholics when every cloud had a golden lining and each chance bystander took the place of a long-lost friend. The position of porter in the saloons and dance-halls, carrying with it the inestimable privilege of sweeping the floor (and, incidentally, of panning the sweepings) was eagerly sought; usually the "house" got a certain proportion of the gold recovered as "rake-off."

Most of the gold produced at Dawson ranged between \$15 and \$17 an ounce in value but, as noted above, the grade depreciated in handling; yet it all had an exchange value of \$16. Operators whose gold was worth more than \$16 frequently exchanged it at a premium for dust of a lower grade with which to pay their bills.

There never was much coin at Dawson, owing to the cost of bringing it in; but the gamblers imported considerable silver for their own use, and this gradually became more widely distributed. It may be interesting to note that even now there are no coins in circulation either at Dawson or Fairbanks of a smaller denomination than the 25-cent piece. No attempt was made in the North to cast "slugs" of gold, as was done in California in the early days. In that district, the assayers made disks and bars of gold, which they stamped with the weight and fineness, and with the name of the individual assayer as a guarantee. These were made in sizes worth from five or ten to several hundred dollars, and circulated freely at their face value. The territorial government of California also made octagonal slugs of gold worth \$50 each.

In the interior of Alaska, dust has passed more or less since long before the discovery of Dawson, but it never attained such importance as a medium of exchange as

it did there. The first important production at Fairbanks was made in 1904, and banks were organized immediately. Some dust circulated during the first year or two of the camp, however, and some still circulates in outlying districts, especially along the Yukon and in the Koyukuk. One thing that militates against the dust from Fairbanks and other Alaska districts as an exchange medium is its great range in value. While nearly all the Dawson gold fell within the limits of \$15 and \$17 an ounce, the range at Fairbanks is from \$12 to \$19—and even these figures do not represent the extreme limits, small pokes sometimes running higher or lower.

METHODS FOLLOWED BY BANKS IN PURCHASING DUST

In 1904, the Fairbanks bankers attempted to make a charge of 4% for handling the dust for the miners,² which would seem to be reasonable enough in view of the 5% charged at Dawson in the early days. So much objection was made by the miners, however, that the charge was soon reduced to 2½%—which means that the depositor receives 97½% of the actual coinage value of the gold, the bank paying all expenses, including the mint charges, from its 2½%. One of the heavy items of expense for the banks is due to the necessity of importing a large amount of currency each spring. During the annual fall exodus to the States, hundreds of thousands of dollars are taken from the district as actual cash, thus creating a deficiency which must be supplied before the next season. Individual banks have had to import as much as a million dollars in a single year, the expense of which must be included in the cost of handling the gold dust. At Dawson, the banks issue their own currency, as provided by the laws of the Dominion; they simply import the unsigned banknotes, sign them, and put them in circulation, all at a minimum of expense.

The nominal charge of 2½% at Fairbanks was rendered inoperative for several years by intense competition among the banks—competition which eventually helped force two of them to the wall. The practice was started of buying the dust outright at a definite price per ounce, the bankers merely taking the precaution of cleaning the dust thoroughly by “blowing” before weighing. Thus, if one bank offered \$17.50 for the dust from a certain claim, another would offer \$17.55 an ounce; in this manner the purchasing price was raised, a few cents at a time, until the profit for the banks dwindled to the vanishing point, and even became converted into an actual loss.

This unhealthy condition of banking affairs lasted for several seasons, during which none of the banks made more than an insignificant profit in handling gold dust, and then they ceased bidding against each other and reverted to the practice of making final payment only on completion of the assay. An advance is made within safe limits previously to assay, however, when required by the depositor. Dust from claims where experience has shown the grade to be uniform is also occasionally bought on the result of former assays. Ordinarily, each lot of dust is assayed separately, except when 10 oz. or less in weight, in which case the expense of the assay, which is debited to the depositor, would be greater than any probable variation in the value of the dust.

²The charge made by the banks at Dawson is now about 4%. The miner there must also pay a government royalty, which was 10% at first but which has been gradually reduced to 2 or 2½%. (Exact data as to the royalty and the bank charges at Dawson could not be obtained by the writer.)

Silver in the bullion is paid for to the nearest five cents an ounce, no attempt being made to follow the market quotations of the outside. Several hundred dollars may be lost in a season this way, but it is sure to be regained when the quotations, in their ceaseless rise and fall, favor the bank.

FINENESS OF VARIOUS KINDS OF YUKON GOLD

The fineness of the bullion produced from Fairbanks and contiguous districts varies from less than 600 for some of the Tenderfoot gold to 965 for some of that from the Koyukuk. (Unless otherwise shown by the context, the word “fine” and its derivatives as used in this paper refers to the bullion produced after melting the dust. The shrinkage on melting varies widely, but averages 2 or 3%). On any individual creek, the fineness of the bullion increases progressively downstream from the source. This is proved by numerous assays, which are not, unfortunately, available for publication, but it is a well known fact among mining men throughout the district. Since the average size of the individual particles composing the dust decreases toward the mouth of a creek, it follows that the fineness of the bullion increases as the grains of gold become smaller. The fineness of the bullion also increases from the sides of the paystreak toward the center; that is, the main paystreak produces bullion of a higher grade than does the so called side-pay. But the gold from the main paystreak is coarser than that from the side-pay, and this brings out an interesting relation, which has never been satisfactorily explained. In the longitudinal direction of a creek, the fineness of the bullion decreases with coarser gold; at right angles to the creek, the fineness increases with coarser gold. Aside from this, however, there are few known exceptions to the rule that the coarser gold from any one cleanup produces higher grade bullion than the gold of smaller grain. The relation is clearly shown in the appended tabulation of the results obtained by actually screening a cleanup from Dome Creek and assaying the different sizes separately:

VALUE OF GOLD GRAINS OF DIFFERENT SIZES					
Size	Wt. before melting	Wt. after melting	Loss %	Fineness 1000ths	Value, per oz.
On 1.8 mm. . . .	38.67 oz.	37.29 oz.	3.57	904.5	\$17.61
On 1.1 mm. . . .	70.86	69.37	2.10	893.5	17.68
On 0.7 mm. . . .	62.35	61.30	1.69	887.5	17.64
Through 0.7 . .	52.52	51.57	1.81	884.0	17.55
Totals and averages..	224.40 oz.	219.53	2.17	891.0	17.62

The screen openings are given in millimeters. The value per ounce given is the price paid the depositor for the raw dust, and is the actual coinage value less 2½ per cent.

In practice, such simple relations as those outlined above become complicated when a producing stream has producing tributaries, each producing a dust with its individual characteristics. Those accustomed to handling much gold dust can tell almost at a glance from what creek a cleanup came, and even from what portion of the creek. In one cleanup it is often possible to recognize dust from several different sources, especially when two distinct paystreaks have mingled their gold.

CHARACTER OF THE GOLD DUST

There is very little exceedingly fine-grained, or “float,” gold in the paystreaks of Fairbanks. Undercurrents and amalgamated plates have been installed at various properties in the hope of increasing the savings, but in many

places these have not returned their cost. Neither have many nuggets of considerable size been found, the largest recorded being worth only \$529. It is estimated that fully 75% of the dust that has been produced in the Fairbanks district would pass a 4-mesh screen and that 95% would remain on a 100 mesh. For obvious reasons, actual sizing tests have never been made on a large scale, and the figures noted merely represent a rough guess based on personal observation; they are given some authority, however, by the fact that the dust is frequently screened into various sizes to facilitate cleaning.

The most common impurity of the dust affecting the grade of the bullion consists of iron accidentally introduced, such as pick points and chips broken from the point-heads. This, like the greater part of the black sand, is usually removed before melting, by means of a magnet. Some of the more common natural impurities besides magnetite are quartz, tourmaline, zircon, ilmenite, garnet ("ruby sand"), and other minerals of high specific gravity. Tin minerals, though abundant in the Hot Springs placers, are found only in unimportant amounts in the Fairbanks district proper. Platinum is common in Dawson gold in small quantities, but it is practically unknown at Fairbanks.

MELTING GOLD FOR TRANSPORTATION

One man does all the melting and assaying for one bank. Since the cleanups frequently come in bunches and returns are always desired as soon as possible, speed in manipulation is an important factor. One assayer makes as many as 75 melts in a day, completing the assays on the following day. Most of the melts are of comparatively small lots of dust, but charges of 1000 oz. are not unusual, and even 2200 oz. have been melted in one charge. The largest amount of bullion ever melted at Fairbanks by one man in one day is believed to be \$220,000—about 13,000 ounces.

The details of manipulation here described refer chiefly to the practice at the assay office of the American Bank of Alaska, of Fairbanks. The dust is melted in graphite crucibles in No. 12 Braun furnaces using Cary gasoline burners. Modern tilting furnaces are unsuitable because of the large number of melts made at a time—each lot of dust being melted and assayed separately if more than 10 oz. in weight. As many as fifteen melts have been made simultaneously.

For the sake of ease and rapidity of manipulation, soda alone is used for flux on placer gold, except when the dust is so impure as to require the addition of other chemicals. The soda slag is soft and earthy and is partly soluble in water, which greatly facilitates cleaning the bricks. The addition of even a small proportion of borax gives a hard, glassy slag that can be entirely separated from the brick only after much pounding and scrubbing. No acid is used to clean the bars of bullion, owing partly to the time involved and partly to the ease with which the soda slag is completely separated by pounding, and scrubbing under water. Another great advantage of the plain soda slag for fast work lies in its rapidity of cooling, since it takes only a fourth of the time to solidify required by a borax slag. When the dust contains a large amount of basic impurities, however, some borax is used. Niter is rarely used because it is too destructive of the graphite crucibles. Even with plain soda, care must be exercised.

Melts are skimmed only when the dust contains large nuggets of quartz; the skimmings are returned to the depositor. The slag, also, is returned if requested. For large depositors, the slag from the various melts is saved, and reworked at the end of the season by grinding in a sort of cleanup barrel with mercury. The "blowings" obtained in cleaning the dust before weighing are likewise returned to the depositor.

CRUCIBLES AND FURNACE BOTTOMS

Experience has shown the best furnace bottom to be a simple disk of the same composition as Dixon graphite crucibles. These disks are made to order and are 2 in. thick by 2 in. less in diameter than the interior of the furnace. They are set in a mixture consisting of ground firebrick, 7 parts; portland cement, 2 parts; raw fireclay, 1 part; and water. The burner bosses are grouted in with the same mixture, which has proved to be very serviceable. The graphite disks in the bottom of the furnace permit chipping away the overflow slag without removing the bottom. Fireclay was tried, but it was found that the slag penetrated it to a depth of half an inch, and this had to be taken up in removing the slag. Bone-ash was found to be subject to similar objections, sticking to the crucibles and coming up in great chunks that littered the floor and cleaning tables.

BULLION SOMETIMES SHIPPED BY MAIL

For several seasons, in order to ship the bullion to Seattle by registered mail, 4-lb. bricks were cast. At present when it is desired to ship by mail, bricks are cast in molds balanced on the scales to just under the 11-lb. limit, avoirdupois, and these are insured by the consignee in Seattle upon telegraphic notification of the shipment. Great care is necessary in casting these bars, for if they weigh even a fraction of an ounce too much they are excluded from the mails. In practice, it is found that the slag bubbles up so in pouring that the mold can be filled almost exactly to the required point, many of the bricks coming within two ounces of 11 lb. Each brick, when the melt contains more than enough for one, is stamped with the serial number of the melt and with a letter to distinguish it from its fellows of the same melt. It is only rarely that bullion is remelted, the original bricks being shipped whenever possible. In shipping by express, the bars of gold are sealed in canvas sacks and stored in steel strong-boxes. The bulk of the bullion is shipped in this manner, resort being had to mail shipments only in winter when the rivers are closed to navigation.

Each lot of dust is assayed separately, but duplicate assays are made only when the melt consists of 200 oz. or more. Samples are taken by chipping one corner of the brick, or, in the case of duplicate assays, diagonally opposite corners. No assay for base metal or silver is commonly made on placer bullion, the silver being determined by subtracting the fineness in gold from 0.994, which is the average fineness of the bullion in gold and silver. While there is some variation with placer gold, it is so slight that it is practicable to ignore it. In the case of bullion from the lode mines, however, a determination of silver is made if the brick is large enough to warrant it, and in exceptional cases silver in placer gold is determined by direct assay.

The gold of the assay clippings is charged to a sepa-

rate account, and when the accumulated scrap is melted, the amount realized is credited. The cornets of pure gold resulting from parting are eagerly purchased by the local dentists at \$21 an ounce.

The assays are made in the usual manner, varying only in a few details from the ordinary routine. The proportion of the parting alloy varies from 2:25 to 2:5 parts of silver to 1 of gold. Silver disks are prepared from the waste of the preceding season by precipitating from the nitrate solution as chloride, drying, and melting with soda. The surcharge has been found to vary so little that proof assays are rarely made. The fineness is reported to half-thousandths—not to quarter-thousandths, as is the usual practice.

Inch cupels are used in batches of 12 in a 4x6x10-in. gasoline-fired muffle. For parting, a 12-cup platinum basket and dish is used. The first boiling is in acid of 22° B. and lasts 10 min.; the second lasts 10 min. in 32° acid. Since practically all the silver is removed in the first boiling, the strong acid from one batch is diluted roughly to 22° and used for the first boiling on the succeeding batch. When many assays are to be made, two sets of baskets are used, and these are lifted from one solution to the other to avoid the delay of waiting each time for the acid to come to a boil.

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The Centennial-Eureka Accident

SPECIAL CORRESPONDENCE

The facts concerning the accident in the Oklahoma stope of the Centennial-Eureka mine, in Tintic, Utah, which occurred Sept. 17, are as follows: The country in which the cave occurred was timbered up tight to the roof of the stope. Owing to the fact that the country was more or less broken, extraordinary care had been taken by angle bracing and by doubling the sets to prevent any sudden fall of rock. According to the statements of the two men who were taken out of the stope alive, the fall of rock came without any preliminary indication whatever. The superintendent of the mine had been through the entire extent of the stope a short time before the accident; there was no undue pressure showing upon the timbers and no movement was to be seen. The shift boss in immediate charge had been all through the stope, and had left it 10 or 15 min. before the accident. There was no indication of pressure on the timbers while he was in the stope.

The cause of the accident is, therefore, not known. The only reasonable explanation that can be given is that there was a cave or opening above the orebody, and that the roof of the cave fell, the impact of the rock crushing the stope timbering. If this be the fact, it is the first instance in this mine where such a condition has existed; the ore has uniformly been found in direct contact with the limestone at the top of the stopes. That something of this sort happened is borne out by the fact that only a portion of the stope caved in; a great part of the timbering is still standing in perfect condition and shows no movement whatever. The cave took out a section straight across the middle of the stope.

That there was no warning is shown by the fact that the men were found exactly in their places, or directly under where they were at work, not having had time to move. Of 13 men in the stope, two got out. One mucker

felt a puff of air and jumped into a drift, and protection was afforded to the other by the timbers when they crushed down. Several of the men caught had timbered in the mine for a long time, one of them for 14 years, and if they had noticed any working or pressure would undoubtedly have got out.

Every floor in the stope was filled as the ore was taken out. It was all filled below, and only a few sets and a narrow strip of country was open. Some ore came down in the caved material. About 250 ft. of work has been done through solid rock to reach the caved portion. Six bodies have been taken out. Work in loose material is being done at present by driving lagging.

No similar accident ever happened before in the Centennial-Eureka, and this is the first fatal accident due to mining operations in 20 years.

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Norwegian Molybdenite

SPECIAL CORRESPONDENCE

The molybdenite deposits in Norway range from 1 to 3% MoS₂. The mineral generally occurs in diorite and pegmatite zones, in joints or following small quartz stringers, and many attempts to handle it profitably have failed. The Knaben deposit in South Norway, operated for some years by the Blackwell company, a British corporation, with an annual output of about 25 tons, has been partially successful, but the mines are believed to be exhausted now. Another commercial attempt was the British Molybdenite Co., Ltd., at Oersdalen, about 1906. An output of 100 tons of 3 to 4% ore, and a ton of wolfram were secured with an outlay of about £30,000 (\$150,000). Another operation was conducted in 1912 at Langvand, in Saetersdalen, near the west coast, by the Gewerkschaft Bergmannsglück, Gotha. The results for seven months' work, of 5410 man-shifts, was about 3100 tons of material, which yielded 600 tons of crude ore and 2500 tons of waste rock. Of the crude ore averaging 2.4% MoS₂, 390.5 tons, were milled, yielding 1020 kg. of ore, assaying 51% MoS₂ and 10,030 kg. of slig running about 23% MoS₂. The trouble is the amount of waste rock that must be handled per ton of recoverable content.

In the province of Lister and Mandal, the Kvina Co. obtained power in 1912 and transported milling machinery to the mines in Knabenheim. The Fjotland district, in the above province, is probably the richest in this mineral yet found in Norway. Near Risør, in Nedenaes province, an English company, Nedenaes Molybdenite, Ltd., is sinking a shaft previous to building a flotation mill. The ore is said to run over 3% MoS₂. At Reins-hommen, in Fjotland, about 200 tons of ore were secured.

About 25 tons of low-grade ore were secured from deposits in Liredalen. Director Leo Jansen, of Hildesheimstrasse, Hanover, has worked occurrences in the parish of Grindum. At Naardal, molybdenite occurs in coarse lumps in quartz; at Flottorp ore is also found though subsequent treatment is necessary. There are also deposits in Lyngdal. Samples from the Folden molybdenite deposits in Nordland have been shown in Christiania, including nuggets, sorted ore, and some enriched by the Elmore process. The country rock there is granite in lode-like masses dipping to the southeast. These are the more important of the deposits already found.

Modern American Rock Drills--IV

BY L. O. KELLOGG

SYNOPSIS—Points of difference between hammer and piston machines. General features of hammer machines with differences in detail. The Leyner machine, the sole representative of its class, is mounted in a shell and used like a piston machine. It uses air and water conveyed through hollow steel to clean the hole bottom.

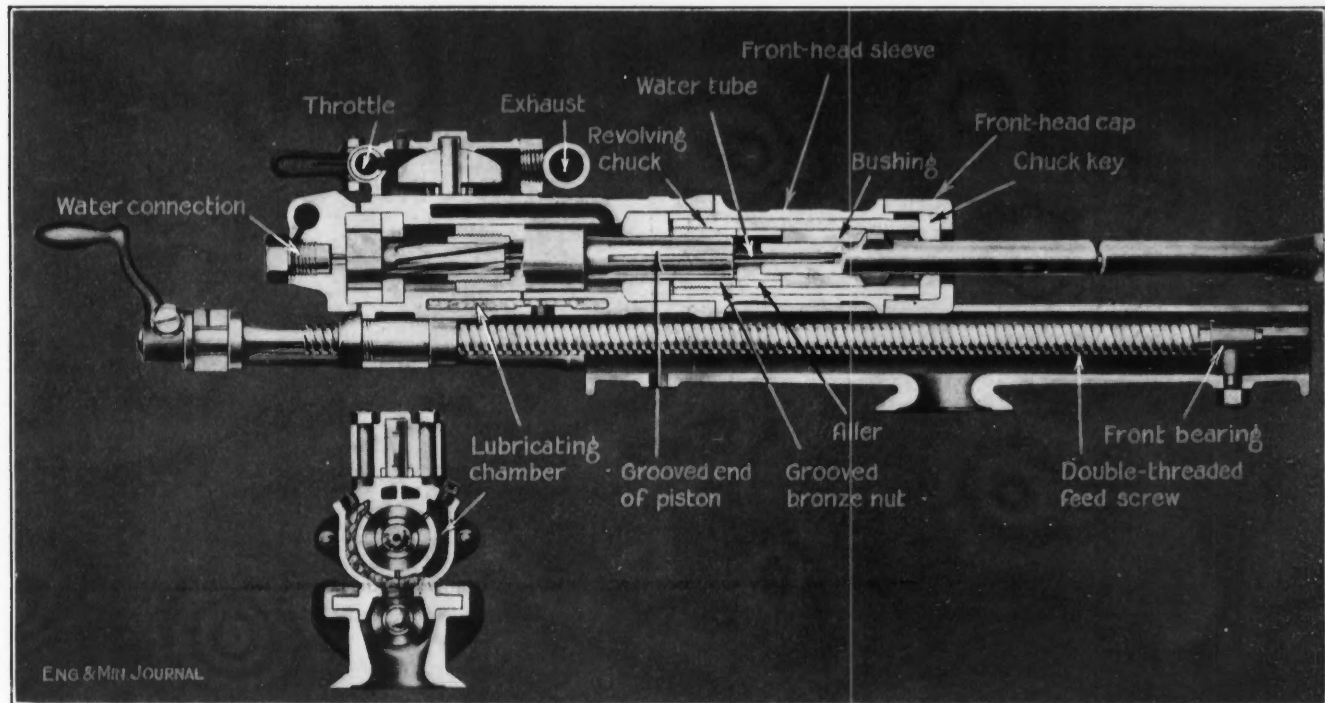
As previously explained, the hammer machines may be classified into three groups; namely, the shell-mounted drills, of which the Leyner is the only example; the stoppers, in which the drilling cylinder is pressed forward by air pressure against a plunger; and the pluggers or sinkers, which are simply held in the hands.

A noteworthy point of difference between the hammer and piston machines is the fact that the free-floating hammer is not subjected to side bending in the way that a piston drill is, when the steel gets out of alignment

not used, some other means must be adopted for keeping the steel in its proper position and for closing the end of the cylinder. To this end, lugs may be forged on the steel shank or the end may be closed. In the case of the round steel used for the Leyner machine, two lugs are applied to the shank, which catch in the chuck and compel the rotation of the steel along with the chuck.

The anvil block is more commonly applied than not to stoppers. It is considered that the loss in efficiency is overcome by the simplification in steel changing and in other respects. In the Leyner and in most of the pluggers, the anvil block is not used, inasmuch as specially shanked steel is usually required anyhow.

The hammer machines are either valveless or have air-thrown valves. In general, the air-thrown valve machines are more common, and except for the Ingersoll-Rand butterfly valve and the Chicago Pneumatic ball valve, the



LONGITUDINAL AND CROSS-SECTION OF INGERSOLL-LEYNER HAMMER MACHINE

with the hole or the hole deviates from the straight and narrow path. Consequently, there is no need of piston rings; the hammer can be made and kept sufficiently tight in the cylinder to eliminate excessive leakage; piston rings are, therefore, not used on hammer machines.

The attempt is made to keep the front head of a piston machine tight against air leakage. For this reason some sort of packing is provided around the piston rod, and this also serves to exclude dirt from the cylinder. In the hammer machine no such care is taken to make the forward end of the cylinder airtight. A certain amount of leakage is permitted and expected, and this is depended upon for keeping out the cuttings. The front of the cylinder may be roughly closed by an anvil block, through which the blow of the hammer is transmitted to the steel. This further serves to prevent the steel from entering the cylinder farther than it should. If an anvil block is

spool valve is the most common. The valves may be set parallel with the axis of the cylinder, and in such case resemble the spool valve of the piston machine; or they may be set in the same axis with the piston, in the back head, in which case they are much shorter and of greater diameter. Tappet-valve and auxiliary-valve motions are practically unknown in hammer machines.

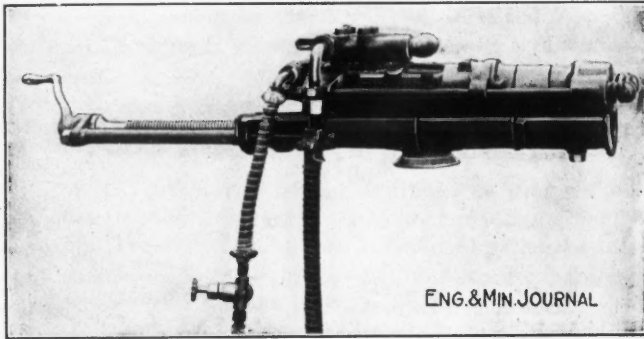
The valveless machine is superior in dispensing with a rather delicate moving part; it is generally held to be a somewhat slower driller and to be more subject to deterioration with wear. The choice between valve and valveless machines is largely a matter of local prejudice. At least two companies make both types.

The hammer machines may or may not be automatically rotated. The Leyner machine always has been. There is at present on the market one automatically rotating stopper. It would seem a logical development that

the rotating stoper should come into use. The rotating plugger has four or more representatives in this country. In fact, it is rapidly displacing the older type.

THE LEYNER

The water Leyner drill, if not the first hammer drill on the market in this country, was at least the first to attain any real success. It is also still the sole representative of its type. In a way, it is transitional between

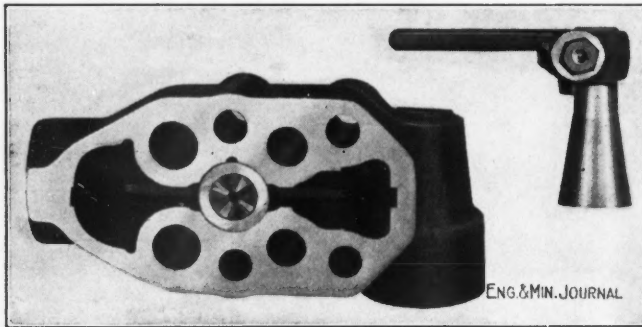


OUTSIDE VIEW OF THE LEYNER

Bleeder valve is missing from hose connection.

the piston drill and the commoner types of hammer drill. It is a hammer drill mechanically, but in weight it corresponds closely to the lighter piston machine and in drilling capacity it is about equal to the larger piston machines used in mining. In fact, the hammer drills are admittedly more efficient, however they may compare with piston machines in other respects.

The Leyner machine was until recently the only one to which the system of cleaning the bottom of the hole



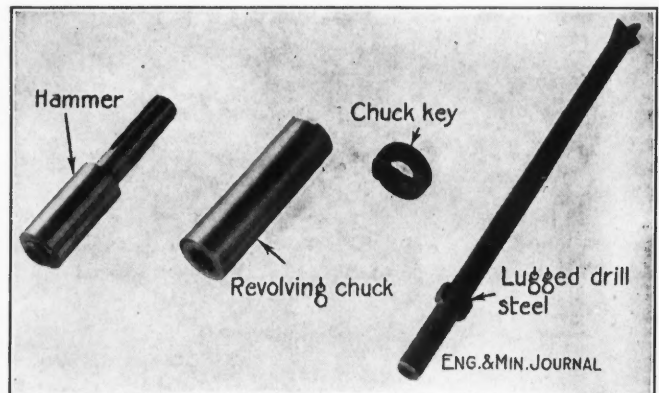
THE LEYNER VALVE CHEST AND THROTTLE

by means of water and air through the drill steel itself was applied. The modification of the Leyner which is now being manufactured by the Ingersoll-Rand Co. differs from the older type chiefly in the substitution of a butterfly valve for the older valve action, and in the use of different materials of construction.

The action of the valve is similar to its action as described for the butterfly-valve piston machine. The air passages extend along the top of the cylinder in much the same fashion; and the piston itself, or rather the hammer, extends forward in the form of a reduced section corresponding to the piston rod of the butterfly piston drill; in this case, however, this smaller section is not fastened to the drill steel, of course, but strikes on the head of the drill-steel shank. This small section of the hammer is grooved and the grooves engage projections on the inside of a chuck bushing. Thus the ham-

mer is permitted to reciprocate and its rotating motion is communicated to the chuck bushing. Another bushing in the front of the chuck is designed to receive the shank of the drill bit and pass on the rotating motion of the chuck to the bit itself. The front of the chuck is closed with the chuck key, which permits the insertion of the shank lugs and retains them, so that the steel can be pulled from the hole by backing up the cylinder. This revolving chuck is contained in the front head sleeve of the machine, and its rear end is placed a little forward from the end of the internal flange of this sleeve, so that the blow of the forward-moving hammer when the bit is not in the machine will be carried through the cylinder front washer to the front-head sleeve and not communicated to the relatively delicate revolving chuck. A front-head cap comes back over a short flange projecting from the forward end of the front-head sleeve, and cap, sleeve, cylinder shell and back head are held together by through bolts which work against helical springs socketed into lugs on the front-head cap.

The rotation mechanism is the same as that used on the butterfly piston machine, but the rifling is steeper, so that in spite of the shorter stroke, the same amount



STRIKING PARTS OF LEYNER MACHINE

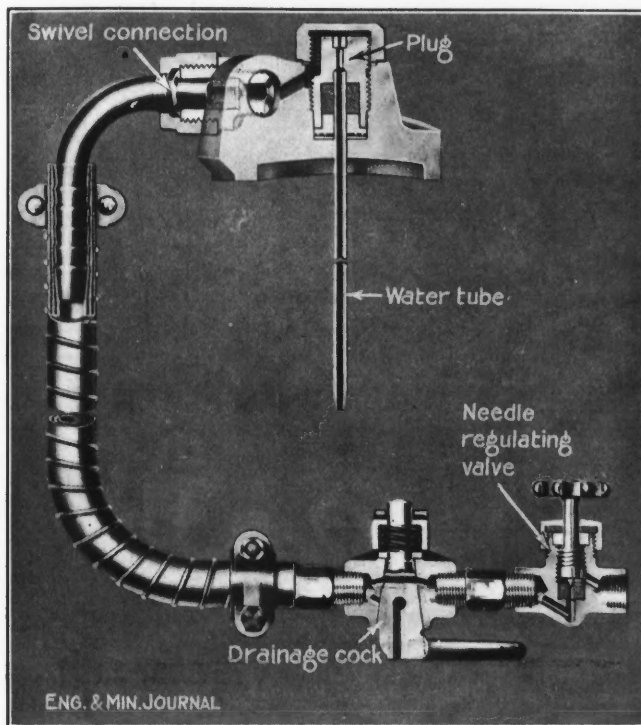
of rotation is obtained. A lubrication chamber is cast below and around the cylinder and contains packing material; oil is sucked into the cylinders through an orifice by the variation in the pressure of the air.

The shell differs from the butterfly-valve piston-machine shell in having no adjustable gibs, and in the fact that the studs do not extend the full length of the shell. The feed screw is double threaded and for the same rate of feed the machine is cranked more slowly. The forward end of the feed screw revolves in a bearing which also acts as a stop to the cylinder in its forward motion.

One of the most interesting features of the Leyner machine is its water connection. A swivel-jointed connection to the water pipe is screwed into the back head at an angle, and a passage through the back head leads to a small central chamber. Into this is screwed a plug carrying the water tube. The tube is open to the water-supply and extends through the rotation mechanism and the hammer. Its tapered end projects some distance into the shank of the steel. The tube does not make a tight joint with the steel, but no water leakage back into the machine is possible, so long as the air pressure is maintained, since the water pressure is not supposed to be as great as that of the air, and even should the pressure be

greater it can be regulated by the needle valve mentioned later. Water should be turned off, however, before the air when stopping the drill. Air from the drill mingles with the water as it leaves the tube for the drill steel, and this mixture is the medium which cleans the hole.

To obtain a water-supply under sufficient head, the pump column may be tapped at a proper height, or water may be collected in a receptacle at some higher point in the mine and conveyed to the machine, or a special pressure tank may be used in connection with the air line. This tank can be set to fill under a drip of water, or it can be filled by hand from a small sump, or by other means. When full of water, it is connected to the water line leading to the drill at the bottom and to the air line at the top, and in this way the air pressure forces the water to the drill steel. It is, of course, understood that a separate pipe and hose line for the water are used with



THE LEYNER WATER CONNECTION
Note drainage cock or bleeder valve.

Leyner machines. The flow of water requires careful control, and for this purpose the needle valve shown in the hose connection was designed. This permits a close regulation of the rate of water flow. An intermediate valve is now set in the water-hose connection, by means of which the water can be drained from the machine when a run is completed.

The cylinder diameter of the Leyner machine is $2\frac{1}{2}$ in., its stroke is 3 in., and the overall length $47\frac{3}{4}$ in.; the machine weighs 150 pounds.

(To be continued)

Lead and Radio Lead

In the JOURNAL of Sept. 12, 1914, there was an abstract of a paper from *Metaux et Alliages*, in which it was intended to state that radio-lead from radium had an atomic weight of 206, while radio-lead from thorium had an atomic weight of 208. Unfortunately a typographical error gave them both at 206.

In the *Journal of the American Chemical Society* for July, 1914, is a very interesting paper by Prof. Theodore W. Richards, of Harvard, and Max E. Lemberg, reporting an investigation of the atomic weight of lead derived from various sources in various parts of the world. The following were the final results:

North Carolina uraninite.....	206.40
Joachimsthal pitchblende (2 samples).....	206.57
Colorado carnotite (2 samples).....	206.59
Ceylonese thorianite (2 samples).....	206.82
English pitchblende	206.86
Common lead	207.15

It is to be observed that these results agree with those of Curie in showing the atomic weight of the lead from the uranium minerals to be much lower than that of ordinary lead.

The ultraviolet spectrum of a radioactive sample of lead was compared with that of ordinary lead. No difference was found, except for a trace of copper too small to affect the result, and a negligible trace of silver. The inference appears to be that radioactive lead contains a mixture of some substance different from ordinary lead, and very difficult to separate by chemical means. This substance cannot be identified by the ultra-violet spectrum, either because it has the same spectrum as lead or because it is masked by lead. "This amazing outcome," say the authors, "is contrary to Harvard experience with several other elements, notably copper, silver, iron, sodium, and chlorine, each of which seems to give a constant atomic weight, no matter what the geographical source may have been."

Mortality Rate from Accidents on the Rand

BY A. COOPER KEY*

A year ago R. N. Kolze, the government mining engineer for the Union of South Africa, made some trenchant comments on the number of accidents on the Rand mines. This year he is by no means so critical. The underground and surface mortality of whites and natives was 3.8 per thousand, a record low rate since 1903, a year which was abnormal in that the ratio of underground to surface workers, instead of being, as usual, over 2:1, was approximately 1:1, owing to the large amount of reconstruction going on after the Anglo-Boer war. As the death rate among surface employees is lower than among underground men, the average death rate was correspondingly reduced during that year.

In the years 1910 to 1912, inclusive, the rate averaged over four and in 1905 and 1906, well over five. It was not until the close of last year that the "safety-first" campaign, a term adopted from the United States, was initiated, and the improvement resulting therefrom is not reflected on the figures for the period under review (the year 1913). While the underground accident mortality among natives was reduced from 5.25 to 4.88 per thousand, that of the whites advanced from the exceptionally low 3.88 to 5.65, still the second lowest recorded.

THREE HIGH-RATE MINES

Mr. Kolze points out that the Simmer Deep, Ginsberg and City Deep have individual rates double the Rand average. At the Simmer Deep, the rate was 7.87 (surface and underground) more than double that in 1912,

*Editor, "South African Mining Review," 71 Permanent Buildings, Johannesburg, Union of South Africa.

when it was below the average for the year. Falls of rock and explosives were the prolific causes. Owing to the high percentage of machine work, the hanging wall gets an unusual amount of shaking and rough handling, causing frequent falls and unsound roof. Reclamation was resorted to more than usual, but the trimming down of foot wall and guarding against falls of rock in stopes were not properly attended to. The high rate of explosive accidents must be attributed mainly to poor supervision and discipline underground. The accident rate rose, and the mine death rate was further affected by septicæmia, which carried off several natives suffering from comparatively trivial underground injuries. Some deaths would have been avoided if natives had consented to operations, but this they would not do. The government mining engineer does not say so, but it may be that the rate advanced, owing to the small proportion of surface employees due to the lavish use of labor-saving devices. This is a factor which should not be overlooked, as it may be of importance.

At the Ginsberg, the rate was 7.74, but reports on accidents and underground inspections show that no complaint can be laid against the management, that the average supervision underground is good, and that satisfactory attention is being paid to the mining regulations. The high rate is attributable largely to hazardous reclamation work on a steep dip of 50° to 70°. From 25% to 33% of the ore won is by reclamation.

At City Deep, the accident death rate based on the average number of persons in service was 7.6. This mine has given the department a good deal of trouble during the year, and from a safety and health point of view, leaves much to be desired. From manager to shift boss, there were so many changes that the government engineer says his remarks can hardly be taken personally by any one and must be divided among four managers, nine mine overseers and 42 shift bosses and other persons who have been responsible for underground work during the last three years. It is impossible thus to fix much individual blame on the constantly changed staff and the department has therefore been compelled to bring its complaint direct to the notice of the owners and their advisers. In 1913, 36 persons were killed and 118 injured and there were no abnormal occurrences to swell the rate. Health conditions were found to be bad on more than one occasion, and inspectors' official reports contain records of careless mining, slack discipline underground and an unusual number of contraventions of mining regulations. The indictment against the controllers of this large property is a long and serious one, and contains facts and figures impossible to ignore. There were 43 prosecutions, one against the manager for permitting work in places containing dust and fumes, 11 against miners chiefly for contraventions against regulations referring to use of water and blasting; the remaining 31 were against natives for drilling dry holes and entering working places before being instructed so to do.

FALLS OF ROCK CAUSE 30% OF FATALITIES

Thirty per cent. of the fatalities in the Rand mines were due to falls of ground. The cause still deserves a large amount of attention and must continually be brought to the notice of managers. It is the duty of the mine owners (the shareholders, not the controlling house, are the owners) and their technical staffs to arrange for

proper and safe support of mine workings, without any interference on the part of government officials, but in certain cases such dangerous conditions have resulted from the stoping of large, unsupported areas that the department has been obliged to interfere. Such direct interference will probably have to continue, since it is a common practice to postpone adequate measures until the last moment.

PERVERSION OF MINING INSTINCTS

The unusual strength of the hanging wall on the Rand appears to have gradually perverted the mining instincts of every one working in the mines. Elsewhere in the world, the usual presumption of mining men is that the hanging wall will fall unless supported. Here the presumption is that it need not be supported unless there are obvious signs of its coming down. This fallacious idea is undoubtedly responsible for the large number of accidents from falls of "hanging." Pack building is still unpopular, is seldom systematic, and is carried out largely on the varying opinions of junior underground officials. The useful pack near the face is considered a nuisance on account of blasting, and catching the fines, and the ordinary slope pack is too frequently only slowly erected in odd times when there are natives to spare. There are, however, bright exceptions, the Modder B, Brakpan Mines, Robinson Deep and City & Suburban have done excellent work in packing heavy ground and exhausted areas. At Modder B the packing is exceptionally well done, the packs being built by experienced masons, and the fines do not get blasted into them.

MINERS SHOULD DO TIMBERING

Splendid timbers are still found in drives and traveling ways, but too little temporary and permanent timber is found in stopes. It is not at all clear why the miner who, on the Rand has practically no manual work to do, should not timber and set props in all cases, instead of waiting for a timberman. Lack of stulls below pillars has caused a number of accidents during the last year. Proper stulling is required, as nearly all pillars are under pressure and liable to crack and flake and sweep the whole stope below when steeply inclined. The shift boss, once hardly recognized, has become an important item in underground supervision. He takes the place of a mine policeman. It is frequently contended that this only devolves on the Mines Department but it is clear that, since the enforcement of regulations involving issuing of orders, such a system would mean dual control which is impracticable. A miner will frequently admit rigging a machine under "drummy" hanging; when remonstrated with, he states that he is waiting for the timberman. The government mining engineer declares: "It is time a stop was put to the absurd and dangerous custom that a machine man does no timbering; any man, if he is worth employing, can put in props with the help of his boys and to enable him to do so, the management should see that proper provision is made for a handy supply of suitable timber and the few simple tools."



The Platinum Output of the United States in 1913 was about 1034 oz., according to the U. S. Geological Survey. About 650 oz. was recovered from gold and copper bullion was made. The production of the country from imported sands was 39,154 ounces.

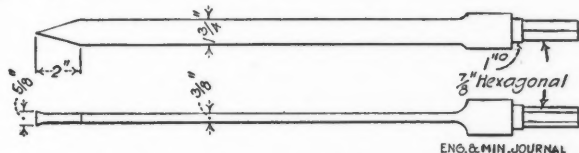
Details of Practical Mining

Cutting Mass Copper

BY ARTHUR C. VIVIAN

In the Lake Superior district a great deal of mechanical cutting of copper is done underground in order to reduce the larger masses of native metal to smaller sizes that will readily go into the skips to be hoisted to the surface. The process as applied there does not differ essentially from that of cutting solid copper in any form, and as frozen masses of this metal are of frequent unwelcome occurrence in metallurgical works, a description of the method will perhaps be of interest.

As used at present, the method is essentially the same as that employed 70 years and more ago, the difference being that pneumatic hammers rather than hand sledges are used to strike the cutting tool. The general dimensions and the shape of the cutting tool are shown in the accompanying sketch; its length when new may be as much as four feet, and it is used until its length has been reduced by continued sharpening to a few inches. It is used in a pneumatic hammer of the size and style usually employed in riveting operations.



TOOL FOR CUTTING MASS COPPER

The operation of cutting a large mass is as follows: After the mass has been freed from its resting place in the rock, and is lying loose on the foot wall, it is marked off by the shaft captain along the lines which will most advantageously divide it into smaller pieces. Grooves are then cut along these lines by taking out successive triangular chips; when cutting is being done by a skilled operator, each chip is continuous through the entire thickness of the mass. It is much easier to have the chips thin out to an edge on one side than it is to take out a flat strip, the tool being reversed at each cut. The width of the tool corresponds closely to that of the cutting edge of the chisel. The hammering action serves to compress the copper in the chip, so that the latter is about one-half the length of the groove from which it came and is correspondingly large in section. The chisels will cut copper for a considerable time without dulling, but they dull rapidly on pieces of included rock which are frequently encountered.

The process is slow and the work tells on the wrist and arms of the operator, as the tool must be held closely to the copper. It is usual for men to work in pairs, one resting while the other takes a cut through the mass. Two men working in this way under ordinary conditions will probably cut 1 sq. ft. of area per shift, making the labor cost approximately \$6 per sq. ft., which is about one-half of the cost with the old method when one man held the chisel for two men striking alternately.

The opinion has popularly existed in the minds of many that copper may readily be cut by the oxyacetylene process. Various inquiries have led to the conclusion that this process is entirely inapplicable, at least in a way similar to that in which it is applied in cutting steel. It will be remembered that the latter is essentially an oxidizing process, steel oxidizing very rapidly in an atmosphere of oxygen when heated to the temperature of the oxyacetylene flame. Copper does not oxidize readily in this way, and its high heat conductivity is also a factor by preventing the localization of the heat. I do not know that the method has been tried out locally on mass copper, but it has been tried at refineries by men expert in its use and these attempts, as far as I know, have resulted in flat failures.

Burned Holes in Blasting

BY E. HIBBERT*

Often in the case of a burned hole, the explosive is completely burned and the hole shows no sign of an explosion's having taken place, but no detonator can be found and it is certain that the detonator was exploded either by the fuse or by the burning explosive. The question then arises: Why does the explosion of the detonator have no effect on the explosive in the hole?

This question kept me guessing for a long time, but recently in talking the matter over with J. J. Johns, mine captain at the Murray mine, Nickelton, Ont., he informed me that when in charge of the quarry at the Mother Lode mine in British Columbia, he could observe the shot-firing from a safe point, and sometimes saw sticks of powder come popping out of a hole and then the primer or detonator exploding outside. Following the matter up, it was found that these were invariably cases of burned holes. This observation supplies the direct answer to the question asked; the reason why the explosion of the detonator has no effect on the explosive in the hole is because the explosion of the detonator takes place outside the hole.

In such cases the gases given off by the burning explosive must generate sufficient pressure to throw out of the hole part of the charge containing the detonator, but the explosive which coats the hole continues to burn down and sets fire to the remainder of the charge. It may be that all the reports are heard, but on examination a burned, unexploded hole is found; the reason for this is that the explosion of a primer or even a detonator alone makes a loud report in a confined space.

In cases where the gases generated by the burning explosive do not throw the primer out of the hole, the explosion of the detonator will fire the unburned charge, and it frequently happens that on entering a place after blasting, the smell of burned powder is noticeable, although no burned hole can be found.

*Superintendent of mines, British America Nickel Corporation, Ltd., Nickelton, via Sudbury, Ont.

It follows from these considerations that the best method of charging a hole is the old one of placing the detonator in the top of the top cartridge and then using tamping. In charging, the paper wrapper is usually slit before the cartridges are placed in the hole and the sides of the hole become coated with explosive; the use of tamping will tend to prevent this coating of explosive from catching fire.

By placing the detonator deep in the charge, the liability to burned holes would seem to be increased, but in this case the burning of the explosive at the top of the charge would not prevent the detonator from exploding in the hole and detonating part of the charge, and so holes only partially burned would probably result.

Card Index of Employees

Mining companies operating in states having an industrial-insurance act in force, or where the companies carry liability insurance or insurance for their employees, should keep an accurate record of the employees. Even where not imperative, such a record is useful.

DATE	NAME
NAME	
AGE	
EMPLOYED AS	
RATE PER DAY	
NUMBER OF YEARS MINING	
LAST PLACE EMPLOYED	
MARRIED OR SINGLE	
CHILDREN	
DO YOU CARRY LIFE OR ACCIDENT INSURANCE	
IN WHAT COMPANY	
ADDRESS	
RELATIVES TO BE NOTIFIED IN CASE OF DEATH OR ACCIDENT	
NAME	
ADDRESS	
NAME	
ADDRESS	
LODGE OR SOCIETY TO BE NOTIFIED	
ADDRESS	
REASON FOR LEAVING	
DATE	

A 4x6-IN. INDEX CARD FOR EMPLOYEES

A simple form of index of employees is shown in the accompanying illustration. The form is printed on a 4x6-in. card, a convenient size for filing in a small cabinet, and while it does not contain the mass of data some companies require on their "death warrants," it includes all the information necessary to enable the timekeeper to fill out insurance forms, etc., in case of accident or death and to inform relatives or societies in case of death.

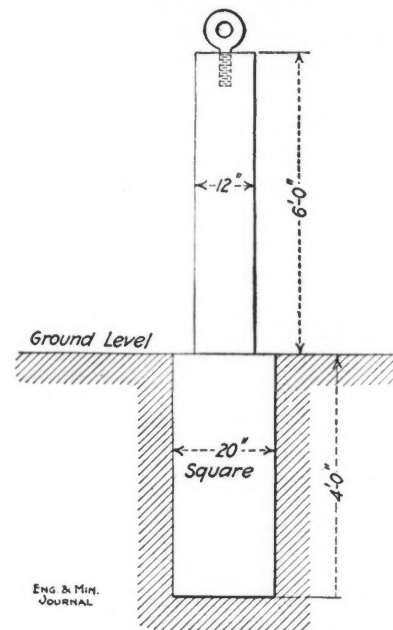
Two methods of filling out such cards are used. At one mine, the shift bosses hand the cards to new men the first shift, the men returning them the next or they are not allowed to go to work. Another mine requires newly hired men to appear at the office and give the data to the timekeeper. The latter system is preferable, for the cards are kept clean, no item is liable to be skipped and the data are placed on the proper lines. When a

man leaves for any cause, the reason for leaving and the date are placed on the card, the card removed from its file and placed in a second file, which contains only the cards of employees who have left. Any notes regarding the man's work, habits, etc., may be written on the back of the card, if desired. In this way a complete record of all men who are working or have worked for the company is kept in a neat, simple and compact form.

Raising Guy Lines

By L. E. IVES*

Those who have had occasion to walk around the surface of mining properties at night, have probably once, at least, stumbled across a guy line leading from a smoke-stack or similar object.



GUY-ROPE SUPPORT

The height at which these generally cross path is just about that necessary to strike one in the neck. The accompanying sketch shows how this may be overcome, at the same time providing a perfectly strong anchor. A concrete post, reinforced with two 30-lb. rails, is made with a total length of 10 ft. The upper 6-ft. section of this post is circular in cross-section and 12 in. in diameter. The remainder is square, 20 in. on a side. The square section is placed in the ground, and the round portion extends above ground. An eye-bolt is embedded in the top, and the guy line is attached to this. In this way the line at its lowest point is 6 ft. above the ground, giving ample clearance.

War Deprives England of Mine Timber

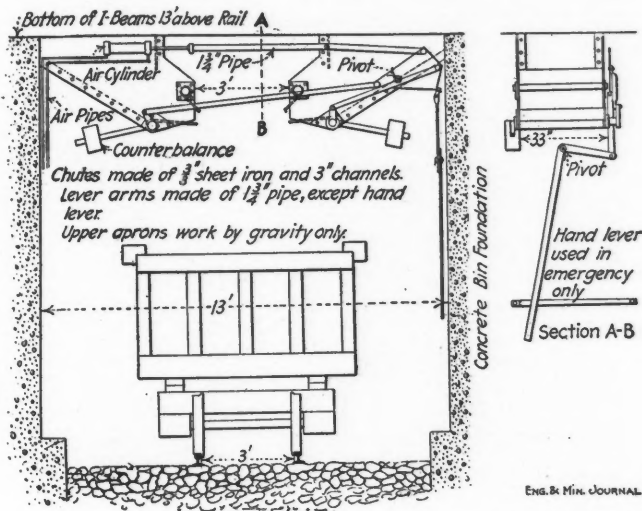
The European war is materially affecting certain phases of the industrial-safety problem in Great Britain, says the *Travelers' Standard* for September. For example, the closing of the ports of the Baltic Sea and the shortage of labor in the neighborhood of Bordeaux have greatly reduced the supply of timber used for props in British mines, a considerable part of which has been obtained, heretofore, from Russia and southwestern France. Shipments from Norway and Sweden are not practicable at the present time. The situation has already become serious and mining engineers are giving it careful attention. One colliery uses props made from old steel pipes, filled with pieces of wood to strengthen them against collapse. It has been suggested, also, that old steel rails be used.

*Chicago Editor, "Engineering & Mining Journal."

Quincy Rockhouse Loading Chutes

BY L. HALL GOODWIN*

The Quincy method of loading stamp rock from the storage bins at the mine into cars for transportation to the mill is unique among those used at the Lake Superior mines in that the chute aprons are operated by compressed air. The accompanying sketch illustrates the chute mechanism. The air cylinder is direct connected to one corner of an irregularly shaped, four-cornered steel disk, the other three corners of which are connected by levers with the lower apron of each chute and a hand lever, respectively; the disk is pivoted so that the various levers have the right amount of play. The hand lever is, of course, thrown whenever the aprons are operated but it is of use only in emergency, when the air accidentally goes off; the aprons cannot be operated easily by hand, but are opened and closed quickly by the air cylinders. The air cocks are centrally placed in a niche left in the concrete bin foundation midway of the tunnel; this niche



LOADING CHUTES AT QUINCY'S STEEL STORAGE BINS

is just large enough to allow the operator room to work comfortably. There is one air cock for each cylinder, that is, for each pair of chutes, and they are arranged on the two sides of the operator's niche corresponding to the position of the chutes they control. The air cocks and pipes are arranged to admit air to either end of the cylinders.

The operation of loading is as follows: The string of cars is pushed through the tunnel by the switching locomotive and left there, the grade of the track being such that the cars may be started easily when the brakes are released. Cars are loaded by two men, one of whom operates the chute aprons; the other rides the forward car and by use of the brake keeps the cars in slow but steady motion, the aim being not to allow them to come to a standstill because they might not start again of their own accord. As soon as an empty car comes under the end chutes the aprons of that pair of chutes are opened and remain open until the car is about to pass from under them; the filling of the car is completed as it passes along under the other chutes, and its load is finally

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topped off by a few splashes from the last pair of chutes. To accomplish this, several pairs of chutes must often be open at once, and the operator must be alert to avoid spilling rock on the track; his work is not difficult, however, as it consists of simply turning air cocks. Air is supplied from the main underground system; between shifts or at other times when the large air compressors are not working, a small Westinghouse air pump takes the load, it being adjusted to start and stop automatically whenever the pressure in the underground system falls below or exceeds a certain amount.

This method permits more rapid loading than does the usual one, with which it is necessary to stop each car for some time under the chutes. This is true not so much because of their operation by air, however, as because the chutes are located in pairs on opposite sides of the track and there are more of them than usual.

Motor Control On Gold Dredges*

The problem of control for the large motors used for digging service on gold dredges would be more simple if direct-current motors could be economically used. As their use is impracticable, the control for alternating-current motors that most nearly approaches direct-current control is desirable. The control must permit of reversing the direction of the motor in such a way as to allow the bucket line to be backed away from obstructions. For service during the repair of the bucket line, small variations of speed should be obtainable, particularly at partial loads. A control permitting continuous running at low-speed points is particularly necessary.

Dredges employing a digging motor of 100 hp. or less can use the ordinary drum-type controller. For larger installations, a combination of magnet switches controlled by a master controller has been used, but for the larger motors the ideal control seems to be the liquid rheostat.

Magnet-switch control has been used satisfactorily by the Natomas Consolidated on most of its dredges having digging motors of 300 hp. and larger. It has, however, several distinct disadvantages for that service, according to Girard B. Rosenblatt. The principal disadvantage is that a limited number of definite points only are available with this type of control unless the number of magnet switches in the secondary circuit is made very large, which, in turn, makes the controller inordinately expensive. Therefore, small variations in speed, particularly at light loads, are not available with this type of control, and in order to obtain slow movement of the bucket chain, it is customary to start the motor up and then plug it, with consequent strain on all mechanical parts, as well as wear on the control contacts. Further, this type of control does not allow the dredge operator to pick out any particular speed at which he desires to run. He can only pick a particular point on the controller and the corresponding motor speed will depend on the torque being exerted by the motor.

Another disadvantage of this type of control is the tremendous amount of resistance required for a large motor, as the resistance must be sufficient in amount to permit very low motor speeds at light loads, and large enough in capacity to permit continuous operation at re-

*Excerpt from a paper read before the American Institute of Electrical Engineers, August, 1914.

duced speeds with heavy torques. This makes a very bulky resistance and unless the resistance is large enough, there is considerable danger from overheating of the grids starting a conflagration.

The liquid rheostat for digging-motor control has, on the other hand, none of the disadvantages of the magnetic-switch control. There are no definite steps, and the speed of the motor may be varied by infinitesimal gradations. The operator simply moves the rheostat handle until he obtains the speed he desires. In other words, he does not work for any particular point on the rheostat, but works simply with the idea of getting the speed he wants. For large motors, the liquid rheostat and its accessories take up much less room than would a corresponding magnetic-switch control and its attendant resistance, and there is never any danger of the electrolyte (water and common washing soda) causing a conflagration.

However, the liquid rheostat for use on dredges must be modified from the forms commonly used for hoist service and the like on land. The first liquid rheostat installed on dredge service was on one of the Natomas dredges, with a 400-hp. motor, and while it was operative it was not entirely satisfactory, because certain essential details of design and application were overlooked. A similar liquid rheostat on which these details have been given due attention, is now being used on one of the dredges of the Conrey Placer Mining Co., and has been entirely satisfactory in operation with a 550-hp. digging motor, which I believe is the largest digging motor on any elevator-type gold dredge in operation today.

In order to keep down the size of the liquid rheostat for this work, it is practically necessary to provide some means of artificial cooling for the electrolyte. Usually this is accomplished by circulating cooling water through the coils in the rheostat tank. On the Natomas rheostat the mistake was made of pumping water from the dredge pond through these cooling coils. Due to the operation of the dredge, this pond water is usually muddy, and often carries a large percentage of solids in the shape of silt. At Natomas this silt coated the inside of the cooling pipes, thus reducing their effectiveness and eventually clogging them up, necessitating a shut-down while they were blown out with compressed air. Shut-downs on a dredge cost money, because to realize the greatest return on the investment, the dredge must be digging all the time. Therefore, this feature made the Natomas rheostat undesirable. At the Conrey Placer Mining Co.'s property, the cooling system consists of a series of pipe coils immersed in the pond, and the electrolyte is pumped from the rheostat tank through the coils and back again, instead of pumping pond water up to the tank and through coils installed therein. There has never been a shut-down on the Conrey dredge, due to the rheostat or its cooling system. The motion of the dredge in the pond is sufficient to keep silt from settling on the cooling coils.

Another trouble that was experienced at Natoma was stalling was the fact that dredges swing, and often rock considerably. This causes the electrolyte to splash out of the rheostat. Usually such loss by splashing was replaced by pouring in additional water, but this, of course, changed the density of the electrolyte and caused the operators some trouble. On the Conrey rheostat, baffle-plates and inclosing covers were supplied, which effectually prevented any splash.

Another trouble that was experienced at Natomas was due to deficiencies in the cooling system mentioned above; the electrolyte often attained a high temperature during hard work, which caused excessive evaporation. Under certain conditions this evaporation was so great that the annoyance and expense of bringing fresh replacing water on the dredge and filling the rheostat was considerable. This trouble has been obviated at the Conrey installation by having an adequate cooling system.

All in all, it may be said that for large digging motors of, say 350 hp. and up, the liquid rheostat makes an ideal method of control, provided the rheostat is of adequate mechanical construction for the service and is provided with a proper and sufficient cooling system. Both liquid-rheostat and magnet-switch control may be arranged to give the same advantages as to protection against acceleration at too high a rate and against excessive overload due to sudden changes in speed.

Reversing a Cable Drum

We often want to pay out rope on a second-motion friction-clutch haulage system having nonreversing engines, says J. J. Piper in *Power*, Oct. 27, 1914. To put on reversing eccentrics and links would be quite expensive and as the engine has to run at a high rate of speed, they would be objectionable on that score also. We put on the device shown and can now pay out rope at will without reversing the engine.

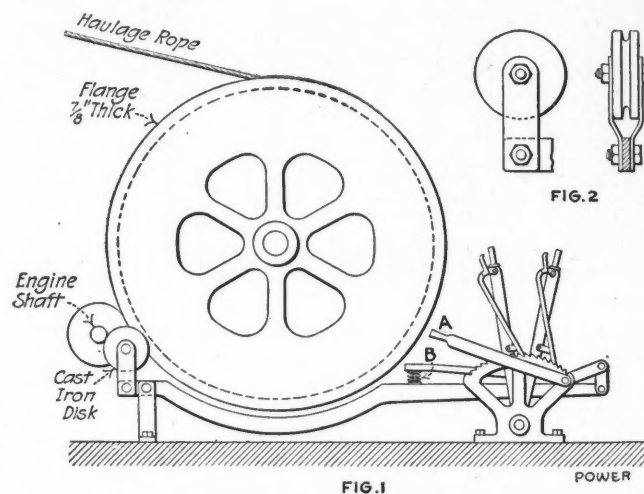


FIG. 1 FRICTION DISK BETWEEN DRUM AND ENGINE SHAFT

Fig. 1 shows the drum, a cast-iron disk, and the control levers. Fig. 2 is the cast-iron disk.

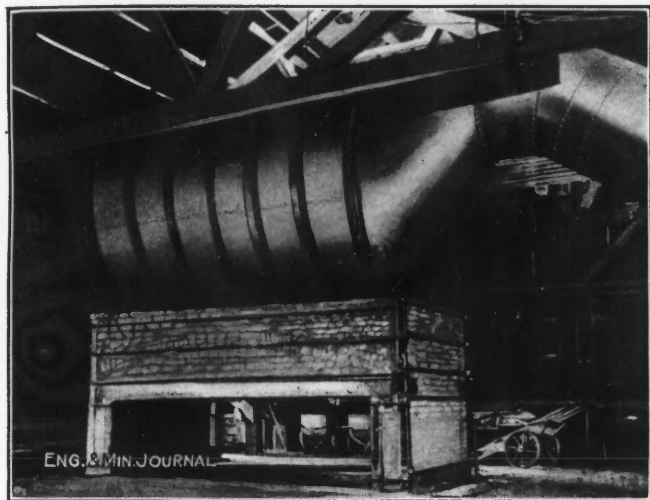
By releasing the brake and clutch and pulling up on lever A, the disk is pressed against the engine shaft and the flange of the drum (in the groove shown in Fig. 2), and causes the drum to rotate in the unwinding direction. B is a coil spring which holds the lever up and keeps the disk from rubbing the engine shaft or flange when not in use.

Mine Caves and Surface Support are to be the subject of a further investigation by the U. S. Bureau of Mines, in cooperation with the U. S. Geological Survey. The immediate work will comprise detailed studies of the extensive open-cut and underground mining operations in southwestern New Mexico. The field investigations will be conducted with special reference to earth pressures and surface subsidence in relation to the geological formation and mining conditions, and the equipment and efficiency of the large mechanical installations in operation there. Charles Enzian, a mining engineer of the anthracite region, represents the Bureau of Mines in this investigation.

Details of Milling and Smelting

Cylindrical Hood over Blast Furnace

In describing the Ladysmith smelting works of the Tye Copper Co., Alfred W. G. Wilson¹ calls attention to the drum-shaped hood erected over the superstructure of the larger blast furnace at this works. The blast furnace is 48x160 in. at the tuyeres, and has jackets 9 ft. 9 in. high, sloping from the base to the top; the width of the furnace at the base of the jackets is 42 in., and at the top 62 in. The end jackets are vertical, and the distance from the bottom plate of the furnace to the feed floor is 11 ft. Blast is supplied to the furnace at



DRUM HOOD OVER BLAST FURNACE AT LADYSMITH, B. C.

32-oz. pressure through 22 tuyeres, each having a diameter of 5.5 in. When this plant was in operation the furnace smelted about 300 tons per day.

The accompanying photograph shows the cylindrical hood over the furnace. The drum is 12 ft. in diameter and is connected by a downcomer to the main flue. The function of the cylindrical hood was to return to the furnace as much as possible of the dust. The large cross-section permitted a momentary check in the velocity of the escaping furnace gases and, according to Mr. Wilson, caused nearly 40% of the dust carried in suspension to be returned directly to the furnace.

✽

Effect of Steam on Magnesite Brick

According to R. H. Youngman, of the Harbison-Walker company, all calcined magnesite, and all magnesite brick, no matter how thoroughly burned, will hydrate in contact with steam (*Iron Trade Review*, Oct. 8, 1914).² The effect of this hydration is to cause disintegration of the brick to an impalpable powder.

¹"The Copper Smelting Industries of Canada," by Alfred W. G. Wilson, Mines Branch, Can. Dept. of Mines.

Difficulties of this nature have been experienced in laying openhearth furnace bottoms, from laying magnesite brick over a bed of water-soaked refractories. It also explains cases of disintegration of brick which had been in contact with steam leaking from coils over steam-heated floors. When the furnace receives its initial heating, steam is formed from this moisture, and trouble results.

✽

Pine Oils for Flotation

In view of the increasing use of pine distillates in the flotation process, it is of interest to know something about the methods of manufacture and the characteristics of the various products.

The raw materials are the resinous woods of the South Atlantic and Gulf states—longleaf, loblolly and Cuban pines. For the purposes of manufacture, the dead and fallen timber generally known as "lightwood" is used. The bark and outer wood have usually rotted away before the timber is gathered. There are two general processes of manufacture:

(1) The steam-and-solvent process from which are obtained turpentine, pine oil, rosin, and "spent wood" which is suitable for paper pulp or may be burned under the boilers.

(2) Destructive-distillation process, the products of which are turpentine, pine oil, pine-tar oils, pine-cresote oils, pine tar, charcoal and uncondensed gases which may be utilized for heating the retorts.

In the steam-and-solvent process, the wood is reduced to fine chips by passing through chipping machines. It is then placed in retorts and superheated steam is driven through the mass until the volatile turpentine and pine oils have passed over to condensers. The pulp remaining in the retort is dried by evacuation, and a liquid hydrocarbon is sprayed over the top and allowed to percolate down through the wood. The rosin and any remaining pine oils are thus extracted and later the solution is separated into its component parts. It should be noted that all of the products of the steam-and-solvent process appear normally in the dead pine wood and are not products of decomposition.

The destructive-distillation process, however, changes the composition of some of the products. In this process, the wood, in the form of cordwood, is placed in a horizontal retort, sealed and heat applied externally, the temperature being raised slowly until the wood is thoroughly carbonized. The volatile constituents are passed to a condenser and later subjected to distillation, whereby the several liquid distillates are separated from one another.

The characteristics, yields and prices of the products made at one of the largest distillation plants in the South, as reported to us by the General Naval Stores Co., 175 Front St., New York, are given in the accompanying table. Up to date, the oil most used has been the steam-distilled yellow pine oil. The commercial pine-tar oil

and the refined pine-tar (creosote) oil have also been used with satisfaction at some mills; as the yields of these oils per ton of wood are large, the cost is low, and experimentation may develop that for certain ores these oils will be as efficient as the more expensive steam-distilled oil.

The use of the pine products in varying grades of purity, that is, before complete separations have been ob-

CHARACTERISTICS OF PINE PRODUCTS

Steam-and-Solvent Process				
Product	Color	Specific Gravity @ 15° C.	Yield per Ton of Wood	Price in Bulk at Point of Manufacture
Turpentine.....	Water white	0.862-0.870	5-7 gal.	32@40c. per gal.
Pine oil.....	Light straw to red	0.920-0.950	1½-2 gal.	20@23c. per gal.
Rosin.....	Ruby red	1.08-1.09	250-300 lb.	1.4@2c. per lb.
Destructive-Distillation Process				
Product	Color	Specific Gravity @ 15° C.	Yield per Ton of Wood	Price in Bulk at Point of Manufacture
Turpentine.....	Water white	0.858-0.865	5-8 gal.	25@30c. per gal.
Pine oil.....	Yellow to red	0.920-0.960	1½-2½ gal.	18@22c. per gal.
Commercial pine-tar oil*	Brown to black	1.02-1.07	35-45 gal.	10@14c. per gal.
Refined pine-tar (creosote) oil.....	Cherry red	0.940-0.990	8-10 gal.	13@17c. per gal.
Pine tar.....	Brown to black	1.07-1.10	25-30 gal.	9@12c. per gal.

* Commercial pine-tar oil is produced in lieu of refined pine-tar oil and pine tar, and yields shown above presume the two separate methods of refining. Great flexibility in characteristics of these products is possible by variance in method of refining.

tained, may considerably reduce the expense for oil in the application of the flotation process. We have also been told by one of the early investigators of flotation that rosin was a valuable ingredient of the mixture with which he experimented. In Australia, eucalyptus oil has been extensively used. In later developments of the flotation process, preagitation of oil and water has been practiced by some. At one successful operation in the Southwest, the following emulsifying-and-frothing mixture is used: Cresol, five parts; Carolina tar oil, one; crude turpentine, five; "stove" oil, eight parts. The concentrates amount to 6.4% of the ore and the oil consumption is 1.227 lb. per ton of crude ore.

Threading Pipe for Future Use

The elimination of small wastes goes a long way toward building up an ultimate profit. One opportunity for such a saving is suggested by J. F. Hobart in *American Machinist*, Oct. 20, 1914.

When ordinary pipe-fitting is being done, there are numerous pieces cut off and thrown aside for future use—or waste. A good plan is to make and enforce the rule that whenever a waste piece of pipe is cut off, that piece shall be threaded before it is placed in the stockpile. It takes but a short time to thread the piece when the pipe vise and the correct size of die is ready and in hand; much less time than will be required when the piece of pipe is wanted badly, usually in a hurry, and dies must be procured. The cutting of threads on all cut-off pieces of pipe is a fine habit to get into. It is one of those little things that look trivial but can be made to represent a saving well worth while.

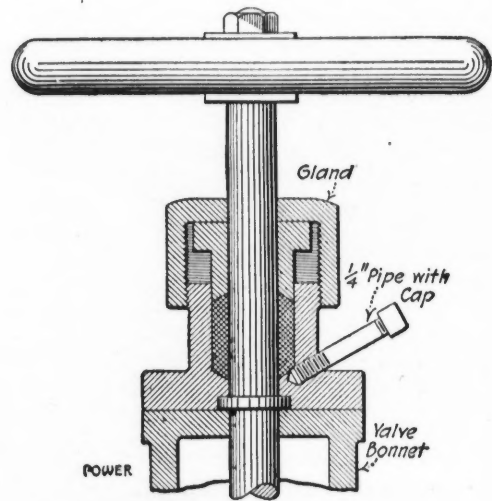
Calorized Iron

A new treatment for iron, copper, brass, etc., which is to be exposed to high temperatures under oxidizing conditions, is known as calorizing (*Gen. Elec. Rev.*, Oct., 1914, p. 947). This consists in tumbling the articles, if small, at an elevated temperature, in contact with a

mixture containing finely divided aluminum. If the object is large, it can be packed in, or painted with the mixture. Apparently, when objects so treated are heated in contact with oxygen, the coating of aluminum formed on the surface is changed to a glaze of alumina, which stops further corrosion.

Valves Packed under Pressure

A method of packing valves under pressure is described by John C. White, in *Power*, Oct. 20, 1914. All modern valves should be capable of being repacked under pressure when wide open or shut, and most manufacturers make that claim for their product. In practice, however, it is found that even though they are tight when new, they soon develop slight leaks past the sealing joint or collar and it is then almost impossible to repack them without cutting out the line.



PACKING SPACE VENTED

To overcome this difficulty, they are drilled and tapped for a ¼-in. pipe and a short piece of pipe with a cap put in as shown. When repacking, the valve is opened wide, the gland and old packing removed, the pipe plug taken out and the hole in the stuffing-box cleared if necessary. The packing can then be put in, the gland brought down on it and the plug replaced without difficulty, any leakage during the operation escaping through the hole instead of blowing out the packing.

Thirty or forty valves have been so fitted and there has been no trouble in repacking them during the three or four years they have been in use.

Diaphragm for Electrolytic Tank

In much electrolytic work now carried on, the solution is fed into one electrode compartment, and drawn off at the other, a very porous diaphragm being a necessity. This diaphragm must often act as a filter. In a recent patent of N. V. Hybinette, residing at Kristiansand, Norway, the construction is advised of such a diaphragm from two perforated lead plates, with loose asbestos, or other filtering material between them. He says that the lead surfaces do not act as series electrodes, and that if the asbestos is acting as a filter, and becomes clogged, it is very easy to remove, wash, and replace it.

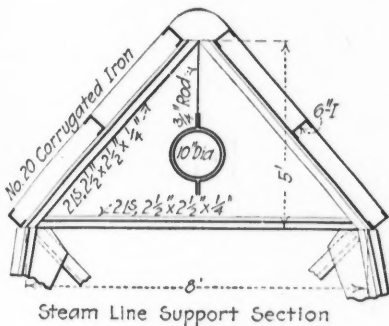
The Cost of Doing Things

Cost of Piping Arizona Copper Co.'s New Smeltery

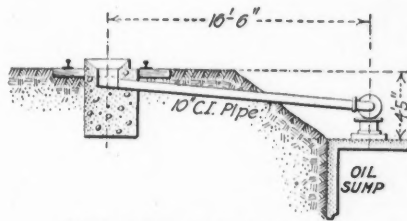
According to numerous items of piping costs contained in "Unit Construction Costs from the New Smelter of the Arizona Copper Co.," by E. Horton Jones, published in *Bull. of A. I. M. E.*, No. 91, it appears that the total cost of piping for the smeltery that has been completed at Clifton, Ariz., was \$122,389. There are probably a few small items of piping costs included in the installation of pumps, etc., that are not included in this summary which has been made up from the figures given in the original article. These costs include excavation, cost of material at Clifton and all labor in erecting. In addition to the

Excavating 1296 cu.yd. of trench from hot-water heating plant to boiler feed pumps through red clay filled with boulders, sand and gravel. The work was performed with picks and shovels and handled 300 ft. with wheelbarrows and slips. Much of the dirt had to be handled three times in removing it from the trench; 200 ft. of the trench was cribbed and lagged 20 ft. high. Cost: Labor, \$1039.91; material, \$51.51; total \$1091.42
Cost per cu.yd., 84c.

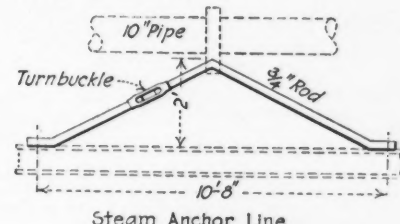
In installing this pipe, ordinary vitrified 15-in. sewer pipe cut in half was used for conduit. The first half was laid in the trench and the joints cemented, followed by laying an 8-in. standard wrought-iron pipe. About this pipe an asbestos filler was packed, and after each section of conduit top was laid, the filler was stuffed in over the pipe to thoroughly cover it. The cost of labor was \$386.25. Cost of supplies follow: 557 ft. of 15-in. J-M sectional



Steam Line Support Section



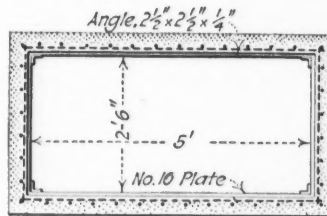
Inlet Piping to Oil Sump



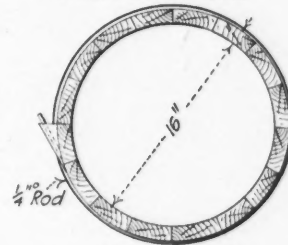
Steam Anchor Line



Exhaust Pipe Covering



Section of Turbine Air-Duct



Redwood Stave Pipe

DETAILS OF PIPING, ARIZONA COPPER CO., CLIFTON, ARIZ.

cost as given for each item a proportionate charge for engineering expense and indirect expense has not been included. Anyone using these figures as a basis of estimate should add this charge, which amounts to 5.40% for engineering and superintendence and 7.53% for indirect expenses. A layout of the piping is reproduced herewith, (p. 832).

BLAST PIPE FROM FANS TO ROASTERS IN ROASTING PLANT

This pipe was made of No. 10 and No. 12 plate and varied in diameter from 18 in. to 36 in. The inlet pipe to each roaster was 18 in. diameter. Installation of this pipe included in the cost given herewith consisted of connecting up and riveting the pipe in place in the field only. This piping amounted to 240 ft. and cost of material, fabrication and installation was: Labor, \$1569.62; material, \$656.62; total \$2,226.24
Cost per foot, \$9.28.

PIPING IN REVERBERATORY PLANT

Miscellaneous piping, boilers and reverberatory building; the sizes were various and the amount of piping installed was not given. Costs were: Labor, \$524.15; material, \$1409.85; total \$1,934.00
Feed piping from heating plant to feed pumps:

conduit, \$2273.47; 557 ft. of 8-in. wrought-iron pipe, \$374.49; asbestos filler and miscellaneous, \$109.83; total supplies, \$2757.79. Total pipe work amounted to 557 ft. Total cost \$3144.04
Cost per foot of pipe, \$5.64.

Total cost of feed piping from heating plant to feed pumps, including trenching 4,235.46
Total cost per foot, \$7.60.

Feed piping from pumps to boilers:

This represents pipe fittings, pipe covering, paint and labor in erecting, covering some of the pipe with insulation and painting all the pipe. The piping was about one steam and two electric feed pumps at the boilers. It also covered a hot-water line the length of the boiler building and a cold-water line of the same length. Each is connected to the boilers. The two main lines are 6 in. Connections to the boilers are 3 in. The hot-water lines are covered throughout. Labor cost was \$1060.53. Materials cost: Standard pipe, \$416.39; extra heavy fittings, \$2408.89; pipe covering, \$137.26; hangers and miscellaneous, \$78.46; total material cost, \$3041. Total amount of piping, 1093 ft. Total cost 4,101.53
Cost per foot of pipe, \$3.75.

Total cost of piping for reverberatory plant of 1200 tons capacity in 24 hr. 10,370.99

PIPING IN CONVERTER PLANT

Air pipe from power house:
Excavating 331 cu.yd. of trench through sand, gravel and boulders with pick and shovel, and backfilling same..... \$224.06
Cost per cu.yd., 68c.

The pipe ran from the power house to connect with all the converters, and was built to carry air under 12 lb. pressure of No. 8 U. S. gage plate riveted, tested for 25-lb. pressure and painted with asphaltum paint. It was made in 30-ft. sections and fastened together with forge-steel flanges. Labor cost was \$674.62. Material cost was: 400 ft. 24-in. pipe, \$1332.70; 22 ft. 10-in. pipe and two 10-in. flanges, \$27.54; two 24-in. cast-iron gate valves, \$138.55; miscellaneous, \$127.85; total materials, \$2041.89. Total cost.. 2,716.51
Total piping, 422 ft., at \$6.43.

Total cost of air pipe from power house, including excavation 2,940.57
Total cost per foot, \$6.97.

SEWER SYSTEM

Excavating 2967 ft. of trench and tunnel. Trenches varied from 18 to 60 in. wide and 2 to 20 ft. deep through various kinds of soil. Costs were: Labor, \$2122.84; material, \$65.20; total \$2,188.04
Cost per linear foot, 74c.

Concrete work amounting to 53.8 ft. for manholes, etc., was performed. The mix was 7 of sand and gravel to 1 of cement. This work cost: Labor, \$168.18; material, \$184.08; total 352.26

Laying and cost of pipe, which consisted of 2967 ft. of vitrified sewer pipe, ranging from 6 to 15 in. in diameter and laid at an average depth of 4 ft. below surface. Cost, \$778.83 for labor and \$1224.72 for supplies; total 2,003.55
Cost per foot of pipe, 68c.

Total cost of sewer pipe, including excavation.... 4,543.85
Total cost per foot, \$1.53.

WATER PIPE LINE

Excavating 4253 ft. of trench through various kinds of ground from 8 to 15 ft. in depth. Labor \$868.11
Cost per foot, 20c.

Concrete work, 2.3 cu.yd., to anchor 6-in. line at foot of hill. Labor, \$17.37; material, \$17.86; total 35.23
Cost per cu.yd., \$15.32.

Pipes and laying; all water lines about smelter consist of 2052 ft. of 6-in. pipe, 1058 ft. of 4-in. pipe, 200 ft. of 2 1/2-in. pipe, 268 ft. of 2-in. pipe, 115 ft. of 1 1/2-in. pipe and 50 ft. of 1-in. pipe; total, 4253 ft. of pipe, and all necessary fittings, valves and fire hydrants. Cost of labor, \$2863.32; material, \$2062.07; total 4,925.39
Cost per foot of pipe, \$1.16.

A 6-in. pipe line from Clifton, distance 8988 ft.; cost, including excavation, laying, material, painting and backfilling, labor, \$1474.71; material, \$6914.95; total 8,389.66
Cost per foot of pipe, 93c.

Total cost of all water pipes 14,218.39
Total cost per foot, \$1.08.

AIR LINE

Excavating trenches amounting to 401 cu.yd. through various kinds of soil and ranging from 18 in. to 6 ft. in depth and 1 to 3 ft. in width. Cost, including backfilling; labor \$267.50
Cost per cu.yd., 67c.

The air lines together were 2316 ft. long and were made up of the following quantities of pipe: 526 ft. of 1-in. pipe, 36 ft. of 1 1/2-in., 80 ft. of 1 1/2-in., 656 ft. of 2-in., 838 ft. of 3-in. and 180 ft. of 4-in. pipe. Cost was as follows: Labor, \$432.37; material, \$623.08; total 1,055.45
Cost per foot, 46c.

Total cost of air line, including excavation..... 1,322.95
Cost per foot, 57c.

STEAM-HEATING SYSTEM

Excavating 225 cu.yd. of shallow trench through red clay and backfilling. Labor cost \$166.36
Cost per cu.yd., 73c.

This pipe was covered with double standard magnesia covering, 260 ft. of 2-in. and 236 ft. of 2 1/2-in. steam pipe were laid in a 2-in. lumber box. Total pipe, 496 ft. Cost: Labor, \$240.78; material, \$305.37; total 546.15
Cost per foot of pipe, \$1.10.

Total cost of steam-heating pipe system 712.51
Cost per foot of pipe, \$1.43.

POWER-HOUSE PIPING

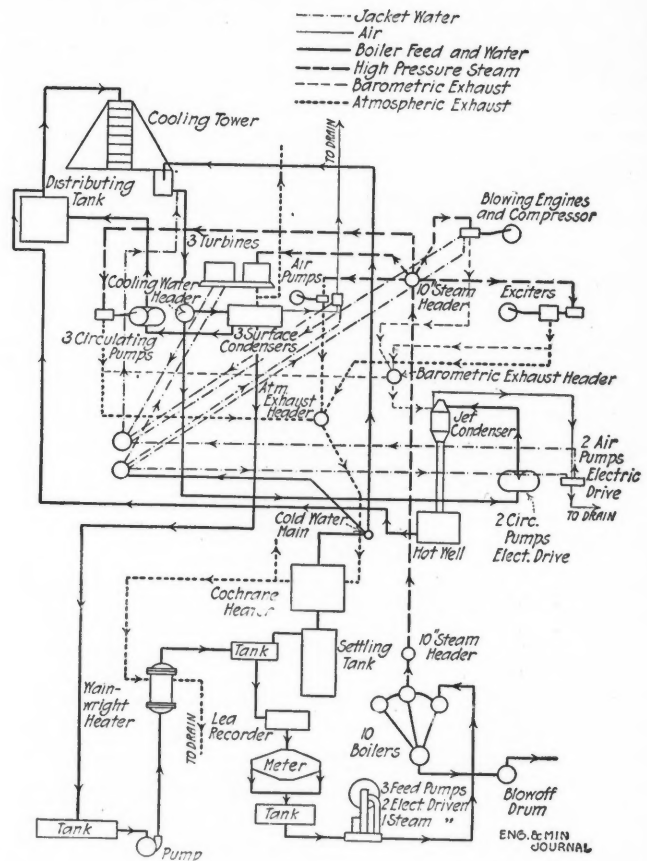
Air pipes or ducts for turbines (see Fig. 57): This pipe was made in the shop of No. 16 steel, with 2 1/2 x 2 1/2 x 1/4 angles. Total length, 103 ft. Cost of labor, \$547.68; materials, \$200.75; total \$748.43
Cost per foot, \$7.27.

In erecting this pipe, cloth insertion packing, rivets, hangers, anchors, etc., were used. Cost of labor, \$232.57; material, \$64.24; total..... 296.81
Cost per foot, \$2.88.

Total cost of air ducts for turbines \$1,045.24
Cost per foot, \$10.15.

Erecting compressor:
All piping, except steam, used in erecting Ingersoll-Rand two-stage compressor. Cost of labor, \$298.46; material, \$160.65; total 459.11

Steam pipe for north and south mains:
Excavating 279 cu.yd. for numerous piers done with pick and shovel and cast to one side. Labor cost..... \$249.65
Cost per cu.yd., 89c.



PIPING LAYOUT, ARIZONA COPPER CO.'S SMELTERY

Foundations; these are concrete piers which support the long structural steam-pipe supports. Part of the concrete was mixed by machine and part by hand in proportions of 6 sand and gravel to 1 cement. There were 194.5 cu.yd. and about 50% of the vertical surface was formed. Cost of labor, \$578.24; material, \$945.97; total 1,524.21
Cost per cu.yd., \$7.84.

Steel support structure (see Fig. 60) for these mains consists of 11.8 tons of corrugated iron and 75.01 tons of structural steel. Cost, including labor 7,694.58
Cost per ton, \$88.64.

Hangers and anchors used for steam piping between boilers and the machines in the power house were made of 3/4-in. rods and 1/2 x 2 1/2-in. iron (see Figs. 60 and 61). Cost of labor, \$1030.68; materials, \$337.26; total 1,367.94
Total, 153 rods, at \$8.94.

Cost and erection of pipe; the pipes run from the boilers to the power house in duplicate, making a complete loop about 1120 ft. around. The main lines are 10 in., branches from boilers 8 in. and all branches to engines of suitable sizes ranging from 4 to 8 in. The line is required to stand 180 lb. pressure with 100° F. superheat. All

joints are Van Stone, all valves and fittings are of cast steel. Corrugated bronze gaskets were used. The 10-in. lines are fitted with six 10-in. Labor cost was \$2286.31
The following gives some details of materials and cost:

Six 10-in. Harter expansion joints	\$1,684.77
One 6-in. cast-iron separator..	126.55
Two 10-in. cast-steel vertical separators	843.47
One 10-in. cast-steel horizontal separator	372.48
Two 6-in. separators and receivers	591.77
One 5-in. cast-steel separator and receiver	261.40
Three 4-in. cast-steel separators and receivers	687.43
Two 4-in. cast-steel separators and receivers	476.28
Corrugated bronze gaskets....	251.93
Ten 8-in. Lagonda valves.....	1,315.52
Twelve 10-in. gate valves.....	2,079.00
Two 34-in. and one 33-in. Crane tilt traps	143.69
Best Mfg. Co. pipe and fittings	8,738.89
Extra pipe and fittings	526.18
Miscellaneous	522.89

Total cost of materials.....\$18,622.25
Total cost of labor and materials..... 20,908.56
Total pipe work, 3401 ft., at \$6.15 per ft.

The steam pipe lines and all fittings were covered with 85% magnesia blocks of double standard thickness, wrapped with 6-oz. duck. All the lines were then painted with two coats. Cost

Cost per foot, \$1.79.	6,079.94
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Total cost of steam lines, north and south mains

Cost per foot, \$11.10.	\$37,824.88
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Exhaust pipe:
Some of the piping used was cast iron, designed for a vacuum of 14 lb. per sq.in. The rest of the pipe used was lap-welded wrought steel and cast-iron fittings. The installation covers the three 20-in. atmospheric exhausts from the turbines, as well as the exhausts from the blowers, compressors, exciters, engines and circulating pump engines, to the jet condenser. It covers likewise the connections between the exhaust of the dry-vacuum pumps, exciters, engines, surface condenser, circulating pumps and heater house. The pipe ranges from 3 in. to 42 in. There were 1541 ft. of pipe. The labor cost for installation was \$1745.71. The supply cost was \$8715.66, made up as follows: Three 42x13 Wainwright turbine expansion joints, \$656.70; three 20-in. atmospheric relief valves, \$804.50; three 42-in. low-pressure flanged base elbows, \$1428.61; three special 8-in. emergency-stop valves, \$234.36; one 14-in. automatic atmospheric-exhaust relief valve, \$123.27; pipe and fittings, \$4585.74; miscellaneous, \$882.48. Total cost of labor and material

Cost per foot, \$6.79.	10,461.37
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All exhaust pipe was given one coat of green silica graphite paint. Cost of labor, \$85.05; material, \$51.19; total..

Cost per foot, 9c.	136.24
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The exhaust pipe from the engines in the power house to the heater house were all covered with 85% magnesia single standard thickness, wrapped in 6-oz. duck. Where the magnesia is exposed to the weather, it is wrapped with No. 28 galvanized iron (see Fig. 62). Total pipe covered, 746 ft. Labor cost, \$318.25; material, \$830.56; total cost

Cost per foot, \$1.54.	1,148.81
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Other costs, including air pipe and erection, painting, exhaust-pipe foundations, supporting structure excavation. Labor cost was \$675.93; material, \$733.56; total

Water pipe about power house:	1,409.49
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Excavating a trench about 3 ft. deep through red clay and boulders for a 16-in. wood stave pipe, 2406 cu.yd. of earth removed. Cost, including back-filling: Labor, \$1485.10; material, \$0.24; total

Cost per cu.yd., 62c.	1,485.34
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The following covers all the water pipe about the power house, the 30-in. cast-iron suction line from the cooling tower to the pumps; the 20-in. wooden lines from the pumps to the equalizing tank; the 16-in. wooden lines from the jet condenser to the cooling tower, and the 16-in. wooden lines from the equalizing tank to the cooling tower; the 12-in. cast-iron lines from the circulating pumps to the jet condenser; the 8-in. line from the condenser to the condensed water pump house; the 6-in. line from the condensed pump

house to heater house, etc. Labor cost for erection was \$3,747.79.
The following gives details of materials and their cost:

1998.7, 4-in. machine banded redwood pipes with collars (not used at new smelter)..	\$397.74
354.6 ft. 20-in. machine banded redwood pipe with collars..	365.24
1104.2 ft. 16-in. machine banded redwood pipe with collars (see Fig. 63)	861.28
22 flange couplings	590.00
Freight on the above items ..	632.00
Two 12-in. check valves	97.00
Four 12-in. gate valves	172.00
Three 20-in. gate valves	283.50
Freight on above items	176.38
Three 20-in. flanged, iron body, bronze-mounted double gate valves	403.49
Five No. 20 gage copper plates	36.28
Two cast-iron bell-and-flange fittings, 6 bell bends	81.11
Freight and patterns on above	78.00
220 lb. cloth insertion packing	91.50
Best Mfg. Co. pipe	9,668.92
Pipe, fittings, miscellaneous material	2,503.44

Total cost of material

Total cost of labor and material....	\$20,185.67
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All this pipe above ground was painted at a cost of: Labor, \$230.59; material, \$25.54; total

Sewer pipe for feed water heating plant:	256.13
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Excavating and backfilling a trench about 3 ft. deep through red clay and boulders, 266 cu.yd. Labor cost, at 59c. cu.yd.

Sewer pipe and laying, 100 ft. of 24-in. vitrified pipe. Cost of labor, \$71.88; material, \$203; total	\$157.19
Cost per foot, \$2.75.	274.88

Total cost of sewer.....

\$38.64; miscellaneous, \$2.37; total.....	432.07
Total cost per foot, \$4.32.	171.32

Total cost of power house-piping (except possibly a few small items connected with pumps, etc.)

	74,844.35
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OIL-SUPPLY SUMP AND PUMP HOUSE

Inlet piping, oil sump (see Fig. 38):
The following is for installing and cost of this pipe between the unloading tracks and oil sump: Labor, \$44.77; six 10-in. wrought pipe 18 ft. long, \$85.54; six 10-in. cast-iron cells, \$38.64; miscellaneous, \$2.37; total.....

108 ft. of piping at \$1.59.	171.32
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Oil piping:
Excavating trenches from 500,000-gal. oil tank to small 163-bbl. tanks. Trenches were 2 ft. wide and about 3 ft. deep. Total earth removed, 1150 cu.yd. Cost of labor, \$990.73; material, \$1.39; total

Cost per cu.yd., 86c.	992.12
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Pipe and laying; there were 1888 ft. of pipe, consisting of 172 ft. of 12-in. wrought-iron pipe, 270 ft. of 16-in., 850 ft. of 8-in. and 596 ft. of 2½-in. wrought-iron pipe. A 16-in. line runs from the oil sump to pump house, also from pump house to storage tanks. The 8-in. line runs from the pump house to the 163-bbl. tanks. The 2½-in. line runs from the Wilgus oil pumps to each of the reverberatories. Cost of labor, \$3156.14; material, \$5654.50; total....

Cost per foot of pipe, \$4.67.	8,810.64
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Heating installation for oil piping; a 2½-in. steam line is tapped off the steam line at power house and runs underground through a conduit and is packed in asbestos fiber. At the other end, the pipe connects with a cast-iron oil heater. Labor cost for installing was, \$167.37. Materials cost \$1068.04, and consisted of a cast-iron heater, \$303.82; No. 33 Crane tilt trap, \$35.91; 280 ft. 8-in. conduit, \$547.49; asbestos, \$29; 2½-in. pipe and fittings, \$151.82. Total cost of labor and material

Total piping, 360 ft. at \$3.43 per ft.	1,235.41
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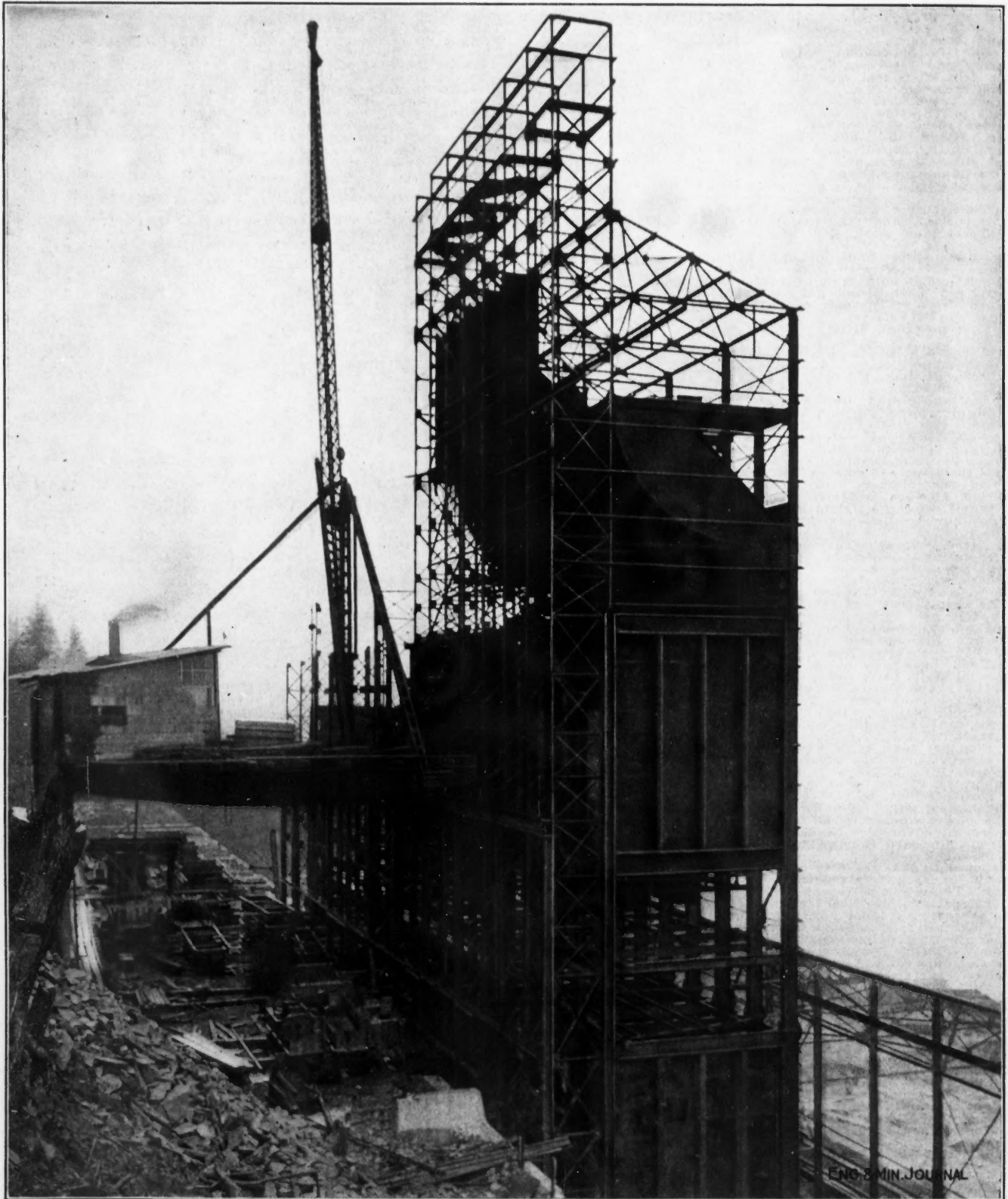
Total cost of piping at smelter, as given in details of cost.....

	\$11,389.34
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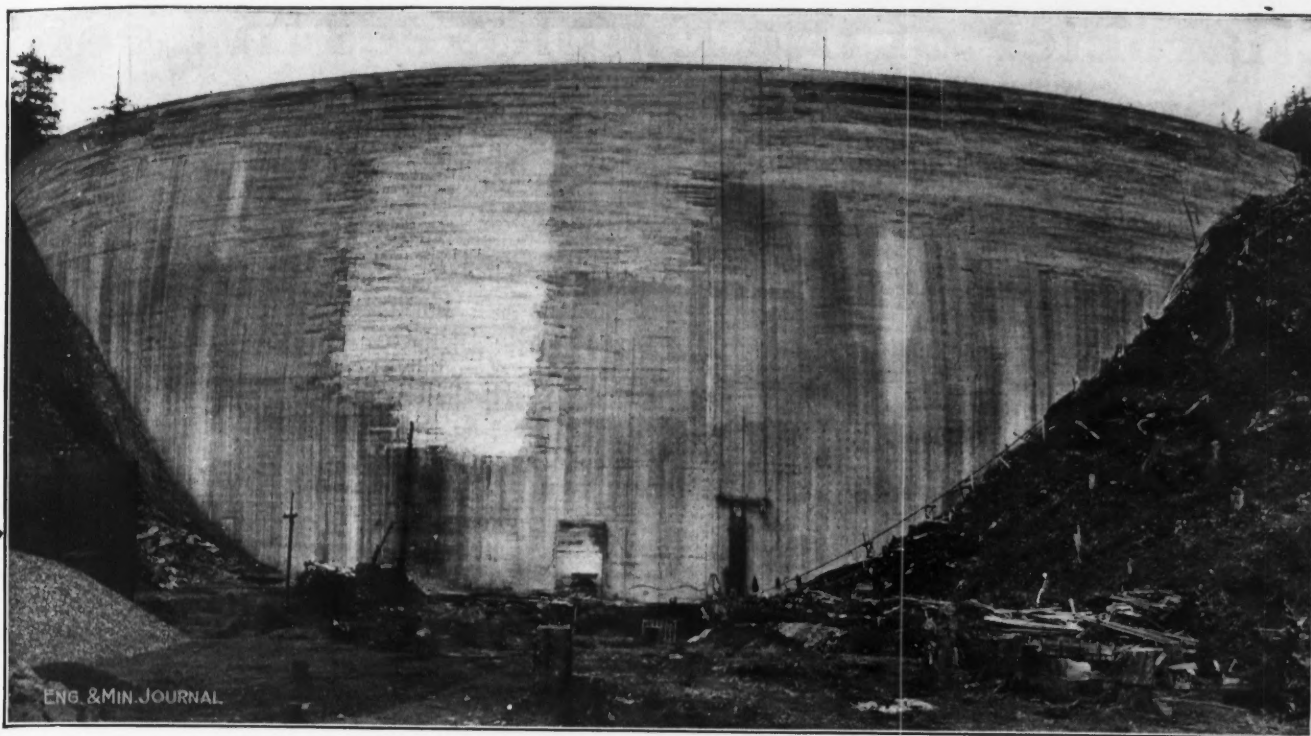
Operating Costs at the Dome

Report of the Dome Mines Co., South Porcupine, Ont., for the year ended Mar, 31, 1914, shows 145,305 tons milled. Costs were: Mining, 68c. per ton; hoisting, 7c.; crushing and conveying, 25c.; stamping, tube milling and amalgamating, 86c.; thickening, cyaniding and precipitating, 50c.; refining, 8c.; general, 64c., and total \$3.08 per ton. Development cost amounted to \$1.11 per ton. Average cost of mining, including hoisting and crushing, was \$1.46 per ton milled.

Photographs from the Field



CONSTRUCTION OF 6000-TON MILL OF ALASKA GOLD MINES CO., JUNEAU, ALASKA



UP-STREAM FACE OF DAM



SALMON CREEK DAM OF ALASKA GOLD MINES CO.
700 ft. long and 165 ft. high.

Character of the Employees in Lead Smelting in the United States

SYNOPSIS—A resumé of the findings of Dr. Hamilton in an investigation of the character of smelting-plant employes in the United States. These workers are of many nationalities, and colonize in different localities. Alcoholic excess exists principally among native-born Americans. They are essentially a shifting class, and employers have difficulty in retaining an experienced crew. Some of the villages are clean and well kept, but inattention and neglect is more common.

In her essay on lead poisoning in smelting and refining in the United States, published as a bulletin of the Bureau of Labor Statistics, to which we have previously referred in the JOURNAL, Dr. Alice Hamilton has some interesting pages on the character of the employees in this industry. She says:

The men employed in lead smelting and refining are for the most part foreign born of different nationalities, often newly arrived immigrants unable to speak English and unacquainted with the dangers of the work they undertake. This does not mean that they do not know the work is dangerous, for usually they have been warned by their fellow-countrymen, who have already worked in the plant, but they have no idea how to protect themselves against the dangers. On the Atlantic seaboard the men are chiefly Austrian Slavs, and the same nationalities are found in and around Chicago, with Magyars in addition. As we go farther west the mixture of nationalities increases. In the Federal plant near Alton there were in the spring of 1913 about 200 American-born whites and 25 negroes, the rest being Germans, Italians, Slavs and Greeks. The Italians were employed at the heaviest work, loading and unloading cars, the Greeks and Austrians in the yard and on blast furnaces, the negroes in the refinery, and the American whites on the ore hearths and in the powerhouse. In Collinsville the employees are negroes, American-born whites, Lithuanians, Italians, Syrians, Mexicans and Germans. The Hoyt Metal Co., in Granite City, employs Turks, Armenians, and Macedonians in addition to other nationalities. At Herculaneum the force consists of a much larger proportion of American-born whites, some of whom are regular smelters by trade, while some are farmers working at smelting only in winter. Some of these are descendants of the Washington County French. There are also Slavs, who form the more shifting part of the force. In Joplin alone the men are all Americans, many of whom come from Arkansas farms, work through the cold season, and return home in the spring. This alternation of employment is excellent for the men's health, and it is fairly general in the smelting industry. In Colorado the beet fields draw the men for the summer months, while the Slavs and Greeks of Chicago and southern Illinois go off on railroad-extension work.

NATIONALITIES

Leadville, Salida and Denver have chiefly Austro-Hungarians and Greeks, with a few Italians and Russians. Pueblo has more Italians and has also Mexicans. Montenegrins are found in the Utah smelters, in addi-

tion to other southeastern Europeans. In 1911 a census of the Omaha Smelting & Refining Co. gave the following nationalities: Italians, 134; Austrians, 82; Hungarians, 85; Americans, 59; Bohemians, 53; Irish, 20; Poles, 18; Swedes, 12; Germans, 11. In 1913 the East Helena plant had 92 Austrians and 44 Americans, the remaining 56 men being scattered among no less than 17 different nationalities. In all these smelters there is always at least a small proportion of skilled American-born or northern European workmen holding the better-paid places.

The force is roughly divided into the yard gang, employed at day wages for a 9- or 10-hour day (eight hours in Colorado) and the inside men who work for eight hours, three shifts, in the western plants and in Perth Amboy, or for 12 hours, two shifts, in Grasselli, East Chicago, South Chicago and Newark. In one typical smelting plant the yard gang numbers 175 to 200, the inside men 90 to 100. In one large refinery the yard gang, including repair men, has 300; the converters and blast furnaces, 250; the refinery, 90.

Wages in the largest eastern plant were given as 20c. an hour for men in the yard gang, who work nine hours, and 25c. an hour for the inside men, who work eight hours. In East Chicago the day wage is \$1.75; piecework averages \$3 a day. In Collinsville and Federal the day wage is \$1.65@1.80; the work on the ore hearths, in the dust-collecting system, and in unloading cars is piecework, and for this the men are paid from \$2.25 to \$3 per day. Farther west the wage for day labor rises, but that for more skilled work hardly changes at all. Thus, in Herculaneum and in Omaha, day laborers are paid \$1.65 per day, in Denver \$1.75, in Leadville and in Salt Lake City \$2, in Tooele and in East Helena \$2.25 or \$2.35, while in all these plants \$2.35 to \$3 was given as the wage for skilled work. Mechanics, repairers, plumbers, blacksmiths, etc., are not included here.

Many vague charges of alcoholic excess are brought against the men employed in lead smelting, but not often by the people who know them best—their own foremen and employers. That Slavic, Magyar, Italian, and German workmen drink beer, wine and even whisky is readily admitted, but they are not regarded as an intemperate class of men on the whole, nor are the negroes. It is really in the plants where many American workmen are employed that one hears most complaint of alcoholism, perhaps because American workmen cannot stand alcohol so well as Europeans.

A SHIFTING LOT OF MEN

The workers are a very shifting lot of men and even the cash bonus offered by one large company to men who remain as long as a year in its employ is not inducement enough to make them stay. This refinery had succeeded in keeping less than 30% of the force as long as one year at the time it was visited. Naturally such a state of things results in far more lead poisoning among the men than is found in a plant where the workmen remain for years, acquire a fair amount of skill, and learn the risks to which they are exposed.

Although almost all of the managers of American plants complain of the shifting character of their labor, the condition is worse on the Atlantic seaboard and in the neighborhood of Chicago and St. Louis than in western Missouri, Colorado, and Omaha. The following are some of the statements made by superintendents as to the shifting character of the men employed by them:

"From 25 to 30% new men must be employed every month."

"We cannot get steady workmen; we are always losing our men, though we pay more than the usual rate of wages."

"Not 30% have been here as long as one year, and those who do stay average only 20 days' work a month."

"In one month 25 out of 92 men quit work."

"Not many of the men stay more than two months. We always prepare for the semimonthly pay day by sending to the employment agencies in St. Louis and Chicago."

"Six hundred and thirty are employed all the time, but there were 800 on the books last month."

"The monthly pay roll is 350, but 100 new men were employed during August, 25 on the blast furnace alone."

In only two plants could accurate information be obtained as to the length of employment of the men then at work. In one, out of 238 men, 52 had been there less than one month, 91 less than six months, 106 less than one year, while exactly one-half the force, 119 men, had been employed less than two years. On the other hand, 75 had been employed over five years and 13 over 20 years.

The second plant gave a more detailed report, as follows: Employed less than one year, 298; one to two years, 75; two to three years, 48; three to four years, 35; four to six years, 39; six to eight years, 22; eight to 10 years, 14; 10 to 15 years, 15; 15 to 20 years, 16; over 20 and under 30 years 53, over 30 years, 15. In spite of the large number of casual workers, this is an unusually good showing, with 68 men employed over 20 years.

It is evident from the records that while none of the managers can boast of anything like a steady force of workmen, yet some of them suffer far more than others from the continual shifting. The plants which are near the big centers of industry naturally have more difficulty in holding their men than do those which are situated where there is not so much demand for labor. It is also true, however, that some of these plants enjoy fair reputations, while others are so notoriously dangerous that the newly arrived Greek or Slav or Italian is warned by his fellow countrymen that two months is the longest time he may safely work there, after which he must look for work in the open air to get rid of the poison.

In talking with the men employed in two neighboring plants it was learned that while one plant was receiving many applications for work from old employees returning from a summer on the farms the other was actually crippled for lack of men. It was easy to see why there should be this difference between the two plants, for one was unusually clean and under the management of an intelligent and careful man, while the other was one of the two most dangerous plants to be found in the country.

HOUSING

In almost every lead smelter there is a large number of foreign-born workmen, who have no families with them,

who have taken up the employment as a temporary thing, and who are eager to save as much as possible from their wages so that they may send home for their families or return to them. This part of the force usually lives close around the smeltery, and groups of men of the same nationality rent a few rooms which they use to the utmost limit permitted by the three-shift system. These rooms are sometimes surprisingly clean and well kept; more often they are as neglected and dirty as would be expected. Most smelting villages are very unattractive, dreary and squalid, and the dreary effect is added to by the sulphurous fumes which escape from the smokestacks of the works, sometimes only at intervals, sometimes almost continuously. Yet there are some pleasant, prosperous looking smelting villages of permanent homes, such as the one the Herculaneum, the one at East Helena, and the Slavic village at Pueblo. It is partly a question of permanence as against excessive shifting, for a migratory population will take little interest in a place of temporary sojourn only, but it is partly also a question of nationality, as can be seen in the contrast between the Italian-Mexican village in Pueblo, with its utter neglect of ordinary cleanliness in the surroundings of the houses, and the clean attractive Slavic village across the river. As a rule the smelting companies do not rent houses to their workmen, but in the three instances where this is done these houses compare very favorably with workingmen's houses in the neighboring towns, and the rent is moderate.

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The Copper Seizures

Four American companies which sell copper, viz., the American Smelting & Refining Co., the American Metal Co., Ltd., the United Metals Selling Co., and the Consolidated Metals Co., sent the following telegram, dated Oct. 28, to William J. Bryan, Secretary of State:

The undersigned, representing nearly 90% of the copper export trade of this country, have the honor to lay before you the following facts: We learned yesterday by cable that the Italian steamers "San Giovanni" and "Regina d'Italia" have been seized by British authorities at Gibraltar because part of cargoes consist of copper shipped from this country. The "San Giovanni" has 450 tons belonging to the American Smelting & Refining Co. and consigned in conformity with universal practice in the trade to order of that company at Genoa. The "Regina d'Italia" has 1160 tons, of which 150 belong to the American Smelting & Refining Co., 200 to the American Metal Co., 410 to the Consolidated Metals Co. and 400 to the United Metals Selling Co., practically all being consigned in the usual course in the same way.

We are further advised this morning by shipping agents that the American Line SS. "Kroonland," flying the American flag, and having on board 800 tons of copper belonging to the American Smelting & Refining Co. and 500 to the United Metals Selling Co., has also been seized and is detained at Gibraltar, the copper being consigned in usual course as in the other cases. Moreover, we have just been notified by the New York agents of the Sicilian American Line that, for reasons which cannot be explained, it absolutely declines to ship any copper by its SS. "San Giorgio," and this morning the Lloyd Sabauda Line has given notice of its refusal of a shipment of copper and cancellation of contract unless the name of an Italian consignee shall be given, together with a guarantee that the copper shall not be reexported from Italy, which guarantee it is manifestly impossible for the American exporter to give.

These measures of interference with our commerce threaten to stop altogether the exportation of copper from the United States to Europe, and this means practically the stopping of the entire export business in that metal, except to England and France, since there is no demand for the American product outside of Europe. The stopping of the export trade would affect disastrously the copper-mining industry throughout the West. We beg leave respectively to ask consideration of the

facts above set forth, and such representations and action by our government as it may deem appropriate for the relief of the critical situation in which the industry we represent is now placed, and we shall be very grateful to be acquainted of the action taken by the department to that end.

Acme Property in the Porcupine District

SPECIAL CORRESPONDENCE

The Acme Gold Mines, Ltd., is incorporated under the laws of Ontario, with a capital of \$3,000,000. Its claims adjoin the Hollinger on the northeast and cover the continuation of the Hollinger vein system. The company has four shafts in operation, is carrying on development work on the 100-, 200-, 300-, 425- and 550-ft. levels, and is sinking to reach the 800-ft. The company is owned entirely by the Canadian Mining & Finance Co., Ltd., which is a close corporation. It is not the intention of the owners to market any stock, as they believe that their best interests will be served by working the property.

The Canadian Mining & Finance Co. also owns the Millerton Gold Mines, Ltd., the property of which adjoins the Hollinger ground on the southwest and contains the extensions of the Hollinger veins in that direction.

If the Hollinger, Acme and Millerton were all one company, great economies in operations could be made, but it is practically impossible to amalgamate the properties on a basis satisfactory to all parties concerned, since the public owns approximately one-half of the Hollinger stock. Plans have been worked out, however, by means of which all three properties will be operated under one administration, and the mechanical details are being so arranged as to achieve most of the economies, which would result from an amalgamation of the properties. The Hollinger is extending its mill sufficiently to accommodate ore from the Acme and later will take ore from the Millerton. This will enable the milling costs to be reduced to the minimum. Sampling will not be relied upon to determine the respective values. The ore and solutions will be kept entirely separate throughout the milling operations. Separate precipitation systems are being provided and the necessary duplication of refinery apparatus will also be made. This means a slightly increased capital cost, but it does away with any question as to the values obtained by sampling. To offset this expenditure by the Hollinger, the Canadian Mining & Finance Co. is now completing a compressed-air generating station with a capacity of 15,000 ft. per min., sufficient for present requirements of all three properties. The building is of reinforced concrete and space has been provided for extensions of the compressing plant.

The Canadian Mining & Finance Co. is also sinking a central shaft. This will have levels at the 425-, 800-, 1250-ft. points and, it is hoped, at others still deeper. Electric locomotives will collect ore from the different properties and deliver it to a rough-crushing plant at the central shaft. The crushed ore will be hoisted to a crusher station at the surface for further reduction, and will be delivered from the crusher to the respective bins of the several companies in the mill. By this means it will be necessary to operate but one crusher station and one hoisting plant, which can be of the most advanced type; it is expected that each company will have to bear the cost of operating this plant during only eight hours per day.

This will result in the maximum economy in tramming, hoisting, crushing and conveying to the mill bins. It is expected that 18 months will be required for getting this central shaft into operation. The shaft will have six compartments, and will serve for carrying on development work on the lower levels of all three properties, as well as for handling men and materials and hoisting ore and waste.

From an engineering standpoint, the opportunities for economy are excellent, and by combining operations as outlined above, it will be possible to work all three properties under approximately the same conditions as would exist if they were combined into one corporation. There will be some duplication of underground superintendents, however, which would not be necessary if the companies were consolidated.

Cessation of Tin Mining in Bolivia

The inability of Bolivia to market its tin in Europe was commented upon in the JOURNAL last week, in connection with the movement to have these ores smelted in the United States. The local conditions with respect to the tin industry are reviewed by the La Paz correspondent of the *West Coast Leader*, under date of Sept. 22, as follows:

In spite of the efforts made by the government and the banks to tide the mining industry of Bolivia through the present crisis, the problem, resting as it does purely on the economic basis of supply and demand in markets which have been closed indefinitely, has shown itself to be not wholly amenable to the dictation of emergency measures. It has therefore been possible to make only partially effective the undertaking, on the part of the government and the banks, to advance to the miners 29 bolivianos per quintal of tin barilla on a basis of 60% tin, with the difference of B/ 0.80 for each per cent. of tin higher or lower than the ore may contain. Advances so far range from B/8 to B/10 per quintal, considerably below the cost of production. The banks also insist upon the miners giving them in guarantee the titles to their mines, and in every way make it so difficult that even if the miners were able to produce at this price, it would be impossible for them to comply with the terms of the banks. Therefore, almost all the tin mines in Bolivia have been shut down.

New Chemical Laboratory at University of Illinois

The University of Illinois, at Champaign, Ill., on Oct. 9 laid the cornerstone for its new chemical laboratory, which will be a five-story, fireproof structure. Combined with the present laboratory, of which it will be a part, it will be 231 ft. long, 202 ft. deep, of nearly four acres floor room. With the completion of this new addition, it is the intention of the faculty to provide a suitable training for chemists and chemical engineers.

Speaking of the need for these men, Dr. E. J. James, president of the University, said: "We cannot expect to rival Germany in a day or a week or a month in a field which she has cultivated with such patience and wisdom for more than a century, but we can take up the competition with her by adopting similar methods. Germany's success in this whole industrial field rests upon the foundation of discoveries made in the laboratories of her universities and upon the work of men trained in methods of independent research in those universities. Such men look upon chemistry as a profession and not merely as a trade by which they may gain a livelihood."

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- 26,818—SCRAP—The Care and Conversion of Rolling Mill Scrap. W. W. Rogers. (Advance copy, Am. Inst. of Metals, Sept., 1914; 4 pp.)
 26,819—SLAG—Utilization of Heat Contained in Slag. Walter L. Johnson. (Advance copy, Iron and Steel Inst., 1914; 7 pp., illus.)

- 26,820—SMELTER MANAGEMENT—Management of a Country Smelter. Herbert Lang. (Min. and Sci. Press, Sept. 19, 1914; 3 pp.) 20c.

- 26,821—SURFACE TENSION of Molten Metals. Sydney W. Smith. (Brit. Inst. of Metals, Sept., 1914; 43 pp., illus.)
 26,821a—WELDING—Tank Welding by the Oxyacetylene Method. Robert Mawson. (Am. Mach., Sept. 24, 1914; 2 pp., illus.) 20c.

- 26,822—WELDING—Thermit Weld in a Crank-Shaft. (Journ. West. Aust. Chamber of Mines, July 31, 1914; 1½ pp., illus.)

FUELS

See also "Petroleum and Natural Gas"

- 26,823—COKE—The Manufacture of Coke in 1913. Edward W. Parker. (Mineral Resources of the U. S., 1913, Part II; 66 pp.)

- 26,824—GASOLINE SUBSTITUTES—Tests of Substitute for Gasoline. J. A. Moyer. (Power, Oct. 20, 1914; 3½ pp., illus.) 20c.

- 26,825—OXIDATION OF COAL—A Study of the Oxidation of Coal. Horace C. Porter and O. C. Ralston. (U. S. Bureau of Mines, Tech. Paper 65, 1914; 30 pp., illus.)

MINING AND METALLURGICAL MACHINERY

- 26,826—BOILER FURNACES—Experiments with Furnaces for a Hand-Fired Return Tubular Boiler. Samuel B. Flagg, George C. Cook, Forrest E. Woodman. (U. S. Bureau of Mines, Tech. Paper 34, 1914; 32 pp., illus.)

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- 26,830—ELECTRIC SUBSTATIONS in Mines. H. Booker. (Iron Tr. Rev., July 9, 1914; 1 p.) 20c.

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- 26,839—PYROMETERS—Recording Pyrometers. Charles R. Darling. (Trans. Faraday Soc., Aug., 1914; 13 pp., illus.)

- 26,840—SMOKE MONITORS, ETC.—The Instantaneous Thermostat and Smoke and Fume Monitors, Precipitators and Recorders. W. W. Strong. (Journ. Ind. and Eng. Chem., Oct., 1914; 1½ pp., illus.) 60c.

- 26,841—STEAM BOILERS—Bericht des Dampfkessel-Ueberwachungs-Vereins der Zechen im Oberbergamtsbezirk Dortmund über das Geschäftsjahr, 1913-1914. Abstract. (Glückauf, July 11, 1914; 3 pp.) Report of the steam boiler inspectors' association of the collieries in the Dortmund district for 1913-1914. 40c.

SAMPLING AND ASSAYING

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INDUSTRIAL CHEMISTRY

- 26,846—CALCIUM CARBIDE and Nitrogen Products. (Engineering, Sept. 4, 18, Oct. 2 and 16, 1914; 9¾ pp., illus.) Conclusion of article previously indexed.

- 26,847—CYANAMIDE INDUSTRY, The. (Eng. and Min. Journ., Sept. 5, 1914; 1½ pp., illus.) Description of plant of American Cyanamid Co., Niagara Falls, Ont. 20c.

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- 26,850—WOOD PRESERVATION—How the Wood-Preserving Industry Can Avoid Injury Resulting from the War. Clyde H. Teesdale. (Eng. Rec., Sept. 26, 1914; 1½ pp.) 20c.

MISCELLANEOUS

- 26,851—BRAZIL—Trade Possibilities with Brazil. Henry C. Carr. (Eng. and Min. Journ., Sept. 12, 1914; ½ p.) 20c.

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- 26,854—RAILWAY—The Electrical Operation of the Butte, Anaconda & Pacific Ry. J. B. Cox. (Gen. Elec. Rev., Nov., 1914; 19 pp., illus.)

- 26,855—RECORDING DATA—Graphic Methods of Presenting Data. Willard C. Brinton. (Eng. Mag., Sept. and Oct., 1914.) Continuation of article previously indexed.

- 26,856—WEIGHTS AND MEASURES—Definitions and Tables of Equivalents of Weights and Measures. Roy Cross. (Kansas City Testing Laboratory, Bull. 7, 1914; 15 pp.)

Editorials

Cyanide Supply and Gold Production

Some alarm is still displayed respecting the effect of shortage in cyanide supply upon the gold production of the world. If there should be any restriction of gold production at this time the results would be serious indeed. However, we are now more than ever of the opinion that the excitement about this last August was only an ephemeral "scare."

The Roessler & Hasslacher Chemical Co., the only producer of cyanide in the United States, has assured us privately, and also has stated publicly, that it will be able to supply the cyanide requirements of this country. We have had no specific information from the British manufacturers, but we are aware of a general feeling in the industry that they will be able to supply the requirements of South Africa and the other British colonies.

The chief uncertainty has existed with respect to Mexico, but it has been appreciated that shortage of supplies in that country would affect silver production more adversely than gold production. However, we are just in receipt of news that arrangements for the renewed exportation of cyanide from Germany have been effected, and that the "Sun" is already on the way with 1000 tons for this country. There is an understanding that further shipments from Germany will follow, and it is understood, moreover, that this cyanide may be reexported from this country. The renewal of exportation from Germany was preceded by negotiations in Washington, which resulted in the removal of cyanide from the contraband lists.

Several independent projects for the manufacture of cyanide in this country have been under consideration. With respect to their present status, there is scarcely any information current. In any event, it would naturally be a matter of a good many months before new manufacturers would be in a position to enter the market. Summarizing, we do not think that difficulties in obtaining cyanide supplies are going to be so serious as to result in any material restriction of gold production.

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The Copper Seizures

The detention of several ships carrying American copper to Italy and Scandinavia, which was reported last week, is an extremely serious matter, more so with respect to its effect upon our copper-mining industry than upon our international relations. It is difficult to conceive of serious friction arising between the United States and Great Britain, but it is easy to foresee events which may be very adverse to our copper-mining industry. Indeed, it is probable that such events have already happened.

Germany is manifestly in great need of copper. Her willingness to pay 20c. per lb. shows that. The fact that copper realizes 20c. per lb. there, and only about 11c. per lb. here shows that outside countries have as yet been unable to deliver but little copper to Germany.

The copper seized last week was shipped by the principal American selling agencies to their own order in Italy. On the face of things, there seems to be no justice in interfering with the shipments by citizens in one neutral country to their own order in another neutral country. Great Britain is apparently convinced, however, that this copper is ultimately going to find its way to Germany, which is something not to be permitted. If Italy herself has put an embargo on copper, as has been reported, there will be a new phase of the situation.

The critical thing is that if the United States is limited to exporting copper to England and France alone, the outlet for our production, even at the present greatly curtailed rate, will be insufficient. Industry in France appears to be almost stagnant, while the British market is already flooded with copper that has been shipped thither on consignment. Let it be remembered that England is getting copper not only from the United States, but also from Australia, Africa, Chile, Spain, and elsewhere, in some of which countries, e.g., in Australia, there has not been so extensive a curtailment as there has been here.

✻

Prisoners of War

The war in Europe has brought out the latest developments of scientific fighting, while at the same time there has been an exhibition of the primitive. Zeppelins, aeroplanes, submarines, automobiles and 16-in. howitzers have been playing a great part, but so has cold steel in hand-to-hand fighting. The savagery of the fighting, the wholesale devastation of cities and the destruction of precious cathedrals have been fearful. Compared with the present war the campaigns of Napoleon were but jaunts of pleasure. To find the compeers of the present captains we have to turn to the mercenaries of the Thirty Years' War, and to Tamerlane, Ghengis Khan and Attila. In other respects also do we see a reversion to ancient customs, viz., in the treatment of prisoners of war, who are immediately put to work. The Russians put the German captives to road-building, canal digging and other things for the improvement of the country. The Germans put their prisoners to harvesting in the fields. What the British do with theirs we have not heard. Perhaps they have not yet any plan. If that be the case, C. Vey Holman, formerly state geologist of Maine and now operator of gold mines in Nova Scotia, is at hand with one.

We learn from *The Evening News*, of New Glasgow, Nova Scotia, that Mr. Holman has written to Lord Kitchener, asking him for prisoners of war to work in the Nova Scotia gold mines. So far as the mines operated under his own control are concerned, he offers to donate to Great Britain "all gold taken by the labor of such prisoners during the continuance of this war, above the actual cost of production." Mr. Holman argues that these prisoners must be made to earn their subsistence in order not to be a burden upon the Empire and how better could they be put to work than in being made to produce gold, which

the Empire needs; and which, rather than steel, copper or lead, is ultimately going to settle things? Mr. Holman goes more into details, which need not be repeated. His argument sounds good. In effect, Britain's prisoners may be caused to win the war for her. This is almost like the all-profit and no-cost of the cat and rat farm. The only thing that we feel doubtful about is the Nova Scotia gold field.

However, there is perfect historic precedent for the use of prisoners that Mr. Holman proposes. Indeed, the Greeks and Romans were wont to make war in order to seize men to work their mines. The mines of Laurium were full of barbarians torn from Macedonia and Thrace, and to man the Rio Tinto mines the Romans raided Gaul. The revival of the idea is interesting. We wonder what the labor unions will say about it?

✽

Construction Work Resumed

In August and September there was a general cessation in mining and metallurgical construction, which afforded some relaxation to certain overworked engineering staffs, but it did not last long, nearly everything now being prosecuted about as previously. Some pictures in the JOURNAL this week give an idea of the huge construction work that the Alaska-Gastineau company is doing. Other pictures show something of Calumet & Hecla activities, also on a big scale. The construction of the Anaconda's sulphuric acid and leaching plants, temporarily interrupted, has been resumed. The remodeling of the Washoe reverberatories is also in hand. The plans for the reconstruction of the Great Falls refinery have been delayed, however. The Inspiration company is moving slowly, there being no need to hurry things with the copper market as it is now. Putting new copper on the market would be robbing the stockholders. Construction at Chuquicamata is going steadily along, but inability to obtain necessary things from Germany is troublesome. In the iron region of Michigan and Minnesota, several concentrating mills are projected. We prophesy that there is going to be a lot of such work in that region in the not very distant future.

In smelting constructions 1914 has not been a very active year, anyway; certainly nothing like 1913, when many large plants were in course of construction. Most of these were completed before the end of that year, or early in 1914. The Rose Lake and Langeloth zinc smelters begun in 1913 are now about finished. The largest copper-smelting works now under construction is the Miami plant of the Anaconda company.

✽

Sheet Zinc

Through the recent ups and downs of the spelter market, the manufacturers of sheet zinc have been enjoying an uninterrupted prosperity that is very welcome, following a long period of dull business, as it does. Whether we export spelter as slabs or sheets, the statistical result is, of course, the same, but the country benefits the more from the more highly manufactured form.

The use of sheet zinc in the United States has not extended as much as we have hoped it would. The use of it for roofing, which is so important in Europe, has never been important here. A new and interesting use has lately developed in the construction of the cottages at

Langeloth, Penn., a sheeting of very thin zinc being put over the studs, which externally are covered with expanded metal and plaster. The zinc sheeting, which adds about \$30 to the cost of a cottage, makes it wind- and weather-proof.

We think that there are possibilities in the sheet-zinc business in the United States which have failed to be appreciated. We need some new outlets for our steadily increasing production of spelter.

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Conditions in Silver

The price of silver continued to decline during all the month of October, and at the opening of this month it reached the lowest point recorded since December, 1908, being 22 $\frac{3}{8}$ d. in London and 48 $\frac{1}{2}$ c. in New York. Both quotations were for cash silver, no futures being offered or bid for. The price has not been strong at any time during the present year, though supplies have hardly been as large as usual, by reason of the troubles in Mexico. The receipts in London, where most of the metal is handled, were approximately 72,600,000 oz. up to the end of September, against 89,600,000 oz. in the corresponding period last year, and 98,300,000 oz. in 1912. The smaller receipts, however, have been more than sufficient for the demand.

As we have often shown, the main support of the silver market has been the demand from the Far East, which has for years absorbed about two-thirds of the silver production of the world. The European demand is mainly for subsidiary coinage and for use in the arts. The coinage requirements were about normal up to July, while those for manufacture were lighter than for two or three years past, owing to the general depression in business. As to the Eastern demand, China has not been a buyer at any time this year, owing to the disturbed financial condition of the country, and to the consequent postponement of the adjustment of the new coinage system, which has not yet been settled. In the early part of this year, India was a smaller buyer than usual. That country has been fairly prosperous, but the tendency to buy gold instead of silver in which to invest its savings has increased to a degree that was perceptibly felt in the silver market.

The breaking out of war, of course, put a temporary stop to all dealings in the silver market. The break lasted only a short time, and dealings in cash silver were resumed. The general financial dislocation which followed the beginning of the war almost stopped the demand from India, and for a time the only demand was for coinage. Now that business with India has begun to resume more normal conditions, a new trouble has arisen from the operations of a German cruiser in the Indian Ocean, which have made the transit of the metal decidedly unsafe.

The last named condition will doubtless be soon removed. The future of the market, however, does not seem specially promising. Coinage and commercial demand must continue limited. The shipments from Mexico are likely to increase. Unless there is a revival in the demand from the East—which is not now expected—the prospect is for continual low prices for a time.

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The Supreme Court, on Nov. 2, granted the application of Minerals Separation Ltd., for a writ of *a certiorari*. This means that the decision of the Circuit Court of Appeals was found to be questionable on points

and that the Supreme Court itself will review the case, which is something unusual in patent litigation as now conducted. Patent litigants seldom get so far as this, even in major cases.

BY THE WAY

Berton Braley, in the *Illustrated Sunday Magazine*, thus characterizes the miner:

—He must work in gas and see in the dark,
The music he hears is the air-drill's bark,
It isn't no picnic in the park,
It isn't no cinch he's stole!
He's carpenter, plumber, machinist, yes,
A sort of surveyor, too, I guess,
A little of everything more or less,
The miner who digs the hole!

In a certain new metallurgical works now under construction, a pattern shop was added to the carpentry. In getting up the new apparatus for which castings were required, the patterns were made under direct supervision and were sent to the foundry instead of sending drawings. This made it possible to see in advance just how the castings were going to look. As everyone knows they are apt to look quite different from the idea that is derived from a drawing.

We read a lot of curious things on technical subjects in the newspapers, and seldom expect accuracy in them, but we wonder what sort of mental aberration led a British Columbia journalist to write: "According to information from the East, our zinc ores may find a new market on account of the war. Hitherto Germany has been supplying half of the world's entire demand for sodium cyanide. That chemical is produced from zinc, and it is not at all unlikely that the United States, which is eagerly taking up the manufacture of products formerly carried on by Germany, will be soon producing sodium cyanide as a byproduct of its zinc, all of which may have a good effect on the market for local zinc ores." Let the much maligned zinc metallurgists ponder upon this suggestion.

"The attached clipping from a Los Angeles paper, showing a report from the U. S. Census Bureau, shows where the engineers have gone, in answer to some of the past questions in the JOURNAL," says a subscriber. "There is room for many more here providing they do not have to depend on the profession for a living." This list is for the city of Los Angeles only:

In professional service are 7717 men and 5094 women. Included are 237 actors, 210 actresses, 252 architects, 550 artists, sculptors and teachers of art, 424 authors and editors, 194 chemists and assayers, 907 civil and mining engineers, 422 designers and draftsmen, 1015 lawyers and judges, 1460 musicians and teachers of music, 2281 teachers, 820 trained nurses and 54 veterinarians.

Woman's suffrage rarely interferes with mining operations or a miner's sleep, but in Hawthorne, Nev., recently, it did both. An ardent woman supporter of the cause was delayed in reaching the Lucky Boy mine; the day shift was in bed and the night shift at work. These were small obstacles. The fire bell was rung, arousing the day shift, and a lively meeting was held, the side of a dump serving as an auditorium. The delegate then went into the mine

through a 6000-ft. tunnel and the night shift listened to a midnight suffrage speech. Needless to state, every miner at the Lucky Boy will vote for woman's suffrage.

The following "Waltmason" illustrates how readily even the semi-educated Mexicans appreciate the advantages of modern scientific achievement, being at times more progressive than is consistent with the degree of progress in their country: "The foreman at the Cobre mine showed up one day at half past nine; so when Don Carlos went to town to buy supplies, he wore a frown, and at the Tienda Aleman de Mercerias he began to price *relojes despertadores*, to wake up lazy Manuel Flores. The suave, polite young German clerk displayed all kinds and made them work; and, praising one, said, "This is nice, just *cinco pesos*, special price; the luminous paint lights every mark so you can tell time in the dark." A test in darkened room was made. Don Carlos then four *pesos* paid and asked a price per hundredweight on luminous paint, with shipment date. Said he, "Those thieving miners steal so many candles that I feel like painting all inside my mine with this new stuff to make it shine. One coat would make a light intense and then I'd have no more expense."

The possible shortage of gasoline in Germany has been the subject of much discussion. The United States, which is the largest producer, has at present a large surplus production that it is anxious to market. The seizure of certain oil-carrying steamers by the British has been with the object of preventing this petroleum from finding its way into Germany, where the petroleum resources are small. In view of the importance of motor spirit in the enormous transport problems of the European war, it is of interest to examine the data of the world's production of petroleum in 1913. The *Financial Times* publishes the following estimate: United States, 32,315,440 tons; Russia, 9,246,942; Roumania, 1,885,286; Galicia, 1,087,286; Mexico, 3,000,000; Dutch Indies, 1,534,223; British India, 1,000,000; Japan, 250,000; Germany, 130,000; other countries, 350,000; total world's production, 50,797,175 tons. It will be seen that the United States is far and away the largest producer of petroleum, its output amounting to 63% of the world's production. Germany's output, on the other hand, is only one-quarter of 1% of the world's total. Hence, the British interest in restricting, to normal domestic consumption, the imports of petroleum into neutral countries, such as Holland, Denmark, and even Italy, which at this writing has not taken sides in the European struggle. The normal production of petroleum in Germany is about a million barrels a year. Lately Germany has been obtaining petroleum from Roumania, via Predeal and Budapest, especially from the Societate Steaua Romana, which is controlled by the Deutsche Bank; probably this source of supply will be cut off, as it is stated that the Roumanian government is exercising a close supervision of all shipments. It is likely that work in the Galician fields is at a standstill, the oil zone being in the line of the Russian advance. The restriction of petroleum imports may hamper Germany in the movement of its armies, but when the supply of petrol becomes scarce, other fuel will doubtless be substituted, such as potato alcohol, distillates from coal, and other manufactured spirits, for the production of which no country is better prepared than Germany.

The Alaska Railroad

Two members of the Alaska railroad engineering commission, W. C. Edes and Thomas R. Riggs, who returned to Seattle from Alaska on Oct. 25, were interviewed by a representative of the JOURNAL. They state that in their report to Washington they will urge the construction of a Government trunk line from tidewater to Fairbanks.

Mr. Riggs, who had charge of the surveys from Broad Pass down the Nenana River to Fairbanks, said that the road will have the effect of prolonging the prospecting and development season a month or so in the fall and will enable summer work to begin a month earlier. It will operate to reduce the cost of living by reducing haulage charges from the coast and by doing away with the necessity of the merchants carrying stocks over long periods. Even this single trunk line will help the development of all interior Alaska by putting the railroad terminus and the base of supplies at approximately the center of the territory.

The commission surveyed 1200 miles of railroad line all told, definitely located part of this and made paper locations of from 400 to 500 miles. This work included relocation of the Alaska Northern line from Seward to



LIEUT. FREDERICK MEARS WILLIAM C. EDES THOMAS RIGGS, JR.

the Susitna River and thence to Fairbanks, location of a route from Portage Bay to the Alaska Northern line, from the Alaska Northern to the Matanuska coal field and from the Alaska Northern to the Kuskokwim, together with routes from the trunk-line route to the Nenana coal field. The commission also had the benefit of surveys already run from Chitina to Fairbanks, from Valdez to the Copper River & Northwestern line and from the Berling River coal field to Cordova.

The last part of the time of the commission was taken up with investigating and surveying port terminals at Cordova, Nelson, Valdez, Seward and Portage Bay. It seems most probable that the first unit of the Government system will be a trunk line from Portage Bay to Mile 63 of the Alaska Northern, thence to Knik, thence to the Susitna River and along the Susitna, Chulitna, Nenana and Tanana Rivers to Fairbanks. It is along this route that the Government has recently withdrawn so many townsites; along the other surveyed routes, townsites have not been withdrawn. This route would, of course, include a branch from Knik up the Matanuska River to the coal fields. Eventually, the system would be

expanded and connection made with the Copper River & Northwestern.

Maps, profiles and estimates are being prepared in Seattle and will be forwarded to Washington as soon as completed, along with the report of Lieut. Frederick Mears, who is still in the North making surveys in the Sheep Creek district. He was to return about the first of November.

Mr. Edes left Seattle for San Francisco to confer with Secretary Lane. He reported great enthusiasm throughout Alaska in expectation of the coming of the railroad.

Mining Dividends for October

Twenty-eight United States mining companies reported dividends aggregating \$3,551,460 for October,

United States Mining Companies	Situation	Per Share	Total
Anaconda, c.	Mont.	\$0.25	1,165,625
Brunswick Con, g.	Calif.	0.06	23,717
Bunker Hill & Sullivan, l.s.	Ida.	0.25	81,750
Bunker Hill Con, g.	Calif.	0.01	5,000
Caledonia, l.s.	Ida.	0.01	26,000
Daly-Judge, s.l.	Utah	0.15	45,000
Eagle & Blue Bell, g.s.l.	Utah	0.05	44,658
Fremont, g.	Calif.	0.02	4,000
Golden Cycle, g.	Colo.	0.05	75,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Iron Blossom, l.s.g.	Utah	0.10	100,000
May Day, g.s.l.	Utah	0.03	24,000
Old Dominion M. & S., c.	Ariz.	2.25	364,500
Portland, g.	Colo.	0.02	60,000
Stewart, l.s.	Ida.	0.10	123,826
Skidoo, g.	Calif.	0.01	10,000
Silver King Con., l.s.	Utah	0.75	62,000
Tennessee, c.	Tenn.	0.75	150,000
Tom Reed, g.	Ariz.	0.06	54,473
Tonopah-Belmont Dev., g.s.	Nev.	0.25	375,000
Tonopah Extension, g.s.	Nev.	0.07½	70,757
Tonopah Mining, g.s.	Nev.	0.25	250,000
United Globe, c.	Ariz.	3.50	80,500
Vindicator, g.	Colo.	0.03	45,000
Wasp No. 2, g.	S. D.	0.01	5,000
Wolverine, c.	Mich.	2.00	120,000
Yosemite, g.	Calif.	0.10	2,400

Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Sm. Sec. pfd. A.	{ U. S. }	\$1.50	\$255,000
Am. Sm. Sec. pfd. B.	{ Mex. }	1.25	375,000
Bethlehem Steel	Penn.	1.25	186,350
Cambria Iron	Penn.	2.00	169,360
Guggenheim Expl.	U. S., Mex.	0.87½	727,768
Old Dominion of Maine, c.	Maine	0.25	73,338
Penn. Salt	Penn.	3.00	150,000
Sloss-Sheffield	Ala.	1.75	117,250
U. S. Sm. Ref. & Min.	U. S., Mex.	0.87½	425,563

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Con. Min. & Sm., c.l.s.g.	B. C.	\$2.00	\$116,088
Crown Reserve, s.	Ont.	0.02	35,376
Hollinger, g.	Ont.	0.15	90,000
La Rose, s.	Ont.	0.25	187,328
Lucky Tiger, g.s.	Mex.	0.09	64,380
McKinley-Darragh-Savage, s.	Ont.	0.03	67,431
New York & Honduras-Rosario, g.	C. A.	0.30	60,000
Nipissing, s.	Ont.	0.25	300,000
Porcupine Crown, s.	Ont.	0.03	60,000
Seneca-Superior, s.	Ont.	0.10	47,638
Standard, l.s.	B. C.	0.02½	50,000

1914, as against \$8,159,716 paid by 39 companies in 1913. American metallurgical and holding companies paid \$2,479,629, as against \$3,393,607 in 1913, while 11 Canadian, Mexican and Central American companies paid \$1,078,241, against \$2,163,393 in 1913.

The month's record is largely that of disappointments, Anaconda, Old Dominion of Maine, Seneca-Superior and United Globe reduced their dividends; Mary McKinney, Shattuck-Arizona, and U. S. Smelting common, omitted them altogether. It is a pleasure to note, on the other side, the dividends paid by Caledonia, Skidoo and Wolverine, after long silences on this subject, as well as the increase by Golden Cycle.

Total for the first nine months of the year are: United States mining companies, \$49,242,100 in 1914, against \$62,175,610 in 1913; smelting and holding companies \$70,127,102 in 1914, against \$71,996,631 in 1913; Canadian, Mexican and Central American mining companies, \$13,680,365 in 1914, against \$18,817,816 in 1913.

PERSONALS

John McGee has been making examinations in the Greenhorn district of Oregon.

Robert H. Richards will spend the month of November in Virginia on professional work.

Edward Carter has taken charge of the work of the Precious Metals Exploration Co. at Mogollon, New Mexico.

Morton Webber has been engaged in examination work in the Flat River lead belt, Missouri, on behalf of Boston interests.

A. M. Swartley, of the Oregon State Mining Bureau is in Granite camp completing some of the details of the field work recently done.

P. Argall, consulting engineer of the Ozark Smelting and Mining Co., at Magdalena, N. M., has returned to Denver after a visit to the mines.

Fred Jones, until recently engineer for the Portland Gold Mining Co., Victor, Colo., is now superintendent. Frank Smale is general manager.

Frederick H. Morley has retired from the practice of his profession of mining engineering, and is going into horticultural work in the vicinity of Santa Barbara, Calif.

Captain Thomas Walters, for many years in direct charge of the Jones & Laughlin mines on the Lake Superior ranges, has resigned. E. F. Bradt has been appointed as his successor.

John Mocine, general manager of the National Copper Mining Co., Mullan, Idaho, has become superintendent of surface plants of the Goldfield Consolidated Mines Co., Goldfield, Nevada.

F. W. Schumacher, of Columbus, Ohio, owner of the Schumacher mine, was recently at Porcupine, Ont., looking over the property in connection with the proposed installation of a new mill.

F. H. Hitchcock, president of the Ernestine Mining Co., at Mogollon, N. M., has been visiting the property. E. A. Wayne, general manager of the company, is in the hospital at Silver City, N. M., recovering from an operation.

Messrs. Laney, Spencer, McDonald and Hunter, of the U. S. Geological Survey, are in Santa Rita, N. M., and vicinity, covering the geology of the country included in the Santa Rita special map of the Survey of three years ago.

Oscar B. Warren, of Hibbing, Minn., has lately returned from a trip to the Pacific Coast. Mr. Warren is now managing two new operations, one being the Isabella mine of the Cascade Mining Co., this mine being situated on the Cascade branch of the Marquette range, Marquette County, Mich.; the other being the Bennett mine, operated by the Keewatin Mining Co., on the Mesabi Range, west of Hibbing.

George E. Roberts has resigned his position as director of the United States Mint. He has accepted the position of assistant to the president of the National City Bank of New York, which office was recently created, and he expects to take up his new duties in a few weeks. Director Roberts served as head of the Mint Bureau during four presidential terms. In 1907 he resigned to take the presidency of the Commercial National Bank, of Chicago. President Taft reappointed him, and although a Republican, he was continued in the present administration. His term would not have expired until December, 1915. Mr. Roberts is one of the country's foremost authorities on financial subjects and author of a number of important papers on international finance.

OBITUARY

Mark Hanna, mine captain of the Porcupine Pet at Porcupine, Ont., and an Italian laborer named Carino, engaged in repair work at the mine, fell into the intake from Simpson Lake on Oct. 27 and were suffocated in the mud. Two others were rescued with difficulty.

Anton J. ("Tony") Jacobson, a well known mine operator of Salt Lake City, Utah, died Oct. 28 after several months' illness. Mr. Jacobson was president of the Alta Consolidated Mining Co., and was instrumental in bringing the former Columbus Consolidated mine at Alta to a productive state.

Frederick E. Calverley, of Whitby, Ont., died Oct. 28, from a severe attack of pneumonia in his 34th year. He was engaged in mining at Cobalt during the early days of the

camp and held extensive mining interests, but for the last few years had retired from active business owing to ill-health.

Albert Teats, a well known mining man in the Leadville district, Colo., committed suicide, Oct. 25, at the office of the Siwatch Tunnel where he has been acting as manager for a pool of lessees. He was born at Mt. Clemens, Mich., in 1853; went to Colorado in 1864, settling at Central City; moved to Leadville in 1879. He has held important positions in the past with the Maid of Erin and Penrose mines. Ill health is ascribed as the only excuse for his act.

John Cowling, a pioneer of the Michigan iron country, died at Ely, Minn., Oct. 20, aged 68 years. He was born in Cornwall and came to this country when 19 years old. After working a short time in Pennsylvania and in the copper country, he became mine captain of the old Quinnesec mine on the Menominee range. In 1884 he went to Minnesota and was employed at several mines on the Vermillion range, including the Pioneer A and the Chandler, as mining captain. Two years ago the Oliver Iron Mining Co. retired him on a pension.

James Green, chairman of the board of directors of the Laclede-Christy Clay Products Co., St. Louis, died Oct. 19, aged 85 years. He was one of the wealthiest men of St. Louis, and was the first to manufacture firebrick and similar products in the West. He was a director of the Mechanics-American National Bank and the Guardian Trust Co. He was a native of England, being born in Staffordshire, but came to America in 1852, first working in rolling mills and was in charge of the old Laclede Rolling Mills, St. Louis, until 1874. He leaves a widow and two sons.

James Hasbrouck Le Fevre, vice-president and general manager of the Electric Steel & Metals Co., Ltd., Welland, Ont., died Oct. 23, from burns caused by an explosion which occurred at the turning on of the electric power at the new plant. He was in his 45th year. After his graduation from Rutgers College, Mr. Le Fevre entered the employ of the Pennsylvania Steel Co., at Steelton, Penn. Later he held important positions with other steel concerns of the United States and Canada. He was widely known for his ability as a metallurgist, and manufactured the first steel made in Canada, at the plant of the Dominion Iron & Steel Co., Sydney, N. S. He was one of the promoters of the Electric Steel & Metals Co., whose plant is being made ready to manufacture shells for the British Government. He was also vice-president of the Standard Tube & Fence Co., Woodstock, Ont. He leaves a widow and two sons.

David John Kelly died at Salt Lake City, Utah, Oct. 10, at the age of 37 years. A great loss has been sustained, not only by his personal friends and associates, but also in those fields of endeavor where his inventive genius has assisted to solve many metallurgical and mechanical problems. He was a native of Utah, was educated in the Salt Lake schools, and later took his M. E. degree at the University of Utah. In 1898-9 he was working under George Moore, as assayer, for the Salt Lake branch of the Consolidated Kansas City Smelting & Refining Co. In 1901 he was again with George Moore at Sunshine, Utah, where the Moore filter was born, and at that time he first conceived the idea of the Kelly filter press. It was not until 1905, however, that he built his first working model and demonstrated his theory. With unbounded faith, courage and perseverance, through financial vicissitudes, mechanical difficulties, disloyalty of a principal associate, he struggled on, never wavering, until the Kelly filter press, through his creative genius and untiring efforts became a recognized factor, not only in metallurgical plants but in sugar factories and chemical works all over this country and in many foreign countries. To those who have known "Dave" Kelly through the years of his struggles to the dawning of his success his death, at this time, seems hard to understand, and we have yet hardly realized that this genial, whole-souled friend has left us. With a joke and a smile he met all difficulties, grappled with and downed them. To his sorrowing widow and two little sons heartfelt sympathy is extended; those who are now carrying on his work realize the trust imposed on them and hope to be able to bring to full fruition the work so well began.

SOCIETIES

American Institute of Mining Engineers—The nominations for 1915 are: President, W. L. Saunders; vice-president, Sidney J. Jennings and Philip N. Moore; directors, Samuel A. Taylor, Robert W. Hunt, Hennen Jennings, George C. Stone and W. H. Aldridge.

Editorial Correspondence

SAN FRANCISCO—Oct. 28

Operation of Compensation Insurance in California as conducted by the state industrial accident commission is reported by the commission as so successful that on Jan. 1, 1915, the state compensation insurance fund will be prepared to allow a return of premiums to its policy holders in an amount equal to 15% of earned premiums and distributed in percentages ranging from 5% to 25% of premiums of employers and various hazards, depending upon the loss in the several groups. Whatever success has attended compensation insurance in California, however, it has in no way benefited the mining industry, as the mines are precluded from state insurance by the inadequacy of the fund appropriated by the legislature.

DENVER—Oct. 20

A Marked Activity in Digging has followed the failure of Congress to pass upon the bill that aimed to relieve prospectors and claim owners of the necessity of performing their annual assessment work for 1914. It is probable, however, that many locations will be open to restaking on Jan. 1, 1915, since the prevailing low market for metals is having a discouraging effect on prospectors. Congressman Edward T. Taylor reports that Secretary Lane found the majority of miners in the country opposed to the bill.

Smelting in Colorado—The Colorado plants of the American Smelting & Refining Co. are handling about the same tonnage of ore as at the mid-year, approximately 55,000 tons per month. The same number of furnaces is running in each plant as before, viz., five in the Arkansas Valley plant, one at Durango, and three each at the Globe and Pueblo plants. The only plant where there is any special change in conditions is the Arkansas Valley, which is busy and is receiving a plentiful supply of ore. The recent sharp decline in the price for silver is creating a poor prospect for ore supplies from some districts, but the ore receipts from Cripple Creek remain about normal, i. e., 3000 tons per month.

BUTTE—Oct. 29

Political Activities have forced all other interests into the background. In the existing political turmoil the affairs of the military would have received scant attention had it not been for the repeated disgraceful disturbances in the county jail, which the authorities seemed unable either to prevent or to suppress. Eight prisoners have escaped, others have attempted several times to set the place on fire, have demolished furniture and fixtures, are insulting and forcibly resisting the attendants and are getting more unruly every day. Due to these disturbances and the hold-ups and other lawless acts in various parts of the city, the confidence of Butte citizens in the military régime, which at first furnished relief from the incompetence of certain civil authorities, has been materially shaken and speculation has been aroused as to the reasons for this return to lawlessness.

Perhaps the utterance of Jesse B. Roote, judge advocate-general, in an appeal made Oct. 27 to the supreme court for a rehearing in the case of Dan Gillis, throws some light on the situation. He says: "The military force in Silver Bow County, by the decree of this court in this case, has been rendered almost powerless to restore order and civil authority." It will be remembered that this decision was that the military courts were illegal. Obviously, somebody made a blunder that is highly deplorable, inasmuch as it puts a doubt on the legality of the whole military régime and begets a general contempt for the laws of the state, which those in power and appointed to enforce them have—presumably through sheer ignorance—been permitted to violate without incurring any visible evil consequences to themselves. Such conditions cannot but encourage prisoners to resist the authorities, who, they claim, are lawbreakers themselves and had no right to imprison them or, at any rate, have no longer the power to punish them. Inviting as such conditions are to the lawbreaker and to the professional agitator, they are discouraging in the highest degree to those commanded to maintain order, but given only partial authority to do so.

Those opposed from the beginning to military authority in any shape are losing neither time nor opportunity to point out the ridiculousness of it all and to make invidious com-

parisons between the blunder committed by so called authorities and the deeds pronounced lawless because committed by less favored individuals. These critics certainly have a large degree of justice on their side, and their arguments are troublesome to answer, however much one may distrust their disinterestedness.

At the present writing it is far from clear how the vexing problems confronting the County of Silver Bow and the City of Butte are to be solved or whether they will ever be solved if the vacillating tactics experimented with in the immediate past are continued.

SALT LAKE CITY—Oct. 20

A Model of the Utah Copper Mine will be constructed for exhibition at the Panama-Pacific Exposition in San Francisco. The model will be 36 ft. long by 27 ft. high, and will be exhibited in the Utah building. A model of a Utah coal mine will also be made, showing the position of the coal beds, method of working, etc. Contracts for the work have been given to E. L. Mulkey. A large relief map of Utah, 16x20 ft., is also being prepared by the Agricultural College at Logan, for the exposition. It will be made in clay, in nine sections, from which plaster of paris casts will be taken.

SEATTLE—Oct. 28.

The Valdez Creek Placer Mines, operating on Valdez Creek, has made a record achievement in installation. This summer the company purchased a hydraulic-mining outfit weighing 260 tons, including a mile of heavy pipe-line, three giants and all the necessary tools and machinery for riveting the pipe and installing the plant. This outfit arrived on Valdez Creek on May 7 and installation immediately began. The layout included a mile and one-quarter of ditch, 8 ft. wide on the bottom, 15 ft. wide on top and 3 ft. deep, capable of carrying 3500 miner's inches of water; a penstock; flume; electric-lighting plant; steam sawmill; an electrically driven air compressor and drilling outfit. Fifty-four men were employed during the greater part of the season. The penstock, flume, one mile of pipe line and the entire water system were completed and the water turned through for the first time on Aug. 27. On Sept. 20, the men started to clean bedrock in the pit made by the hydraulicicking, but freezing weather setting in at once, forced them to suspend work. They did, however, clean the boxes, which yielded \$4200; the bedrock should yield a much larger sum.

The Kenal Peninsula stands a good chance of becoming a formidable competitor of Nome as a gold-dredging region. A number of mining men are figuring on the construction of dredges for installation there next summer, while this season there were many cleanups of gold ranging up to as much as \$30,000. The biggest was made on Crowe Creek by Dick Lawson and associates, who, it is reported, took out about \$40,000. N. B. Solner, of the Union Savings & Trust Co., Seattle, brought down over 700 oz. from the property. The peninsula during the summer was visited by many Nome dredging men and engineers, among them being J. H. Hutchinson, former governor of Idaho, who opened up the tin deposits in the Nome region several years ago. Hutchinson optioned a number of claims at Hope for \$25,000. They lie on Resurrection Creek, where Gus Sleffert, formerly of Nome, has just installed a big hydraulic plant for the St. Louis Hydraulic Mining Co. Maj. L. H. French and C. E. Herron, also formerly of Nome, operated a drill on Six Mile Creek, near Sunrise City, and are planning to install a dredge for next summer. The drilling showed a content in excess of \$1 per cu. yd.; it was conducted by Arthur Jett, former manager of the Miocene Ditch Co., of Nome. The creek was opened in 1896 and about \$300,000 was taken out by rocking along the rims. The stream itself was never worked on account of the heavy flow of water. Two years later, the discoverers deserted the camp for Dawson.

Frank Young will install a dredge on the Kenal River; Prof. Herschel Parker, of Mount McKinley fame, is developing a large tract of ground in that region; and Paddy Cummings, of Nome, will install a hydraulic plant. The Gilpatrick quartz property, situated on the peninsula, 14 miles from Seward, recently was bonded to E. G. Wilson, of Washington, D. C., who has shipped in 800 tons of freight and supplies for development work this winter. With all this development, Northerners are anticipating a much larger gold production from the section next summer.

The Granite Gold Mining Co. operating in the Port Wells district, has issued a report of progress signed by Pres. B. F. Millard. The property consists of three lode claims. To Tatom and Irving, original owners, \$28,500 has been paid and the balance of the purchase price, \$21,500, is due in March, 1915. Development work was done first by the Millards under partnership agreement with J. E. Chihberg and Jafet Lindenberg. The Granite company was organized in the fall of 1913. Under the partnership arrangement, a 156-ft. crosscut was run to the vein, the latter drifted on for 222 ft. and a 156-ft. raise put through to the surface. After the company organization, a hoist station was cut, the tunnel extended, a raise put up to Tatom and Irving's original shaft, a working shaft put down in the vein and the vein opened up by another drift for 360 ft. The shaft was further continued 85 ft. at the same angle of 45°, leaving the vein which flattened to 35°, and a crosscut run to the vein again. Good ore was found here as on the second level. Surface equipment includes a mess-house, tents with board floors and metal roofs, power house, blacksmith shop, carpenter shop, 4500 ft. of corduroy road to the beach, storehouse and mill. At the mine power house there is a one-drill compressor, a 25-hp. gas engine and a 6-hp. gas engine for lighting. In the mine there is a 15-hp. gas-engine hoist, two sinkers and a 12-hp. gas station-pump. The mill contains a crusher, a set of rolls, a 7-ft. Lane mill, two concentrating tables, a clean-up barrel and a gold-melting furnace. A 20-hp. West Coast engine drives the mill and a 26-hp. oil engine drives the crusher and rolls. Since Mar. 18, 1914, about 3000 tons has been milled, yielding about \$85,000. The tailings have been impounded for future cyanide treatment. A larger power plant and a tunnel at a much lower level are contemplated.

SILVER CITY—Oct. 20

The Experimental Mill of the Hurro Mountain Copper Co. will operate all winter for the purpose of ascertaining the most effective method of treating the company's ores. The original equipment included a Minerals Separation flotation unit, but the quality of the concentrates produced was not good enough for economical operation. It is believed the fault lay in the agitation. The company discarded the unit and installed a Towne separator using air agitation. This is embodied in the mill and is doing satisfactory work, although readjustments of the agitation and of the oil mixtures is constantly being made in order to obtain a cleaner separation. The management believes the flotation process will be incorporated in the final large mill and not used merely as an auxiliary method, but since flotation is still largely in the experimental stage, a large amount of testing work will be necessary before large units can be installed. The flow sheet of the experimental mill in its present form includes crushing, screening and rolling to get a ½-in. product, which is tumbled and classified, reground to 80-mesh and delivered to the Towne unit.

Recent Acquisition of Property by the Empire Zinc Co. at Hanover, has brought forth the announcement of a power plant and a concentrator to be erected at Hanover and another concentrator at Pinos Altos, for the reduction of the company's sulphide ore. It is expected to have one concentrator operating in a year. The Copper Queen mine on the Santa Rita-Hanover divide, formerly owned by the General Electric Co., was recently purchased from Messrs. McCarty and Bell for its mine-water supply. When operated, 50 gal. per min. was pumped from between the 80- and 200-ft. levels. The Copper Queen is believed to be on the same underground flow with the Booth mine water of the Chino Copper Co., at Santa Rita. A one-mile pipe line would carry water from the Queen to the proposed power-plant site. However, drilling will be done in Hanover Gulch before constructing a pipe line. A tramway is under erection from the Santa Fe to the Thunderbolt group of blende claims east of Hanover and adjoining the Chino Copper Co. These orebodies will be extensively worked when the ore reduction plant is finished. The company is now shipping only carbonate zinc ore from the Nason tunnel. At Pinos Altos the Empire Zinc has done a good deal of road work and has reduced the distance to Silver City by two miles.

WICKENBURG, ARIZ.—Oct. 20

In the Constellation Camp, 12 miles east of Wickenburg, the only property now actively developing is the Monte Cristo. Here an inclined shaft has been sunk to 950 ft. on the vein and extensive drifting has been done above the 800 level. The ore carries silver and gold. The former is generally distributed in the vein matter and in places is found as slabs of native metal while the gold is irregularly distributed. The grade of the ore below the 800 is reported to be better

than above and therefore it is proposed to continue development to the 1000 and then completely open the mine by drifting, before building a mill. The ore occurs in a fault plane in schist cut by pegmatite dikes and dipping to the south at about 50°. The ore is brecciated above the 800 and the ore-body varies greatly in width; in some places it is 50 ft. wide. Three parallel veins have been disclosed. Plans for treatment have not yet been made but it is likely that it will be decided to transport the ore to the railroad at Wickenburg, as the water supply at the mine is limited. The development of the property so far has been financed by Ezra W. Thayer, of Phoenix, and some local associates. The Duluth-Arizona, adjoining the Monte Cristo, is idle. This was developed in a limited way by a Duluth and Superior syndicate a few years ago and a mill with cyanide plant was installed. The development is mainly on a gold-bearing quartz vein. J. A. Merrill, of Superior, Wis., is now in control of the property. It has been recently examined. Work on the Uneeda mine, west of the Monte Cristo about two miles, is suspended pending the adjustment of an estate. It was operated for a time by the Golden State Mining Co. The Copper Belt Mining Co., controlled by the Delthy interests at 25 Broad St., New York, is doing a small amount of development. An extremely small mill has been erected. The Keystone and Interior mines, controlled in Pittsburgh, have closed temporarily. A large amount of development has been done on both of these. A number of smaller operations in the district are under way awaiting the realization of the large expectations which everybody seems to have for the Monte Cristo mine. The district is reached by a daily automobile stage from Wickenburg.

LUNING, NEV.—Oct. 20

The Luning District is Active—The Vemilla is starting to ship, a good road having been built to the property, which lies seven miles southeast of Luning, about 1½ miles northeast of the old Garfield mine, a record breaker in the '80s. The property consists of nine claims with a 140-ft. tunnel driven on the ore.

New York Cañon is still enjoying active development. Leases have been let on the Mayflower, owned by T. L. Patrick of Goldfield, and on the West End, controlled by H. B. Ling, also of Goldfield. This section of the district has a large developed tonnage of low-grade copper ore and is anxiously awaiting the opening of the leaching plant to custom ore.

The Red Butte Mining Co., of Spokane, has financed the development of its property and will start active operations immediately, Capt. Chris Smith having just returned from headquarters with the necessary money. This mine is about 12 miles northwest of Luning. The ore is a high-grade lead and silver, and from present indications the property will become a shipper soon. The Esmeralda Copper Co. is about to resume operations, and Manager Jacobs is now on his way from the East. There has been much development work done on the property.

The Wagner-Azurite has closed down its leaching plant temporarily. It is possible that it will be found necessary to roast the ores on account of the excess of lime in the rock, but this will not greatly increase the expense of making metal. The development of the mine is satisfactory and the company has sufficient ore blocked out for many years' run. The leaching test so far carried out on ores from the Alameda and Shipper properties has proved that these properties can be worked by this process in a manner that will insure the early erection of a plant on their ground.

An Important Sale was made recently when Sacramento and Nebraska mining men, represented by M. T. Rowland, formerly a Tonopah mining operator, secured the property of the Luning Gold Mines Co. under a lease and sale agreement. This property consists of thirteen claims about four miles north of Luning, adjoining the Luning-Idaho. These people will immediately commence operations and have ample resources for carrying on the work. They propose to treat the ore themselves and thus save the expense of shipping and smelting. The price secured for the property is not definitely known, but is said to be \$100,000 or over.

Work on the Luning-Idaho has been progressing continuously in the tunnel, which has just struck the casing of the vein on which the shaft was sunk. Another body of ore should be cut soon at a depth of over 150 ft. and near the hanging wall of the mineralized zone. This vein is about 70 ft. beyond the 18-ft. vein encountered a month or so ago and if it improves in width and content as did the first vein it will place the mine in condition for a large production. It is reported that an offer has been made to take an interest in the mine for the erection of a large leaching plant to handle these ores.

CHICAGO—Oct. 31

The Smelting Plants at Mineral Point, Wis., according to a press dispatch from Milwaukee, Oct. 28, are running at full capacity for the first time in a year, necessitating the appointment of a deputy collector of customs. It is said that conditions in Mexico have been responsible for this resumption.

Increased Interest in the Treatment of Low-Grade Iron Ores is being manifested throughout the Minnesota and Michigan iron districts. This interest is taking practical form in the insertion of certain clauses in some leases, under which the lessee is required, within a specified time, to construct a plant to treat such ores. This is the popular conception, at least, of a recent development on the Mesabi range. Butler Bros., stripping contractors and railroad builders, not long ago leased the Harrison property from the Great Northern interests, and this is now being operated jointly with the Quinn mine. One of the conditions of the lease is supposed to have provided that Butler Bros. build a concentrating plant having an annual capacity of at least 100,000 tons. It is known that Butler Bros. was recently in the market for such a plant, the estimates on the machinery having been furnished by a large Milwaukee concern. While this concentrator will eventually be installed, it is held up until next spring, probably because of the unsettled business conditions, and particularly the low state of the iron market. In general, the design of this plant and the method of treatment are said not to vary greatly from that at the Nashwauk and Coleraine washeries, which have been in operation for some time and are giving good results. In addition, it is understood that one other concentrator is being planned for the Mesabi range, the name most frequently mentioned in this connection being that of the M. A. Hanna Co. It is not known, however, what property this plant is for or whether it is a Hanna property.

DULUTH—Oct. 31

In the Hibbing-Chisholm District the Leonard pit continues to be the range's leading producer, and will head the 1914 shippers; 250 to 300 cars are being loaded daily, a considerable reduction from mid-season shipments. The daily shipments from several mines in the district are about as follows: Albany, 60; Utica, 65; Agnew, 55; Hill, 30; Mahoning, 130 to 150.

The Great Northern is handling about 1500 cars per day out of its Kelley Lake yards. A decided slump is looked for immediately following the end of October, as many operations are planning to wind up the season with this month.

New Mines Are Being Opened on the Mesabi, notwithstanding the depressed state of the iron-ore market. Tod-Stambaugh is making ready to take over the Dean mine near Buhl, lately leased from the Great Northern interests. Butler Bros. has nearly completed the stripping of the property. Mining will be under the management of John S. Lutes. Tod-Stambaugh has also started to open a Great Northern property adjoining the Morton mine. B. A. Middlemiss is in charge of this development. It is generally believed on the range that the Great Northern will work the Leonard mine next year to capacity, probably 500,000 tons. It is stated also, that the Great Northern will mine and ship 2,500,000 tons in 1915—if it can sell it. Prospects for the independent producer are not bright. If the Great Northern is forced into the independent market by reciprocal agreements, it is certain to crowd somebody outside. Independent producers are hoping, therefore, that the Great Northern tonnage will be sold to the Steel Corporation.

Labor Is By No Means Scarce in the iron districts, even though the European war did reduce the supply somewhat. Those returning to fight were largely those with property interests in their home country. While no uniform reduction in wages has been made, some operators have, during the past few weeks, made 10 and 15% cuts. At Hibbing, a considerable amount of city work is kept going for the purpose of assisting the unemployed, and a plan has been evolved whereby an entire new crew is put on every second week, in an endeavor to assist as many as possible. Married men are given preference, as are taxpayers of the village. The local governments of the Mesabi range, almost without exception, have undertaken various public works for the purpose of keeping the unemployed occupied. The situation will find some relief with the approach of winter, when the lumber camps will take care of a large number—if these are willing to accept a severe cut from the pay of former years. The lumber market is flat, but the large operators are taking advantage of the low labor costs, and expect to do much logging. The common laborer in the woods this season will get \$16 to \$18 per month and board, while in former years he has received \$35 to \$40 for the same service. Hence, in the spring, the "lumberjack" will not have the usual fat roll when he returns to the mines.

ISHPEMING—Oct. 31

Illustrative of Depressed Conditions, there are employed in the Crystal Falls district fewer than 600 men, whereas in normal times 2000 names are on the payrolls. The Wickwire interests have cut the working force at the Homer mine at Iron River to 130 men. Shipments from stockpiles on the Menominee range have been suspended by the Steel Corporation; most of the ore now being hoisted is, however, going to the Escanaba docks.

The Steel Corporation is Preparing a Novel Exhibit for display at the Panama-Pacific Exposition. It will show how ore is mined in the Lake Superior region and transported therefrom. It will contain miniature reproductions of mines and of ore docks and a replica of the Pittsburgh Steamship Co.'s "Wm. J. Olcott" taking on a cargo. A relief map showing the various iron districts will be another feature, as will an exhibition of safety devices. Walter Croze, geologist, is in charge of the work.

Measures of Retrenchment similar to the recent 10% payroll cut of the Cleveland Cliffs have been taken by Pickands-Mather, Corrigan-McKinney, Oglebay-Norton, and the Buffalo Iron Mining Co. In most of the districts affected, including the Crystal Falls and the Iron River, the wage cut was 10%; elsewhere, as at the Cary mine on the Gogebic, it is 25c a day. Hereafter the woodchoppers cutting material for the charcoal kilns of the Pioneer Iron Co. will be paid 80c a cord, as against 90c. prior to Oct. 20.

Engaged to Sink a Shaft at Lyon Mountain, N. Y., a score of skilled miners recently left Negaunee and Ishpeming to enter the service of the Chateaugay Ore & Iron Co. Most of the men are Cornish; more than 100 applications for membership in the party were made within a few hours. The shaft is now down to the 300-ft. level and will be carried to the 1200 ft. It is probable that more experienced men will be procured from the Lake Superior iron region early in 1915. Harry Whear, formerly of Negaunee, is the superintendent.

HOUGHTON—Oct. 31

The Isle Royale is producing 2100 tons daily, 300 more than before the strike, and this is secured with practically the same working force. The apparent increase in efficiency is accounted for by the fact that all extraordinary work was shut off with the decline in the price of copper. No construction work is under way and no advance openings are made underground, except those absolutely necessary. No men, however, directly employed in getting out rock have been let out, and only a few miners have been dropped from the rolls. So Isle Royale today is making a fairly good showing, considering that it never before was able to contend successfully with 11c. copper. How long operations can continue on the present basis is cause for speculation, but all friends of the property hope for the best. The present rock output comes from four shafts, the largest quantity from Nos. 4 and 6, much less from Nos. 2 and 5. No. 6, the farthest south, in territory practically new, continues to show good general rock, better than the average of No. 2 in fact.

TORONTO—Oct. 31

The Manufacture of Shrapnel in Canada, for which the British War Office has placed large orders, will materially benefit the silver-lead industry of the Kootenay district of British Columbia. The shrapnel bullets are to be made of lead from the smelting plants at Trail, B. C.

The Prevention of Nickel Exportation has been strongly agitated since the outbreak of the war, inasmuch as Canada is the only source from which Germany can draw her supplies of that metal for armor plating. The first step in that direction has been taken by the Canadian government, which has issued an order-in-council prohibiting the export of a number of articles classed as contraband of war "to all foreign ports in Europe and on the Mediterranean and Black Seas, save France, Russia (except Baltic ports), Spain and Portugal." The list includes nickel and nickel ores, gold and silver bullion, unwrought copper, lead sheet or pipe, iron ore and coal, in addition to foodstuffs and many manufactured articles. The order will hardly prove effective as regards the main object, namely, that of preventing Germany from procuring supplies of nickel, as the export of nickel ore to the United States is not prohibited, and all nickel shipped from the Sudbury mines across the line is in the form of matte. It is pointed out that the refined metal can be reshipped from the American refineries to Holland, Denmark or Italy and thence to Germany or Austria. It is probable that more drastic legislation will be enacted at the next session of Parliament. A report issued by the Canadian conservation commission some time ago stated that Canada had it practically in her power to prevent the continued construction of battleships by her monopoly of nickel.

The Mining News

ALASKA

HAMILTON & IRVING PROPERTY near head of Pigot Bay in Port Wells country bonded to B. F. Millard who will start development on quartz lode.

HONEY BOY GROUP, south of Ptarmigan Drop roadhouse near Valdez, bonded by B. F. Millard from Frank Frase, Charles Koppus and Fred T. Elkins. Claims cover gold bearing quartz lode.

GOLDEN EAGLE MINING CO. (Port Wells)—Latest shipment concentrates ran \$111 per ton. Company owned by Cordova men.

JUALIN (Jualin)—Operations started with 10-stamp mill. Work in charge of H. G. Young, consulting engineer of Algonian Development Co., the holding company furnishing capital.

EBNER (Juneau)—Reported U. S. company has done a good deal of development work during summer; 400 ft. of tunnel driven, together with crosscuts and raises; five-stamp mill installed for testing.

MOTHER LODGE COPPER MINES CO. (Shushanna Junction)—Intention to work 40 men through winter and get out 1000 tons for shipment; sledding it to railroad. Reported by Superintendent Parks that Pittsburgh crosscut intersected main vein, giving 380 ft. of backs on Mother Lodge fissure.

TREADWELL GROUP (Treadwell)—In September Alaska Treadwell crushed 78,015 tons; estimated value free gold, \$93,196; of concentrates, \$88,144. Corresponding figures for Mexican: 19,173 tons, \$18,504 and \$2,137; for United: 33,157 tons, \$41,235 and \$57,079.

WATSON PROPERTY (Fairbanks)—Charles Watson, on Chatanika flats, has cosmopolitan force: Three Bulgarians, four Swedes, four Russians, three Austrians, two Norwegians, one German, one Scotchman, one Native Son of Golden West. Watson feared European war might be epitomized in his mine. Not so! Men were all Alaskans, worked together like brothers. To show hearts were in right places, put forth extra efforts and broke hoisting record: 582 buckets from 147-ft. shaft in one shift, beating best previous record by 31 buckets.

ARIZONA

Cochise County

TRANQUILITY (Tombstone)—New track to loading platform completed and shipping begun. Several carloads of timber and building material received recently and company has put on 20 men. Private telephone line put in to connect main office and various departments.

Mohave County

TOM REED (Oatman)—Company purchased of Henry Lovin mineral in Fraction claim. Lovin retains surface rights and buildings thereon.

Pinal County

KELVIN-SULTANA (Kelvin)—Coarse-crushing department of new concentrator in operation Oct. 20. Concentrator itself in operation Oct. 26. Capacity 125 tons, designed and built by O. N. Brown. Three shifts at work in mine. Stopping in progress on No. 2 vein at 300-ft. level. No. 1 drift on 500-ft. level advanced 82 ft. Auxiliary hoist being set to handle material from big stockpile. Raise to be made on No. 1 vein from 500 to 400 level.

CALIFORNIA—Amador County

ORIGINAL AMADOR (Amador)—Reported order placed for two 8x3-ft. Hardinge mills. Expected to increase recovery and handle larger tonnage.

Humboldt County

COMPLETION OF EUREKA-SAN FRANCISCO branch of Northwestern Pacific announced. This fills gap of about 100 miles north of Sherwood, Mendocino County, and provides direct line between Eureka and San Francisco. Humboldt County heretofore dependent on water transportation, which, though sufficient for handling of great lumber business, retarded mine development.

Nevada County

EMPIRE (Grass Valley)—Installation of additional 20 stamps in 40-stamp mill progressing. New hoist designed to operate to inclined depth of 7500 ft. Mill running steadily on good ore; monthly cleanup reported at about \$50,000; definite figures not obtainable.

Placer County

MAGNESITE DEPOSIT, said to be much larger than that near Towle, reported near Alta, situated between Boardman ditch and Bear River. Stated deposit will be developed by D. J. Sullivan.

Shasta County

CALCIUM NITRATE plant reported by newspapers as contemplated for vicinity of Heroult. Charles G. Carter said to represent Boston capital has taken option on limestone deposit. Three units to be built, first with annual capacity of 100,000 tons.

Sierra County

SOVEREIGN (Downieville)—This quartz property in Ladies Cañon leased to George Bigelow and Horace A. Morse, who will mill ore now stored in bins and will cyanide tailings.

OXFORD-GOLD BLUFF (Downieville)—Recent prospecting disclosed that vein recently found on surface had been cut by tunnel run 30 years ago. Vein at this point 10 ft. wide, running over \$3 per ton. Additional equipment being installed by Grant Snyder.

COLORADO

Boulder County

CONGER MINE (Lakewood)—Primos Chemical Co. demonstrating continuity in depth of this tungsten deposit. Main shaft down over 800 ft. on dip of vein, 700 ft. vertically; with fine orebody developed in bottom level. Deepest tungsten mining yet done in region. Primos company recently took option on large group of claims in Daley district about eight miles west of Empire in Clear Creek County, is working party of miners in development of molybdenite deposit.

Chaffee County

EUREKA MINING & REDUCTION (Garfield)—Application for injunction by minority stockholders to prevent majority interests from selling property under execution; assert it is freezeout. Complainants are John L. Farrell and Esther R. Abbott. Property stated to have value of \$300,000.

Clear Creek County

ONEIDA (Idaho Springs)—New mill now completed and turned over by contractors. Plant constructed by Hendrie & Bolthoff, of Denver, for \$35,000. Uses continuous decantation system. Capacity, 50 tons. Mine contains large supply of developed ore, running from \$8 to \$12 a ton.

BIG FIVE TUNNEL (Idaho Springs)—Lessees Mosher & Co. are developing Lake vein, about 9000 ft. from portal and 1800 ft. from surface. Vein 3 to 4 ft. wide, contains 8-in. streak of smelting ore that assays \$70. Milling ore averages about \$16. Product shipped to Newton mill for treatment. Lessees Klein & Wilson are blocking out ore east of junction of Bellman and Lake veins, with average value of about \$30. Lessees on west Lake vein drifting on vein of \$8 ore. Drifting on East Bellman toward Dove's Nest indicates improvement in vein. Vitagraf Leasing Co. is sinking on promising vein below tunnel level.

Gilpin County

COLORADO PINE CONE (Central City)—Milling plant, including grizzly, Samson crusher, two automatic feeders, ten 850-lb. stamps, plates, one bumping table and one Wilfley concentrator completed. Electricity to be used for power.

Lake County

DORIS (Leadville)—Verhofstad, et al., reopening this old property in Iowa Gulch, expect to unwater in order to attack known oreshoots.

BENGAL TIGER GORDON (Twin Lakes)—G. W. Boyce, backed by Midwest capitalists, has undertaken operations. Will send large samples of ore to Denver for metallurgical tests. Litigation arose during sale, 17 years ago, after first payment of \$50,000 had been made toward total price of \$225,000; mine never resumed until now.

Ourray County

AMERICAN NETTIE (Ourray)—Development done by Wankah company on neighboring property demonstrated advisability of working this famous old mine on lower or second "contact"; is now proposed to drive new adit about 2000 ft. to open this ground.

Teller County

DEEP EXPLORATION FASHIONABLE AND PROFITABLE in district. Portland working between levels 5 and 17 and finding best ore at lowest level; further sinking to begin Nov. 1. Vindicator sinking almost to 200-ft. mark, said to find best ore in lowest levels. Granite and Golden Cycle preparing to go down.

BLUE FLAG MINING & MILLING (Cripple Creek)—Sinking of main shaft 300 ft., from 8th level to 11th, completed; property will now be explored by north and south drifts. Machine drills will be installed for new work. J. F. Erlsman manager.

ABE LINCOLN (Cripple Creek)—Holmewald Leasing Co. has opened orebody on 300-ft. level of May Queen vein which may be of great importance; is 20 ft. wide and 70 ft. long, said to assay \$18 per ton. Development on company account on third level has opened 4-ft. vein of \$50 ore for 400 ft. Crosscut being driven north from third level to intersect vein system in Womack Hill, now 1200 ft. long. Heading approaching Lucky Bill vein which showed rich ore on surface. West heading on sulphide vein advanced 300 ft., now in payable ore. Crosscut on 500-ft. level advanced 300 ft., must continue 75 ft. further to cut sulphide vein. North and south headings on 800-ft. level now in payable ore. Frank Vetter manager.

Summit County

FRENCH GULCH (Breckenridge)—Hermann J. Reiling states he is digging bank 40 ft. deep, 410 ft. wide, and making daily profit of \$1000. Does not propose to work boat during severe winter months, for, while feasible and carried on several years, found increased cost amounts to nearly 10c. per cu.yd.

IDAHO

IN OLD PIERCE MINING DISTRICT, 30 miles west of Orofino, W. J. Harris expects to start dredging 300 acres on Quartz Creek next year. Will build \$75,000 dredge and have it operating by Aug. 1, 1915.

SILVER CABLE (Mullan)—Good showing of ore developed, lead and zinc; company has let contract for seven months of tunnel work this winter.

NATIONAL COPPER (Mullan)—Mine operations suspended until 14c. copper returns. After mill closed mine work continued for some time with 30 men.

CALEDONIA (Wallace)—Second dividend recently declared and surplus held in treasury. Property fully developed, operated through Kellogg tunnel of Bunker Hill & Sullivan, has large reserves. Charles McKinnis manager.

IDORA HILL (Wallace)—Constitutionality of law providing that discharged employee, when not paid immediately on discharge, can collect wages for each day after his dismissal for 30 days, attacked by Idora company in the suit brought against it by Harry Olsen et al. Company was unable to meet obligations last spring owing to financial difficulties. Does not deny amount of wages due employees at time of discharge, but does deny liability for penalty provided by law.

MICHIGAN

Iron

ROGERS-BROWN has suspended operations at Chicago and Rogers mines, Iron River.

CORRIGAN-MCKINNEY has closed Colby and Ironton mines at Bessemer, retaining in service only superintendents and captains. Has closed Tully at Iron River and scaled down force in Great Western at Crystal Falls.

PICKANDS-MATHER has only Caspian mine at Iron River working in Menominee region; has given up all exploratory work, including that on Warner property at Amasa and Calumet tract in Felch Mountain district.

NEWPORT (Norwood)—Men at Newport, Anvil and Palms shafts put on half-time.

COPPS (Marenisco)—Whiteside-La Rue interests suspended work. Exploration and development had proceeded for more than two years.

CLEVELAND-CLIFFS (Ishpeming)—Dividend passed, first time in many years, result of depression. Believed other companies in district will follow suit.

MINNESOTA

Cuyuna Range

THOMPSON (Crosby)—Pit will be largest Cuyuna producer this season, shipping well over 200,000 tons. Two shovels working in ore continuously.

AMERICAN MANGANESE MFG. CO. (Ironton)—Company now shipping 25,000-ton stockpile at Ironton shaft and 20,000-ton stockpile at Cuyuna-Mille Lacs shaft to its furnaces at Dunbar, Penn.

DULUTH-BRAINERD (Ironton)—At recent stockholders' meeting control passed to new hands. Formerly controlled by Locker-Donahue interests, along with Cuyuna-Mille Lacs and Cuyuna-Duluth. New directorate represents Duluth capital only. Otto J. Wendlandt, president, 314 Palladio Bldg., Duluth.

Mesabi Range

MINING AGENTS from Colorado and other western mining districts are on Mesabi range securing laborers from openpits now suspending for winter. One party of 150 left recently for coal mines at Walsenburg, Colo., and smaller parties going west almost daily.

ANNUAL REPORT OF ITASCA COUNTY INSPECTOR for year ended June 30, 1914, just issued. Shows 13 of county's 21 mines shipped during that period, the Canisteo, Hill, Holman, Judd, Mississippi, Crosby, Hawkins, Pearson, La Rue, Bray, Bennett, John Jr. and Quinn-Harrison. Number of men employed, 2527; 2010 in openpits and 517 underground. Average wage, \$2.81. Total injuries, 272; eight fatal. [Death rate about 3.15 per 1000. Apparently based on payroll, not on number at work. Season short; rate would be increased if reduced to 300-day, or 300,000 man-shift, basis. Extremely high for district where openpit work predominates.—Editor.]

QUINN-HARRISON (Nashwauk)—Concrete work beginning on new washing plant, one mile south of Nashwauk, on Swan Lake road. Planned to begin operations early next spring.

ELBA AND CORSICA (Elba)—These Pickands-Mather properties being put in shape for constant operation through winter. New boiler houses being constructed at both properties, new boilers and engines installed, and 150-ft. concrete stacks will be erected.

DUNWOODY (Chisholm)—Stripping operations being rushed on this Great Northern property by Winston-Dear, contractors. Property, formerly known as St. Louis, held under lease, with 30 years to run, which will necessitate removal of about 1,000,000 tons annually if deposit is to be mined out during life of lease.

LEONARD (Chisholm)—Beginning Nov. 1, 500 additional men will be employed. Day shift increased and night shift added. Additional motors and equipment recently installed permit enlargement of force; management announces production will be kept at highest figure throughout winter. Property, both openpit and underground mine, one of Great Northern leases canceled by Steel Corporation. Great Northern interests obliged to work it to limit, since their lease from Clark Mining Co., fee owners, has but four years to run.

Vermillion Range

SOUDAN (Tower)—Accident in shafthouse caused suspension of all underground operations at mine for number of days.

MONTANA

Jefferson County

ALTA (Corbin)—Cave-in Oct. 27 caused death of Roy Barnes and serious injury of James Belch. Barnes in trying to save Belch who had been caught in fall of rock, lost his own life by crushing under larger fall.

Silver Bow County

HOMERUN (Butte)—Leasers of this mine, north of famous old Alice mine in Walkerville, report strike of rich silver vein in shaft, at depth of 85 ft. from surface. Vein from 18 to 24 in. wide and ore assays extremely high. Mine surrounded by other claims, formerly large producers of silver.

BULLWHACKER (Butte)—At stockholders' meeting, Oct. 26, in Phoenix, Ariz., plans for reorganizing, reported in recent issue of "Journal," approved. New company will be known as Butte-Bullwhacker Mining Co., with headquarters in Butte. Stockholders in old company may acquire stock in new by paying 15c. a share. It is believed that before end of six months company's property will be in active operation again.

NEVADA

Clark County

REVIVAL OF PROSPECTING IN GOODSPRINGS DISTRICT reported. Many old prospects relocated and being worked with satisfactory results.

Elko County

BUNKER HILL TUNNEL (Bullion)—Tunnel now in 2200 ft.; last opened mineral-bearing formation.

KEY LEASE (Bullion)—Mine retimbered throughout, 25 tons good-grade silver-lead-copper ore shipped daily. Two auto-trucks as well as teams used for ore haulage in Bullion district.

Esmeralda County

HASBROUCK (Gold Mountain)—Contract made with West End company, of Tonopah, to mill ore being extracted in development work.

ATLANTA MINES CO. (Goldfield)—Development work will be resumed on 1750-ft. level as soon as new pumping plant is installed in Merger shaft, through which Atlanta works at this depth. Stated, at time of shut down on account of water, southwest crosscut had opened wide oreshoot of commercial grade.

JUMBO EXTENSION (Goldfield)—Estimated \$50,000 value of ore extracted from 60-ft. raise between 1017-ft. level and intermediate below 921-ft. One 50-ton car ore assayed \$302 per ton. Final payment of \$30,000 for Velvet claim made to Goldfield Merger six months before due.

GOLDFIELD MERGER (Goldfield)—New pumping plant received, will be installed at once. When workings, flooded several months ago, are drained, development work will be resumed. Believed oreshoot recently discovered at depth in Jumbo Extension will be found in Sunflower claim of Merger. Main development work to be done on 1750-ft. level; deepest working in southern Nevada.

Humboldt County

LEASING COMPANIES IN NATIONAL are Wheeler, working on White Rock through White Rock tunnel; Hatch, on National Mining Co. ground; and Baldwin-McCloud, on West Virginia National Mining Co. land.

CROWN POINT EXTENSION (Rochester)—Lease taken on this block adjoining Big Four lease. Thought east vein of Big Four crosses ground. Work will start at once.

ROCHESTER MINES CO. (Rochester)—Concrete work of new mill completed, water pipe received, and expected superstructure will be finished in few weeks, when machinery will be shipped.

SEVEN TROUGHS COALITION (Seven Troughs)—Mill produced \$37,000 in bullion from 18 days' run in September, according to manager's statement. Station cut on 1300-ft. level and oreshoot appears to extend to greater depth.

BUCKSKIN NATIONAL (National)—Raise being lifted from 250-ft. level to No. 2 tunnel level; will be timbered, station cut on No. 2 tunnel level, hoist installed and raise used as working shaft for deeper work. Development work on No. 2 level continues to open large tonnage of milling-grade ore and some high-grade ore.

Lyon County

NEVADA-DOUGLAS (Ludwig)—Foundation for leaching plant finished. Reported plant will be in operation soon after first of 1915.

Nye County

ROUND MOUNTAIN SPHINX MINING CO. (Round Mountain)—Suit for \$11,267 filed against company by former manager for salary due and money advanced.

WEST END CONSOLIDATED (Tonopah)—Recent attachment by Jim Butler dissolved to permit plaintiff to file application for amended restraining order. Stated will be no interference with operations of company.

NEW MEXICO

Grant County

MANHATTAN (Pinos Altos)—Body of pyrite with good gold content penetrated. Shipments being made.

CHINO COPPER CO. (Santo Rita)—Property near Hanover with galena outcroppings under lease. Development work being prosecuted.

HARDSCRABBLE (Pinos Altos)—Vein of good copper-silver ore encountered from 1 to 2 ft. wide. Is in soft ground, and extensive timbering will be done before shipments are made. J. T. Janes is in charge.

PRECIOUS METALS EXPLORATION CO. (Mogollon)—Sinking and raising in No. 3 tunnel on Gold-Dust vein under way. Shipments of good milling ore being made to Deadwood mill. Extensive new work to be prosecuted.

GREEN KING (Lordsburg)—Water struck at 40 ft. in sinking shaft. Four-foot vein of good gold ore found. Shipments made weekly. Other operators in new camp are Higgins & Scarborough, Hayden & Weldon, Hickman & Weldon. Strikes attracting much attention.

Taos County

CARIBEL MINE (Red River)—Reported 50-ton treatment plant will be erected in spring. Six properties in camp have commercially valuable ore. Road improvement under way making all grades below 6.5%. Greatly needed, will add much to future of camp.

OREGON

Baker County

GOLDEN GATE (Greenhorn)—Ten-stamp mill being constructed, large quantity of hay and mine supplies being hauled from Greenwood station.

MORNING MINE (Greenhorn)—Reported sold, new owners having taken it over from lessees who worked it for some time. Has over 3000 ft. drifts and tunnels, producing for number of years from oxidized orebody; large seams sulphide ore practically untouched for lack of proper treatment process.

NORTH POLE (Cracker District)—Drift from E. & E. mine into this property to be continued, opening vein more than 200 ft. below the present lowest working level of North Pole. Development continued in upper levels of North Pole after mill was closed in early summer, disclosing pay ore at different points. Mine being operated under bond and lease by John C. Lewis, of Portland, belongs to Baring Bros., of London. E. & E. is property of Jonathan Bourne and associates; called valuable, but idle for many years.

SOUTH DAKOTA

ORO HONDO (Lead)—Use of pumps for handling water discontinued, skips being employed instead.

RATTLESNAKE JACK (Galena)—Completion of mill postponed. Mine being developed by shaft and drifts.

BLACK HILLS TUNGSTEN (Hill City)—Mill leased to local men; to be put in shape for concentrating tin.

HOME LODE (Silver City)—Machinery for new mill arrived, being moved to site. Oil flotation will be used in treatment of complex ore.

TROJAN (Trojan)—New town being built by company will be ready for occupancy before Jan. 1. New hotel will be modern in every respect.

WASP NO. 2 (Flatiron)—New locomotive and self-dumping cars reduce cost of handling product from steam shovel. New porphyry orebody opened up shows increase in content.

HOMESTAKE (Lead)—Annual gift of \$200 to each church in Lead, Central and Terraville being distributed. Thirteen in all receive gift. Superstructure for new hoist nearing completion. Good progress being made at installation of machinery.

GOLDEN REWARD (Deadwood)—Tube mill, installed for sliming of roasted "blue ores" in continuous operation, handling about 30 tons daily. Good extraction obtained. Trent replacer nearly ready for use. Installations being made will greatly increase capacity of plant.

UTAH

Beaver County

BEAVER GOLD MINES (Beaver City)—Company making tests on Sheep Rock ores at five-stamp mill, with view to increasing capacity of mill.

HORN SILVER (Frisco)—At annual meeting held in October instead of December as heretofore, directors elected as follows: E. F. Emmet, C. Brennehan, A. B. Simmonds, H. R. Britton, H. S. Young, E. B. Critchlow, W. J. Barrette, and J. Neadle. Reports will be sent to stockholders after first of year. Mine has paid \$5,662,000 in dividends, last payment made in September, 1907. Thirty men employed. B. B. Lawrence consulting engineer.

Juab County

MAMMOTH (Mammoth)—About 50 tons of ore carrying gold, silver, and copper being mined from new orebody on 600 level, daily. There is streak of bismuth ore, from which assays of 35% bismuth have been obtained. Some leasing being done.

LEONORA (Milford)—Zinc ore opened on tunnel level. Widened from 8-in. streak to about 3 ft. at breast. Lead ore running well in silver opened for 75 ft. on strike along contact of white and blue limestones. Material taken out in development sacked. Property is in Star district, near Red Warrior and Moscow.

MONITOR (Milford)—Property in Star district short distance southeast of Moscow has shipped 16th car of ore for present year thus far. Ore being mined from 125-ft. level, where there is good showing. Winze being sunk in ore from this level, with two shifts working. Ore carries lead, silver and some gold; averages from \$12 to \$15. E. H. Althon manager.

Summit County

THOMPSON-QUINCY (Park City)—Work resumed Sept. 23, when five mine-cars of first-class ore were obtained from material which had caved while property was idle.

SILVER KING CONSOLIDATED (Park City)—New compressor and other machinery being installed, interrupting ore shipments for week ended Oct. 23. Roads soft from recent snow.

DALY WEST (Park City)—Expected both mine and mill will be in operation early in November. Good milling ore, over 3000 tons, accumulated, and in addition there has been developed first-class ore, which will be mined as soon as work begins.

SNAKE CREEK TUNNEL (Park City)—Face in hard marbled limestone near contact with diorite, good progress, 13-ft. daily, being made with two shifts, although normal rate is about 15 ft. Some mineralization, with copper staining. New compressor will be installed, within next 30 days, which will facilitate work. Tunnel in about 9600 ft.; there is a flow of 11,000 gal. of water per minute.

WASHINGTON

RATHFON REDUCTION WORKS (Republic)—Fine body of ore encountered. Shipments being made to Trail.

PALMER MOUNTAIN (Loomis)—Reported this property and Summit property will be worked by a Dr. Barton, of Los Angeles, who has obtained option. Stated he will install electric smelting plant.

CANADA

British Columbia

CARMI—Operations by Burke & Collins being resumed in mine and mill of this property, on west fork of Kettle River.

GUEDETTA—Vancouver men have secured a working bond on this group of 14 claims in Franklin camp, on North Fork of the Kettle River, from John Morrell; development work will begin soon.

CONSOLIDATED MINING & SMELTING (Trail)—Company notifies customers it will receive ore for treatment; preliminary payment for silver 40c. per oz.; lead settled for on New York quotations instead of London. Final settlement for silver as company disposes of product. Each month's receipts will be pooled, that from company's mines being included and handled on exactly same basis as that of customers; distributions of returns made when sales amount to month's output. Lead paid for at 90% on New York price for third month after receipt of order. Company will charge existing smelter rates for treatment, plus 4% of net value of ore.

Ontario

NIPISSING (Cobalt)—Mine has discontinued shipments to Europe until conditions improve, is storing output.

CROWN RESERVE (Cobalt)—Company seriously affected by war, having contract for its high-grade with Kingdom of Saxony. Payment for two cars still owing and of course uncollectible until close of war.

MCINTYRE (Schumacher)—Mill production for October will be between \$70,000 and \$75,000; daily tonnage 175, averaging about \$9.75. Underground No. 4 shaft being sunk from 500- to the 600-ft. level, and No. 5 from the 300 to 600, at which depth they will be connected by crosscut. Also contemplated to connect the McIntyre workings with main shaft of Pearl Lake.

Yukon Territory

CANADIAN-KLONDYKE MINING CO. (Dawson)—Dredge No. 2 sank in October, not likely to be in commission again during present season.

ASSESSMENTS

Company	Delinq.	Sale	Amt.
Annie Laurie, Utah (old stock)	Nov. 9	Nov. 28	\$0.004
Annie Laurie, Utah (new stock)	Nov. 9	Nov. 28	0.001
Austrian, Calif.	Sept. 29	Nov. 28	0.02
Black Bear, Ida. (post)	Oct. 30	Nov. 28	0.01
Blaine & Emmett, Ida.	Oct. 26	Nov. 14	0.005
Bullion, Ida. (post)	Nov. 4	Dec. 7	0.005
Busy Bee, Utah			0.0025
Carney Copper, Ida. (post)	Sept. 21	Nov. 21	0.00225
Challenge Con., Nev.	Oct. 27	Nov. 17	0.05
Coeur d'Alene Investment, Ida.	Oct. 10	Nov. 14	0.002
Comet, Ida.	Oct. 20	Nov. 20	0.0005
Confidence, Nev.	Nov. 11	Dec. 2	0.10
Con. Virginia, Nev.	Nov. 27	Dec. 18	0.10
Copper Chief, Nev.	Nov. 4	Dec. 7	0.005
Copper Crown, Ida.	Oct. 10	Nov. 14	0.002
Copper King, Ida. (post)	Oct. 1	Dec. 1	0.01
Copper Plate, Ida.	Aug. 29	Nov. 29	0.002
Custer Peak, S.D.			0.02
Davis-Daly, Mont.	Oct. 15		0.25
Diamondfield Black Butte, Nev. (post)	Oct. 15	Nov. 21	0.01
East Hercules, Ida. (post)	Nov. 1	Dec. 1	0.001
Eastern Star, Ida.	Oct. 20	Nov. 20	0.002
Echo, Ida.	Nov. 20	Dec. 15	0.0015
Ely Con, Nev.	Oct. 15	Dec. 2	0.03
Emerald, Utah, (three installments)		June 9, '15	0.01
Excelsior Iron, Utah	Oct. 25	Nov. 15	0.115
Federal Ely, Nev.	Oct. 21	Nov. 24	0.115
Gold Mountain Champion, Utah	Nov. 14	Dec. 2	0.0025
Greenhorn, Utah	Oct. 26	Nov. 30	0.005
Hilarity, Ida.	Oct. 12	Nov. 23	0.003
Hypotheek, Ida.	Oct. 26	Nov. 16	0.01
Idaho-Montana, Ida.	Nov. 2	Nov. 21	0.001
Idaho-Nevada, Ida.	Nov. 7	Dec. 1	0.001
Imlay, Nev.	Nov. 15	Nov. 26	0.01
Lead King, Ida.	Nov. 1	Nov. 16	0.0005
Lewis & Clark, Ida.	Sept. 15	Nov. 13	0.001
Little North Fork, Ida.	Oct. 12	Nov. 12	0.001
Lucky Deposit, Utah	Oct. 12	Nov. 15	0.005
Lucky Swede, Ida. (post)	Oct. 19	Nov. 19	0.001
Mammoth Gold, Nev.	Nov. 23	Jan. 4, '15	0.02
M. & P. Gold, Utah	Nov. 10	Dec. 1	0.0025
North Seranton, Utah	Nov. 3	Dec. 3	0.002
Ophir, Nev.	Nov. 19	Dec. 11	0.10
Peerless, Utah	Oct. 30	Nov. 16	0.001
Phoenix, Ida.	Oct. 26	Nov. 26	0.005
Rainbow, Ida.	Nov. 30	Dec. 31	0.002
Rarus, Utah	Nov. 13	Nov. 30	0.001
Reindeer-Queen, Ida. (post)	Sept. 21	Nov. 28	0.002
Revelator, Utah	Nov. 9	Dec. 8	0.005
Santaquin, Utah	Oct. 7	Nov. 21	0.005
Silver Dipper, Utah	Oct. 27	Nov. 16	0.001
Spider, Utah	Oct. 28	Nov. 17	0.0025
Sunset, Ida.	Nov. 7	Nov. 30	0.003
Tarbox, Ida. (post)	Oct. 26	Nov. 27	0.0025
Triumph, Utah	Nov. 2	Nov. 23	0.01
Tuseumbia, Ida.	Oct. 20	Nov. 20	0.002
United Tintic, Utah	Nov. 7	Nov. 23	0.31
Venture, Ida. (post)	Oct. 12	Nov. 12	0.001
Wasatch-Utah, Utah	Oct. 26	Nov. 26	0.01
Wisconsin, Ida.	Nov. 16	Dec. 21	0.003
Yellow Jacket, Nev.	Nov. 5	Nov. 25	0.05
Zella, Utah	Oct. 25	Nov. 25	0.0025

The Market Report

METAL MARKETS

NEW YORK—Nov. 4

The copper market has been shrouded in gloom, but there has been no pronounced weakness in price. Spelter has been dull, a little below where it closed last week. Lead has been distinctly firmer. Tin has exhibited much strength. Silver declined further.

Copper, Tin, Lead and Zinc

Copper—There were other seizures in addition to those we reported last week, but this week there is news of the release of two of the detained ships: the "San Giovanni" and the "Regina de Italia." Diplomatic negotiations are now going on in Washington. Although the situation is viewed with profound pessimism by the copper producers, there is an undercurrent of feeling that conditions are already as bad as they can be, and that any change must be for the better; yet it is certain that there must be further curtailment of production if exportation is to be limited to England and France. The shock experienced last week did not seriously affect the market, business having been done this week at 11.10c. cash, New York, and at 11¼c. regular terms, equivalent to 11.10c. cash, New York, which is only a little under the level of prices in the previous week.

The Secretary of the Treasury has issued instructions to collectors of customs that returns of exports of metals shall not be made public until after 30 days from the date of clearance of the vessel. Heretofore these returns have been available each day.

Base price of copper sheets is now 16½c. per lb. for hot rolled and 17½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 12@12½c. per lb. for carload lots at mill.

The copper mines of Japan are producing at about 70 to 80% of their rate in 1913. Such curtailment as there has been is due to the low level of price which has made some mines unprofitable.

Brass Prices, Base, are announced by the American Brass Co. as follows, to date from Nov. 2: Sheets, high brass, 13½c. net per lb.; low brass, 14¼c. Wire, high brass, 13¼c.; low brass, 14¼c. Rods, high brass, 13¼c.; low brass, 15¼c. Tubes, brazed and open seam, 17¼c. Brass angles and channels, 17¼c. Scrap allowances are 8c. net per lb. for high brass; 8½c. for low brass.

DAILY PRICES OF METALS

NEW YORK

Oct.	Sterling Exchange	Silver, Cts. per Oz.	Copper		Tin		Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	
29	4.9000	48½	*	30½	3.50	@3.37½	5.00	@4.90	4.85	
30	4.9000	48½	*	30½	3.50	@3.37½	5.00	@4.85	4.85	
31	4.9038	48½	*	30½	3.50	@3.37½	5.00	@4.90	4.85	
2	4.9050	48½		31½	3.50	@3.40	@5.05	@4.90	4.85	
3	.....	.....		.....	.....	.....	.....	.....	.....
4	4.9000	49½	@11.15	32	3.50	@3.40	@5.05	@4.90	4.85	

*No quotations.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15¼c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12¼c.; Chicago-Baltimore, 10¼c.; Chicago-New York, 13¼c.

Visible Stocks of Copper in Europe on Oct. 31 are reported at 21,457 long tons in Great Britain and 1150 tons in Rotterdam; a total of 22,607 tons. In addition 450 tons are reported afloat from Chile and 4000 tons from Australia, bringing the total up to 27,057 tons.

Tin—This market developed great strength for near-by shipments, due to the fear of an interruption of shipments from the Far East, because of the entrance into the war of Turkey and the threatened blockade of the Suez Canal.

The New York Metal Exchange will open on Nov. 9 for trading in tin.

Tin production of Federated Malay States seven months ended July 31 was 29,484 long tons in 1913, and 28,009 in 1914; a decrease of 1475 tons this year.

Lead—Right through the week a large business has been done, including at least one 1000-ton transaction. Some of the independent sellers appear to have sold all they want to at the present level, having let competitive business go to the largest interest. The St. Louis market has risen a little further above the ordinary differential.

The S.S. "Suruga" took 750 tons of lead and 360 tons of antimony last week from New York for Archangel, Russia.

Spelter—A business of a few hundred tons daily, including both domestic and foreign orders, was reported, but the volume was not large enough to characterize the market as otherwise than dull. Sales were made at 4.85c., 4.87½c. and 4.90c., this range prevailing from day to day.

Other Metals

Aluminum—Business is quiet and unchanged. Sales are moderate. The current quotation is slightly easier at 18@18.50c. per lb. for No. 1 ingots.

Antimony—The export demand has apparently stopped, but is expected to start up again. Meantime, the market is firm. Ordinary brands—Chinese, Hungarian, etc.—are quoted at 15½@16½c. per lb. Cookson's is 18@19c., with 17@18c. asked for other special brands.

Quicksilver—Asking price is rather higher here, chiefly owing to a reported advance in London to £11 per flask. New York price is \$50@55 per flask of 75 lb. About 1500 flasks were imported from Italy a short time ago, but the results were not encouraging, and no more is expected to come.

Nickel—Shot, blocks or plaquettes are 40@45c. per lb. Electrolytic is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are \$2.85@3 per lb. **Magnesium**, \$1.50 per lb., New York. **Selenium**, \$3@3.25 per lb. for lots of 100 lb. or over, \$5 per lb. for small quantities.

Mineral Exports of Spain half-year ended June 30 are reported by the "Revista Minera" as below, in metric tons:

	Metals		Ores	
	1913	1914	1913	1914
Iron.....	6,887	6,969	4,894,841	3,745,509
Copper.....	11,871	11,009	86,621	66,011
Copper precipitate.....	2,829	5,747	.....	.....
Lead.....	107,685	86,414	1,124	1,310
Zinc.....	507	985	62,714	53,448
Quicksilver.....	1,472	1,273	.....	.....
Manganese.....	.....	.....	11,265	6,45
Pyrites.....	.....	.....	1,523,481	1,637,10

Exports of salt were 326,976 tons in 1913, and 317,430 in 1914; an increase of 20,454 tons.

Gold, Silver and Platinum

Gold—Exports of gold to Ottawa, Canada, on account of the Exchange or Bankers' pool, have stopped for the present.

Silver—The market has gradually been going down for the reasons so often mentioned, namely, the inability of India to trade her exports for bullion, as result of war conditions. Supplies have fallen off and this has had a tendency to check the fall.

The London official quotations for the week were: Oct. 29, 22¾d.; Oct. 30, 22¾d.; Oct. 31, 22¾d.; Nov. 2, 22¾d.; Nov. 3, 22½d.; Nov. 4, 22½d., per oz. standard silver.

Exports of silver from London to the East, Jan. 1 to Oct. 22, as reported by Messrs. Pixley & Abell, in value:

	1913	1914	Changes
India.....	£8,156,500	£4,649,500	D. £3,507,000
China.....	702,000	42,000	D. 660,000
Total.....	£8,858,500	£4,691,500	D. £4,167,000

Platinum—Business is rather slow and most transactions of any size are based on special negotiation. The demand for the jewelry trade is small for the season. Quotations are rather nominal at \$48@50 per oz. for refined platinum and \$53@57 per oz. for hard metal, according to iridium content.

Zinc and Lead Ore Markets

JOPLIN, MO.—Oct. 31

Blende high price is \$49; assay base, 60% zinc, \$43@46; metal base suspended; Calamine, base, 40% zinc, \$22@23. Average, all grades zinc, \$39.60 per ton. Lead, high price, \$42; base, \$40 per ton of 80% metal content; average, all grades of lead, \$40.16 per ton.

Verification of the closing down of the big zinc mine at Butte, and the declining production of this district is materially strengthening offerings for all grades of blende. Producers are hoping for further advances, based on the Montana restriction of 2500 tons weekly and a curtailing of 1000 tons weekly in this district.

SHIPMENTS WEEK ENDED OCT 31

	Blende	Calamine	Lead	Value
Totals this week...	8,012,470	1,098,090	1,455,710	\$209,650
Ten months.....	435,698,920	32,689,390	75,449,070	\$10,797,520
Blende value, the week,	\$167,340; 10 months,			\$8,649,530.
Calamine value, the week,	\$13,160; 10 months,			\$381,950.
Lead value, the week,	\$29,210; 10 months,			\$1,766,040.

PLATTEVILLE, WIS.—Oct. 31

The base price paid this week for 60% zinc ore was \$42@44 per ton. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED OCT. 31

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	5,027,790	.....	905,420
Year	134,865,910	4,230,700	28,850,630

Shipped during week to separating plants, 3,838,440 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Nov. 4

The iron and steel trades have become somewhat more stagnant in the past week. In many branches of the trade there is practically no new business at all, not enough to show definitely where market prices stand. Steel-mill operations are still trending downward, and are now probably under rather than over 45% of the capacity. As bookings are still less, on an average, further decreases in production and shipments are to be expected.

Despite the almost uniformly unfavorable showing made by concrete developments in the iron and steel trade itself, there has begun to appear a more hopeful feeling, based upon influences outside the trade—large crops with an excellent market, increased export demand for many manufactured goods, a large drop in the price of exchange on London, further improvement in the financial situation, the prospective release of loanable funds through the reduction in required bank reserves Nov. 16, the adjournment of Congress, the ending of the election campaign and the prospect that the war scare as an incubus on all thought and action will soon pass.

Several of the smaller iron and steel interests have lately made reductions in wages. The large independents had the matter under advisement in the spring, but deferred action, and perhaps chiefly because the Steel Corporation was then opposed to any reduction. Conditions have now changed. The corporation has cut its common dividend, and may later pass it entirely, while the war promises a large export trade and a reduction in manufacturing costs would help to make such trade enlargement permanent. It is therefore accepted in most quarters that by Jan. 1, there will be a general reduction in both wages and salaries throughout the iron and steel industry.

A curious point in the market is the sale of some considerable quantities of ferromanganese for export. The inquiries came from Sweden and Italy, nominally, though it is suggested that Germany was the ultimate destination.

United States Foreign Trade in Iron and Steel, including machinery, eight months ended Aug. 31, is valued as follows by the Bureau of Statistics of the Department of Commerce:

	1913	1914	Changes
Exports.....	\$203,650,904	\$140,245,692	D. \$63,405,212
Imports.....	23,287,536	20,718,089	D. 2,569,447
Excess, exports.....	\$180,363,368	\$119,527,603	D. \$60,835,765

This shows decreases this year of 31.1% in the exports, and of 11% in the imports.

PITTSBURGH—Nov. 3

Steel prices are not closely quotable, as not enough business is offered to test the market. Nominal quotations are 1.10c. on plates, 1.15c. on bars and shapes, 1.90c. on black sheets, 2.90c. on black sheets and \$1.60 on wire nails. The cutting in steel pipe that has been going on for some time is recognized by the National Tube Co. in the issuance of new discounts dated Nov. 2. The net reduction in the quoted price averages about \$1.15 a ton.

Pig Iron—Prices have been softening in the local market, basic being quoted down to \$12.50, Valley, or 50c. under the quotation that obtained for six months, until quite recently, while bessemer has dropped to \$13.75, Valley, 25c. under the quotation of that obtained for six months. The market stands quotable as follows: Bessemer, \$13.75; basic, \$12.50; No. 2 foundry and malleable, \$12.75@13; gray forge, \$12.50@12.75; at Valley furnaces, 90c. higher delivered Pittsburgh. Since Oct. 1 the rate from the Shenango Valley has been 95c. to Pittsburgh, the rate from the Mahoning Valley remaining at 90c., but the Shenango furnaces would equalize with the others. W. P. Snyder & Co. announce average prices in October, based on the actual transactions, at \$13.9375 for bessemer and \$12.85 for basic.

Steel—The market is absolutely stagnant again and nominally, at least, prices have not declined. We quote f.o.b. maker's mill, Youngstown, billets at \$19 and sheet bars at \$19.50, and at maker's mill, Pittsburgh, billets at \$19.50 and sheet bars at \$20. These prices are for prompt specification, and for a contract running to the end of the year the mills would endeavor to obtain somewhat more. Rods are nominal at \$26, Pittsburgh.

FOREIGN IRON

Steel Production in Germany half-year ended June 30, in metric tons:

	Basic	Acid	Total
Converter.....	5,341,406	50,922	5,392,328
Openhearth.....	3,527,455	185,930	3,713,385
Direct castings.....	122,080	54,426	176,506
Crucible.....	.....	45,432	45,432
Electric.....	.....	53,216	53,216
Total.....	8,990,941	389,926	9,380,867

No comparisons can be made as the German Iron & Steel Union has not reported steel production monthly until this year.

Pig Iron Production in Great Britain for the half-year ended June 30, in comparison with preceding years, was, in long tons:

	1911	1912	1913	1914
First half-year.....	5,110,823	3,606,147	5,410,627	4,507,984
Second half-year.....	4,607,815	5,282,777	5,071,290	.....
Year.....	9,718,638	8,888,924	10,481,917	.....

Production of the first half this year was 902,643 tons less than 1913, and was the smallest reported for a half-year in 10 years, with the exception of 1912, which was the year of the great coal strike.

Pig Iron Production in Germany in August was 625,927 metric tons, against 1,564,345 in July. For the eight months ended Aug. 31 the total make of pig iron was 12,865,037 tons in 1913, and 11,478,468 in 1914; a decrease of 1,386,569 tons, or 10.8% this year.

IRON ORE

The Lake Superior shipping season will be a short one this year, as most of the large steel companies are planning to close down their mines early in November.

The Carnegie Steel Co. has lost about 5000 tons of Indian manganese ore on two vessels captured by the German cruiser "Emden."

Dunbar furnace of the American Manganese Manufacturing Co., at Dunbar, Penn., is now running on 40% ferromanganese. The ore is from the Cuyuna range in Minnesota.

Imports at Baltimore for the week included 3952 tons ferromanganese from Great Britain; also 16,400 tons iron ore from Cuba.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 229,519 tons; shipments, 214,132 tons. Production of Greensburg and Upper Connellsville districts, 30,352 tons.

Fuel Exports of Great Britain nine months ended Sept. 30, long tons:

	1913	1914	Changes
Coal.....	54,517,788	48,116,349	D. 6,401,439
Coke.....	838,055	824,325	D. 13,730
Briquettes.....	1,542,365	1,431,938	D. 110,427
Steamer coal.....	15,545,617	14,581,962	D. 963,655
Total.....	72,443,825	64,954,574	D. 7,489,251

The decrease this year has been wholly in August and September, when shipments were very light.

Coal Production in Germany in August showed a heavy decrease, as was to be expected. For the eight months ended Aug. 31, the total production was, in metric tons:

	1913	1914	Changes
Coal.....	127,318,665	119,187,604	D. 8,131,061
Brown coal.....	56,658,980	56,401,120	D. 257,860
Coke.....	21,418,997	20,127,970	D. 291,027
Briquettes.....	17,995,383	18,548,987	I. 553,604

Of the briquettes reported this year, 14,529,040 tons were made from brown coal or lignite.

SAULT STE. MARIE CANALS

Total tonnage of freight passing through Sault Ste. Marie Canal between Lakes Huron and Superior, in September, was 8,417,716 net tons. For the season to Oct. 1, the total freight was: Eastbound, 30,668,547; westbound, 12,365,128; total, 43,033,675 short tons, a decrease of 17,039,619 tons from last year. The number of vessel passages was 14,556, showing an average cargo of 2956 tons. The mineral freights included in the totals were, in short tons, except salt, which is given in barrels:

	1913	1914	Changes
Coal.....	14,721,491	11,303,724	D. 3,417,767
Iron ore.....	38,018,387	25,923,002	D. 12,095,385
Pig and m'f'd iron.....	281,160	191,326	D. 89,834
Copper.....	72,466	47,237	D. 25,229
Building stone.....	6,181	.....	D. 6,181
Salt, bbl.....	504,659	565,736	I. 61,077

Iron ore was 60.2% and coal 26.3% of the total freight this year.

The new canal at the Sault, with the third lock on the American side, went into commission Oct. 21, a number of vessel owners being present at the opening.

The new lock is the largest one at the Sault, being 1350 ft. long, 80 ft. wide and 24 ft. 5 in. deep over miter sill. Two of the largest Lake vessels can be locked through in tandem. This lock is 350 ft. longer than the locks of the Panama Canal.

CHEMICALS

NEW YORK—Nov. 4

The week has brought no material changes in the general market, which remains quiet.

Arsenic—There has been no change and quotations remain at about \$3.75 per 100 lb., in a quiet market.

Copper Sulphate—The market continues steady, with about the usual demand. Current quotations are \$4.50 per 100 lb. for carload lots and \$4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is slightly more active, so far as inquiry is concerned. There is no change, prices holding about 1.87½c. per lb. for November and December; 1.90@ 1.92½c. per lb. for deliveries in January and later.

Magnesite—The American Refractories Co. has received at Philadelphia a cargo of 6000 tons magnesite, brought by an Italian steamship from its works in Austria.

Imports and Exports of Fertilizers in the United States, eight months ended Aug. 31, in long tons:

	Imports		Exports	
	1913	1914	1913	1914
Kainit.....	247,832	317,205	140	.....
Manure salts.....	118,592	150,973	.....	.....
Other potash salts.....	149,709	182,091	2,569	2,746
Nitrate of soda.....	463,689	371,952	3,727	6,114
Sulphate of ammonia.....	33,135	51,483	.....	.....
Phosphates.....	.....	.....	933,992	899,100

Exports include reexports of imported material. Some phosphates are imported, but are not given separately in the returns.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
	January.....	56.260	62.938	57.572	25.887	28.983	26.553
February.....	59.043	61.642	57.506	27.190	28.357	26.573
March.....	58.375	57.870	58.067	26.875	26.669	26.788
April.....	59.207	59.490	58.519	28.284	27.416	26.958
May.....	60.880	60.361	58.175	28.038	27.825	26.704
June.....	61.290	58.990	56.471	28.215	27.199	25.948
July.....	60.654	58.721	54.678	27.919	27.074	25.219
August.....	61.606	59.293	54.344	28.375	27.335	25.979
September.....	63.471	60.640	53.290	29.088	27.986	24.260
October.....	62.471	60.793	50.654	29.299	28.083	23.199
November.....	62.792	58.995	.....	29.012	27.263	.....
December.....	63.365	57.760	.....	29.320	26.720	.....
Year.....	60.835	59.791	.....	28.042	27.576	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN

Month	New York		London	
	1913	1914	1913	1914
	January.....	50.298	37.779	238.273	171.905
February.....	48.766	39.830	220.140	181.556
March.....	46.832	38.038	213.615	173.619
April.....	49.115	36.154	224.159	163.963
May.....	49.038	33.360	224.143	160.702
June.....	44.820	30.577	207.208	138.321
July.....	40.260	31.707	183.511	142.517
August.....	41.582	.....	188.731	.....
September.....	42.410	32.675	193.074	.....
October.....	40.462	30.284	184.837	.....
November.....	39.810	.....	180.869	.....
December.....	37.635	.....	171.786	.....
Av. year.....	44.252	.....	206.279	.....

New York in cents per pound; London in pounds sterling per long ton. †Not reported.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
	January.....	6.931	5.262	6.854	5.112	26.114	21.533
February.....	6.239	5.377	6.089	5.228	25.338	21.413
March.....	6.078	5.250	5.926	5.100	24.605	21.460
April.....	5.641	5.113	5.491	4.963	25.313	21.569
May.....	5.406	5.074	5.256	4.924	24.583	21.393
June.....	5.124	5.000	4.974	4.850	22.143	21.345
July.....	5.278	4.920	5.128	4.770	20.592	21.568
August.....	5.658	5.568	5.508	5.418	20.706	.....
September.....	5.694	5.380	5.544	5.230	21.148	.....
October.....	5.340	4.909	5.188	4.750	20.614	.....
November.....	5.229	.....	5.083	.....	20.581	.....
December.....	5.156	.....	5.004	.....	21.214	.....
Year.....	5.648	.....	5.504	.....	22.746	.....

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

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January.....	16.488	14.223	71.741	64.304	77.750	69.488
February.....	14.971	14.491	65.519	65.259	71.575	70.188
March.....	14.713	14.131	65.329	64.276	70.658	69.170
April.....	15.291	14.211	68.111	64.747	74.273	69.313
May.....	15.436	13.996	68.807	63.182	74.774	67.786
June.....	14.672	13.603	67.140	61.336	70.821	66.274
July.....	14.190	13.223	64.166	60.540	69.446	64.955
August.....	15.400	.....	69.200	.....	74.313	.....
September.....	16.328	.....	73.125	.....	78.614	.....
October.....	16.337	.....	73.383	.....	79.250	.....
November.....	15.182	.....	68.275	.....	73.825	.....
December.....	14.224	.....	65.223	.....	69.583	.....
Year.....	15.269	.....	68.335	.....	73.740	.....

New York, cents per pound, London, pounds sterling per long ton. †Not reported.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
	January.....	4.321	4.111	4.171	4.011	17.114	19.665
February.....	4.325	4.048	4.175	3.937	16.550	19.606
March.....	4.327	3.970	4.177	3.850	15.977	19.651
April.....	4.381	3.810	4.242	3.688	17.597	18.225
May.....	4.342	3.900	4.226	3.808	18.923	18.503
June.....	4.325	3.900	4.190	3.810	20.226	19.411
July.....	4.353	3.891	4.223	3.738	20.038	19.051
August.....	4.624	3.875	4.550	3.715	20.406	.....
September.....	4.698	3.828	4.579	3.658	20.648	.....
October.....	4.402	3.528	4.253	3.384	20.302	.....
November.....	4.293	.....	4.146	.....	19.334	.....
December.....	4.047	.....	3.929	.....	17.798	.....
Year.....	4.370	.....	4.238	.....	18.743	.....

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

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
	January.....	\$18.15	\$14.94	\$17.35	\$13.23	\$18.59	$13.99
February.....	18.15	15.06	17.22	14.12	18.13	14.08
March.....	18.15	15.07	16.96	13.94	17.53	14.10
April.....	17.90	14.90	16.71	13.90	16.40	14.13
May.....	17.68	14.90	15.80	13.90	15.40	14.27
June.....	17.14	14.90	15.40	13.90	15.10	13.96
July.....	16.31	14.90	15.13	13.90	14.74	13.90
August.....	16.63	14.90	15.00	13.90	14.88	14.90
September.....	16.65	14.90	15.04	13.90	14.93	14.03
October.....	16.60	14.84	14.61	13.75	14.80	13.97
November.....	16.03	.....	13.91	.....	14.40	.....
December.....	15.71	.....	13.71	.....	14.28	.....
Year.....	\$17.09	.....	\$15.57	.....	\$15.77	.....

* No quotations made. † London Exchange closed.