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## Zinc Mining in Tennessee

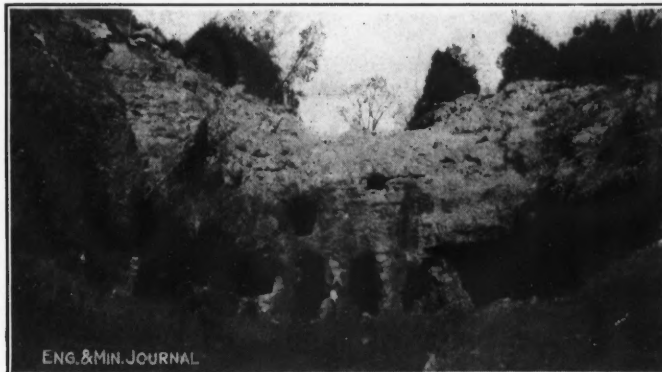
By A. H. PURDUE\*

*SYNOPSIS*—Ores, consisting of smithsonite, calamine and sphalerite, sometimes with galena and pyrite, are found deposited upon "pinnacles" and in pockets and in residual clays from Knox dolomite. Principal commercial deposits are worked by the Grasselli Chemical Co. and American Zinc Co. of Tennessee.

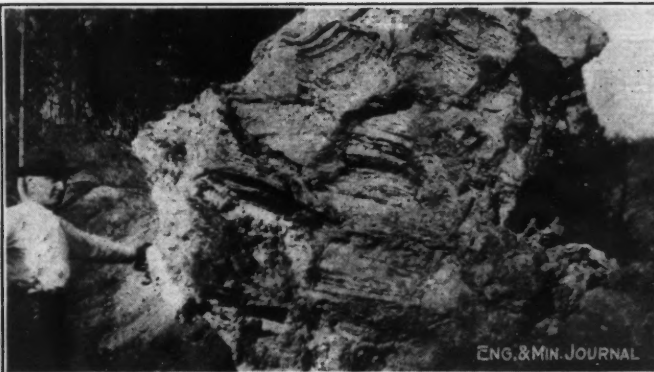
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The zinc ores of Tennessee that occur in commercial quantities are found in the valley of East Tennessee, and mining has been confined to that part of the valley lying northeast of Knoxville. The westernmost points where commercial ores have been found are on Powell River, in Union and Claiborne Counties, and the easternmost

The wide area over which the ores occur is due to the great thickness of the formations containing them, to their occurrence at different horizons, and to the comparatively small amount of folding the ore-bearing formations have suffered. But while the folding has been small as compared with other parts of the Appalachian area, actually it has been considerable, and accompanying the folding there was much faulting and shearing. In places, as at New Prospect mine on Powell River, the shearing was sufficient to polish and slickenside the bed that forms the floor of the mine. The folding, faulting and shearing resulted in profound fracturing of the brittle rock beds and the promiscuous rotation of the pieces.



NEW PROSPECT MINE  
Showing inner end of open cut



A BRECCIATED PINNACLE  
Common to zinc pits of eastern Tennessee

at Embreeville, Washington County. The extreme width of the zinc area is perhaps 40 miles, and the length 80 miles.

### ORES OCCUR IN DOLOMITE

With the exception of those at Embreeville, the ores occur in Knox dolomite, a formation which, according to Arthur Keith, exceeds 3000 ft. in thickness, and which, according to the same authority, is of Cambrian age in its lower and Ordovician in its upper part. The deposits along Powell River, in the western part of the area, and those on Straight Creek, in Claiborne County, occur near the base of the formation, and most of those in the eastern part of the area, not far from the top. Those at Embreeville occur in what Keith calls the Shady limestone, a formation older than the Knox dolomite.

\*State geologist, Nashville, Tenn.

These were subsequently cemented into breccia by calcite and dolomite, whether the one or the other, apparently depending upon the nature of the beds in which the cementation took place. The general direction of the faults is that of the strike of the rocks, namely, northeast and southwest.

### FAULTS AS GUIDES IN PROSPECTING

The area, as a rule, is covered with a thick mantle of soil, which renders prospecting difficult. There is good reason to believe that this heavy soil mantle has many valuable ore deposits hidden in and beneath it. As guides in seeking them, the prospector should make use of the maps of the several folios of the area, published by the U. S. Geological Survey. For the prospector, the most important feature of these maps is the faults, for along and near them brecciation is greatest; but his

work should not be confined to the faults that are mapped, for doubtless there are numerous others of smaller size that have to the present escaped the geologist, and which may bear ore. Of course, it must be understood that all the faulted areas will be barren of ore in most parts and some of them in all parts, and that failure to find ore at one point on a fault is no ground for condemning it throughout. Other criteria for the prospector are outcrops of breccia, whether ore bearing or not, in stream beds, and on hillsides, and the occurrence of smithsonite in the soil of hill slopes. The detection of the latter will require the closest observation.

The commercial ores of the area consist of sphalerite, smithsonite and calamine. As would be expected, the first named occurs in the breccia, and the others in the residual clays and on or near the surface of the limestone beneath. The sphalerite ores near the base of the Knox dolomite are associated with pyrite and galena, while those from near the top of the formation are usually free from both of these minerals.

#### DESCRIPTION OF ORE OCCURRENCE

In the weathering of the limestones, their surfaces have taken the usual form produced by solution, namely, that of numerous "pinnacles" and their complementary pockets, as shown in Fig. 1. The smithsonite or calamine, as the case may be, occurs mainly in the clay of the pockets, but the tops of the pinnacles may be encrusted over with ore, and even the sides may contain some. It must not be understood that all the pinnacles or

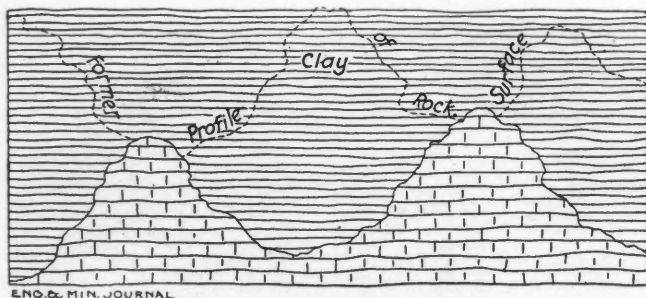


FIG. 1. SKETCH SHOWING THE POSSIBLE ORIGIN OF RICH ORE DEPOSITS CAPPING PINNACLE

The broken line represents the supposed former profile of the rock surface.

pockets of any mine are productive. On the contrary, many of both contain none at all. The presence or absence of ore is thought to be due mainly to the difference in underground flowage conditions over the different pinnacles and through the different pockets, but as one looks at these ores in the mines, he is impressed with the suggestion that there is some connection between the rate of limestone weathering and deposition of the oxidized ores. The crusts of ore adhering to the pinnacles are as a rule on more or less disintegrated parts of the rock.

A striking feature of these oxidized ores is their frequent occurrence on the tops of the pinnacles. These are the parts that now are reached by the smallest amount of ground-water, and the parts where such water lingers the shortest time. The ore could not have been deposited from super-saturation after the pinnacles were formed, and most of them are out of reach of surface evaporation, thus eliminating that process as a possible means of precipitation. The upper parts of the pinnacles are

frequently lithologically like those below, so that the chemical reactions between rocks and solutions are the same in both parts. I cannot account for these deposits under present rock surface conditions. The explanation that has been offered is that the ore now constituting the caps was deposited in pockets, and being less soluble than the limestone beneath, protected it chemically, while the adjacent pinnacles were converted by solution into pockets. The supposed process is analogous to the manner in which a boulder on clay will protect the material beneath from the mechanical beating of the rain drops, thus forming a stone-capped column.

#### ZINC MINING BEGAN 30 YEARS AGO

Northeastern Tennessee began to attract the zinc miner at least 30 years ago. One of the first if not the first mine to be worked was New Prospect mine, on Powell River, in Union County. This was opened in 1883 and worked at different times till 1901, since which time it has been idle, with the exception of three weeks in 1903. The ore was recovered from brecciated limestone, apparently magnesian, most parts of which were very rich. The ores are sphalerite and galena, with their oxidized products, smithsonite and cerussite. The accompanying minerals are dolomite and iron sulphide. Incidentally, it should be said that prospects in this locality are reported to have been worked for lead during the Civil War.

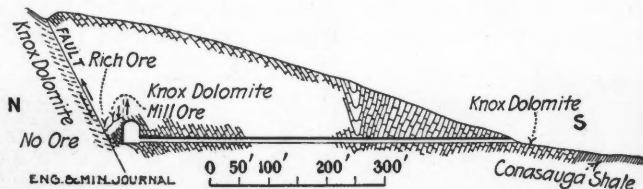


FIG. 2. SECTION OF THE STRAIGHT CREEK MINE

Subsequent to the opening of New Prospect mine, others were opened in the Holston River area, near Mascot, New Market, Jefferson City and other places, as well as in the Straight Creek area in Claiborne County. The mines of the Holston River area were mainly smithsonite producers, most of the ore having been recovered from the residual clay of the Knox dolomite. In the Straight Creek area, the ores were recovered from the brecciated rocks along a fault. The oxidized ores in this region are smithsonite and calamine, with hydrozincite in small amount. Greenockite is not infrequently found as a yellow stain on the magnesian limestone.

At present there are three zinc mines operating in Tennessee, one at New Market, in Jefferson County; one at Mascot, in Knox County, and one at Embreeville, in Washington County. The one at New Market is operated by the Grasselli Chemical Co., and produces smithsonite. The ore is recovered from the residual clay of the Knox dolomite and from the surface of the underlying rocks. It is taken from open pits, where the expense of removing the overburden will permit; elsewhere, from shafts and drifts. The material as it comes from the mine is first run through a log washer, then over the sorting belts, thence in order to the crusher, jigs and tables. The success of the mine is due to the efficiency of the mining and the milling. In less skillful hands, it would be a money loser instead of a money maker.





## New Butters Filtering Process

Some time ago Charles Butters patented a new filter leaf, which has already been described in the JOURNAL\*. Butters has now extended the idea and devised a complete process of filtering, which he believes differs essentially from the one formerly used. He has found that internal pressure is not necessary to reliable cake dislodgment within an economical time, and that complete success can be obtained by saturation of the entire area of the filter medium. It appears desirable, however, to have the external and internal pressures equalized, and he accomplishes this by allowing communication between the external and internal water. The cake discharge under this system is made in a tank of water. The leaf already mentioned is used in the process, and with it no back pressure is attainable since the cover is open at the bottom. (U. S. pats. 1,100,221 and 1,100,223).

He has found by experiment that the difference in specific gravity of the dirty wash water in the tank and the relatively clean water used for dislodging the cake would be sufficient to maintain a column of the clean water inside several inches higher than the level of the tank wash water, so that the relief valve and inlet for the cake-discharge water may be several inches above the surface of the tank water without producing greater pressure inside the leaf than outside. This fact has been taken advantage of, since it gives considerable latitude between the level of the tank wash water and that of the entrance to the relief valve and that of the funnel valve through which the discharging water is supplied to the leaf, thus preventing the entrance of the tank wash water into the leaf, while at the same time preventing excess of internal pressure. It is quite possible with this type of leaf to saturate completely the entire filter surfaces during the dislodging step, because the air is permitted to escape through the relief valve. Since there is never any internal pressure, a lighter filtering cloth may be used and all means heretofore required to prevent distention may be dispersed with, and the filtering surface may be smooth, clear of bracing, stitching and other surface-roughening means which have formerly been used.

The process depends upon several steps, among which may be mentioned the step in slimes treatment which consists in running water through the filtering means, while submerged in the slime. The process of filtering slimes, which consists of running clean water through the filtering means while submerging it in the slimes, creating difference in pressure between the two sides of the filtering medium to form a cake, and subsequently filling that means with water to discharge the cake. The process of filtering slimes, which consists in running water through the filtering leaf while submerging it in the slimes, decreasing the internal pressure and then permitting the escape of air from the leaf while completely filling it with water to clean the filtering medium. The process of dislodging slimes cakes from filter media is by saturating the media, and while doing so equalizing the pressures on the cake and the media. The process of dislodging slimes cakes from filter media by saturating the media while the cake and the media are submerged and equalizing the hydrostatic pressures thereon. The process of submerging a filter medium in slimes, forming a cake

on it, washing the cake while submerged, saturating the entire area of the medium and equalizing the hydrostatic pressures on the medium and cakes.

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## Canadian Iron in 1914

The make of pig iron in Canada in the first half of 1914 is reported by the American Iron & Steel Association, as below, in long tons. Comparisons are made with the first half of 1913:

	—1913—		—1914—		Changes Tons
	Tons	%	Tons	%	
Basic .....	292,625	53.6	197,806	44.7	D. 94,819
Bessemer .....	125,052	22.9	126,040	28.5	I. 988
Foundry .....	128,293	23.5	108,058	24.4	D. 20,235
Miscellaneous .....	11	...	10,526	2.4	I. 10,415
Totals .....	545,981	100.0	442,430	100.0	D. 103,551

Foundry iron includes a small quantity of ferrosilicon. Miscellaneous includes white and mottled iron and ferroalloys. The total decrease from the second half of 1913 was 26,707 tons. Of the iron produced this year, 433,733 tons were made with coke and 8697 tons with charcoal or in the electric furnace.

Of the 442,430 tons of pig iron produced in the Dominion in the first six months of 1914, 281,030 tons were delivered to mixers, openhearth furnaces, foundries, etc., in a molten condition, 123,397 tons were sand cast, 37,994 tons were machine cast, and 9 tons were direct furnace castings. The iron made for consumption by the makers, in steel furnaces, forges, etc., was 323,855 tons, or 73.2%; for sale, 118,575 tons, or 26.8% of the total.

There were 11 furnaces active in 1914, running an average of 152.8 days. This gives an average of 263 tons per furnace a day. The total number of completed stacks in the Dominion is 22, of which 17 burn coke and 5 charcoal. Two electric plants are in use, making ferrosilicon and ferrophosphorus.

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## Utilization of Copper-Nickel Ores

In the recent patents of George M. Colvocoresses (U. S. pats. 1,106,785 and 1,106,786), new methods of treatment of basic ores containing copper, nickel and iron are laid down. Such ores are those of Sudbury. In the first patent he specifies crushing to below 20-mesh, roasting off the sulphur to under 1%, then smelting to a ferro-copper-nickel, with suitable flux, and refining the ferro alloy in the electric furnace, producing a final alloy containing 1.5 to 12% of cupronickel, according to original tenor of the ore.

Examples of ores treated and alloys produced are given:

	Per Cent.					
	Fe	Ni	Cu	S	SiO <sub>2</sub>	C
Ore No. 1.....	50	1.5	0.4	29	10	...
Metal No. 1.....	96.35	2.8	0.75	..	..	0.1
Ore No. 2.....	46	2.0	0.5	25	20	...
Metal No. 2.....	94.8	4.0	1.0	..	..	0.2
Ore No. 3.....	40	2.5	1.0	20	32	...
Metal No. 3.....	91.4	6.0	2.2	..	..	0.4

The alloys are said to be white, less corrodible than steel and of great strength.

The second scheme consists in smelting the Sudbury ores, as at present, for a copper-nickel matte, but producing as basic a slag as can be economically handled, and without attention to metal loss. This foul slag is then smelted to a low copper-nickel pig iron, which is then refined electrically.

\*"Eng. and Min. Journal," Dec. 6, 1913.



# Globe Consolidated Mill, Dedrick, Calif.

BY H. A. MORRISON\*

*SYNOPSIS—The first modern, all-slime cyanide mill in northern California. Motive power is from water wheels directly, no electrical transmission being used. Standard practice is followed absolutely in the mill, there being no novelties. Precipitate is shipped to smelter, instead of being melted and refined at the mill.*

Under the management of Wallace Macgregor, the new 100-ton cyanide mill of the Globe Consolidated Mining Co. was completed and commenced operations last November. There were many special problems to be solved, but under supervision of H. S. Payson, the plant has met all expectations and has been operating smoothly.

The mill site slopes at 36° toward Cañon Creek, and the lower floor is about 200 ft. from that stream. On account of the steep slope and heavy snow fall, a large amount of lumber was considered advisable and 300,000 ft. was used. In addition, it may be mentioned that the company's own saw mill is on the same site and the whole country is heavily timbered. The building is double-boarded and roofed with galvanized corrugated iron.

The least charge for hauling from Redding, 75 miles distant, the nearest railroad point, is 2c. per lb. Cement retaining walls for the many high banks were, therefore, not to be considered, and timber has been found a good substitute. The excavations are in hornblende schist and stand fairly well if only slightly supported. At the foot of the banks, double 2-in. plank lagging was placed behind the heavy posts of the regular framing plan.

Whenever the planks begin to weaken, they can readily be replaced by the familiar methods of the mine timberman.

## POWER FROM IMPACT WATER WHEELS

All machinery is driven by Hendy impact water wheels. Seven wheels of from 10-100 hp. are used. Water is diverted from Cañon Creek one mile above the plant and carried in a flume along the opposite side of the cañon to a point across from the mill. Here the penstock is placed and from it, a 20-in., inverted siphon conveys the water across the deep cañon and up the other slope to the water wheels. In the bottom of the cañon the head is 600 ft. and at the battery water wheels the pressure is 175 pounds.

The flume is 6800 ft. long 2x4 ft. in cross-section, and laid with a grade of 3½ in. per 100 ft. Selected fir lumber was used for the boxes, which are each 12 ft. long. All material for this flume was delivered at the penstock over a single span cable-way, 2200 ft. long. A small double-drum hoist for this work was improvised from the parts of two derricks and worked splendidly,

\*Dedrick, Calif.

using water power. The method used in flume construction was carefully formulated before work started and gratifying results as to cost and time were obtained. Placing of trestles, stringers and ties was started at the penstock, the floor only being placed upon the ties as the work advanced toward the intake. This provided a good runway four feet wide upon which small, four-wheeled trucks, propelled by one man, carried lumber to the increasingly distant points of activity. Against the moderate grade, one man readily handled a stiff load. When the flooring reached the intake, construction of the sides was started and the carpenters worked back down to the penstock, completing the flume as they retreated. Floor and side cracks were battened as needed, and spill-



THE GLOBE CONSOLIDATED MILL, DEDRICK, CALIF.

ways were put in at frequent intervals. Water was admitted as soon as a spillway was left behind the carpenters, and allowed to overflow there until the flume was completed down to another. This practice, together with the use of freshly sawed, green lumber, obviated any serious leakage.

## AERIAL TRAMWAY FOR ORE TRANSPORT

A double rope aerial tramway, made and installed by the Painter Tramway Co., of San Francisco, transports ore from the mines to the top floor of the mill. The terminals are 6000 ft. apart and the fall is 2500 ft. The longest single span is 702 ft. and in some places the grade is as much as one to one. Nineteen, 10-cu.ft. buckets are used, special care having been taken to so design the grips that they would be positive in action and exert constant pressure on the pulling rope and at the same time, be easily detached from or placed on the line. They have proved entirely satisfactory notwithstanding the heavy strain. Heavy snow fall had to be reckoned with, slides being not infrequent, and the 20 supporting towers were built of heavy fir timber and securely bolted

together. Erection was in charge of W. S. Standish, and miracles of labor were performed in assembling and erecting the towers and placing the cables. All freight for the mine is carried up on the returning buckets. The loading terminal is peculiar in that it is well underground in one of the mine tunnels. Buckets are automatically detached at that point and pushed into the tunnel 160 ft. to the main ore chute where they are loaded. At the lower terminal, ore is dumped upon a grizzly and runs into the crusher ore bin. When operating at its rated capacity, 100 tons on 8 hr., this tram is expected to generate 40 horsepower.

#### ORE TREATED AS TOTAL SLIME

Standard practice has been followed throughout in mill equipment. The Gates crusher is followed by twenty 1000-lb. stamps, crushing in cyanide solution through 16-mesh screens. Pulp from the batteries is classified by a Dorr classifier, coarse sand going to the 5x22-ft. Chalmers & Williams tube mill, and slime going to two Dorr thickeners. The tube mill operates in closed cir-



HIGH-PRESSURE PIPE TRESTLE, 600 FT. HEAD

cuit and does excellent work although pebble consumption is rather high. Thickener overflow is practically clear solution, and goes direct to the zinc boxes. Underflow has a specific gravity of 1.45 and the stream is diluted with barren solution as it passes to the agitators. There are three of these, of Dorr make, and they are operated in series, the contained pulp having a gravity of 1.35. The method of transfer from one to the other is ingenious and original in this plant and there is no accumulation of heavy material, as might at first be expected. Transfer is effected as shown in the drawing, and further description seems unnecessary.

After leaving the agitators, barren solution is again added to the stream entering the two lower thickeners. Solution overflow from the latter goes to the gold solution storage tank and the thickened pulp flows to an Oliver filter. All of the Dorr machines are doing excellent work, the agitators in particular. Recently the power flume was put out of commission by a small snow slide and a falling tree. No power was available for any of the mill machinery during a period of 72 hours. The air lifts were first started in the agitators and operated

two hours, at the end of which time they were raising a moderately fluid stream—then the stirring arms were easily started at normal speed, and in another hour the charge was in perfect agitation. The thickeners were all started without trouble, meeting the severe test without a tremor.

#### CONTINUOUS FILTRATION OF RESIDUES

The large Oliver filter in this plant has justified its selection. Globe slimes are particularly fast settling and it has been difficult at times to keep the charge from accumulating in the filter tank. A system of air lifts



CLOSE VIEW OF THE GLOBE MILL

will probably be put in with the object of overcoming this difficulty. Frequent scrubbing of the filter cloth with dilute hydrochloric acid is found necessary.

#### ZINC-BOX PRECIPITATE SHIPPED

Solution from the upper and lower thickeners and the filter is collected in a 12x26-ft. gold-storage tank placed on the filter floor. All solutions entering the gold tank are clarified by passing up through a filtering medium of burlap and excelsior which occupies 3 ft. in the bottom of the tank. From the gold tank all solutions gravitate to 8 steel zinc boxes where standard practice is followed. In cleaning up, the gold precipitate and short zinc are washed through metal-lined launders to a steel clean-up tank. A small triplex pump raises this material to a home-made vacuum filter, vacuum being supplied by the ejector on the Oliver filter. This does not interfere in any way with operation of the Oliver, since the vacuum averages about 25 in. The product is dried and



shipped to the Selby smelter. Acid treatment is not used largely because of high freight rates, but also because that method entails considerable additional consumption of zinc.

Solution effluent from the zinc boxes is collected in three steel sump tanks and from this, the lowest floor, is raised back to the battery tank by three 5x6-in. Deane triplex pumps, two being in operation constantly. Cyanide is added in the sumps to bring the strength to 1.4 lb. of sodium cyanide per ton, and in the central sump, to which the pumps are connected, an air lift secures uniform mixing of solution. 4-in. pipe forms the central column, and from the top of this column, 6 in. below the rim of the tank, two arms radiate to a point one foot from the sides of the tank. Air enters through a 1/2-in. pipe at the foot of the 4-in. column.

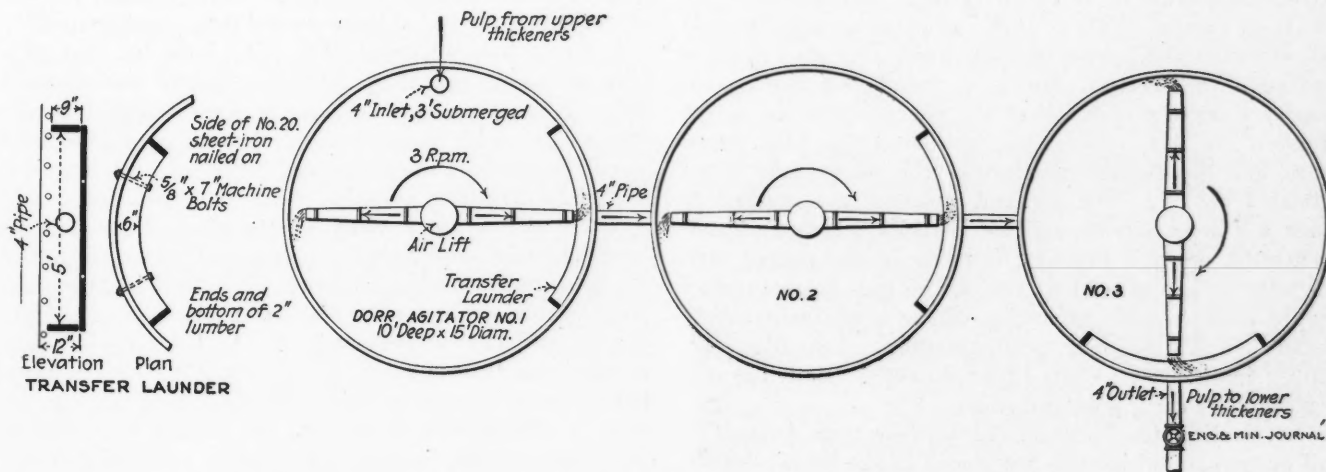
court finds that the grantor cannot retain title to the ore by mere mental reservation, and that mere extraction of ore without proof of intention presently to sever it from the realty does not change its character into personalty.

### Wedge Furnaces at Humboldt, Arizona

BY G. M. COLVOCORESSES\*

In January, 1914, the Consolidated Arizona Smelting Co., started to make over its plant at Humboldt, Ariz. The first unit of the renovated plant consisted of one circular roasting furnace and a reverberatory furnace 60x19-ft. hearth measurements.

The roaster was manufactured by the Wedge Me-



SYSTEM OF CONTINUOUS AGITATION THROUGH DORR MACHINES WITH SPECIAL TRANSFER LAUNDERS

Operations cover too short a period to give more than approximate figures at this time. The indicated recovery exceeds 94%, and 0.5 lb. of sodium cyanide, 5 lb. of lime, and 4-5 lb. of Danish pebbles are consumed per ton of ore treated.

chanical Furnace Co., of Philadelphia, and has a diameter of 22 ft. 6 in., is fitted with seven hearths besides a drying hearth at the top. The arms of the furnace are air cooled. The air is supplied by a rotary blower, delivering about 3000 cu.ft. of air per min. through an 8-in. galvanized-iron pipe, at a pressure of 2 oz. The furnace is supported on a step bearing instead of the trunnion bearing with which Wedge furnaces have usually been supplied.

### Removed Ore as a Part of Realty

BY A. L. H. STREET\*

Where an owner of a mine removes ore and places it on a dump on the premises, preparatory to the removal of a better grade of ore, and the mining property is subsequently sold, does the ore so removed belong to him or to the purchaser of the mine? This question was lately passed upon by the Arizona Supreme Court in the case of Steinfeld vs. Omega Copper Co., 141 Pacific Reporter 847, and the decision is: "The vital fact to be determined is whether the ore was so annexed to the realty and remained so annexed thereto as to become a part and parcel thereof. If so, it passed with the conveyance of the mines. The intention with which the owner of the property extracted the ore from the ground and the purpose and intention of the owner with which it was placed on the dump is controlling in arriving at a solution of the question of whether the ore after having been extracted and placed on the dump was personalty or realty." The

The steel work and radial brick, designed to line the circular central shaft, were shipped by the Wedge company from Pennsylvania. The brick for the hearths and for lining the outer shell were procured locally. The erection of the steel and brick work was done under contract by the Barker Construction Co., and through its courtesy I am able to submit the actual figures of the cost of erection, all the material required for this work being supplied by the smelting company and not included in these figures, but the tools and rigging being furnished by the contractors.

COST OF ERECTING ROASTING FURNACE

Erecting steel work .....	\$782.88
Equipping arms .....	42.00
Erecting brick work .....	932.92
Carpenter work .....	146.00
Supervision .....	273.57
<b>Total .....</b>	<b>\$2177.37</b>

The erection of the furnace was begun on Apr. 1, and the furnace put in operation the latter part of May.

\*Attorney-at-law, St. Paul, Minn.

\*General manager, Consolidated Arizona Smelting Co., Humboldt, Ariz.

During the first four weeks the operators were being gradually trained to handle it in a proper manner, and the tonnage was slowly worked up to full capacity. Since that time the furnace has been roasting 110 tons of charge per day. The average charge sent to the roaster is approximately 30 tons of concentrates: Cu, 11%; Fe, 28%; insol., 20%; S, 30%; 55 tons of smelting ore, approximately, Cu, 4.5%; Fe, 20%; insol., 42%; S, 20%, and 25 tons of limestone, containing 52% CaO.

The concentrates above mentioned are produced from jigs, Wilfley tables, and flotation plant. All the concentrates will pass 4-mesh screen, while approximately 40%, representing the great bulk of the flotation concentrates, will pass 65-mesh, and a large proportion of this is composed of minus 200-mesh material. Such a condition makes for heavy dust loss in the calcines. Great care must be taken in getting these to the reverberatory furnace with as little agitation as possible, and all elevators and chutes through which they pass must be calked with asbestos. Owing to insufficient storage capacity a large proportion of the concentrates fed to the roaster are wet, containing approximately 15% moisture, and the average moisture of the charge may be estimated at 7%. The ore and limerock are crushed to pass a 4-mesh screen, and an intimate mixture of concentrates, ore and limerock is made in the charge cars, elevator and bins, so that the charge goes to the roaster containing an even proportion of the constituents above named, and analyzing approximately: Cu, 6%; Fe, 20%; insol., 34%; CaO, 12%; S, 20%. Both ore and concentrates carry gold and silver.

In starting the furnace, the hearths were heated by oil burners, of which two are placed in the lowest hearth, the ports for these oil burners having been designed in constructing the furnace. Additional oil burners were inserted in the doors as deemed necessary. For the first few weeks it was frequently necessary to use oil fuel in order to keep the charge evenly heated, but since that time, and more particularly since the roaster men became accustomed to their work, the furnace has been operating entirely without fuel, and, in fact, it is frequently advisable to open the side doors a trifle in order to prevent the heat from becoming too great, and the roasting from proceeding faster than desired.

The upper or drying hearth of the furnace is cool and moist. The charge passes to the first roasting hearth with probably 1 to 2% of moisture, and immediately begins heating up until the maximum temperature of about 1450° F. is reached on the fourth and fifth hearths. The calcine slightly cools on the sixth and seventh hearths before passing out of the furnace.

As stated above, the average charge contains approximately 20% sulphur, and over a period of six weeks the average sulphur in the calcine was 5.47%, this being just about the sulphur content desired in order to mix with the unroasted charge for the reverberatory, and to produce therein the most suitable grade of matte. Occasionally the sulphur in the calcine has been allowed to go as low as 4.20%, and it seems quite certain that we could, if desired, reduce the sulphur to 4%, always without the use of any fuel.

The operation of the furnace proper requires one man on each shift, although the wet and sticky nature of the charge has made it necessary to employ a second man on the charge elevators and hoppers. The direct charge

against the roasting operations over a period of six weeks has been figured as follows:

Labor (\$3 per 8-hr. shift).....	8.18c. per ton of charge
Electric power (1½ c. per kw.-hr.)....	3.15c. per ton of charge
Total .....	11.33c. per ton of charge

No charges for repairs are included in the above figures, as the repairs to date have been quite negligible and give no clue to the actual repair cost taken over any extended period. I have figures from several other plants which seem to show a repair cost on roasting furnaces of Herreshoff, McDougall and Wedge types, or approximately 2c. per ton charge. Whether or not this figure will be attained here we have as yet no means of knowing.

Just in passing it might be of interest to state that for the White-Howell roasters formerly operated in this plant the cost for fuel alone amounted to \$1.25 per ton of charge, while the sulphur in a charge averaging 25% was rarely reduced below 15% in the calcine, but it is only fair to say that these old White-Howell roasters were only 32 ft. long, and were in no sense adapted to the purpose to which they were put, having been purchased second hand from another plant, in which they were installed for handling an entirely different material.

There are a great many points which have not yet been entirely determined or adjusted concerning the Wedge furnace mentioned above. The dust loss has been considerable, owing to the fine nature of the concentrate charge, and careful regulation of the draft is necessary to minimize this as much as possible. We have not yet any accurate figures covering this dust loss, nor are we able to estimate the exact cost for repairs that will be chargeable to the roasting department. We believe that the operations can be considerably improved by certain slight alterations in the mechanical arrangement and particularly by thoroughly drying the concentrates and other materials which go to make up the charge before feeding them on to the drying hearth of the furnace. This last should enable us to treat a slightly increased tonnage, and thereby make a corresponding decrease in operating costs.

### ✻ Lessor's Liability for Lessee's Improvement

An owner of a mine who has leased it is not liable for work done or materials furnished in unwatering a mine under a contract made by the lessee with a third person, unless the owner "knew or had reason to believe that the persons so furnishing the materials and performing the labor were relying upon him for pay," according to the decision of the Colorado Supreme Court just handed down in the case of Reynolds vs. Norman, 141 *Pacific Reporter*, 466.

### ✻ British Columbia Mineral Output in 1913

Final figures have been issued by Provincial Mineralogist William Fleet Robertson on the mineral output of British Columbia in 1913. They are, arranged in order of descending value: Coal, 2,137,483 long tons; copper, 46,460,305 lb.; gold, \$6,137,490, of which \$510,000 is placer; lead, 55,364,677 lb.; silver, 3,465,856 oz.; and zinc, 6,758,768 pounds.



# Lake Superior Iron-Mine Ventilation

*SYNOPSIS—Results of field work in connection with metal-mine investigation by Bureau of Mines here presented. Conditions in the mines summarized. Gases to be expected in mine air. Effects of high temperatures and humidity. Causes of heat and of air vitiation. To remedy bad conditions air must be more generously supplied and better distributed; and the production of noxious gases must be decreased. Permissible limits in heat, moisture and CO<sub>2</sub> content. Remedial measures include use of fan and of completely combustibile explosive.*

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This paper is based upon field work undertaken in connection with the investigation by the Bureau of Mines of ventilation in the metal mines of the United States. Visits were made to most of the iron mines in Michigan and Wisconsin and to some of those in Minnesota.

All the mines visited, with the exception of two, depended on natural ventilation. Of the two exceptions, one had a blower fan installed underground, and the other used compressed-air jets. In a few cases booster fans were found in use in dead ends, especially in those immediately under the timber mat. The amount of air entering the mines per man employed underground varied greatly, but in the majority of cases was between 50 and 100 cu.ft. per man per minute.

## GASES, TEMPERATURE AND HUMIDITY

The analyses of many air samples showed that seldom in the main airways did the air contain any appreciable amount of noxious gases. The only exception to this statement might be said to be in reference to the "return" air issuing from the mine after use therein; this showed a minimum of 0.2% and a maximum of 0.8% of carbon dioxide. Invariably the heavily timbered mines showed a higher percentage of carbon dioxide in the return air, than did those mines in which little timber is used.

The fresh down-cast air varied in temperature with the season of the year. At all times its humidity is comparatively low. In the heavily timbered mines, the return air ranged in temperature from 75° to 90°, and in humidity usually from 95% to 100%. In mines where little timber is used the return air is from 10° to 15° cooler.

The working places near the main air courses were found to present no abnormal conditions. However, in the dead ends, such as are encountered in driving long crosscuts or drifts, or in sublevels immediately under the timber mat, severe conditions were noted in many cases. In the heavily timbered mines, temperatures in such working places were found to range from 75° to 100° humidity from 95% to 100%. Many air samples taken from such places showed from 0.5% to as high as 3% carbon dioxide. It was found that the gases produced by blasting gave a great deal of trouble. The expedient of turning on the compressed air after blasting was not always effective.

\*An abstract from a paper prepared by Edwin Higgins, mining engineer of the U. S. Bureau of Mines, for the meeting of the Lake Superior Mining Institute, at Ishpeming, Mich., Sept. 1, 1914.

With the exception of the combustibile hydrocarbon gases reported from time to time from some of the mines situated in the carbonaceous black slate area of the Menominee range, the only noxious gas that is encountered under ordinary operating conditions is carbon dioxide. No explosive gases occur.

In addition to carbon dioxide there are produced by the combustion of explosives, depending on the kind used, varying percentages of hydrogen, methane, oxides of nitrogen, carbon monoxide, water vapor and hydrogen sulphide. For the purpose of this paper it will suffice to say that extremely small percentages of either carbon monoxide, oxides of nitrogen or hydrogen sulphide have marked effects upon the human system; 0.1% of any of these gases has a serious effect upon the miner. Experiments by the Bureau of Mines indicate that the oxides of nitrogen and hydrogen sulphide are even more dangerous, in the same quantity, than carbon monoxide.

From timber fires the noxious gases produced are carbon dioxide and carbon monoxide. Carbon monoxide is a product of incomplete combustion of wood or other matter, and also of the explosion of various types of blasting powder or dynamite. The amount produced is enormously increased when the explosive burns instead of detonating. Carbon monoxide is more than likely to be encountered during a smoldering fire, such as would result in a damp or wet mine.

## EFFECTS OF HIGH TEMPERATURES AND HUMIDITY

High temperatures in a comparatively dry air do not have an extremely severe effect on the miner. This fact was forcefully illustrated on a recent trip through the Comstock mines in Nevada. In one place the dry-bulb thermometer read 110° F., and the wet bulb 100°. This represents a humidity of 70%. While performing no work the place was not unbearably hot. Nearby, where the return-air current was encountered, the wet and dry bulbs both read 110°, representing a humidity of 100%, and the effect was distressing.

Frequent observations in Lake Superior iron mines show that miners working in temperatures above 75° wet bulb, relative humidity 100%, showed a marked falling off in energy. At wet-bulb temperatures of from 80° to 90°, relative humidity 90 to 100%, the average miner works only from one-half to one-third of his time. In one mine four miners produced the same tonnage of ore as was produced by nine miners in a similar place in the same mine where the temperature was 10° hotter. Many cases of this kind could be cited.

The great importance of proper ventilation has been recognized by some, and efforts are now being made to improve conditions in this respect. Good results have already been obtained in one or two cases. The management of one mine, where production per man has been increased greatly recently, attributes the increase in a great measure to better ventilation facilities.

## CAUSES OF VITIATED AIR

Oxygen is consumed, and carbon dioxide produced in the mines, through the following agencies: Oxidation or

rotting of timbers; breathing of men; burning of various types of miners' lights; blasting; oxidation of certain rocks.

Without going into a detailed discussion, it may be stated that investigation points to the oxidation or rotting of timbers in the heavily timbered mines as the chief cause of the vitiation of air. The breathing of men and the burning of candles and lamps come next in importance. In heavily timbered mines, especially where the mine is wet or damp, the timbers consume from three to four times as much oxygen as do all the other factors combined.

In general, it may be said that heat is developed in mines through the following agencies: Rock temperatures; presence of men and lights; crushing and working of rock and timbers; oxidation of timbers; operation of machinery and presence of steam lines connected thereto.

The cause of humidity, of course, is the absorption of moisture in the mine by the comparatively dry air admitted from outside.

It was found that rock temperatures had practically no bearing on the great heat encountered in the sub-levels, especially those subs directly under the timber mat. In several cases rock temperatures, at depths of 1500 to 2000 ft., were as much as 10° lower than air temperatures from 500 to 1000 ft. nearer the surface but under the timber mat. Air currents passing through timbered workings where no men were employed were tested at various intervals, and the temperatures were found to increase gradually, regardless of whether the course of the air was downward or upward. The oxidation of the timber is the chief cause of the production of heat. In one mine before the introduction of timber in a new sub, the temperature averaged 75°; when drift sets had been put in the average temperature of the level was 80°.

#### THE NATURE OF THE PROBLEM

There are two problems presented in the proper ventilation of Lake Superior iron mines: (1) To supply a sufficient quantity of air, and distribute it so that it will carry off the noxious gases produced and will have the effect of lowering the temperature and humidity existing in working places. (2) To produce smaller quantities of noxious gases.

It is a difficult matter to state just how much air should be supplied in the heavily timbered mines for the reason that there is no accurate method of calculating how much oxygen the timbers will consume. The factors effecting this are extremely variable. Damp timbers are much more active in oxygen consumption than are dry timbers. Again, due to the methods of mining, it is impossible to figure with any degree of accuracy the amount of timber in a mine. However, a study of actual conditions leads to the belief that, in untimbered mines, where no animals are used, 50 cu.ft. of air per min. per man employed underground, is sufficient. In mines where a moderate amount of timber is used there should be 100 cu.ft. per min. per man employed underground. In the heavily timbered mines, it may be necessary to increase the amount to 150 or even 200 ft. per minute.

#### CRITERIA OF QUALITY OF VENTILATION

There are several guides in determining whether or not there is a sufficient amount of air entering the mine.

In the first place there should be sufficient air to prevent the humidity in working places from rising higher than 90%. With 90% humidity the wet-bulb thermometer should not read more than 80° in still air, 85° in a current of 400 to 500 ft. per min.; with 100% humidity these figures may be set at 75° and 80°.

A second criterion is the diminution of the amount of oxygen in the air. This is closely related, in these mines, to the content of carbon dioxide.

While a miner may feel no discomfort so long as he does not exert himself in an atmosphere in which a candle will become extinguished (from 16 to 17% oxygen), the effect may be different when carbon dioxide is present and he is working hard. Another factor to be considered is the heat usually encountered in places containing vitiated air. Miners have been observed who showed ill effects working in an atmosphere containing 1% carbon dioxide and 19.7% oxygen, the temperature being 75° and the relative humidity 95%. It is believed that miners will begin to lose efficiency in air containing more than 1.25% carbon dioxide and less than 19% oxygen, in ordinarily cool temperatures; when the working place is hot the effect is correspondingly worse.

It is a simple matter to determine whether conditions in working places are such that miners can perform efficient work. Temperatures and humidity may be determined by the use of the sling psychrometer; gases present may be determined by sampling and analyzing the air.

#### REMEDIAL MEASURES

The principal remedy for the conditions referred to is a sufficient air supply, and its proper distribution throughout the mine. Increased air supply may be obtained: (1) By providing a greater number of openings to the mine; (2) by providing for downcast and upcast openings, with due regard to the elevation of the shaft collars, and the presence or absence of steam pipes in the shaft; (3) by the use of fans either at the shaft collar or within the mine.

A blower fan at the collar of the downcast shaft is preferable. If an air shaft is not available, that is, one not used for hoisting, it may be possible to utilize the manway in an operating shaft as an airway, but in this case the partition between the manway and the hoisting compartments must be absolutely tight. If it is not practicable to place the fan at the shaft collar, it must then be placed within the mine workings, preferably a blower fan somewhere near the downcast shaft.

Many of the mines have a sufficient amount of air passing into them but, owing to insufficient airways, most of the air escapes from the mine without reaching the working places. Such conditions can be remedied by the running of additional crosscuts, drifts and raises for carrying the air, and by the installation, at proper places, of doors and brattices. An important aid in ventilating dead ends may be found in the intelligent use of electrically operated booster fans.

#### MEASURES FOR REDUCING QUANTITY OF GASES PRESENT

Of measures looking to a reduction in the quantity of noxious gas produced, those worthy of consideration are: (1) The treatment of timber with such preservatives as will prevent or retard oxidation or rotting, and (2) the use of explosives that produce a minimum amount of noxious gases. The treatment of timber has been



discussed in various papers and publications and it is probable that the use of some preservative that will act as a sterilizing agent will be effective in the Lake Superior mines. Probably the preservative most used at this time is creosote. This is a subject that requires further investigation before definite recommendations can be made. The cost of treatment is an important factor. It might be added that stripping the bark from timber retards, to some extent, its liability to oxidation.

On account of the serious effect of powder gases on miners, the Bureau of Mines recently undertook an investigation with the hope of developing a powder which would evolve a minimum quantity of noxious gases.

As the result of a number of tests with straight nitroglycerin, low freezing, ammonia, and gelatin dynamites, the fact was brought out that the gelatin dynamites evolve smaller quantities of noxious gases than any other.

The gelatin should, however, be made with an oxygen excess sufficient to oxidize completely all combustible matter present, including the wrappers. It is further essential that detonation be complete.

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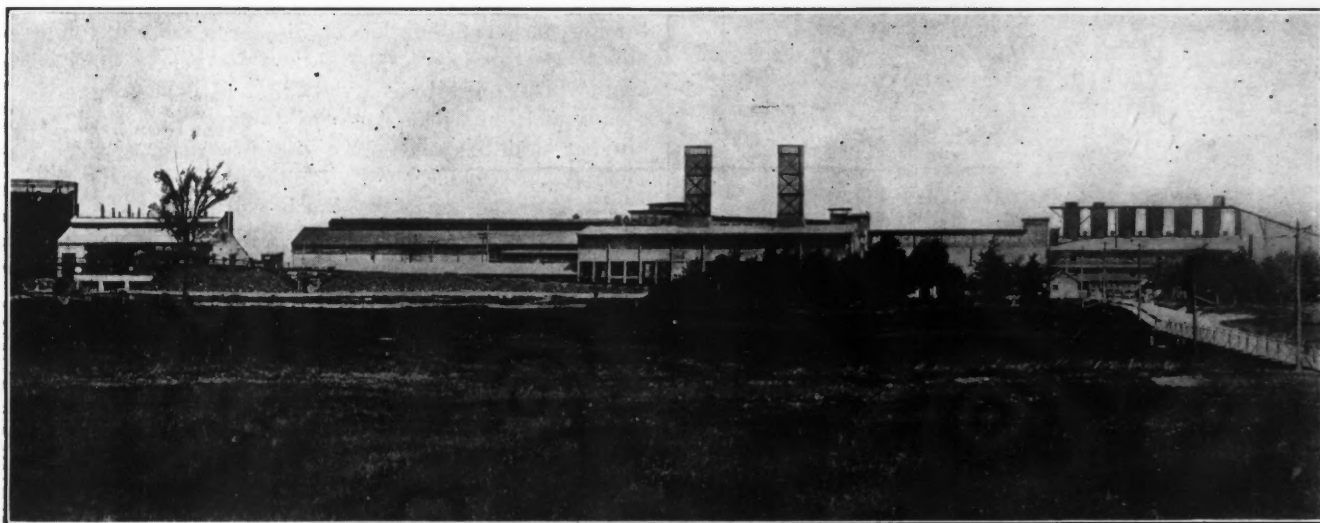
### The Cyanamide Industry

The factories of the American Cyanamid Co. at Niagara Falls, Ontario, began operations in January, 1910. The original plant had an output of 12,000 tons a year, but this was increased during 1912 to approxi-

indefinitely. Cyanamide nitrogen is readily soluble; 96% will dissolve in cold water and is, therefore, available as plant food. On contact with the soil, it reacts quickly and forms first urea, and then changes into double ammonium compounds. Every 100 lb. of cyanamide contains the equivalent of about 70 lb. of slacked lime, which adds considerably to its value as a fertilizer.

The manufacture of cyanamide depends upon the chemical fact that calcium carbide at a high heat combines with atmospheric nitrogen and forms calcium cyanamide. Calcium carbide is made by fusing together lime and coke in an electric furnace. The carbide is placed in the ovens heated by electricity to white heat and nitrogen is led into the ovens and there combined with the carbide, forming calcium cyanamide. After cooling, the cyanamide is ground, treated with water and put through a mechanical finishing process.

Before the installation of the cyanamide plant at Niagara Falls, a matter of importance was to determine the kind of reducing gas to be used in the preparation of nitrogen. After careful consideration, a coal-gas plant was decided upon, as the entire output of coke could be used in the manufacture of calcium carbide, and the coal gas gave the greatest amount of carbon content for use in the nitrogen ovens. The nitrogen ovens consist of a series of vertical retorts heated by small individual furnaces. Copper oxide is packed in these retorts, and when brought to the proper temperature, air is forced



PLANT OF THE AMERICAN CYANAMID CO., NIAGARA FALLS, ONT.

mately 32,000 tons a year and further extensions are under way to give an annual output of 64,000 tons. From the commencement of operations, it was clear that a plant producing 12,000 tons per annum was unable to meet the market requirements, but the directors of the company adopted the policy of thoroughly proving the commercial practicability of and demand for cyanamide before building a large plant. After two years, they realized that the product could be looked upon as an undoubted commercial success and it was necessary to double the existing plant in order to cope with the increasing orders.

Cyanamide is a bluish black, odorless material, containing from 18% to 20% ammonia, about 12% carbon and the equivalent of about 70 lb. of slacked lime. The material is shipped in burlap bags and can be stored

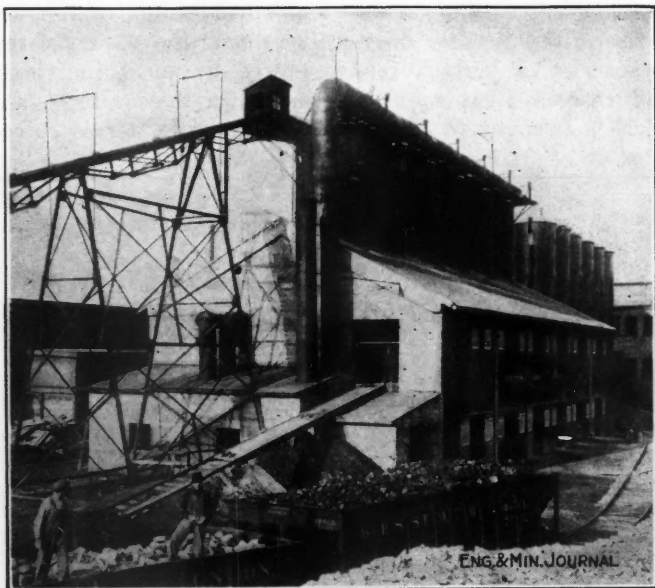
through them. The oxygen combines with the copper as cupric oxide, leaving the nitrogen free. The air is then shut off and as the oxide has gradually become foul during this cycle, coal gas is then passed through the retort, which acts as a reducing agent. The nitrogen is then forced through pipes into the electric furnaces where it combines with the calcium carbide and forms calcium cyanamide, or commercial cyanamide.

The plant for the manufacture of lime to be used in the cyanamide plant was designed and installed by the Improved Equipment Co. The original plant consisted of six Doherty-Eldred lime kilns equipped with the Eldred process, and induced draft. The present plant consists of 12 kilns.

While the nitrogen in the original plant and the 1912 extensions is being produced by the copper oxide process,

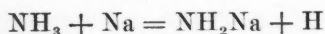
the nitrogen in the 1913 extensions is being produced by the liquid-air process. Three complete sets of Claude liquid-air nitrogen apparatus, manufactured by L'Air Liquide, Paris, are used. These operate at a pressure of 600 lb. per sq.in. and a temperature of minus 300° F. The nitrogen is delivered at a purity of about 99.9%. The oxygen in this product seldom reaches 0.1%. The coke and gas plant which has a capacity of 500,000 cu.ft. per day, was also installed by the Improved Equipment Co.

In the past, the efforts of the manufacturers have been directed toward simplifying and cheapening the manufacturing process and improving the product for use as a commercial fertilizer, since there has always been a ready market for the entire production for fertilizer purposes. There are, however, a number of other ways in which the product may be used. It is well known that when calcium cyanide is fused in the presence of carbon and a suitable fluxing agent, it is converted to cyanide. The crude product, known as surrogate, may be used directly for cyaniding gold and silver ores, or it may be treated to recover the cyanide in a purer form.

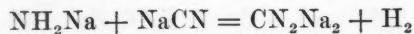


LIME KILNS OF AMERICAN CYANAMID Co.

In the original Castner process for the manufacture of sodium cyanide, ammonia gas is absorbed by sodium at 400° C., with the formation of amide and liberation of hydrogen.

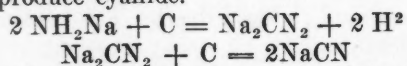


When melted with one molecule of sodium cyanide, the amide is converted into sodium cyanamide between 550° and 600°.



Cyanamide, when mixed with carbon and heated to 750° to 800°, combines with the carbon to form cyanide.

The use of the intermediary molecules of cyanide may be avoided by proceeding in a different manner, using a first carbon atom to convert two molecules of amide into sodium cyanamide, and later, at 800°, a second atom of carbon to produce cyanide.



The usual methods of cyanide manufacture make use of sodium as the alkali, while commercial cyanamide

uses calcium, but there is no reason to believe that the latter is any less efficient than the former for metallurgical purposes when the same quantity of cyanogen is present.

Hardening and cementing powders constitute a second class of cyanide derivatives of importance. These all contain cyanamide as the nitrogen basis. The hardening powders are used in the same way as cyanides, burnt leather, etc., for case-hardening. The cementing powders are used for making cement and blister steel. Another class of derivatives consists of certain compounds used in explosives. The principal members of this class are dicyandiamide, guanadine, nitro-guanadine, guanadine-nitrate and ammonium nitrate. Urea, which, as well as dicyandiamide is used in the dye industry, may also be derived from cyanamide.

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### Debris Transportation by Running Water\*

The U. S. Geological Survey, in *Professional Paper* 86, publishes some interesting results of a study of the laws governing the transportation of debris by running water. The investigation was carried on in a laboratory established at the University of California, in Berkeley. The paper in general is what is called "high-brow stuff." Certain of the conclusions arrived at, however, are of value to geologists, hydraulic miners and hydraulic engineers.

For each combination of discharge, width, and grade of debris there is a slope, called competent slope, which limits transportation. With lower slopes there is no load, or the stream has no capacity for load. With higher slopes capacity exists; and increase of slope gives increase of capacity. The value of capacity is approximately proportional to a power of the excess of slope above competent slope. This is not a deductive, but an empiric law. This power is not fixed, but depends on conditions. It ranges from 0.93 to 2.37, being greater as the discharges are smaller or the debris is coarser.

For each combination of width, slope and grade of debris there is a competent discharge. The stream's capacity varies as a power of the excess of the stream's discharge over competent discharge. This power varies from 0.81 to 1.24, the values being greater as the slopes are smaller or the debris is coarser. Capacity is less sensitive to changes of discharge than to changes of slope.

For each combination of width, slope and discharge there is a limiting fineness of debris below which no transportation takes place. The stream's capacity varies with a power of the excess of the degree of comminution over this competent fineness. This power varies from 0.50 to 0.62, the values being greater as slopes and discharges are smaller. Capacity is less sensitive to changes in fineness of debris than to changes in discharge or slope.

Most of the experiments were with straight channels. A few with crooked channels yielded nearly the same estimates of capacity. The ratio of depth to width is a more important factor. For any combination of slope, discharge, and fineness it is possible to reduce capacity to zero by making the stream very wide and shallow or

\*An abstract taken from U. S. Geol. Surv. "Professional Paper" No. 86.



very narrow and deep. Between these extremes is a particular ratio of depth to width, corresponding to a maximum capacity. The values of this ratio range, under laboratory conditions, from 0.5 to 0.04, being greater as slope, discharge and fineness are less.

The velocity which determines capacity for bed load is that near the stream's bed, but attempts to measure bed velocity were not successful. Mean velocity was measured instead. If slope be the constant, in which case velocity changes with discharge, capacity varies on the average with the 3.2 power of velocity. If discharge be the constant, in which case velocity changes with slope, capacity varies on the average with the 4.0 power of velocity. If depth be the constant, in which case velocity changes with simultaneous changes of slope and discharge, capacity varies on the average with the 3.7 power of velocity. The power expressing the sensitiveness of capacity to changes of mean velocity has in each case a wide range of values, being greater as slope, discharge and fineness are less.

In general, débris composed of particles of a single size is moved less freely than débris containing particles of many sizes. If fine material be added to coarse, not only is the total load increased but a greater quantity of the coarse material is carried.

Some particles of the bed load slide; many roll; the multitude make short skips or leaps, the process being called saltation. Saltation grades into suspension. When particles of many sizes are moved together the larger ones are rolled.

When the conditions are such that the bed load is small, the bed is molded into hills, called dunes, which travel downstream. Their mode of advance is like that of aeolian dunes, the current eroding their upstream faces and depositing the eroded material on the downstream faces. With any progressive change of conditions tending to increase the load, the dunes eventually disappear and the débris surface becomes smooth. The smooth phase is in turn succeeded by a second rhythmic phase, in which a system of hills travels upstream. These are called antidunes, and their movement is accomplished by erosion on the downstream face and deposition on the upstream face. Both rhythms of débris movement are initiated by rhythms of water movement.

The laboratory formulas discovered are not immediately available for the discussion of river problems.

The energy of a stream is measured by the product of its discharge, its slope, and the acceleration of gravity. In a stream without load the energy is expended in flow resistances, which are greater as velocity and viscosity are greater. Load, including that carried in suspension and that dragged along the bed, affects the energy in three ways: (1) It adds its mass to the mass of the water and increases the stock of energy *pro rata*; (2) its transportation involves mechanical work at the expense of the stream's energy; (3) its presence restricts the mobility of the water, increasing its viscosity, and thus consumes energy. For the finest elements of load

the third factor is more important than the second; for coarser elements the second is the more important. For each element the net result is a tax on the stream's energy.

In flume transportation capacities are notably larger than for stream transportation, and their laws of variation are different; rolling is an important mode of progression; for rolled particles the capacity increases with coarseness, for leaping particles with fineness; capacity increases with slope and usually with discharge also, but the rates of increase are less than in stream transportation; capacity is reduced by roughness of bed.

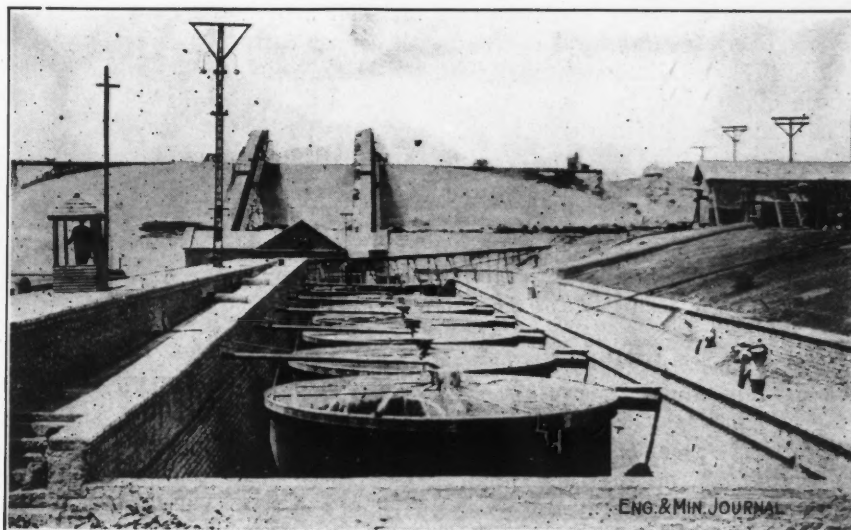
The level of maximum velocity may have any position in the upper three-fourths of the current. In loaded streams its position is higher as the load is greater. In unloaded streams its position is higher as the slope is steeper, as the discharge is greater and as the bed is rougher.

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## Mill Construction in India

SPECIAL CORRESPONDENCE

Conditions affecting labor and material in India are so different from those in other parts of the world that construction methods and results are unique. One of the most striking points is the universal employment of granite blocks, cut and dressed, for almost all kinds of construction. It is much cheaper than any other means which can be utilized, a fact which has not only been arrived at by careful computation, but also



SAND-COLLECTING TANKS AT MYSORE MILL, MYSORE, INDIA

through the actual experience of building a mill with timber framework, covered with the usual corrugated galvanized iron. It cost much more than it would have had the native stone been used.

The native granite splits readily into blocks and slabs, and its cheapness in combination with the low price of native labor accounts for the economies obtained through its use. In some cases it has even been used for building fences, posts of squared granite and rails of granite slabs being used. Slabs 3 to 4½ ft. long are not unusual with the stone. Buildings, foundations, retaining walls and all such construction are usually erected with the granite.

Our illustrations shows the mill of the Champion Reef,

Mysore, India, in the Kolar gold fields; the 80-stamp mill of the Mysore Gold Mining Co., Ltd., at the same place, and also the sand-collecting tank installation at the same plant. All of this construction is of cut and

in large quantities. The nascent hydrogen reduces the arsenious acid to arsine:



If there is copper sulphate present, it will react with



CHAMPION REEF MILL, MYSORE, INDIA

dressed granite, as may be seen, even the walks and stairways being built of the stone. It is an object to employ as many different native laborers as possible, in order to save them from starving to death.

### Arsine Formation in Electrolytic Refining

BY FRANCIS R. PYNE\*

Practically all blister copper contains arsenic in varying amounts, good pig carrying up to 0.05%, while particularly foul pig may carry as high as 2%. The anode-furnace treatment eliminates but a small amount with relatively low arsenical copper; with copper carrying 1 to 2%, the elimination may be taken in the neighborhood of 20 to 30 per cent.

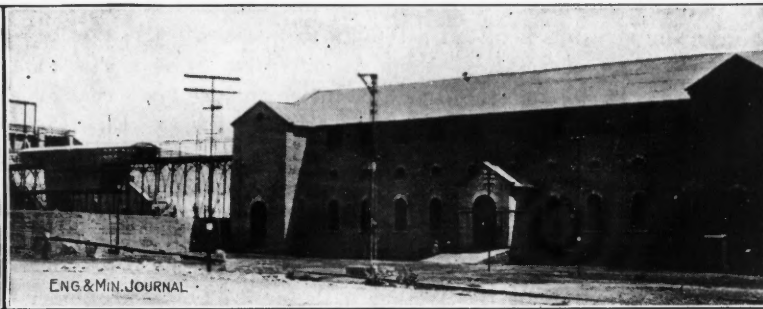
The remaining arsenic goes to the tank house, where it partly passes into the anode slime, and partly into the electrolyte in the form of arsenious acid. With a highly arsenical pig, the arsenic may be made to pass into the anode slime to a considerable extent by the addition of a certain percentage of nickel to the anode which causes the formation of an insoluble nickel arsenide.

The arsenic passing into the electrolyte should not be allowed to accumulate above a certain point, else there is considerable danger of its depositing on the cathode, and exerting a tremendously unfavorable effect upon the conductivity of the resulting product.

To prevent the accumulation of arsenic in the electrolyte to an undesirable degree, it is usual in electrolytic copper refining to draw off a certain amount of electrolyte daily, and pass it through a series of tanks in which the copper anodes have been replaced by insoluble anodes, usually of lead. In these tanks the current removes the copper, arsenic and antimony partly or entirely. The solution is then returned to the tank house, or else, if high in other impurities, such as iron, nickel, etc., is given further treatment for the elimination of those impurities, and the recovery of the free sulphuric acid.

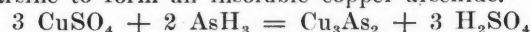
When using insoluble anodes and carrying a high current density, no metal enters the solution while, there being an insufficient number of metallic ions present at the cathode to carry the current, hydrogen is deposited

\*Refinery superintendent, U. S. Metals Refining Co., Chrome, N. J.



ONE OF THE MYSORE MILLS, 80 STAMPS

the arsine to form an insoluble copper arsenide.



However, should there be an insufficiency of copper sulphate present, the excess arsine escapes into the atmosphere. This gas being highly poisonous, it is a wise precaution to place the insoluble anode tanks in the open, where air currents can rapidly dissipate the gases as they are liberated.

A test was made some years ago to determine the amount of arsine liberated in this manner. The arsenic content of the electrolyte has been allowed to accumulate to a fairly high degree. The solution was passed through a series of four insoluble tanks, each tank having 23 pairs of electrodes. A tightly fitting hood was made to collect the gases which were drawn through a solution of silver nitrate. The arsine present formed insoluble silver arsenide, and by determining the amount of this material, the weight of arsine liberated was obtained.

The original solution contained: Cu, 3.42%; As, 0.72%. Samples taken at the outlet of each tank showed the following, the circulation of the solution being about one gallon per minute: Tank No. 1, Cu, 0.27%; As, 0.46%; tank No. 2, Cu, 0.04%; As, 0.12%; tank No. 3, Cu, 0.005%; As, 0.014%; tank No. 4, Cu, 0.004%; As, 0.003%.

The amount of arsine liberated per tank per hour was found to be: Tank No. 1, none; tank No. 2, 0.00443 cu.ft.; tank No. 3, 0.00027 cu.ft.; tank No. 4, 0.00002 cu.ft.; total, 0.00472 cu.ft. Total per day was 0.11328 cu.ft., containing 0.37 oz. arsenic.

From the above table it is seen that no arsine is liberated in tank No 1, there being sufficient copper sulphate present to react and form the insoluble arsenide. The greatest amount is liberated in tank No. 2, as would be expected.

The above solution is considerably higher in arsenic than is usual in tank-house practice, so that the danger from arsine is almost negligible. But in cases where very arsenical anodes are used, arsine may be liberated to such an extent as to be plainly noticeable.

The above may be of interest at the present time, owing to the development of leaching and electrolytic precipitation of copper direct from the ore. Many of these ores contain arsenic to a considerable extent and it will probably accumulate in the solution rapidly, necessitating frequent purification.



## Details of Practical Mining

### Reversing Rope on Single-Drum Hoist

BY R. S. SCHULTZ, JR.\*

It is well known that the life of a hoisting rope can be considerably lengthened by reversing it at the proper time. This is due to the fact that the weight of the rope itself brings a heavier load on the drum end of the rope and causes that end to fatigue more rapidly.

With a two-drum hoist, reversing the ropes is a simple process, but with a single drum, and especially with a long rope of large diameter, the change becomes more of a problem. By using two old cable-reels, reversal can be made by winding the rope from the drum on to one of the reels, rewinding to the second reel and then re-winding on the drum, but this is a slow, tedious operation and requires considerable preparation.

The following method is simple, comparatively rapid, and requires little or no preparation other than clearing a small space in front of the engine house. The skip or cage is hoisted to the collar of the shaft, securely fast-

### Intake for Mine Water-Supply from Lake\*

When the draining of Kerr Lake at Cobalt was begun, it was necessary to provide another water-supply for the mines that had been getting their water from that lake. It was decided to get this from Giroux Lake. The water and mud from Kerr Lake were to be pumped to Giroux so that precautions were necessary to protect the new water-supply.

It was at first planned to mount the pumps on the shore of Giroux Lake and carry the suction intakes out on piers, but the difficulty of placing piers firmly on the steep, smooth bottom, and of protecting the suction pipes against freezing, made this seem inadvisable. A well, 10 ft. square by 12 ft. deep, was sunk by air drills in the solid rock on shore, almost at water line, leaving a thin shell between lake and well. When the well was completed, a series of flat holes drilled at a depth of 5 ft. below water level and "looking out" under the lake was put in. The holes were heavily loaded, blasted simultaneously, and a clear connection made between well and

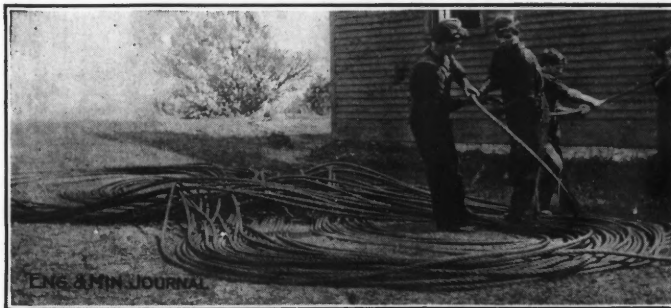


FIG. 1. COILING THE ROPE IN FIGURE 8.

ened, and the rope detached. The end, just above the socket, is tightly wound with wire to prevent raveling; the socket is cut off and the rope wound over the sheaves on the drum until the end is at the cleared place in front of the engine house. The hoist is then reversed, and the rope coiled on the ground in a large figure eight, as shown in Fig. 1. Then the coils are taken a few at a time and thrown over, as shown in Fig. 2, until the whole rope is reversed.

The former skip-end is then refastened to the drum, the rope rewound on the drum, the end pulled over the sheave, the socket rebabbitted and the rope made fast to the skip or cage. Special care must be taken to bend the rope naturally in coiling and uncoiling, otherwise a serious kink may result.

In the case illustrated, seven men reversed 3000 ft. of 1 1/8-in. plow-steel rope in about four hours, including rebabbitting the socket on the skip end. Considerably better time could have been made, had speed been necessary.

\*Mining engineer, Hannibal, Mo.



FIG. 2. THROWING OVER THE COILS

lake. A 14x20-ft. pump house was erected on cement foundations over the well, in which 10x10-in. timbers were set at 3-ft. intervals, as sills for the pumps and equipment.

The pumps for this water supply are two in number, of the single-stage turbine type, each capable of delivering 500 imperial gallons per minute against a total head of 175 ft. at 1750 r.p.m. The pumps are mounted on the same base plate with a 45-hp., 2200-volt, three-phase, 60-cycle motor, direct-connected to the pumps with flexible pin coupling. The equipment comprises auto-starters, oil and knife switches, lightning arresters and meters.

The water is pumped through an 8-in. spiral-riveted bolted-joint pipe 1300 ft. in length, against a 125-ft. head to a 46,000-gal. receiving tank erected on an eminence. From this tank the supply for the different mines is delivered by gravity through 6-in. wrought-iron pipe.

Owing to the severe cold of the winters, great care

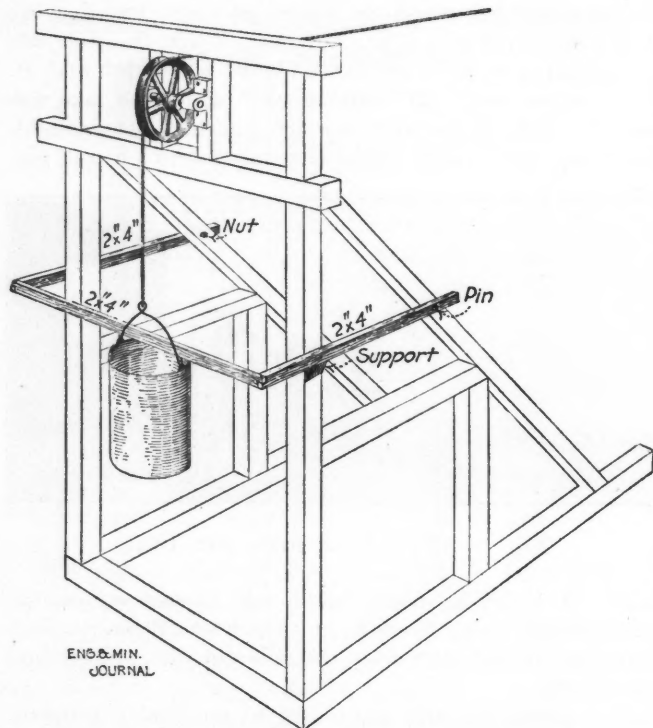
\*From "Draining Kerr Lake," a paper presented before the Salt Lake meeting of the A. I. M. E.

was necessary in protecting all water lines. The 8-in. line was inclosed in a 4-ft. plank box, filled with saw-dust and covered on top with paroid. A 1-in. steam line from each of the two mine-heating plants was run alongside the pipe to the pump house, where it was run through a coil for heating purposes, and thence to the well inlet to keep the intakes free of ice. For protection against the muddy water from Kerr Lake, a filter dam made of jute, supported on spiles, was placed around the inlet, which formed a small pond of comparatively clear water. Two gate filters of 8-oz. duck were placed over the direct inlet, further to clarify the water.

An automatic electric signal system from tank to pump house was installed. This rings a bell in the pump house when the water in the tank passes a predetermined high or low point, and flashes one of two lights to show whether the water is high or low.

### Device to Stop Whirling Bucket

A simple contrivance to stop the whirling of a bucket, and thereby save time and trouble, where hoisting is being done without a crosshead, is shown in the accom-



SWINGING BAR IN HEADFRAME TO STOP BUCKET FROM SPINNING

panying illustration. It consists of two pieces of 2x4-in. lumber pivoted on the backstay of the headframe by pins and joined together, in front of the headframe, by a third 2x4-in. piece. The stop thus is free to swing upward, and is prevented from falling by two supports on the headframe posts. The outer face of the crosspiece is almost flush with the hoisting cable, and the piece is level with the top of the bucket when it is at an elevation convenient for dumping.

When hoisting, the bail of the bucket may strike the stop and lift it temporarily, but when the bucket makes a quarter turn the stop will fall alongside the bail and prevent any further whirling.

### Cast-Iron Guide Brackets

The Kintore shaft of the Central mine, at Broken Hill, New South Wales, consists of three compartments, of which two are used for hoisting. Each of these hoisting compartments contain six guides, the principal guides upon which the cage shoes run, being 6x7 $\frac{3}{4}$  in. in section. These are approximately 20 ft. long, 5 to the level.

Referring to Fig. 1, the outside guides *A* and *B* were formerly fastened to the wall plate and the divider with  $\frac{3}{4}$ x10-in. countersunk lagscrews. Where the guides were joined, cast-iron brackets with recessed faces, Fig. 3,

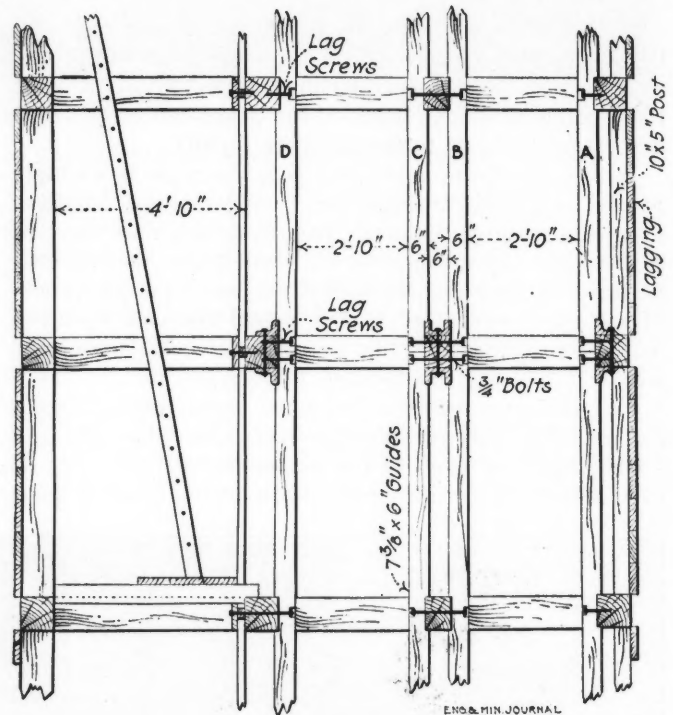


FIG. 1. LONG SECTION OF SHAFT, SHOWING OLD METHOD OF FASTENING GUIDES

were bolted to the sets by two  $\frac{3}{4}$ x13-in. bolts, the guides being dapped to set back over the timbers into the recesses of the brackets. The brackets prevented side movement.

The two middle guides *B* and *C*, Fig. 1, were similarly held by recessed brackets of the type shown in Fig. 4, and the guides were held to the dividers by through bolts. Each bracket had two vertical faces, one for each guide. The bolts holding the guides to the divider were peculiar in being made of  $\frac{3}{4}$ -in. square iron, 16 $\frac{1}{2}$  in. over all, with one end made into a square head, and the other swaged round for 5 or 6 in. and threaded to take the nut.

In the case of the outside guides *A* and *B*, the lagscrews kept breaking, and it was inconvenient to replace these. Similarly, when any breaking occurred to the inside guides *C* and *D*, it was necessary to loosen both guides and thus disable both compartments, in order to replace one. Furthermore, the through bolts twisted off when being tightened, and were not easily extracted for replacement.

It was, therefore, decided to bolt all the guides to the

Note—An abstract from an article by N. J. Roberts, published in the "Proceedings" of the Australasian Institute of Mining Engineers, No. 12, 1913.



brackets. To do this they were bored with a brace and bit, and the casting then drilled by using a twist drill of  $\frac{7}{8}$  in. diameter, set in a machine rock drill, with a feed screw fitted to the machine at the back instead of the ordinary handle. The work was done on Sundays by two timbermen or a timberman and a helper, working from the cage. Air was obtained by means of a hose 60 ft. in length attached to the air pipe at the nearest level. In this manner the brackets in the shaft were drilled for 600 ft. of depth.

The advantage of this method of fastening guides being apparent, it was decided to place brackets also at the intermediate sets where the guides had previously been screwed to the timbers. The guide *D* was easily fitted with the bracket of Fig. 3; for guides *B* and *C* it was necessary to design a bracket which could be slipped in from the side. This is shown in Fig. 5. Be-

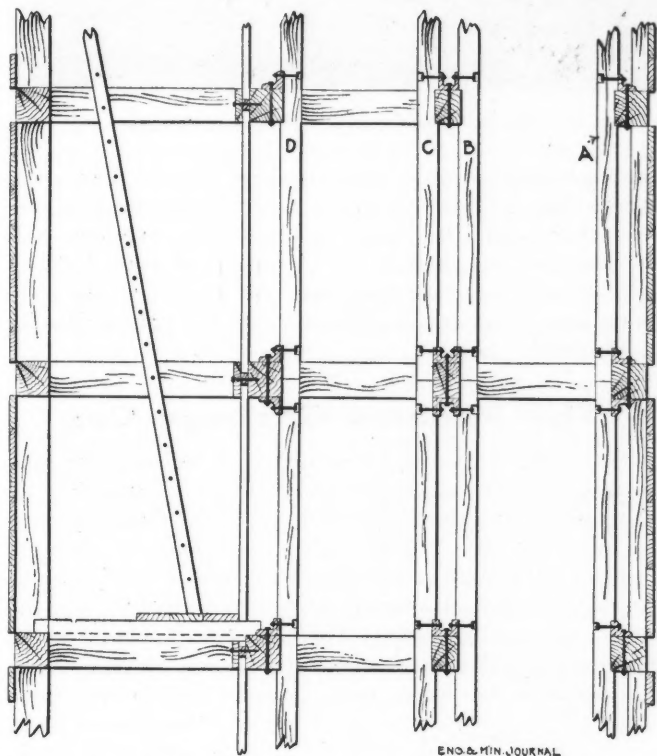


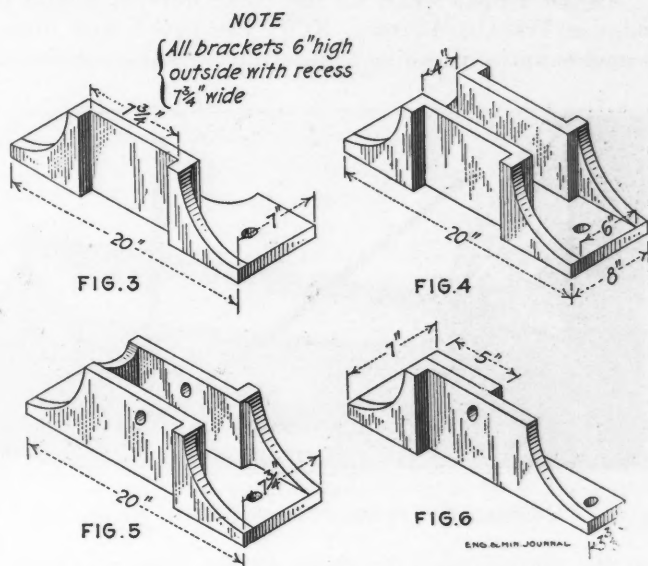
FIG. 2. COMPLETE SET OF GUIDE BRACKETS

hind guide *A* was a vertical post between the sets, which interfered with the use of a bracket similar to that shown in Fig. 3; therefore, the bracket of Fig. 6 was designed, to slip in the 4-in. space between the back of the guide and the face of the post, with one end broader to give a better bearing on the end plate. The brackets were made right and left, in order to support the guide on alternate sides. The same length of the shaft, 600 ft., was fitted with these brackets. The new method of fastening is shown in Fig. 2.

The bolts for the guides *A* and *B* are  $\frac{3}{4} \times 7$  in. and for *B* and *C* are  $\frac{3}{4} \times 6\frac{1}{2}$  in., the heads in all cases being  $1\frac{1}{2}$  in. square and  $\frac{3}{4}$  in. thick. It was, of course, necessary to countersink these heads, and for this purpose a special chisel, as shown in Fig. 7, was made, with lugs on the sides to limit the depth to which the countersunk holes could be cut.

The convenience of removing and replacing guides with the use of these brackets is, of course, obvious.

When it becomes necessary to renew all four guides from the 700-ft. level to the surface, a distance of 600 ft., the work was done in about four and a half days, working three shifts of 8 hr. each. This was made possible

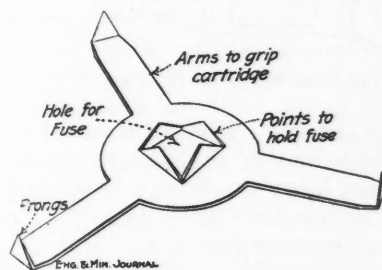


THE VARIOUS STYLES OF BRACKETS

by systematizing the work, cutting every guide to measure on the surface, having it stacked on the proper level, and arranging hoisting devices and working platforms in each compartment.

### Fuse Clip for Primer

A device for holding fuses to their powder sticks in making up primers was described by W. W. Jones in the *JOURNAL* of Feb. 21, 1914. A clip to serve a similar purpose is described in the *Journal* of the Chem., Met. & Min. Soc. of So. Africa, February, 1914. It is intended to obviate the necessity of tying the fuse to the cartridge in order to prevent its pulling out when tamping.



METAL CLIP FOR HOLDING FUSE TO CARTRIDGE

The fuse is threaded through the clip with the points shown in the illustration toward the detonator end. When the detonator is inserted in the cartridge, the three arms are bent over so as to grip the end of the cartridge by means of the prongs into which their ends are bent. The points around the center hole grip the fuse when it is pulled back.

The clips are cheaply made and rapidly applied. It is recommended that brass or copper be avoided as likely to interfere with ore treatment and tinned or painted iron is suggested as suitable and safe material. For electric detonators, the center hole is made square.

A Heavy Concrete Lining for Openings which conduct gases from the Lowell fire zone is provided in the Copper Queen mine, according to the August, 1914, "Bulletin" of the A. I. M. E. The lining is applied to the more important drifts and raises. Presumably the concrete is intended to make the passages both impervious and fireproof.

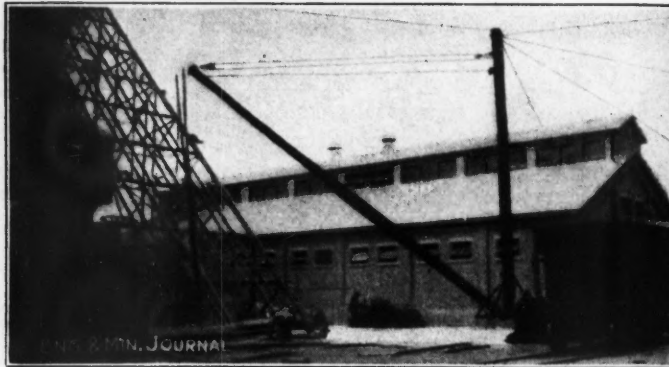
## Loading Derrick at Shaft Collar

BY CLARENCE M. HAIGHT\*

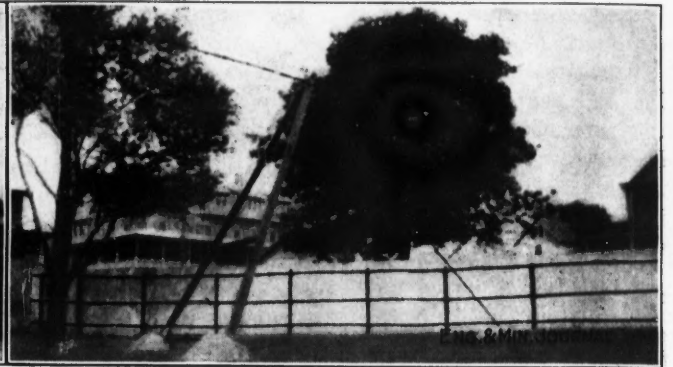
At the Palmer shaft of the New Jersey Zinc Co.'s mine at Franklin Furnace, N. J., the derrick here illustrated is used for loading timber, rails and other material

electricity, distance is a small consideration. Accordingly a vertical shaft was decided upon, to be lined with steel and concrete.

[The question of vertical or inclined shaft for ore-bodies dipping, say, between 50° and 80° is persistent. The Newport company operating the biggest and deepest

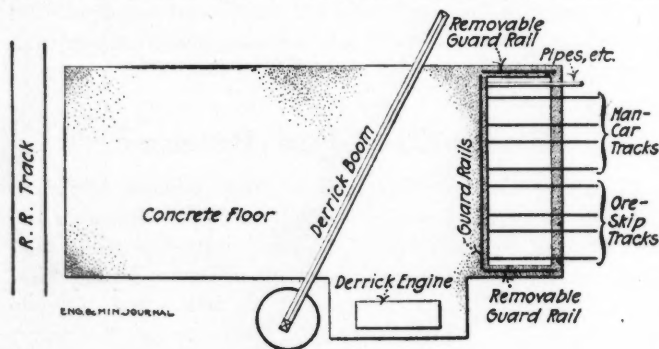


DERRICK SWINGING A LOAD TO THE CAGE



METHOD OF ANCHORING GUY LINES

on the shaft cages. As shown by the drawing, it can reach all the compartments of the shaft as well as cars spotted on the railroad track. The mast is made of 14x14-in. timber and is supported by six guy lines; the



RELATION BETWEEN DERRICK, SHAFT, TRACKS, ETC.

boom is made of 12x12-in. timber. The method used to anchor the guy lines, which support the mast, is shown in a photograph. When not in use the boom is supported on a post. The power is furnished by a two-cylinder Lambert engine, operating on compressed air.

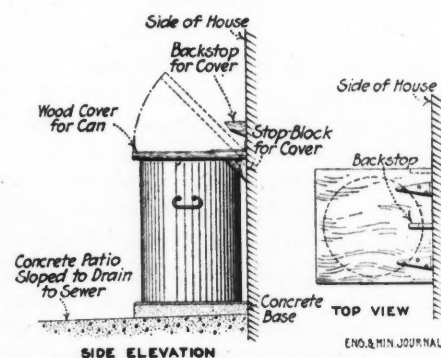
## Vertical vs. Inclined Shaft†

Before sinking the shaft for its Palms mine, the Newport mine management made a detailed comparison of the advantages and disadvantages of inclined and vertical shafts. An inclined shaft would have the disadvantages of rails, back runners, skip wheels, axles and boxes, and the expense and trouble of axle lubrication, and of frequently replacing supports for ropes; longer ropes would be required and the skips would have to travel a greater distance and at limited speed. There would be a constant and considerable expense for the upkeep of the shaft and its equipment. A vertical shaft in the foot wall would have only the disadvantages of longer crossovers from the orebody to the shaft, and of the greater distance of transportation; but with transportation by

inclined shaft in any American iron mine at Ironwood, Mich., may be assumed to know something about it. On the other hand, Dr. Chance makes out an excellent case for the inclined shaft in the *JOURNAL* of July 4, 1914. Like all other mining questions, the answer is the algebraic sum of a host of plus and minus local conditions. —EDITOR.]

## The Panama Garbage Can

One of the simple and homely devices concerned in promoting the present healthful condition of the City of Panama is reproduced herewith from the *Canal Record*, of June 17, 1914. This garbage can must be strongly built of galvanized metal, 19x25 in. in size, and must be provided with a self-closing cover, which shall fit over the top of the can perfectly. The can is to be placed in an approved position; and where the floor is sloping, as in the patios of buildings, on a concrete foundation; these



SELF-CLOSING GARBAGE CAN IN POSITION

will strike the cover about midway.

The can is to be sold to householders at about \$2.50 and the cover at about \$0.50. Apparently, it is intended that the can be removed from the position only temporarily for emptying. If the exigencies of the collecting system should require the can to be left some time away from its permanent position, it ought to be provided with another detachable cover.

\*Mining engineer, Franklin Furnace, N. J.

†From a paper presented before the Marquette Range meeting of the Lake Superior Mining Institute, Aug. 31, 1914.



# Details of Milling and Smelting

## Bosh of Lead Furnaces

The angle of bosh for lead furnaces has been the subject of considerable controversy, as well as of experimenting. With the furnace charge constituted as at present at most plants, the weight of experience is decidedly in favor of a moderate bosh, said Irving A. Palmer, in a paper before the Salt Lake meeting of the American Institute of Mining Engineers. At one plant the furnaces were built with a 20° bosh, so that the width at the top of the 6-ft. jackets was 84 in., or 36 in. greater than at the tuyere level. Whenever a furnace was blown in, and for some time thereafter, it was noticed that there was a tendency for the charge to hang at the bosh, and to descend irregularly. The assays of the slags and mattes were usually higher than those of the furnaces longer in blast. After a week or two the furnace work would begin to improve, and later would become normal. On blowing out a furnace, after a campaign, it was almost invariably observed that the space on each side of the furnace above the bosh had been filled in with partly fused charge, changing the furnace lines so as to form a gently flaring shaft 60 in. wide at the top of the jacket, or with a flare of about 1 in. to the foot on each side. The furnace had thus accommodated itself to the descending charge, and, as stated, better work was done as a consequence. The extra width of the furnace above the bosh was not only useless, but detrimental. With the furnace charges as they are now prepared and until the fusion zone is reached, there is but little contraction in volume as they descend in the shaft. There is also a much more rapid movement of the charge. In addition, the narrower shaft insures a better distribution of the ingredients of the charge, and as a rule produces hotter slags.

✽

## Reduction Treatment of Precious-Metal Ores

Charles Butters has been granted U. S. Patent No. 1,103,346, covering the process of reducing or desulphurizing precious-metal ores by means of contact with certain metals, zinc, aluminum, tin or galladium, in the presence of caustic alkali: The precious metal is freed under these circumstances, and is readily dissolved by cyanides.

This is the process applied by Denny and Johnston to the Nipissing ores, of Cobalt, Ont., where aluminum and caustic soda solution are successfully employed.

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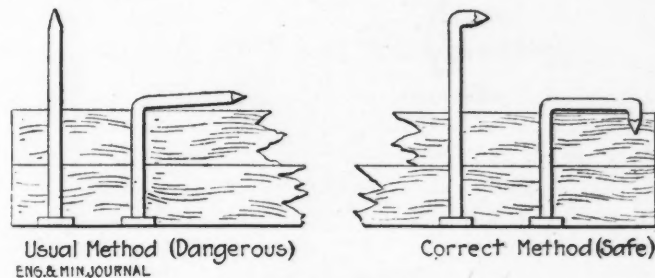
## The Nail Hazard\*

Projecting nails are met with everywhere. The danger from nails is important and attention should be given to the best means of eliminating it. Men should be taught the importance, from a safety standpoint, of

\*From "The Travelers' Standard."

pulling the nails out or of bending them over and hammering their points down in a proper manner. It is safest, of course, to remove the nails entirely; but if they are bent over and hammered down, the work should be done in the right way. A nail with its point  $\frac{1}{8}$  or  $\frac{1}{4}$  in. above the level of the board is still dangerous, because it is likely to tear the flesh of one who has occasion to handle the board, or who may brush against it in passing. A nail point thus treated is also likely to catch in the sole of the shoe and cause a serious fall, and if it stands up by as much as  $\frac{1}{4}$  or  $\frac{1}{2}$  in., there is danger of the point's entering the upper or soft leather of the shoe.

In hammering down a nail,  $\frac{1}{4}$  in. or so of the pointed end should first be turned over at right angles, by means



Usual Method (Dangerous)  
ENG. & MIN. JOURNAL

Correct Method (Safe)

## WRONG AND RIGHT WAYS OF CLINCHING NAILS

of pliers or the claw of a hammer. The body of the nail then is bent over and hammered down, so that the pointed end enters the wood. The operation is shown in the illustrations.

A prolific source of accidents is the leaving of nails in the staves or hoops of a barrel, after the head has been removed. The act of knocking in the head tends to turn the points of the nails downward, and as a person removes the contents of the barrel he is quite likely to have his hand or arm lacerated.

An injury from a nail should receive immediate medical attention and treatment, because septic material is likely to be carried into the wound by the nail, and blood poisoning or lockjaw may follow if the wound is neglected, with loss of life or limb as a possible result.

✽

## Some Notes on Furnace Construction

In a paper read at a meeting of the New York section of the Society of Chemical Industry, on May 22, 1914, Gilbert Rigg, of the New Jersey Zinc Co., presented valuable data on refractory materials, particularly from the standpoint of the zinc smelter. Incidentally, he offered some hints on furnace design, of which we quote the following:

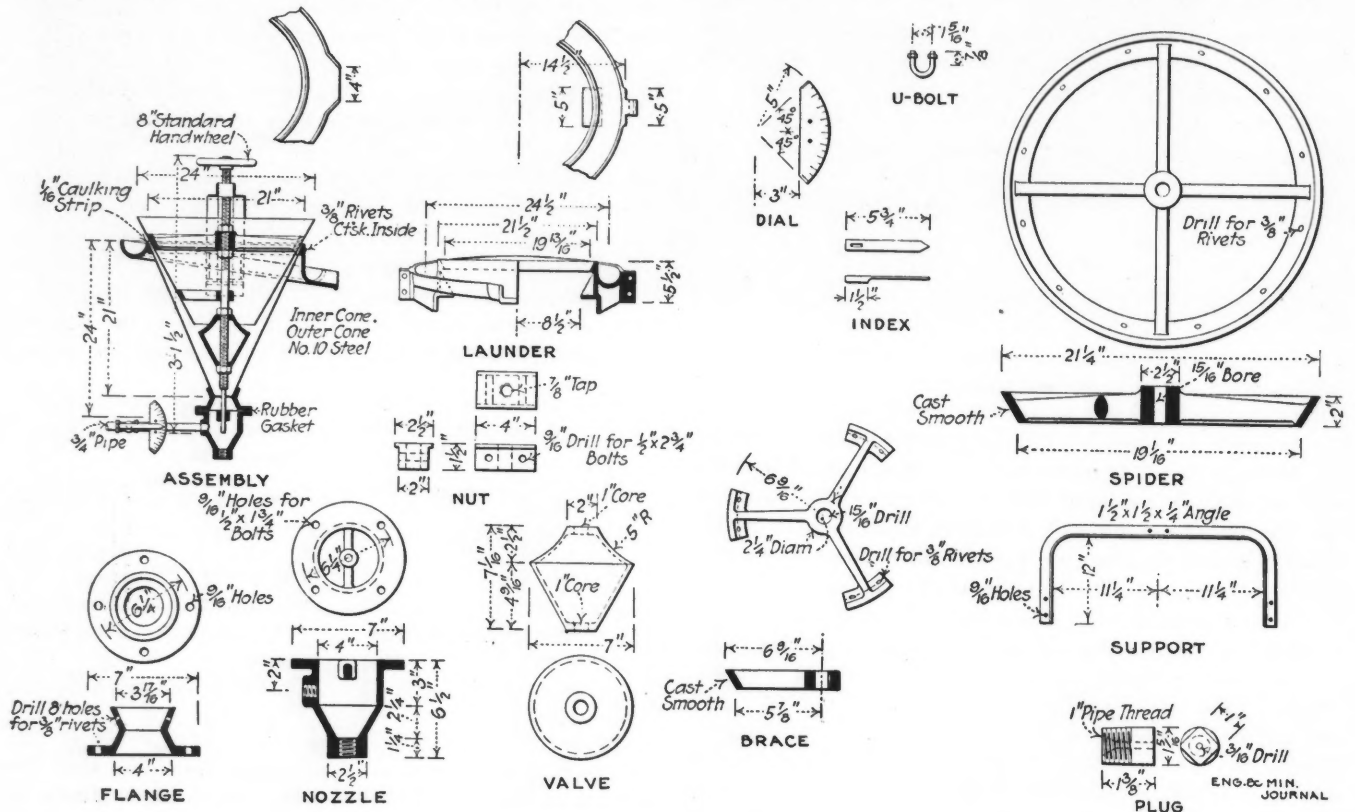
The shapes that can be made by machine are much more limited in variety than those that can be made by hand. To engineers who have to design furnaces I would say: "Avoid as far as possible complicated shapes.

Try to be a cubist. Use rectangular masses wherever possible, and try to keep ont dimension as near to a 4 1/2-in. maximum as the design will permit. By doing this you have a chance of getting your brick burned hard to the heart, whereas, if you have all three dimensions running high, it is very difficult to avoid underburning in the middle. As long as you keep your shapes simple you can get them machine made. It is not all possible to avoid complicated shapes, but the more

### Hydraulic Cone Classifiers

BY PERCY E. BARBOUR\*

The accompanying detail drawings show the 24-in. hydraulic cone classifier designed by the late J. B. Fleming and by G. B. Shipley, engineer for the Allis-Chalmers Co., for the Goldfield Consolidated mill. One of these classifiers was provided for each battery and was designed



DETAILS OF HYDRAULIC CONE

you can do it the more chance the brick manufacturer has to give you satisfaction."

When the object is to retain heat, loosely-compacted masses are more effective than close-textured ones. An extreme case of this condition I worked out some time ago. The questions at issue were: How many rings of brick would it be economical to place over a certain furnace arch in order to retain the heat, and what class of brick would be best? Or, could anything more effective than brick be used? We started out with 12-in. thickness of firebrick in three rings. Under the third ring and on top of the furnace arch four thermo-couples were placed at different points, and the temperature was noted from day to day, until an average figure was obtained for the temperature on top of the furnace arch. Then the three rings were taken off and other materials were tried. Eventually we found the most economical material was boiler ashes screened through 1/4-in mesh; 3 1/2 in. of this kept the top of the furnace arch as hot as 12 in. of fairly compact firebrick.

**Sintering Fines at the Mond Nickel Co.'s Works, at Coniston, Ont.,** has resulted in the practical elimination of heap roasting. Two Dwight-Lloyd sintering machines are now in operation, treating the fines screened out at the mines. Using sinter on the blast-furnace charge has also enabled the metallurgists to reduce the coke to about 8% of the charge.

to handle the quantities shown in the accompanying table. It is a double cone, as may be seen, instead of the usual single settler, and a screw is provided to facilitate the adjustment of the two. It is made of steel throughout, and is durable and satisfactory.

#### CAPACITY OF 24-IN. CONE CLASSIFIER

	Tons	Cubic Feet	Gallons
20-24 in. classifiers per 24 hr.:			
Dry slime, 16 mesh and finer, No. 21 wire .....	600	.....	.....
Water .....	3600	.....	.....
Water added to classify .....	144	.....	.....
Total wet pulp .....	4344	.....	.....
Ratio water to ore, 6.24: 1.			
Feed to each classifier:			
Dry slime per minute .....	0.416	.....	.....
Water per minute .....	4.000	.....	.....
Water added to classify, per minute ..	0.16	.....	1.20
Wet pulp per minute .....	4.576	.....	34.23
Spigot product, 20 classifiers:			
Dry slimes, 65% from 16 to 150 mesh	390	.....	.....
Water .....	594	.....	.....
Wet pulp .....	984	.....	.....
Ratio water to dry slime, 1.523: 1.			
From each spigot:			
Dry slime for minute .....	0.27	.....	.....
Water per minute .....	0.66	.....	.....
Wet pulp per minute .....	0.93	.....	6.9
Overflow from 20 classifiers:			
Dry slimes, 35% from 150 to 200 mesh	210	.....	.....
Water .....	3150	.....	.....
Wet pulp .....	3360	.....	.....
Ratio of water to ore, 15: 1.			
Overflow from each classifier:			
Dry slimes per minute .....	0.17	.....	.....
Water per minute .....	3.5	.....	.....
Wet pulp per minute .....	3.67	.....	27.45

\*Mining engineer, 887 Middle St., Bath, Maine.



# The Cost of Doing Things

## Drilling Costs at the North Star\*

The rock at the North Star mine, in Grass Valley, Calif., is close-grained diabase in the upper levels and tough grano-diorite in the lower levels. The vein, which has an average dip of 23°, consists of about 5 ft. of "formation" lying between walls of unaltered country rock. In this 5 ft., solid quartz and stringers make up 18 in. of pay ore. The formation consists of but slightly altered country rock and is almost as hard as the unaltered walls. From 4 to 4½ ft. is sent to the mill. About one-third of the holes are drilled in the quartz; two-thirds in the formation. The holes are about 4½ ft. deep and break an average of 1.15 tons per hole. The average number of holes per stope-drill-shift is at present 5.65. The number of drill shifts throughout the mine in 1913 was 18,679, and the cost of labor for drilling, power, supplies, upkeep of machines and air lines, tool sharpening and distribution, amounted to 33% of the total mining expense. To do this work there are in commission 43 No. 12A, three No. 17V and eight No. 16V Waugh stopers, three jackhammers, two Waugh pluggers, and 17 No. 8 and two No. 7 water Leyners.

TABLE I—COST PER DRILL SHIFT FOR WATER LEYNER No. 8

Item	Description of Unit	No. of Units Used per Drill Shift	Price per Unit	Cost for Item per Drill Shift
Labor of drilling.....	8-hr. shift.....	1	\$3.25	\$3.25
Maintenance, Labor.....				0.10
Supplies.....				0.62
Power.....	1,000 cu.ft. of free air compressed to 100 lb. }	15	0.0275	0.41
Supplies, Lubricants.....	Quarts of "Red Engine" oil.....	0.66	0.07	0.05
	Feet of 1-in. 5-ply wire-wound; ½-in wire-wound	0.12	0.33	0.04
Hose.....	16.75	0.12	0.19	0.025
Drill steel.....	Pieces used.....			
Labor sharpening and repairs.....				1.12
Labor distribution.....				0.35
Steel consumed.....	Pounds.....	2.66	0.12½	0.33
Power for sharpener.....	1,000 cu.ft. free air compressed to 100 lb. }	5.00	0.0275	0.15
Oil for forge.....	Bbl. of 42 gal.....	0.12	1.80	0.21
Upkeep of air pipe.....				0.09
<b>Total.....</b>				<b>\$6.75</b>

TABLE II.—COST PER DRILL SHIFT FOR WAUGH 12A

Item	Description of Unit	No. of Units Used per Drill Shift	Price per Unit	Cost for Item per Drill Shift
Labor of drilling.....	8-hr. shift.....	1	\$3.00	\$3.00
Maintenance, Labor.....				0.10
Supplies.....				0.37
Power.....	1,000 cu.ft. of free air compressed to 100 lb. }	17	0.0275	0.47
Supplies, Lubricants.....	Quarts of "Red Engine" oil.....	0.33	0.07	0.02
Hose.....	Feet ½-in. 5-ply wire-wound. Pieces used.....	0.12	0.27	0.03
Drill steel.....	10			
Labor sharpening and repairs.....				0.30
Labor distribution.....				0.21
Steel consumed.....	Pounds.....	2.2	0.065	0.14
Power for sharpener.....	1,000 cu.ft. of free air compressed to 100 lbs. }	1.5	0.0275	0.04
Oil for sharpener.....	Bbl. of 42 gal.....	0.034	1.80	0.06
Upkeep of air pipe.....				0.09
<b>Total.....</b>				<b>4.83</b>

\*From a paper by Robert H. Bedford and William Hague, presented at the Salt Lake meeting of the A. I. M. E.

For the past three years a record has been kept of the repairs on each machine and the number of shifts operated by it. The figures given in Tables I and II for the cost of repairs per drill shift have been taken from this record. The underground air pressure is about 90 lb. The air consumption per drill shift was measured by aërometers. The leakage of pipe lines between compressor and meter is not included. From the number of pieces of steel sharpened for each type of drill during the year, the average used per drill shift has been ascertained. For other supplies the figures given represent a year's average.

The 16V and the 17V Waugh drills cost 10c. less for maintenance and supplies than the 12A model, but require 15 pieces of steel per shift instead of 10, which leaves the cost about equal.

## Cost of Fast Tunneling

The accompanying figures cover the work done in driving the Jualin tunnel in June, 1914. The work is being done by the Algonic Development Co., L. K. Kennedy, manager in charge, at Jualin, a few miles north of Juneau on the Alaskan coast. The tunnel will serve for prospecting and drainage and is to be 7000 ft. long. It is being driven in what is known as Jualin diorite.

COST OF DRIVING THE JUALIN TUNNEL FOR JUNE, 1914

Distance driven.....				539 ft.
Average per shift.....				17.96 ft.
Average round.....				4 ft. 8 in.
<b>Total Wages</b>				
	<b>Labor</b>	<b>Number per Shift</b>	<b>Number of Shifts</b>	<b>Rate per Shift</b>
	Machinemen.....	2	199	\$3.50
	Machine helpers.....	2	180 ¼	3.25
	Muckers.....	4	376 ¼	3.00
	Carmen.....	2	27 ½	3.00
	Blacksmith.....	1	31	4.05
	Blacksmith helper.....	1	23	3.50
	Powderman.....	1	30	3.50
	Compressor man.....	1	30	4.80
	Teamster.....	1	34	4.00
	Dumpman.....	1	22	3.50
<b>Total.....</b>				<b>\$3160.80</b>
Foreman.....	1	30		\$6.00
Shift bosses.....	2	60		5.00
<b>Total.....</b>				<b>\$480.00</b>
<b>Supplies and Labor per Foot</b>				
				<b>Cost per Ft.</b>
	15-in. No. 18 gage fan pipe.....			\$0.70
	3-in. iron pipe.....			0.20
	1-in. water pipe.....			0.45
	30-lb. rail.....			0.40
	No. 4 copper wire.....			0.21
	Oil.....			0.03
	Candles.....			0.07
	Powder, 200 boxes, \$7 per box.....			2.59
	Fuse, 22,000 ft., \$4.75 per 1000 ft.....			0.18
	Caps, 33 boxes, \$1.25 per box.....			0.075
	Labor.....			5.86
	Bosses.....			0.89
	Bonus.....			3.04
	Waterproof goods allowance <sup>1</sup> .....			0.86
<b>Total cost per ft.....</b>				<b>\$15.15</b>

<sup>1</sup>Boots, slickers, hats for 34 men at \$15 for each.

The drilling is done with two No. 18 Leyner machines. During June tramming was conducted by hand. During the month the entire 1100 ft. of track then laid was torn up and relaid with heavier rails. This work resulted

in the loss of 4 rounds. At present mules are used for tramping and better footage is being made.

The crew consists of tried tunnel men; it was organized late in May and is in charge of A. Ricandeu who has all the work systematized to the last degree.

It will be noticed that the drills are Leyners as against the big pistons used on the Sheep Creek tunnel recently completed by the Alaska Gastineau not many miles away. The footage for June is an excellent showing. The two tunnels should afford an unusual chance for comparison between the two types of machine.

### Concentrate Treatment Costs at Goldfield

The figures given in the following tables were taken from the 1913 report of the Goldfield Consolidated Mines Co., Goldfield, Nev. The mill treated 330,217 tons of ore from which 22,148 tons of concentrates were produced. In addition to this tonnage 3847 tons from the reserve dump were treated, making a total of 26,022 tons treated by the concentrate treatment plant. The cost of treating the dump concentrates was \$13,247, which is included in the tables given herewith.

GOLDFIELD CONSOLIDATED COST PER TON OF CONCENTRATE TREATED, 1913

Department	Labor	Supplies	Power	Total	% of Total
Raw cyanidation.....	\$0.095	\$0.561	\$0.185	\$0.841	15.11
Filtering and conveying .....	0.230	0.045	0.040	0.315	5.66
Roasting .....	0.223	0.529	0.102	0.854	18.03
Acid treatment.....	0.118	0.403	0.173	0.694	14.65
Tube milling.....	0.028	0.018	0.043	0.089	1.87
Cyanidation of roasted product....	0.085	1.077	0.138	1.300	27.42
Assaying .....	0.016	0.127	0.143	0.286	2.57
Precipitation of Cu..	0.024	0.002	0.026	0.052	0.54
Precipitation .....	0.014	0.091	0.019	0.124	2.23
Refining .....	0.038	0.069	0.001	0.108	1.93
Disposal of tailing..	0.026	0.017	0.008	0.051	1.07
General expense.....	0.015	0.011	0.026	0.052	0.47
Handling dump.....	0.065	0.010	0.002	0.077	1.63
Water .....	0.323	0.323	0.323	0.970	6.82
<b>Total per ton of concentrate</b> .....	<b>\$0.977</b>	<b>\$3.283</b>	<b>\$0.711</b>	<b>\$4.971</b>	<b>100.00</b>
<b>Total per ton ore</b> .....	<b>0.072</b>	<b>0.248</b>	<b>0.053</b>	<b>0.373</b>	<b>18.94</b>

GOLDFIELD CONS. DETAILS OF CONCENTRATE TREATMENT COSTS, 1913

Item	Quantity	Price per Unit	Quantity per Ton Concentrate	Cost per Ton Concentrate	% of Total Cost
Cyanide.....	155,540 lb.	\$0.1915	6.26 lb.	\$1.200	24.14
Zinc.....	19,316 lb.	0.0844	0.87 lb.	0.082	1.65
Lime.....	740,000 lb.	0.0084	30.12 lb.	0.254	5.11
Lead acetate.....	43,654 lb.	0.0931	1.83 lb.	0.171	3.44
Water.....	27,673,000 gal.	0.2894	1060 gal.	0.308	6.20
Fuel oil.....	7,424 bbl.	1.6242	11.98 gal.	0.463	9.31
Sulphuric acid.....	364,800 lb.	0.0258	14.02 lb.	0.362	7.28
Muriatic acid.....	3,672 lb.	0.0465	0.14 lb.	0.007	0.14
Borax.....	2,583 lb.	0.1174	0.11 lb.	0.013	0.26
Litharge.....	7,468 lb.	0.0768	0.34 lb.	0.027	0.54
Coke.....	20,975 b.	0.0073	0.95 lb.	0.007	0.14
Pig lead.....	2,490 lb.	0.0614	0.11 lb.	0.007	0.14
Slag.....	12,768 lb.	0.0073	0.58 lb.	0.004	0.08
Pebbles.....	16,460 lb.	0.0156	0.63 lb.	0.010	0.20
Assaying.....				0.127	2.55
Roaster parts.....				0.046	0.93
Machinery and repairs.....				0.075	1.51
Belting.....				0.100	2.00
Lubrication.....				0.005	0.10
Filter cloth.....				0.023	0.46
Pipe and fittings.....				0.032	0.65
General stores.....				0.050	1.01
<b>Total supplies</b> .....				<b>\$3.283</b>	<b>66.04</b>
Labor.....	5463 shifts	\$4.36	0.224	0.977	19.65
Power.....	244 hp.	72.00	3.60 hp.	0.711	14.31
<b>Total cost concentrate treatment</b> .....				<b>\$4.971</b>	<b>100.00</b>

### Milling Costs at Goldfield

The following figures were given in the annual report of the Goldfield Consolidated Mines Co., Goldfield, Nev., for year ended Dec. 31, 1913. The mill treated 330,217 tons of ore averaging \$14.88 per ton, of which \$1.19 was

lost in tailings and \$13.69 recovered. It cost 8c. per ton or 1.24% of the total cost of production to transport this ore from the mines to the mill. Milling cost was \$1.60 per ton and concentrate treatment 33c. per ton milled. Transporting, milling and concentrate treatment costs were equal to 30.07% of the total cost of production.

GOLDFIELD CONSOLIDATED MILLING COSTS, 1913, PER TON MILLED

Department	Labor	Supplies	Power	Total	% of Total
Crushing and conveying .....	\$0.017	\$0.008	\$0.005	\$0.033	2.08
Stamping .....	0.032	0.028	0.065	0.125	7.73
Chilean milling .....	0.018	0.033	0.046	0.097	6.07
Elevating and classifying .....	0.012	0.004	0.006	0.022	1.36
Tube milling .....	0.014	0.101	0.107	0.222	13.93
Concentration .....	0.040	0.007	0.016	0.063	4.00
Neutralizing .....	0.007	0.048	0.000	0.063	3.46
Settling .....	0.013	0.049	0.000	0.062	3.86
Dissolution .....	0.021	0.363	0.034	0.418	26.23
Filtering .....	0.038	0.025	0.013	0.076	4.78
Tailing expense .....	0.001	0.000	0.000	0.001	0.09
Assaying .....	0.003	0.019	0.000	0.022	1.39
Precipitation .....	0.008	0.055	0.012	0.075	4.68
Refining .....	0.023	0.041	0.000	0.064	4.05
Water .....	0.005	0.066	0.000	0.071	4.47
Surface and plant.....	0.011	0.005	0.000	0.016	0.97
Steam heating .....	0.003	0.007	0.000	0.010	0.60
Storehouse and office	0.012	0.003	0.000	0.015	0.94
Stable .....	0.001	0.001	0.000	0.002	0.12
Watchman .....	0.024	0.000	0.000	0.024	1.52
Superintendent and foreman .....	0.059	0.000	0.000	0.059	3.72
Lighting .....	0.002	0.002	0.014	0.018	1.22
General expense.....	0.003	0.005	0.001	0.009	0.55
Mill tools.....	0.001	0.001	0.000	0.002	0.07
Electrical department	0.003	0.003	0.000	0.006	0.33
Pumping battery					
water .....	0.005	0.002	0.015	0.022	1.34
Experimental .....	0.005	0.002	0.000	0.007	0.44
<b>Totals</b> .....	<b>\$0.381</b>	<b>\$0.878</b>	<b>\$0.337</b>	<b>\$1.596</b>	<b>100.00</b>

GOLDFIELD CONS. DETAILS OF MILLING COSTS, 1913

Item	Quantity, Lb.	Price per Unit	Quantity per Ton	Cost per Ton	% of Total Cost
Cyanide.....	485,740	\$0.1915	1.47 lb.	\$0.282	17.65
Zinc dust.....	173,845	0.0944	0.53 lb.	0.050	3.16
Lime.....	3,780,500	0.00836	11.45 lb.	0.096	6.01
Lead acetate.....	259,893	0.0932	0.79 lb.	0.074	4.64
Muriatic acid.....	93,168	0.04654	0.28 lb.	0.013	0.81
Water, gal.....	75,072,000	0.2706	230 gal.	0.062	3.88
Borax.....	22,770	0.1174	0.07 lb.	0.008	0.50
Litharge.....	67,207	0.07856	0.20 lb.	0.016	1.00
Pig lead.....	22,410	0.0614	0.07 lb.	0.004	0.25
Shoes and dies.....	152,649	0.0477	0.46 lb.	0.022	1.38
Pebbles.....	1,316,800	0.01618	3.99 lb.	0.065	4.07
Tube mill lining.....	201,415	0.053	0.61 lb.	0.032	2.01
Chilean steel.....	104,397	0.0603	0.32 lb.	0.019	1.19
Coal.....	71 tons	15.28	0.43 lb.	0.003	0.19
Coke.....	188,775	0.00727	0.57 lb.	0.004	0.25
Slag.....	114,912	0.00727	0.35 lb.	0.003	0.19
Waste.....	6,400	0.111	0.02 lb.	0.002	0.13
Belting.....				0.011	0.66
Lubrication.....				0.007	0.43
Machinery and repairs.....				0.018	1.14
Screens.....				0.004	0.29
Office supplies.....				0.003	0.13
Filter cloth.....				0.007	0.45
Iron and steel.....				0.008	0.59
Assaying.....				0.019	1.14
Hose and fittings.....				0.003	0.10
Pipe and fittings.....				0.008	0.59
Lumber.....				0.005	0.39
Crusher parts.....				0.006	0.30
Pump parts.....				0.003	0.11
Electrical repair and upkeep				0.004	0.27
General stores.....				0.017	1.09
<b>Total cost of supplies not including concentrate treatment</b> .....				<b>\$0.878</b>	<b>54.99</b>
Operating labor.....	19,294 shifts	\$4.97	0.058	0.290	18.20
Repair labor.....	6,633 shifts	4.53	0.021	0.091	5.70
Power.....	1,546 hp.	72.00	1.78	0.337	21.11
<b>Total milling 330,217 tons, not including concentrate treatment</b> .....				<b>\$1.596</b>	<b>\$100.00</b>

The costs of concentrate treatment are not included in the above tables in this article, but are given in the special tables in the preceding column.

**The Efficiency of Coal-fired Reverberatory Furnaces** is much affected by the amount of fines in the coal. C. D. Demond in the August "Bulletin" of the American Institute of Mining Engineers, states that a standard furnace at Anaconda smelted 270 tons per day with 60 tons (ratio 4.5) of good run-of-mine Diamondville, Wyo., coal, 60 to 70% of which was coarser than 3/4 in., and 240 tons (ratio 4.0) with poor run-of-mine coal, 40% coarser than 3/4 in. But with Diamondville lump coal, 80% or more coarser than 3/4 in., the furnace smelted 328 tons with 63 tons of coal (ratio 5.2). Comparing ratios, the lump coal gave 30% better smelting results than poor run-of-mine and 15% better results than good run-of-mine coal.



# Supporting Excavation at Lightner Mine

BY LEROY A. PALMER\*

*SYNOPSIS*—Lightner, a small but profitable property in Angels Camp, on the Mother Lode, California. It lies in the so called "talc belt." Mining by adjoining properties and between the 300 and 600 levels of the Lightner caused bad slipping in the latter. New shaft became necessary. Good body of ore found above the 300 level in drifting from this shaft. Cribs used to hold the bad ground and old stopes. Methods of drifting and mining.

The Lightner mine, one of the operating properties on the Mother Lode, is situated at Angels Camp, Calif., between the Utica and the Angels Quartz mines. Its length on the vein is only 420 ft. and its width 450 ft., so that its area is  $4\frac{1}{2}$  acres; yet this mine has paid dividends of over \$330,000 as the result of work practically confined to ground between the 300- and 600-ft. levels. The mine

would be expected, the "talc" shows by analysis that it has the same composition as the schist walls. It has a strike almost due north and south and an easterly dip of 45 degrees.

This shear zone is cut by the Angels Quartz shaft, between the 200- and 300-ft. level and at continually increasing depths as one passes southeasterly along the lode until at the Stickle shaft of the Utica, it is cut between the 900- and 1000-ft. points. The Stickle is the last shaft to cut it, as it thins out and disappears before it reaches the Cross shaft of the Utica, but it has been encountered in stoping a short distance north of the Cross, and if produced, would cut the latter at about the 1300-ft. level.

Both the Utica and the Angels Quartz mines stoped to the end lines of the Lightner, the Angels Quartz to a

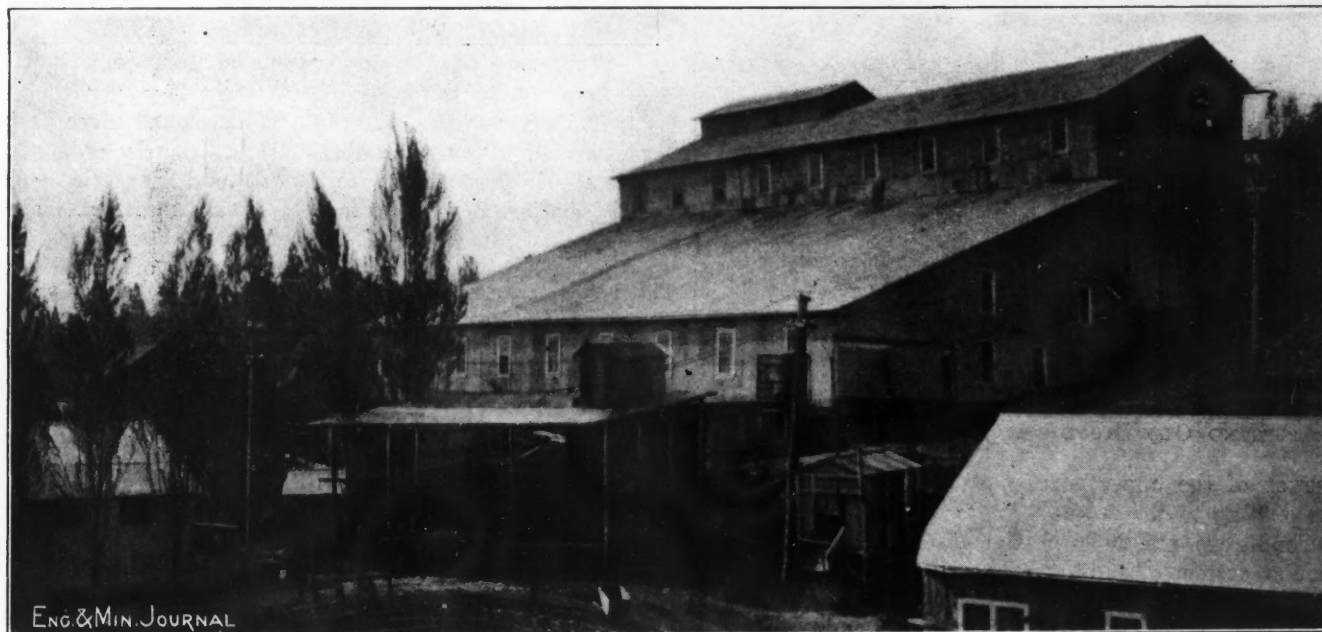


FIG. 1. THE LIGHTNER MILL

Note displacement of roof of concentrator building against side of main building.

is equipped with a 60-stamp mill and at present, with 30 stamps dropping, is treating 150 tons daily, using amalgamation and concentration.

## GEOLOGY

The ore at Angels Camp is found in fissure veins or "stringer leads," in a hornblende schist associated with greenstone. The Lightner lies in what is locally known as the "talc belt," which includes also the Angels Quartz, and Utica, three of the four producers of Angels Camp.

The talc belt is a shear zone, commonly but incorrectly called a talc vein, caused by crushing during a rock movement associated with a thrust fault; this ground the hard schist to a talcy mass, which has a maximum thickness of 400 ft., but thins to the southward and disappears a short distance north of the Cross shaft. As

depth of 600 ft. and the Utica to a depth of 640 ft. Meantime, the Lightner had sunk its old shaft in the hanging wall, crossed the vein into the foot wall, and starting at the 600 level, had stoped up to the 300. The inevitable happened. The general slippage southerly along the talc belt was worst at the Lightner where the small block of ground, weakened within itself and at each end, was displaced perceptibly as the foot wall settled on the talc. An idea of the amount of settling can be gained by reference to Fig. 1, which shows the mill; the line above the roof of the concentrator floor represents the original position of the roof. Some delicate points might be developed in case suit for trespass were started among these mines, as it has been found that one witness tree has slid 21 ft.

The settling caused endless trouble with the old shaft and much time was lost in easing and realigning timbers until finally conditions got to be such that in a period of

\*Mining engineer, San Francisco, Calif.

two months, just one-half of the time was spent in keeping the shaft open. Then the management gave up and went 260 ft. northeasterly, at right angles to the strike, and sank a new two-compartment-and-manway shaft. This shaft, farther over in the hanging, is in greenstone, well timbered on 4-ft. centers with 12x12-in. stuff and should last as long as the mine. It has been carried to the 1000-ft. level and levels cut at the 100-, 200-, 300-, 400-, 500-, 600- and 900-ft. points.

The old stopes which had been supported with square sets and had been neglected while the mine was being reopened were naturally in bad condition. A drift was run out on the 400 level and a raise from this found ore at 40 ft.; stoping was commenced and carried up to the 300 level and work started to make that the main haul-

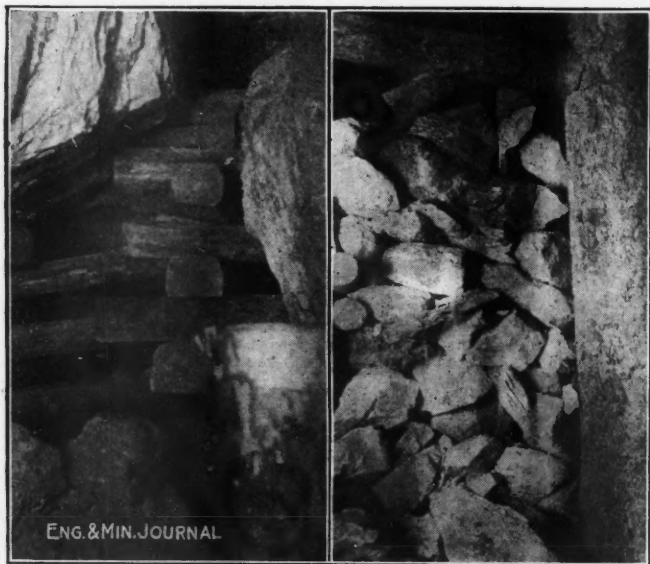


FIG. 2. TIMBER CRIB SUPPORTING OLD STOPE



FIG. 3. ROCK FILLING BETWEEN CRIBS

ageway of the upper portion of the mine and to carry the stoping to the surface.

Conditions are such in the caved territory that no regular system of mining can be carried on in all portions; it is necessary to fit the mining practice to the exigencies of the ground. The general plan when caved ground is hit, is to put up a manway and chute one set apart, each 4x4 ft. in section and solidly cribbed with 10-in. round timbers. Three such pairs, manway and chute, are put in for each new stope, one on the hanging wall, one on the foot wall and one between. The stope is then opened by starting a sill floor and working overhead as in square setting, manways being put in every 50 ft. along the vein and chutes every 20 ft. Instead of the usual square sets, rock and timber cribs are used for support, such as shown in Fig. 2. As a stope is worked out the height of a set, the spaces between these cribs, except along passageways, are roughly filled with waste, Fig. 3.

When the works ran into an old stope and old timbers were encountered, they were used whenever possible in building cribs and many such have been built of solid timber; when more timbers were found than could be used to advantage, they were hoisted out and stocked; at one time the supply in the timber yard from this source amounting to 600 cords.

As soon as the work had progressed to such a point that the management had an idea as to conditions, the

300 was chosen for the main-haulage level. The level from the old shaft was tapped, but had settled and almost squeezed shut, Fig. 4. The rock from the stopes, therefore, is being dropped through chutes to the 400, and a drift has been started from the stope to tap the new portion of the 300 level, the waste from the drift being used in filling.

With the exception of about 50 ft., which, north of the shaft, is stopped from the 300 to the 200, the orebody extends practically from the 300 to the surface. All of



FIG. 4. CAVING IN OLD PART OF 300 LEVEL

this stoping, with the exception of one small piece that can be held with square sets, must be done by cribbing, since all of the ground above the 400 level has settled and badly shattered ore and cracks on the hanging wall are of common, in fact usual, occurrence.

Under the old system, the ordinary type of tunnel set was used in the drifts, but the ground was so heavy that 30-in. round timbers and even larger were crushed. Under the new system, bridged sets are used exclusively in drifts in shifting ground and these answer well, but require continual easing to keep the sets open and in line. In drifting a heavy pole lagging, 6 in. and thicker, is always carried up to the working face so the men have continual protection overhead, the system being similar to that of forepoling in loose ground.

In spite of the nature of the ground with which the operators must continually contend, in the past two years only two serious accidents have occurred. One man was killed by falling down the shaft and another had a leg broken by a fall of roof; the latter accident is, of course, the only one attributable to the mining method.

Ingersoll-Rand butterfly stopers are used, five or six holes generally being drilled to the round, which breaks an average of 15 tons. The daily output is 175 to 180 tons with a total of 32 men, besides the foreman, employed underground as follows: 12 miners, 10 muckers, four trammers, six timbermen. The cost of mining from stope to mill, taking into consideration all charges, including insurance under the new California liability law, which amounts to about 7% of the payroll, is, in round numbers, \$1.50 per ton, or \$0.75 for timbering, \$0.50 for breaking rock and \$0.25 for trampling, hoisting, etc. One month, when conditions were favorable, these costs were brought down to \$1.03. Fortunately, timber is cheap, being obtained in the Sierras at no great distance from the mine.

I am indebted to Alexander Chalmers, superintendent, and to members of his staff, for courtesies extended to me while collecting these notes.



## Lake Superior Mining Institute

SPECIAL CORRESPONDENCE

The Lake Superior Mining Institute opened Aug. 31, at Ishpeming, with an estimated attendance of 350. The first-aid contest was participated in by 12 teams of six men each from various Lake Superior ranges, at Union Park, near Ishpeming, in the morning. The judges were Dr. A. F. Knoefel, vice-president Vandalia Coal Co., Linton, Ind.; R. Y. Williams, director Illinois Miners' & Mechanics' Institute; G. H. Hawes, rescue engineer, Pittsburgh, Penn. Before the contest, Doctor Knoefel stated that published rules would govern the awards, and that efficiency, not show, would be considered first in judging. Event seven, the treatment of broken back, was most spectacular, and visitors showed great interest in this and other events. The teams were remarkably proficient and the participants were well trained and keen in rivalry. The expenditure of much time and money by the various companies represented was indicated, as many had been preparing for weeks with all members off regular work but on full time. The results were announced at the conclusion of the ball game in the afternoon. The teams were judged on points and prizes awarded on total points. First prize was \$50 and five bronze medals of the American Mine Safety Association, won by Team Seven, Republic Iron & Steel Co., Marquette Range, Capt. Paul Mitchell. Second prize, \$30 and six silk umbrellas, was won by Team Eleven, Cleveland Cliffs Iron Co., Marquette Range, Capt. J. S. McNabb. Third prize, \$30 and one self-rescue apparatus was finally taken by Team Five, Oliver Iron Mining Co., Marquette Range, after being tied for by Teams Five, Eight and Nine, which worked off the tie by additional contests. Luncheon was served at the Wawonowin Golf Club. After the ball game, 50 automobiles took members to Athens and Negaunee mines of Cleveland Cliffs, at Negaunee, two of the most modern shafts in district.

The interesting features at Athens were the method of concreting the shaft and using permanent equipment to sink. At the Negaunee mine, all machinery is electrically operated by current from Carp River plant. Visiting members could inspect the latter by special arrangement. Automobiles transferred party to new steel and concrete dock of Lake Superior & Ishpeming at Presque Isle, near Marquette, then to Lake Shore Engine Works, Marquette. This company was host at a whitefish dinner, served in its pattern shop, to 300 guests. The company also formally exhibited a new loading machine, which it has been developing for five years. It is intended for iron, copper and coal mines, and is compact and differs widely from other machines for similar purposes. It created a favorable impression and much discussion. This one was built for Judson mine, Alpha, Mich., and will go into service soon. A vaudeville and moving-picture entertainment was given in the evening.

## New British Export Regulations

According to the *Chemical Trade Journal*, Aug. 22, 1914, the British Government has issued a proclamation prohibiting, among other materials, the exportation of certain warlike stores from the United Kingdom to all foreign ports in Europe and on the Mediterranean and

Black Sea, with the exception of those of France, Russia (except the Baltic ports), Spain and Portugal. The list includes the following products: Aluminum, aluminum alloys; asbestos; coal, steam, large; explosives of all kinds; fuel, manufactured; manganese; mercury; mica; mineral jellies; molybdenum; nitrates of ammonium; nitrates of potassium; nitrates of sodium; nitric acid; salt peter; sulphur; sulphuric acid; tin; tin plates; tungsten and vanadium.

## August Mining Dividends

Twenty-three mining companies making public reports paid \$1,830,362 in dividends in August, as against \$2,089,605 paid by 26 companies a year ago. Steel, smelting and holding companies paid \$11,617,745, a decrease of \$100,000, and Canadian and Mexican companies \$563,506, as compared with \$1,163,324.

Company	Situation	Per Share	Total
Alaska Mexican, g.	Alas.	0.20	\$36,000
Alaska Treadwell, g.	Alas.	1.00	150,000
Alaska United, g.	Alas.	0.20	36,040
Bunker Hill, g.	Calif.	0.01	5,000
Bunker Hill & Sullivan, l. s.	Ida.	0.25	81,750
Chief Con., s. g. l.	Utah	0.05	43,831
Duluth & Utah, l. z. s.	Utah	0.07½	3,750
Eagle & Blue Bell, g. s. l.	Utah	0.05	44,657
Elkton, g.	Colo.	0.02	50,000
Fremont, g.	Calif.	0.02	4,000
Golden Cycle, g.	Colo.	0.03	45,000
Homestake, g.	S. D.	0.65	163,254
Hecla, l. s.	Ida.	0.02	20,000
Miami, c.	Ariz.	0.50	373,380
Mohawk, c.	Mich.	1.00	100,000
Oroville, g.	Calif.	0.06	85,000
Parrot, c.	Mont.	0.15	34,477
Skidoo, c.	Calif.	0.05	50,000
Stewart, c.	Ida.	0.10	123,826
Ton Reed, g.	Ariz.	0.06	54,573
United Verde	Ariz.	0.75	225,000
Wasp No. 2, g.	S. D.	0.01	5,000
West End Con. g.	Nev.	0.05	93,424
Yosemite, g.	Calif.	0.10	2,400
<b>Iron, Industrial and Holding Companies</b>			
Amalgamated, c.	U. S.	\$1.50	\$4,616,637
Cambria Steel, pfd.	Penn.	0.62½	562,500
International Nickel, pfd.	N. J.	1.50	133,689
U. S. Steel, pfd.	U. S.	1.75	6,304,919
<b>Canadian, Mexican and Central American Companies</b>			
Amparo, g. s.	Mex.	0.03	\$60,000
Crown Reserve, s.	Ont.	0.02	35,376
Dominion Steel, pfd.	Can.	1.50	150,000
Hollinger, g.	Ont.	0.15	90,000
Lucky Tiger, g. s.	Mex.	0.09	64,380
Standard, s. l.	B. C.	0.02½	50,000
Steel Co. of Canada	Can.	1.75	113,750

Dividends for the first eight months are: Mining companies, 1914, \$42,410,582; in 1913, \$47,540,327; metallurgical and holding companies, \$56,652,093 in 1913; \$56,167,506 in 1914; Mexican and Canadian companies, \$12,064,368 in 1914; \$15,042,619 in 1913.

## Magnesite

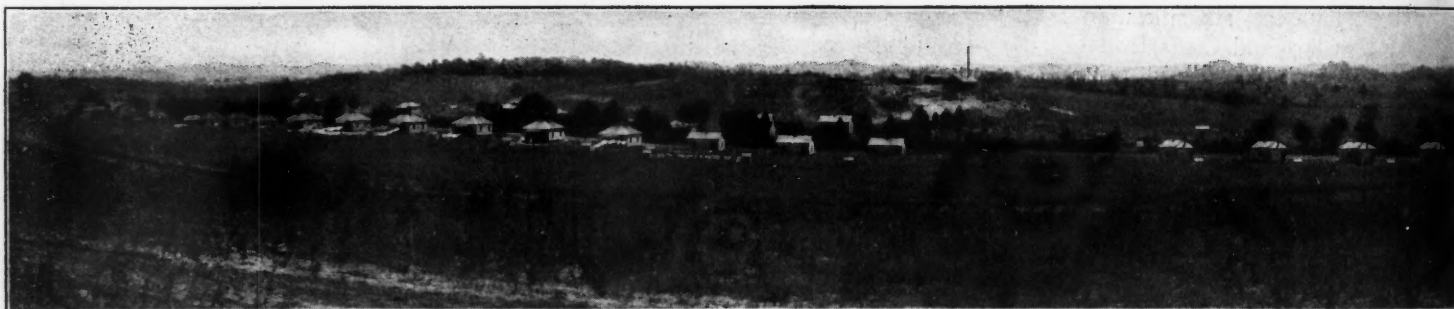
Among the shortages of minor materials due to the war is that of magnesite, which is largely used in making openhearth furnace bottoms. Most of this has been imported from Austria and Greece, and shipments have been cut off for the present, and for an uncertain time to come. The consumption has been about 12,000 tons per month, and the stocks now on hand are reported to be from 38,000 to 40,000 tons, or about three months' supply. In addition, dolomite can be used to some extent.

There are considerable deposits of magnesite in California, but no mining of any importance has been done, because the demand on the Pacific Coast was small, and high freight rates prevented competition in the East with Austrian magnesite delivered by water at low rates. With the Panama Canal open the California material would seem to have found an opportunity.

## Zinc Concentrator at Mascot, Tenn.



CONCENTRATOR BUILDING, AMERICAN ZINC CO. OF TENNESSEE, A SUBSIDIARY OF THE  
While designed to treat 1000 tons of ore per day, the actual capacity is from 1200 to 1400 tons per



VIEW SHOWING THE EMPLOYEES' LIVING QUARTERS, COMPANY'S



CONCENTRATOR AND MINE HEADFRAME, AS VIEWED FROM  
Some difficulty has been experienced in securing a high recovery of zinc from slimes. Experimental work on this  
been solved and the next move will be to install

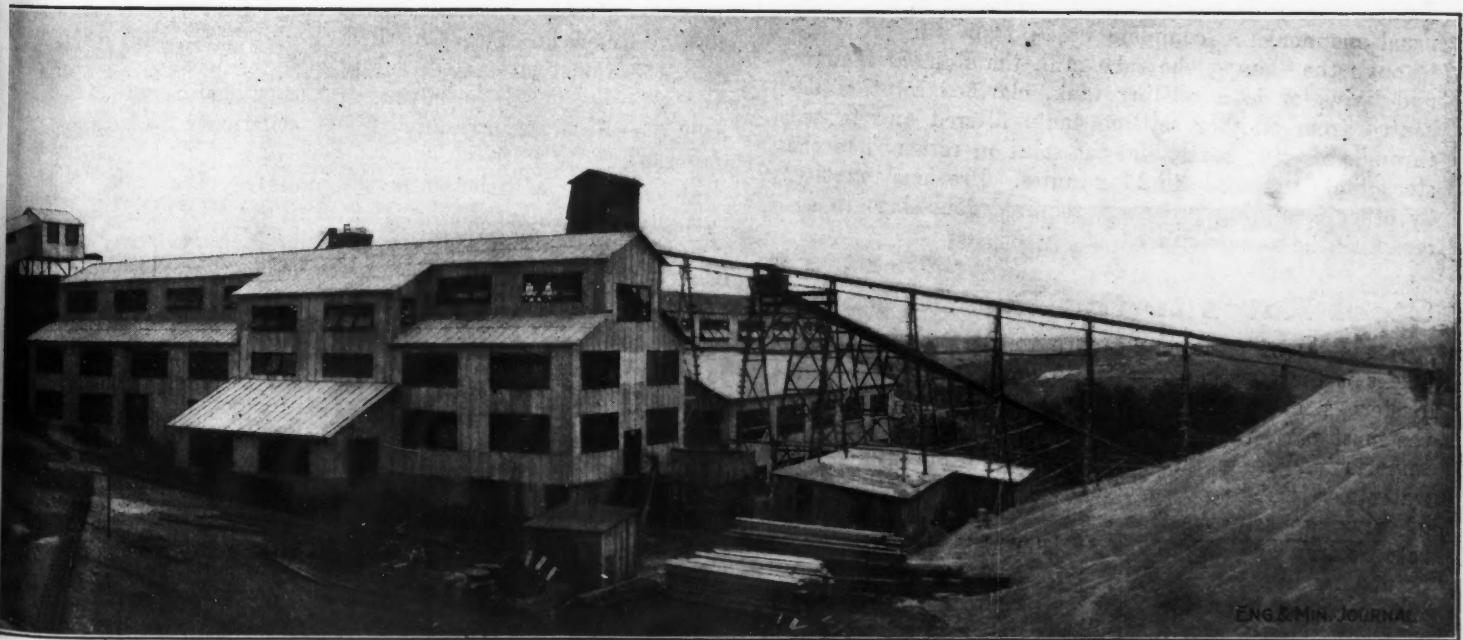




AMERICAN ZINC, LEAD & SMELTING CO., BUILT AND IN OPERATION IN SIX MONTHS  
day, the concentrates containing 58 to 63% zinc, very low in impurities, such as lead and iron.



MILL AND GENERAL CHARACTER OF THE COUNTRY AT MASCOT



SIDE OPPOSITE THAT SHOWN IN THE UPPER PHOTOGRAPH  
problem has been carried on for some time, many treatment processes being tested, including flotation. The problem has  
additional equipment to treat all slimes made.

### More Trouble in Butte

An explosion early Sunday morning, Aug. 30, destroyed the employment office of the Anaconda Copper Mining Co., near the Parrot mine. The building was a two-story brick building. A great hole was torn in the roof and one wall was blown completely out. No one is known to have been killed, but the watchman is reported missing.

The cause is supposed to have been the outcome of the reopening of the union's jurisdictional quarrel, in which the new union claims that the old was dominated by the Anaconda company.

It is said that the mayor and sheriff have announced that they were powerless, and that they requested the governor to send aid. He then mobilized the second regiment of the Montana National Guard, at Helena, but no time has been set for its departure to Butte. In the meantime it is also reported that the miners threaten to burn Butte, in case the soldiers are sent. Martial law was declared in Butte at midnight, Sept. 1, and troops were expected there the morning of Sept. 2, according to dispatches received as we go to press.

### Rapid Cyanidation of Ores

The American Rapid Cyaniding Co., of Detroit, Mich., reports that it has installed a Reinohl rapid-cyaniding apparatus at the Suffolk mill, Ophir, San Miguel County, Colo., operated by the Ophir Gold Mines, Milling & Power Co., George B. Pickett, vice-president and general manager, and supplies the following information:

Ore is run from a bin through crushers, then to a stamp mill where it is further crushed in a cyanide solution, and conducted through a tube mill and reduced to about 200 mesh. The pulp is then delivered to a Reinohl apparatus, comprising a launder and a lixivator, where the pulp is heated, additional cyanide supplied progressively to maintain its strength, and the pulp continuously agitated in the presence of the oxygen of the atmosphere.

From the end of the lixivator the pulp is conducted to settling tanks, the pregnant clarified solution decanted, filtered and conducted through zinc-shaving boxes in the usual manner. A complete cycle, from the ore bins, through the stamps, the tube mill, the Reinohl launder and lixivator to a settling tank, clarified solution decanted from another settling tank, filtered and passed through the zinc boxes, and the solution returned to the stock tank, was made in 11 minutes. Previous practice, by other cyaniding processes, required four days to accomplish the same result.

### Steel Rates to the Pacific Coast

A matter of some importance to the iron and steel trades is the question of rates to the Pacific coast from Eastern steel mills. These rates have been so high, for the most part, that they have given an opening for the importation of material from Europe brought on a water rate which could be made very low for the sake of securing business. For some time past, the through rate on iron and steel from Pittsburgh to Pacific Coast points has been 80c. per 100 lb., or \$16 per ton. Now the rate from New York to San Francisco by steamer through the Panama Canal has been fixed at 30c. per 100 lb., or \$6 per ton. Adding the rate of 16c. from

Pittsburgh to New York, with an allowance for transfer and dockage charges, gives about 48c., or \$9.60 per ton, from Pittsburgh to San Francisco, the difference from the present rate being an important one. Eastern mills would, however, have an advantage over the Pittsburgh district in lower freight rates to New York.

Now the railroads propose to meet the canal competition by a heavy reduction in rates. The proposed new rate is based on 50c. per 100 lb. from Chicago to the Pacific Coast. This is a heavy drop, and would make the rate from Pittsburgh to coast points 61.2c., or \$12.24 per ton, which is still \$2.64 above the rate through the canal. The change, however, if it should go no further, will make an important difference in conditions of competition, and will probably enable our manufacturers to undersell their foreign rivals on the Pacific Coast, as they have not been able to do heretofore. So far as the Pittsburgh district is concerned, both Eastern mills and those in the Chicago district will have advantages in competition not to be neglected.

### Chronology of Mining for August, 1914

*Aug. 1*—First reports of curtailment in production by Butte mines and copper porphyries. Decision by Interstate Commerce Commission on railroad rate case only partly favorable to roads.

*Aug. 2*—Germany declared war on France and Russia.

*Aug. 4*—Five men killed and four injured by premature blast in steam-shovel pit of Nevada Consolidated at Ely, Nevada.

*Aug. 6*—Beginnings of hearings before Federal Industrial Commission at Butte.

*Aug. 8*—First announcements of impending closing of Cobalt silver mines.

*Aug. 10*—Beginning of A. I. M. E. meeting at Salt Lake City. Suit brought against Bullwhacker Copper Co. by some of company officers to recover money advanced.

*Aug. 12*—Three men suffocated while fighting fire at Big Ben mine, Kern County, Calif.

*Aug. 14*—Jacob Langeloth, chairman of board of directors of American Metal Co., died.

*Aug. 15*—Constitutionalists entered City of Mexico.

*Aug. 22*—Smoot bill for silver purchase passed Senate.

*Aug. 24*—Receivers appointed for International Steam Pump Co.

*Aug. 30*—Alleged rebel miners dynamited Anaconda company's employment office at Parrot mine.

*Aug. 31*—Beginning of Lake Superior Mining Institute meeting at Ishpeming, Mich.

### Tennessee's Mineral Output in 1913

The principal items of mineral production of Tennessee in 1913 were as follows, the figures being taken from the annual report of George E. Sylvester, Chief Mine Inspector: Barytes, 1618 tons; bauxite, 14,516 tons; coal, 6,739,486 tons; coke, 372,741 tons; copper, 18,911,750 lb.; gold, 367 oz.; iron ore, 409,087 tons; pig iron, 280,879; phosphate rock, 398,044 tons; crystalline quartz 71,482 tons; silver, 108,104 oz.; sulphuric acid, 247,713 tons; zinc ore, 145,917 tons.



# Correspondence and Discussion

## Physical Examination under Workmen's Compensation Act

Since the Workmen's Compensation Act became operative in New York State on July 1 of this year, a number of corporations have adopted the policy of subjecting employees and applicants to a physical examination with the idea of reducing accidents and the resulting compensation to a minimum by maintaining a standard of physical and mental fitness. This policy has been met by a protest from labor organizations, which claim that men are being discharged because of failure to meet the physical examination requirements, regardless of their length of service or other considerations.

While not approving of the policy of discharging old employees on this account, preferring rather some system of transferring to other occupations, I nevertheless believe that the practice of physical examinations for all classes of labor engaged in hazardous employment is not

self insured, for the reason that the rates to be paid in the future will be based on the actual loss experience of the present.

The examination record blank which I have adopted for the St. Lawrence Pyrites Co. is shown herewith.

F. T. RUBRIDGE.

New York, Aug. 5, 1914.

## What Becomes of All the Mining Engineers?

Is it true that only about 1% of graduates of mining courses are holding positions in their chosen work three years after their graduation? Are the higher positions in the mining and metallurgical field open only to outsiders? I feel sure that many have read J. I. Blair's article in the JOURNAL of May 30 with surprise. The student will read it with dismay. The latter fact prompts me to attempt a reply.

Mr. Blair's question, "What becomes of all the mining engineers, metallurgical engineers and electrometallurgists who are graduated year after year from our universities?" is not happily phrased. Our universities and technical schools never did and never will graduate mining engineers, metallurgical engineers or electrometallurgists. Our universities and technical schools graduate men who have or should have the training which should enable them in the course of time to become mining engineers or metallurgists.

I think that most of us who have graduated from technical schools have at some time previous to our graduation labored under the delusion that we would graduate as mining engineers or metallurgists. Most men with

whom I have talked admit that such is the case. Some of us have graduated with a full realization of how far short we were of being mining engineers. Others have floundered for some time in the quagmire of our delusions until the lesson of our failures has at length set us right. Still others, but their number is comparatively few, have given up in despair and turned their efforts to other lines of endeavor.

So much for Mr. Blair's question, but what does become of the graduates of mining-engineering courses in our technical schools and what percentage of the men who graduate are holding positions in their chosen work? To settle this question we need but to refer to the registers of graduates of some of our technical schools. The Case School of Applied Science has living 160 graduates in mining and metallurgy, of whom 85% are actively engaged in some line of engineering work and the greater number of them in mining and metallurgical work. Ta-

EMPLOYEE'S EXAMINATION RECORD					
NAME	NUMBER	EMPLOYED AT		DATE EXAMINED	
		DATE EMPLOYED	DATE EMPLOYED		DATE EXAMINED
AGE	NATIONALITY	HOME ADDRESS			
WEIGHT	CONDITION OF	RIGHT	LEFT	GENERAL REMARKS - SCARS, ETC.	
HEIGHT	SIGHT				
COMPLEXION	HEARING				
HAIR - COLOR	LUNGS	EXPANSION		RESPIRATION	
EYES - COLOR	HEART	PULSE		PRESSURE	
	HEAD				
	ARMS				
MARRIED	HANDS				
WIFE LIVING	TORSO				
WITH HUSBAND	LEGS				
NO. OF CHILDREN	FEET				
AGES OF CHILDREN	PHYSIQUE				
PARENTS LIVING	MENTALITY	PHYSICIAN'S RECOMMENDATION:			
BROTHERS LIVING	TEMPERAMENT				
SISTERS LIVING	DISPOSITION				
	OTHER PARTICULARS				
	LANGUAGES SPOKEN				
	LANGUAGES READ	SIGNATURE			
		PHYSICIAN			

only a just and logical sequel to the act for the protection of the employer, but inures quite as much to the benefit of the employee, for, notwithstanding the unquestioned liberality of the New York State Act, no laborer can afford to risk injury through physical unfitness to perform the task allotted him.

I personally believe that it is as much the duty of the employer to select employees capable of exercising due diligence in avoiding accidents inherent to the work involved as to provide safeguards for them, and especially so in cases where failure to exercise such diligence involves possibility of injury to other workmen. It has been stated that those corporations which are requiring physical examinations are mostly those which have elected to carry their own insurance. The fact that a corporation is insured under the state or in a mutual or stock company should not blind it to the fact that it is quite as necessary to reduce accidents to a minimum as when

ble I, giving graduates by classes, may prove of interest:

TABLE I. CASE SCHOOL OF APPLIED SCIENCE

Class	Graduates Living	Engaged in Mining or Metallurgy, Per Cent.	Engaged in Engineering Work, Per Cent.	Total in Some Form of Engineering Work, Per Cent.
1887.....	1	100	..	100
1888.....	..	..	..	..
1889.....	..	..	..	..
1890.....	1	..	100	100
1891.....	..	..	..	..
1892.....	4	75	..	75
1893.....	..	..	..	..
1894.....	1	100	..	100
1895.....	2	100	..	100
1896.....	1	..	..	..
1897.....	1	..	100	100
1898.....	1	100	..	100
1899.....	5	20	80	100
1900.....	7	29	57	86
1901.....	7	29	57	86
1902.....	9	67	22	89
1903.....	13	23	62	85
1904.....	9	56	22	78
1905.....	13	15	77	92
1906.....	6	50	33	83
1907.....	5	40	20	60
1908.....	6	50	50	100
1909.....	7	43	29	72
1910.....	13	54	38	92
1911.....	18	39	33	72
1912.....	17	41	41	82
1913.....	13	69	15	84
Total ...	160	44	41	85

Table II shows the occupations of graduates of the mining course at the Massachusetts Institute of Technology from 1868 to 1909, inclusive, as stated in January, 1910. Of the 374 graduates then living, 277, or 74%, were engaged in engineering work, for the most part mining, either as engineers, metallurgists, geologists, professors of mining and metallurgy or as executives. Many of the graduates who have gone into other lines of work have done so not because they were failures in engineering work, but rather because it fell to their lot to take up business interests inherited by them. Failures there doubtless have been, but the percentage has been small. Classes graduated recently show no decrease in the number of men following their chosen line of work.

TABLE II—OCCUPATIONS OF GRADUATES IN MINING. MASSACHUSETTS INSTITUTE OF TECHNOLOGY, 1868-1909

Occupation	No. of Men
Army officer.....	1
Bankers.....	3
Builder.....	1
Business (unclassified).....	6
Chemists.....	17
Civil engineers.....	4
Contractors.....	2
Engineering work, mostly mining.....	53
Editors.....	2
Examiners, Patent Office.....	2
Foremen, metallurgical plants.....	8
Fruit grower.....	1
Geologists, mining and metallurgical engineers.....	105
Inventor.....	1
Lawyers.....	2
Managers, mining and smelting works.....	15
Managers, other industrial corporations.....	4
Manufacturer.....	1
Mine owner and operator.....	1
Opticians.....	2
Patent solicitor.....	1
Presidents, vice-presidents, secretaries or treasurers, mining and smelting companies.....	15
Presidents, vice-presidents, secretaries or treasurers, other industrial corporations.....	16
Printer.....	1
Promoter.....	1
Private business.....	3
Professor mining or metallurgy.....	13
Real estate and insurance.....	2
Representative metallurgical corporation.....	2
Student.....	1
Sugar planter.....	1
Superintendent mining or smelting works.....	38
Superintendent, assistant, mining or smelting works.....	6
Superintendent, other industrial works.....	6
Teachers, or in educational work.....	7
Trustee.....	1
Unknown.....	27
U. S. Land Office.....	1
Total.....	374

Mr. Blair's remarks with reference to conditions in various mining and metallurgical centers present much that is true, but are, I believe, overdrawn. He states, for instance, that at the great steel works technical men who have been trained to solve difficult problems in the metallurgy of steel, are working as chemists or sometimes as inspectors, doing work that requires common sense but not technical training. Such may be the case. Engineering work is, however, about 90% common sense. Without the gift of common sense the technical training that a man may have avails little. A man's ability as an engineer is judged no less by his handling of the innumerable little details and problems requiring common sense and judgment than by his ability to solve the difficult problems which confront him. If he does not show common sense and judgment in his handling of the little problems, surely he can never expect to have the larger responsibilities entrusted to him. May it not be true that the conditions described by Mr. Blair are due primarily to lack of common sense and business training on the part of the technically trained men who might otherwise obtain and hold the positions now held by men who have obtained their experience in the school of hard knocks? I have never yet talked with a so called practical man in charge of work requiring technical training who did not deplore the fact that he lacked technical training.

The higher positions in the mining and metallurgical field are open to technical graduates who are willing to fit themselves to fill them. Technical graduates endowed with good health, good habits and tact will succeed in proportion as they are able to apply their knowledge in practical ways; in proportion as they develop judgment and engineering sense, the ability to analyze conditions and to look at problems from the economic as well as from the purely scientific standpoint.

E. S. BARDWELL.

Great Falls, Mont., July 1, 1914.

[The discussion of the subject of "What Becomes of All the Mining Engineers" will now be considered closed.—EDITOR.]



### Concentrating Nomenclature

The nomenclature of wet concentration requires some additions. It is now awkward to discriminate among the several methods of wet concentration, especially since flotation has to be discussed as a competitor of the older wet-concentrating methods. "Table concentration" and "wet gravity concentration" have been used by some writers, but these terms are neither sufficiently comprehensive nor sufficiently discriminating. Table concentration is perhaps the better of the two, even though it does not comprehend the action of jigs, which is important in dealing with the ores of many districts. "Table-and-jig concentration" would accurately describe the treatment of such ores but this designation is awkward. The treatment of many ores would be comprehended by the term "table concentration," which is the better of the two terms that have been most used to distinguish the older forms of wet concentration from flotation concentration, but I should like to have the suggestions of some other JOURNAL readers on this point.

JOHN H. HOWARD.

New York, Aug. 28, 1914.



## Editorials

### Some Hope in Mexico

Since the great calamity, affairs in Mexico have faded into relative insignificance, and no longer are they chronicled on the front pages of the newspapers. Indeed, there is scarcely mention of them in obscure corners. This has prevented the heralding of what really seems to be a promise of peace in that heretofore distracted country, and a resumption of business operations. Huerta has gone, Carranza has come in, and neither Villa nor Zapata appears disposed to foment further trouble. The fact of the matter is, we think, that Mexico has been exhausted by her years of revolution and the destruction of property, and now prefers peace to starvation. Just what measures are going to be taken to restore living conditions and abolish the previous causes of discontent, we do not pretend to say, but that such measures will be taken is quite likely.

The really tangible thing that comes to our notice is the definite assurance of a resumption of industrial operations. We hear directly of mining organizations that are going back to Mexico to reopen their mines. This might appear to be an inauspicious time, when there is no market for copper and only an uncertain market for silver. However, we fancy that the crippled and disorganized mining operations of Mexico are not going to become producers right away in any circumstances. Rather have they got to engage in construction to restore their destroyed, or partially destroyed, property. This is likely to be a matter of a good many months, and a beginning now is probably not too early. It will bring cheer to the hearts of manufacturers of mining and metallurgical machinery and supplies, whose Mexican business has been practically nothing for several years, and also will it bring cheer to the many mining engineers and other mining employees who have been chafing in distress through the loss of their jobs.

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### The Export Trade

This is the time for American manufacturers to be alive to get their share of the export trade with South America, South Africa, China and Australia, that is surely going to develop. The development of such a trade from the United States has been a dream for many years, and some serious efforts have been made by some interests, like the U. S. Steel Corporation, to create it, but in general we have not made the headway that we hoped. In general, American manufacturers have been too inert, too little disposed to go out for foreign business, and consequently unwilling to take the trouble to study the nature of foreign requirements and the methods that must be followed in order to do business abroad. British and German manufacturers, but especially the latter, have been quite different. Their travelers have scoured the world, have studied the local requirements, have reported home, and their manufacturers have been alert to supply what was wanted.

Now we have the unique condition that the foreigners must come to us in order to get what they need, their previous sources of supply having been cut off. No longer do we have to cater especially to them, inasmuch as they are coming to us, begging us to furnish them with what we have got. Yet, it behooves our manufacturers to meet them half way, or at least a quarter way. Those who are ready to do so will reap great reward.

Already, we are reading in the commercial papers about the inauguration of new business with foreign countries, and we hear privately of numerous demands for mining supplies. We foresee in the very near future the growth of an important export trade, first probably in the staple commodities, and later in the higher grades of manufacture.

In the way of mining and metallurgical supplies, we shall doubtless export to South America and elsewhere, such things as dynamite, candles, cement, calcium carbide, structural steel, pipe, steel rails and track material, sheet steel, galvanized iron, copper wire and steel wire, firebrick, roofing material, shovels, rubber hose, rubber, leather and canvas belting, assay supplies, wire cloth, roll shells, and other crusher parts, steel castings, power-transmitting machinery, lubricants, mining machinery of all kinds, electrical machinery, etc.

The new demand for these and many other things is coming. Enterprising manufacturers will prepare for it. The shipping facilities are being provided, and banking interests are rapidly making arrangements for direct exchange between New York and South America. The Panama Canal, through which commercial ships are now passing, was opened very opportunely in view of the commercial conditions that have subsequently come about. Now let our manufacturers and merchants be enterprising and energetic.

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### Labor Troubles at Butte

The labor troubles at Butte continue as a war between two rival unions, with the Anaconda company standing calmly aside. Previous to the war in Europe the company wanted only to work its mines and was willing to pay high wages for labor. The miners fell out among themselves over several disputes, but the upshot is that one group does not want to let another group work. This resulted last week in a closure of some of the Anaconda mines, to which the company was probably not averse, and to some rioting and destruction of property.

If the miners only knew it, this is not a good time for the inauguration of labor troubles. The copper mines of the United States have curtailed their production by about 50% because of inability to sell their normal output. Some of the foreign mines that have been shipping their copper to this country for refining have been closed by refusal of their consignees to take any more copper. A troublesome feature of the situation is that the curtailment of output at the mines could not affect the 60-

to 90-day production that was in transit and in stock at the refineries.

In putting the mines upon a reduced scale, the companies have exhibited all possible consideration for their employees, avoiding the discharge of any men, giving preference to the married men, etc., and in general acting in the most coöperative, humane and patriotic way that is possible. However, there is no treasury that is inexhaustible and there is consequently a limit to things. There is a strong conviction in some minds that our principal mines will have to shut down completely for a period in order to correct the situation in the market. The mine managements are naturally averse to such a step, which would inflict great hardships on their employees. However, if the employees themselves want to shut down the mines, the managements are, of course, relieved from the responsibility.

### Some Deficiencies in Mineral Resources

We have in this country grown so accustomed to consider our mineral resources as abundant and all sufficient that only a few who have been especially interested have realized that there were some points in which they were insufficient. It has taken a severe wrench, like that of the present suspension of foreign trade, to make us realize generally our deficiencies. Of course, the supply of the important metals, with exception of tin, is abundant, indeed rather too abundant at the present time, in some cases.

Perhaps the most important deficiency just now is in ferromanganese, which is essential in steel manufacture. We have mined very little manganese ore, and our known deposits are entirely insufficient to supply what we need. Foreign ores have been easily accessible, and a large supply can still be had without interference from war conditions. The trouble now is that we have heretofore made only small quantities of these alloys ourselves, having bought them from England and Germany, so that our supply has been cut off at short notice, and it will take some time to arrange for their manufacture here, though an abundant supply of ores can be had from Brazil.

Another mineral extensively used in the steel trade for furnace linings and refractory brick is magnesite, which we have imported from Austria largely. The only important deposits in this country are in California, and these have not been worked because the freight to Eastern furnaces was too heavy to permit competition with the imported material and cheap water rates. With the Panama Canal open the California magnesite can reach the East at lower rates. In addition, there are large deposits near the seacoast in Colombia, which can be quickly developed.

Among the metals which have had extraordinary advances in price since the war began, the first is antimony. With the exception of a small quantity made from imported ores, our only native supply has been found in the antimonial lead from the lead refiners. While antimony is not an important metal of construction, it is essential in many alloys, chief of which is type metal, and in most of them there is no known substitute. In the last few weeks the price of the metal has more than

doubled, and our only free supply just now comes from China.

Platinum is another metal which, though used in small quantities, is essential for certain purposes. Our imports from Russia are cut off, and we have only the intermittent and irregular supply from Colombia to depend upon. The price has already advanced rapidly, and is likely to go much higher.

Quicksilver is another secondary metal which has more than doubled in price in a few weeks, going from \$37 to \$95 per flask. In this case, however, it is not because we have none, for our supplies have generally been enough for our needs. It is the special demand for fulminate for cartridges created by the war, coupled with the cutting off of the Idria mines, which have brought about the advance.

We do not now go into the question of the many important chemicals, the supply of which has been cut off, for that is an extensive subject of itself. Enough has been said to show some of our deficiencies in mineral resources, of more or less importance.

### A Poor Compensation Law

The principle of workmen's compensation has become pretty generally accepted in this country. A compensation law is primarily a protection for the workman, prescribing a direct or indirect payment by his employer for injuries received while working, and insuring that he shall receive this without cost and without fail, the old pleas of culpability of fellow servant, assumption of risk, and contributory negligence being disallowed.

From the point of view of public policy, such a law is justified on the ground that each industry should take care of its own injured and dead instead of leaving them or their families as charges on the community. It is argued that the additional burden on the operator will be thrown back by him on the consumer. This may take some time and the individual employer will meantime suffer; furthermore, it is hard to see how it will so work out in the case of gold mining, or in the case of any other industry until all states and countries prescribe uniform rates of compensation.

But all laws involve hardship to somebody, and in fact the extra burden thus imposed is not so very large. A typical compensation law tends to reduce the maximum award received, to increase the average and to increase the total, as compared with the old system of recovering damages through the courts. But this increase is offset largely by the savings effected in lawyer's fees and legal costs. By the elimination of parasitic lawyers it is believed that in some cases the companies get off even cheaper than before. Furthermore, the company can figure its losses much more closely and can reap the benefit of safety precaution in a way not possible before.

But to have these beneficent effects, the compensation law must be positive in its action. It must fix the compensation to be received in every case and must not permit legal action for recovery of higher damages where employer and employee are operating thereunder. This brings us to the case in point. Arizona enacted such a law not long ago, and it appears now on information received by us that this is really no compensation law at all, as the term is usually understood. The employee is not obligated to receive the fixed compensation, but may



sue through the courts for a larger sum, if he prefers to take the gamble. Of course, employees and their families do thus sue frequently. For such a law, there is no justification whatever. It does not remove the old uncertainties that harassed the operator; it does not insure that the expenditure of money on safety work will yield a sure return; it does not eliminate the shyster lawyer. Indeed, we are inclined to think that the lawyers had too much of a finger in mixing and baking this legislative pie.

As a concrete instance of how the law works, an employee of one mining company received an injury of some consequence, but one not entailing permanent disability. The compensation award would have been generous enough to cover loss of time. The man elected to sue, did so, and was awarded \$7500 by a jury of his peers. He recovered rapidly of his injury and then went to work for another company at a job more arduous than his old one. So far he was from deserving \$7500 for permanent disability! At last accounts, however, he had not got the money. It is to be hoped in the interest of justice that the company will win on appeal.

The JOURNAL has this week moved to its new offices in the Hill Building, just completed by the Hill Publishing Co. at the corner of 10th Ave. and 36th St. The 34th St. crosstown cars are near at hand, as is also the 34th St. station of the 9th Ave. elevated railway, which is 12 minutes run from Rector St. We shall be glad to see our friends in our new quarters. Our new telephone number is 1500, Greeley.

### BY THE WAY

London bankers have been able to arrange for the payment of dividends by the Rand gold-mining companies whose funds have been tied up on account of the moratorium. Payment of dividends was made in August by over 20 of the Rand companies and it is likely that British investors would be glad to exchange some of their industrial stocks for Kafirs, were the stock exchange transacting its regular business and the industrial stocks negotiable at anything like their former value.

Electric lighting underground is not practiced in the Calumet & Hecla, and James MacNaughton, the manager, explained the reason before the Congressional Committee investigating the recent strike. The chief difficulties in the way of employing electricity appear to be the great extent of the workings and the fact that the ground is insecure. A fall of rock might easily interrupt the service for the mine and the fact that the foot and hanging walls in shafts and drifts are both moving would necessitate constant repair work on the wires and great expense. This can be easily believed in view of Mr. MacNaughton's testimony to the fact that the company has 300 men continually repairing timbering in the shafts on account of crushing. We assume this includes the subsidiaries as well as the Calumet & Hecla itself.

On Aug. 14, the famous Potrero No. 4 well of the Mexican Eagle Oil Co., was set on fire by lightning which struck a temporary staging with the resultant firing of escaping gas and oil. No information has been

received in New York as to whether the fire has been extinguished. The London *Financial Times*, of Aug. 18, reports that up to that date the capping to the well remained intact and the small flow of oil to the tanks continued. Some time ago the well was capped to avoid any unwelcome interference from the Mexican rebels. The closing down of the property created certain leakages of an extensive character, and it is these which are now burning. The intensity of the fire prevented any attempt to extinguish it during the first week, but appliances are ready and available for this purpose when the flames can be approached. As the oil has continued to flow into the tanks the capping has remained cool. The company has been producing at the rate of 30,000 bbl. per day for some time without the Potrero No. 4 well.

Mining engineers, who have been accustomed to adapting themselves to all sorts of conditions, should be capable of efficient service in war times. We note that the Institution of Mining and Metallurgy has offered to the British War Office a volunteer corps for special home service. Most of the 2400 members of the Institution are engaged in mining and metallurgical operations abroad but in all probability the present home list includes a sufficient number to form a useful corps. Their experience with unusual conditions and their technical training might be especially valuable in these times when so many untrained civilians are entering the service. The War Office has acknowledged the proposal of the Institution to create a special corps of mining engineers and while the time was not ripe for giving a definite answer, was glad to know that such a plan was capable of being set on foot. In this connection it may be mentioned, that the Mining and Metallurgical Club has offered its premises at No. 3 London Wall Buildings to the British Red Cross Society as an emergency hospital.

Daniel Guggenheim returned from Europe in an optimistic frame of mind. In an interview with the *Boston News Bureau*, he said:

We are in presence of the greatest opportunity in history of this country. It is up to the press and public-spirited men to emphasize this. It is a public duty. Ordinarily, I do not advocate paternalism in the central government, but I believe this the exception that proves the rule. Let every one push and pull to get started. Washington should pass laws, and speedily, to develop our finance and commerce, ship subsidies, special bills, anything necessary to get things going.

For the first time the world's marts lie at our feet uncontested. Our European competitors are hopelessly crippled for the time being, and it is up to us to reap the benefits. Let us get ships without delay, start building them, let the Government buy private ocean-going pleasure yachts, any kind of ships that can be used for transportation. Europe wants our products and manufactures, and in a short time will be desperately in need of them.

There must be financing and plenty of it, but we can do it. The new currency act gives us power to finance a thousand millions of trade. The machinery to set this country humming is at hand—it only remains to see whether we are energetic and enterprising enough to set it in motion. The outlook? In six months, even less, I expect to see this country fairly boiling with activity.

Copper may be a drug on the market now, but its time will come, even before the war abroad ends, for the domestic consumption, I believe, will shortly call for more metal. Right now the two largest consumers of copper in Germany are shut down tight and consequently not taking a pound of copper. The Government should now stop baiting the trusts.

I ran out of funds while in England, and could get no accommodation except through cabling home. I received a remittance by return cable with this addition from my son: "Now you know how it feels to be broke."

## PERSONALS

Carl A. Allen has returned to Denver from Nevada.

B. B. Thayer has returned to New York from Butte.

Granville Moore, of San Francisco, is in Alaska on examination work.

John T. Fuller, of Little Rock, Ark., is spending a few weeks at his old home in Pennsylvania.

Vernon M. Bovie, of New Rochelle, N. Y., has been appointed superintendent of the United States Assay Office at New York.

A. F. Huston, president of the Lukens Iron & Steel Co., who has been detained in Paris by war conditions returned to this country last week.

Leon J. Pepperberg, of San Francisco, a former member of the U. S. Geological Survey, is making an investigation of the Calgary oil field in Canada.

Wilbur E. Sanders has retired from the superintendency of the Alkali Mines Co., of Eureka, Nev., which has ceased operating, and he is now at Oakland, Calif.

C. B. Lakenan was operated on at the Mayo Hospital for duodenal ulcer on Aug. 28, and surgeons report he will be fully relieved from an old time malady.

S. H. Brockunier, of Nevada City, Calif., is examining the property of the Montana Consolidated Gold Mining Co., at Jardine, Montana, in the interest of eastern capitalists.

Henry C. Frick was last week reported dangerously sick at his summer residence at Beverley, Mass. Later advices are that his illness was slight, and that he is recovering.

C. T. Griswold is now at the Pittsburgh office of the Associated Geological Engineers, having returned from examining several gold prospects in the Sudbury mining district in Ontario.

Baylies C. Clark, of Sutter Creek, Calif., has been examining placer properties in the department of Antioquia, Colombia, for Breitung & Co., during the past year. He expects to return to California in October.

L. H. Underwood, formerly superintendent of blast furnaces at the Riverside, W. Va., works of the National Tube Co., has been appointed assistant superintendent of the by-product coke department at the Gary, Ind., works of the Steel Corporation.

Francis Church Lincoln, until recently resident engineer of the Bolivian Development & Exploitation Co., with headquarters at La Paz, Bolivia, has left that company to take the position of Head of the Mackay School of Mines at the University of Nevada, Reno, Nevada.

L. Selim has accepted the position of chief chemist and metallurgist with the Otis Steel Co., Cleveland. For the past seven years, he has been in charge of the chemical and metallurgical laboratory of the Lake Superior Iron & Chemical Co. Since June 1, he has been employed on special work at the plant of the Zenith Furnace Co., Duluth.

H. M. Wolfen, acting for the California Industrial Accident Commission and the United States Bureau of Mines, has recently visited Trinity, Siskiyou and Shasta counties continuing his tour of mine inspection. He will go next into Plumas and Sierra counties, and will visit Jackson on Labor Day to address the first-aid meeting to be conducted by Mr. Krogdahl. Later in the season Mr. Wolfen will make a tour of the quicksilver districts south of San Francisco.

Frederick Lyon, managing director of the United States Mining & Smelting Co., having completed adjustment of working conditions at the Mammoth smeltery at Kennett, Calif., returned to San Francisco on his way to Needles. Other properties to be visited are at Gold Road and Kingman, Ariz.; Midvale and Tintic, Utah, besides the Grasselli and Chrome plants in the East.

The Batopilas Mining Co. is going to resume operations at Batopilas, Chihuahua, Mexico. The operating staff intended to leave El Paso for the mines on Aug. 24, consisting of the following men: John R. Harbottle, general manager; Charles F. Gerhardt, superintendent of mines; Homer L. Nix, chief accountant; W. R. Kaufman, master mechanic; J. C. Rumball, chemist; and Dr. O. H. Talley, company physician.

Reginald W. Brock, director of the Canadian Geological Survey and deputy minister of mines, has resigned his position to become professor of applied science in the new University of British Columbia. Much of his research work has been done in that province, one of the principal contributions to the knowledge of Canada's mineral resources being

his report on the Rossland mineral area. R. W. McConnell, of the Geological Survey, has been appointed acting deputy minister of mines, and will probably be confirmed in the position.

## OBITUARY

Jack Harris, one of New Mexico's most widely known pioneer mining men, died in Albuquerque, Aug. 8. He had been connected with mining operations in the state for many years. The body was interred in the Santa Barbara cemetery, Albuquerque.

William Thomas Lewis, Lord Merthyr, died in London, Aug. 26, aged 77 years. He was one of the largest coal mine owners and operators in Wales. He served for many years on royal commissions on matters connected with coal mining, trade disputes, and various labor questions. He was president of the University College of South Wales and Monmouthshire, formerly president of the South Wales Institute of Engineers, the Mining Association of Great Britain, and the Institute of Mining Engineers, vice-president of the Iron & Steel Institute and the Institute of Mechanical Engineers, and chairman of the Monmouth & South Wales Board of Examination for Mining Certificates.

Fritz Cirkel, of Montreal, died recently, age about 50 years. He was a German by birth and graduated from the Royal Technical Academy at Aachen in 1888. In 1891 he became managing engineer of the Templeton Asbestos Mining Co., at Templeton, in the Ottawa district, Canada. He was subsequently engaged in the exploration of mica and graphite deposits in the Laurentian formation, and also did considerable work in the Sudbury nickel region and the Lake of the Woods gold area. Mr. Cirkel went to British Columbia in 1897 as consulting engineer for Vancouver and Ottawa investors, and returning East in 1901 established himself as a consulting engineer in Montreal. He was the author of a number of reports issued by the Canadian Department of Mines dealing with the mica, asbestos and graphite resources of Canada.

## SOCIETIES

**American Institute of Metals**—The eighth annual meeting will be held in Chicago, Sept. 7-11, and will be in part a joint meeting with the American Foundrymen's Association. A long list of papers is on the program, and the meeting promises to be an unusually strong one and of great interest to the nonferrous metal industry. It certainly represents a lot of work on the part of the chairman of the Papers Committee, H. W. Gillett. The headquarters of the institute for the meeting will be at LaSalle Hotel, Chicago.

**Michigan College of Mines**—The chair of metallurgy and ore dressing at the Michigan College of Mines, recently made vacant by the resignation of S. S. Bruce, has been filled by the appointment of A. J. Houle, who is a graduate of the class of 1896, and for the last few years has been connected with the college as assistant professor of mining and civil engineering. Previous to that, he had considerable experience in metallurgical work, having built the smeltery of the North American Copper Co. at Encampment, Wyo. More recently, and during a year's leave of absence from the college, he was at the Calumet & Arizona smeltery at Douglas, Ariz. T. G. Chapman, a graduate of the Massachusetts Institute of Technology, who has instructed in the metallurgy department at the Michigan College of Mines for the last two years, has been recently appointed assistant professor of metallurgy and ore dressing, under Prof. Houle. The chemistry department will be headed this year by S. R. Brinkley, a graduate of a Georgia college and an assistant at Columbia last year. Mr. Brinkley succeeds Dr. A. A. Koch, resigned.

## INDUSTRIAL NEWS

At a meeting of the board of directors of the Westinghouse Electric & Manufacturing Co., held in New York, Aug. 26, Henry D. Shute was elected treasurer to succeed T. W. Sieman who recently resigned to accept the position of secretary-treasurer of the Union Switch & Signal Co. Truman P. Gaylord, district manager of the Electric Company at Chicago, was elected acting vice-president to succeed Mr. Shute.



## Editorial Correspondence

### SAN FRANCISCO—Aug. 27

**Gold Mining Investments in California** will no doubt be retarded by the effects of the European war on financial conditions in London, Berlin and New York, whence most of the capital for mining investments comes. The report that the dredging land deals that have been under negotiation in Trinity County for several months must be postponed is probably true, as the John Hays Hammond interests are back of them. Another report is that the Golinsky copper mine in Shasta County was under consideration by German investors and that George Bayha, engineer and promoter, has wired from New York that owing to the war he will not continue his journey to Germany where it is claimed the purchasers of the Golinsky awaited his arrival and the closing of the deal. Whether or not these reports are strictly true the present conditions in Europe and in this country due to the European war will interfere with the exploitation, development and reopening of old mines that were, in early days, among the producers and only await judicious investment and intelligent development to place them again in the producing and dividend class. The dredging industry is in particular need of financial encouragement at present. The great dredging fields are gradually being worked out and new fields are eagerly sought. Dredging men are and for some time have been pessimistic regarding the future of the industry, and there have been a number of reasonably good prospects turned down in the last two years, due largely to disagreement as to terms and to the fact that in some instances the land is not as rich as desired. There are still some large areas of dredging lands and many smaller holdings that will pay to dredge, since both the initial cost of installation and the operating costs have been reduced. While the financial depression may not largely effect the present operators who are acquiring new dredging lands, it will be difficult to finance new enterprises until European affairs are settled.

### SALT LAKE CITY—Aug. 27

**The Reports of Sensational Gold Strikes** continue to come from the new camp of Fortuna, in Beaver County, and the Salt Lake Commercial Club has received requests for definite information as to this camp. At a recent meeting of the board of governors, it was decided to send four members of the mines committee to visit the camp and district, and report on it. These members will leave for the camp Aug. 29, and will file a report on their return.

**The Utah Copper Co. Will Continue Its Steam-Shovel Operations** on the same scale as has been in force since the recent curtailment. The company has been treating 12,000 to 14,000 tons per day at the Magna plant. At present, there are twice as many shovels on stripping as in ore, and it is proposed to continue stripping as long as possible. About the same amount of overburden will be removed this year as last, but less stripping will be required each succeeding year. There is at present enough ore exposed to permit mining for a long period. The curtailment has been about 50%, or from a normal monthly output of 13,200,000 lb. to 6,600,000 lb. copper.

**The Bureau of Mines Rescue Car**, which was in this city at the convention of the American Institute of Mining Engineers, will visit the various coal camps of the state, giving instruction in mine-rescue work and first aid to the injured. The car is in charge of J. C. Roberts and assistant, Mr. Boardman. The itinerary is as follows: Leave Salt Lake City, Aug. 15, for Sunnyside, and remain until Aug. 22; then Hiawatha to Aug. 29, Black Hawk to Sept. 5, Mohrland to Sept. 12, Kenilworth to Sept. 19, Standardville to Sept. 26, Storrs to Oct. 10, Castle Gate to Oct. 17, Schofield to Oct. 24, Winterquarters to Oct. 31, Clear Creek to Nov. 7, and return to Salt Lake City, Nov. 8.

**The Smelters Are Now Buying Direct From the Mines**, instead of advancing 25c. or 40c., as was done a short time ago. Local settlement by the smelters from Aug. 12 to 19, inclusive, was at the rate of 56½c. per oz.; Aug. 20 to 22, at 56c. On Aug. 23-24, settlement was made at 55½c.; Aug. 25, 53½c.; Aug. 26, 54½c.; Aug. 27, 55c. Since Aug. 19, silver has been paid for in full. Lead has been settled for at \$3.57 to \$3.90. The provisional advancement of 10c. per lb. is

still being made on copper. The recent advance in the price of spelter to \$5.87½ will be of benefit to some of Utah's zinc producers. The May Day and Lower Mammoth of Tintic have put men to work on this class of ore and will start shipping. The Gemini, Yankee and other properties will doubtless ship. The Scranton, in North Tintic, produces a high-grade zinc ore from large deposits of zincite, and also zinc-carbonate ores. The zinc in the other properties mentioned is chiefly in the form of the carbonate. Zinc sulphides are mined with other ores in Bingham, Park City and other parts of the state. Park City produces zinc middlings and concentrates, and the Bingham mines of the United States company furnish zinc, which is treated at this company's Huff electrostatic plant.

**Curtailment of Ore Shipments** has gradually been taking place at Bingham, Tintic, and Park City. These camps have decreased their output approximately 50%. At Bingham, the Utah Copper has cut down its output one half; the Bingham-New Haven has practically closed, the Yampa, and Utah Metal have stopped work. Shipments of copper ore from the United States properties have been reduced, but shipments of lead ore are being made as usual. The Utah Consolidated has curtailed shipments. The Utah Apex is shipping lead ore and the Ohio Copper is operating. At Tintic the output for the week ended Aug. 14, was 76 cars as compared to 146 cars two weeks ago. The Lower Mammoth, May Day, Uncle Sam, Gemini, Godiva, Ridge & Valley properties are working, but have stopped shipments,—though some ore is being shipped by lessees. The Eureka Hill, Mammoth, Grand Central, Gold Chain, and Ophongo are employing only enough men to keep the properties in repair. The Centennial Eureka is shipping 200 tons a day, the Eagle & Blue Bell, 75 tons, The Iron Blossom and other Knight mines, 125 tons, and the Chief Consolidated, 150 tons. At Park City the Silver King Consolidated and Silver King Coalition are shipping about as usual. The Daly-Judge has suspended shipments. The Daly West is installing its new equipment. All of the smelting plants are operating, though on account of the reduced output of concentrates by the Utah Copper, the Garfield smeltery is running three reverberatories and one blast furnace, as compared to five reverberatories under normal conditions.

### SPOKANE—Aug. 28

**Stockholders of the National Copper Mining Co.** have formally ratified the action of the board of directors in authorizing an increase from \$2,000,000 to \$2,500,000 in the capitalization of the company. The new issue of the stock will go to the owners of the Continental company, which holds the Nellie claim, adjoining the National's property in the Cœur d'Alenes, near Mullan, Idaho. The National's oreshoot has been proved to run through the Nellie, and the claim will now be in possession of the company. The National mill is temporarily shut down, but full production will be resumed before December.

**The Increase in the Price of Zinc** due to the European war situation has resulted in increased activities in the Nine Mile zinc mines, near Wallace, Idaho, in the Cœur d'Alenes. Instructions have been received by the managers of the Interstate-Callahan mine to put on 100 miners at once and push the property to its capacity as fast as possible, according to advices received in Spokane. The Interstate-Callahan company will take advantage of the zinc situation as fast as its plant can be enlarged, and with this end in view a new milling plant has been planned for construction at an early date. The location of the plant has not been made public, but it is known that several different places have been looked over, including a site at Enaville, Idaho. At this point, the company would have plenty of room and plenty of water for milling purposes, as well as cheap transportation from the mine after the necessary arrangements for tunnels and tramways were completed. The present mill is unable to handle a quantity approaching the output of the mine. The Interstate is easily the largest zinc mine in Idaho.

**Increased Activity Is Apparent around the Republic Mine**, at Republic, Wash., now that the Rathfon Reduction Works people have clear title to the property. This week three groups of lessees were given blocks in the mine, and more are negotiating for leases. By next week Manager F. W.

Bewley expects to have leasing contracts in effect. Aside from the leases the company has six miners on the payroll. A car of high-grade ore was sent out last week by the Rathfon Reduction Works from the Republic mine to the Granby plant, at Grand Forks, the last to be shipped to that point until the furnaces blow in again. The company is negotiating with the Tacoma works to take the ore.

**President Conrad Wolfe, of the United Copper Mine,** at Chewelah, Wash., who was on Vancouver Island looking after his mining interests when the European war closed down the plants and mine, arrived at Chewelah last week to size up the situation and decide upon the future action. Mr. Wolfe stated that he had decided to keep from 20 to 25 men at work indefinitely, extending the north drift, filling the ore bins with the shipping ore and taking out just enough low-grade to keep the mill running one shift. He will continue the raise from the 400-ft. level to the old shaft, which will open up some new stoping ground. Much depends on what the smelters do as to the length of time work will be continued. All the smelters are refusing to receive ore and no returns will be made on the July shipments until the exchanges reopen to establish the price of metal.

**Directors of the Caledonia Mining Co.,** operating the Caledonia mine, at Kellogg, Ida., do not consider it necessary to build up a large treasury fund, but have decided to disburse the monthly profits in dividends as soon as the treasury contains a reasonable operating fund, according to the annual report of the corporation received in Spokane this week. The report adds:

"The present unsettled condition of the metal market makes it impossible for us to say definitely when we can commence the payment of dividends. We assure you that this will be done as soon as business conditions permit. In settling the litigation with the Bunker Hill & Sullivan Mining Co. last fall, arrangements were made whereby the Caledonia ore was to be worked through the lower tunnel belonging to the Bunker Hill & Sullivan Co., and milled in a mill furnished by them. In order to connect with the Caledonia mine it was necessary to drift off to one side of the Bunker Hill tunnel and connect with the Caledonia workings by means of two double-compartment raises. This work was begun last October, was completed in July and is now in full operation. The mill furnished us by the Bunker Hill Co. was completely overhauled and equipped by them with modern concentrating machinery. It has a daily capacity of 300 to 350 tons, can be operated at a low cost and will make as high extraction as any mill in the district. During the month of June the mill was started and run a few days; 360 tons of concentrates and crude ore were shipped. In July the production amounted to over 700 tons, about half of which were concentrates. This tonnage was produced with an average of 23 men employed in the mine. The crude ore gives net smelter returns of \$50 to \$60 per ton; the concentrates run from \$60 to \$140 per ton. A large body of good ore is developed in the mine. The cash statement shows \$50,172 on hand in the new corporation and \$36,933 held for the stockholders in the old company, before the capitalization was increased to settle the Bunker Hill litigation. The Caledonia is one of the Coeur d'Alene producers whose stock is held largely in Spokane."

#### MARQUETTE—Aug. 29

**The Newport Company's Power House at "K" Shaft** was partially destroyed on Aug. 22, when some unknown person placed a large quantity of dynamite near the building and set it off. The electric hoist used for raising coal to the automatic stokers was wrecked and damage done to the coal dock. The boilers remained intact, otherwise the damage would have been heavy. Every effort is being made to locate the guilty party.

**The Bodies of All Seven Men Entombed** in Pickands, Mather & Co.'s Balkan mine at Alpha, a few weeks ago, when a run of overburden suddenly filled the workings with sand, have now been recovered. It was unnecessary to sink a drop shaft, as advised by some mining men. Instead, the drift which the sand had engulfed was cleared of its debris. The work was perilous, but was performed without mishap. The condition of the mine was found much better than expected. Most of the bodies were 250 ft. distant from the shaft. Winston Bros., contractors, who are removing the overburden from the orebody, are making excellent progress.

**The Newberry Furnace of the Lake Superior Iron & Chemical Co.** will go into blast on Sept. 10, and the Ashland plant will be started on Dec. 1. Both plants have been idle since last spring to permit repairs. A new chemical plant is being constructed at the Ashland furnace to replace the one destroyed by fire a few months ago. It will be ready for operation when the furnace is blown in. The Elk Rapids and Boyne City furnaces of the company have been in

operation continuously all year. No reason is given for starting the other plants at this time, and the management states that the pig-iron market has not shown any improvement.

**The Jones & Laughlin Steel Co. Laid Off 100 Men** at its Forbes mine, near Iron River, a few days ago, and little mining will be done until next spring, if the market is in better shape by that time. A similar number of miners have been let out at the company's Rolling Mill mine, at Neegaunee. Little ore will come to surface, only enough men being employed to carry on development work and keep the workings open. The management states that it can purchase ore at a lower figure in Minnesota than it can be mined for in Michigan. Last year, Jones & Laughlin used the ore from all of its mines and purchased about 1,000,000 tons from other producers.

#### CALUMET—Aug. 29

**The Following Notice Has Been Posted** at the Calumet & Hecla mine and at the various subsidiaries: "On account of the extraordinary conditions prevailing in the copper market, it has become necessary for this company to curtail production. Beginning Sept. 1, all the mines, mills and smelters of this company will be operated three-quarter time, and the rate of wages existing immediately prior to May 1, 1912, will be restored. A reduction of 15% in the pay of the officers and all those not affected by the increase May 1, 1912, will be made. A similar reduction will be made in the pay of all officers and employees of the Boston and New York offices."

**The Tamarack Mining Co. Has Suspended All Operations** with the exception of pumping, and the La Salle Copper Co. has shut down the two shafts on its property. At the Osceola Consolidated Mining Co., No. 5 shaft has closed down. The Quincy Mining Co. has announced a reduction in wages of about 12½%, starting Sept. 1, and a material reduction will be made in production. Some of the exploration companies that have sufficient money to carry on development work for some time are maintaining their working forces. The Keweenaw is sinking its shaft below a depth of 700 ft. and is putting some of the houses at the Phoenix in shape for occupancy.

#### TORONTO—Aug. 29

**The Drop in the Price of Copper,** together with the inability to market copper and nickel, has resulted in a partial closing down of the Canadian Copper Co.'s plant at Sudbury. Approximately 1500 men have been laid off and little new work of any importance will be undertaken.

**The European War Had a Decided Effect** upon mining throughout Ontario. While the gold mines are the least likely to be affected, and, in fact, while it is strictly to their advantage to keep operating, trouble may arise over the failure to receive supplies of cyanide, zinc dust and Danish pebbles for tube-mill work. There has already been a shortage of cyanide and unless further supplies are received in the near future, some of the mines may be forced to close down, or at least to depend altogether upon amalgamation and store their tailings for future treatment.

**The Cobalt Bank Managers and Mine Operators** have made arrangements under which the banks will make advances covering the cost of operating the mines, accepting silver bullion as collateral. This will enable the companies to meet current liabilities and continue production. Owing to the closing down of several mines and the reduction of working forces about 1200 men in the camp are unemployed. It is expected that the action of the banks will prevent any further suspension of operations and probably lead to the resumption of work by some of the mines temporarily closed down. Bullion shipments have been resumed, the express companies accepting it for trans-Atlantic shipment at the same rate of insurance as before the war.

**The Iron and Steel Industry,** which has been paralyzed by the war, is likely to experience a sudden revival, owing to the demand in England for building and construction material, the supply of which from Germany and Belgium has been cut off. These products include wire nails, wire rods, steam tubes, bars and sheet metal, the imports of which from Germany to England have been steadily increasing. A syndicate of British manufacturers has commissioned P. G. Donald to visit Canada with the object of arranging with Canadian steel mills for a supply of these products for the British market. The Steel Company of Canada, with headquarters at Hamilton, Ont., the Dominion Steel Corporation and other large manufacturers have been notified of this new opening for Canadian trade, which is likely to tax their capacities in these lines to its full extent, and as soon as arrangements can be effected through Mr. McDonald, a resumption of activity is anticipated.



# The Mining News

## ARIZONA

### Cochise County

COMMONWEALTH (Pearce)—Reported that Commonwealth mine of Nevada Arizona company has been closed.

WILLIE ROSE (San Simon)—Hoist, oil engine, compressor and air drills have been ordered. Last car shipped to El Paso averaged \$12 per ton.

TRUAX (Bisbee)—Juniper Flats gold prospects continue to attract attention. From original discovery in Truax ore running up to \$500 per ton has been found. Small force taking out high-grade.

CALUMET & ARIZONA (Douglas)—During July all previous records at C. & A. smelting plant were broken; 85,000 tons ore smelted, producing 7,350,000 lbs. copper. Recently there was received from mines at Bisbee heaviest ore train yet shipped carrying 65 cars of 50 tons each.

### Maricopa County

KAY COPPER (Phoenix)—New concentrator is being installed on Kay and Harris copper properties, 50 miles north of Phoenix. Expected to be running within the next 30 days.

### Mohave County

GOLCONDA (Golconda)—Sauer truck working three shifts lands about 60 tons of ore daily at railway to be shipped to Bartlesville.

## CALIFORNIA

### Placer County

BANNER (Auburn)—Mine is being examined by Wilbur E. Sanders, consulting engineer for purpose of enabling owners to decide on contemplated development.

DAIRY FARM (Sheridan)—Development has been temporarily curtailed at this copper mine operated by Guggenheim interests, on account of conditions resulting from war in Europe. Work still progresses on grading narrow gage railroad from Sheridan to mine.

BLACK CAÑON (Westville)—Electric power for hoist, mill and compressors being installed. Current to be furnished by Pacific Gas & Electric Co. over pole line 13 miles long from Alta. Machinery for installation at mine being hauled from Auburn on S. P. R. R., over 30 miles at cost of \$1.50 per 100 lb.

### Plumas County

ENGEL (Keddie)—Forty of the 100 men employed have been laid off on account of condition of copper market and financial disturbance. Installation of concentrating plant interrupted.

### San Bernardino County

ATOLIA (Atolia)—Leasers at tungsten mines notified that leases will expire Aug. 30. Cleanups by leasers in July aggregated about \$12,000.

HARDENBERG (Jackson)—Operation reduced, but mine and mill are kept in shape for early resumption of regular extraction and milling.

### Shasta County

DRY SLIDE (Keswick)—Mine bonded to I. Washburn and D. W. McCleum of Los Angeles, with option of purchase at \$25,000. Mine was producer about 15 years ago when there was large demand for siliceous quartz by smelting plants.

### Trinity County

ALTA BERT GOLD DREDGING CO. (San Francisco)—Poverty Slide hydraulic mine adjoining dredging ground of this company near Trinity Center will be taken over Sept. 1. Negotiations consummated over a year ago, and in August certain required payments made, giving possession. Price is \$100,000. Poverty Slide worked since 1908 by hydraulic methods.

## COLORADO

### Clear Creek County

CAPITAL CENTRAL (Georgetown)—Property secured under bond and lease by J. R. Reed and associates; 300-ft. crosscut tunnel started which will cut vein at depth of about 200 ft. L. G. Davenport in charge of operations.

GOLDEN EMPIRE (Empire)—Satisfactory progress being made in driving main crosscut. Ore struck in Arvada tunnel. Track to mill being laid on new grade. Additional bins will be constructed and mill will be ready to resume operations in near future. Mr. Tefft is superintendent.

BIG FIVE (Idaho Springs)—Work resumed on Edgar property which is intersected by crosscut tunnel at distance of 2500 ft. from portal. Development being performed in breast of East drift 400 ft. from tunnel. Streak of ore is 8 in. wide and assays \$40 per ton. Lessees are driving through Lake and Windsor Castle properties to reach Bald Eagle vein. West drift on Lake vein has opened a 3-ft. pocket of \$8 ore. Development on Bellman vein, about 9000 ft. from portal of main crosscut, has opened up promising shoot of ore which runs \$25 per ton. Lessees will sink 100-ft. winze to prospect this ore shoot in depth. Connection is being made on tunnel level between Bellman and Lake workings for purpose of ventilation. East drift on Lake vein has opened pocket of \$15 ore 4 ft. wide. Big Five Co. is driving east on tunnel level to connect with Dove Nest shaft. Total advance to date is about 1000 ft. Company plans to drive another 2500 ft.

## Lake County

SIWATCH TUNNEL (Leadville)—New leasing company composed of local business men resumed development in this Sugar Loaf Mt. tunnel and opened into Venture vein. A 40-ft. raise disclosed 3 ft. of ore said to average \$50 in gold and silver.

EVENING STAR (Leadville)—About midnight, Aug. 14, hoisting engine was destroyed by incendiary charge of high explosive that must have been placed within motor parts; 112-hp. electric motor was blown to pieces and frame and drum of engine broken. Fire, set at same time, destroyed building, which was not occupied. Two nights before, owing to curtailment in market demands for ore, night shift had been laid off and it is supposed that the damage was perpetrated by one or more of men thus dropped from payroll. George E. Cramer, manager, is having plant rebuilt. Self-dumping skip at shaft collar at time of fire was permitted to drop to bottom of the shaft when fire had burned the brake shoes on the drum, and intense heat appears to have severed the hoisting cable close to the drum. Fortunately, surrounding buildings were uninjured.

## San Juan County

SILVER LAKE (Silverton)—Mill being remodeled and will be ready for operation as custom plant within next few weeks. New flotation process developed by manager L. R. Clapp and others, installed. Estimated that process will increase recovery and reduce milling costs. Process is especially designed for treatment of gray copper ores.

MEARS-WIFLEY MILL (Silverton)—Plant recently placed in operation, now running three 8-hr. shifts. Designed to treat from 400 to 500 tons of tailing per day from Silver Lake mine. Average value of these tailings estimated at \$3. Quantity in Silver Lake available for treatment placed at about 500,000 tons. Planned to operate plant the entire year. Equipment includes double deck 12x47-ft. Wifley tables, one of latest inventions of A. R. Wifley of Denver, designed to handle large quantity of low-grade material. Tailings from these tables reground in tube mill and passed to multiple-deck Wifley slimers. Mill was built by Otto Mears, A. R. Wifley, and associates. C. J. Estabrook, superintendent.

## San Miguel County

STANDARD CHEMICAL CO. (Vanadium)—On account of collapse in market for carnotite ore, due to war, all mining operations of this company discontinued and most of miners laid off. Few men employed on surface improvements.

## Summit County

CONGRESS (Breckenridge)—D. A. Knight has moved ten-stamp mill from the Carrie mine and is erecting it at the Congress. He will install also two Wifley concentrators and a Deister slimer.

PROSPECTING AND LODE MINING in Breckenridge district is about twice as active as year ago. While this indicates reasonable improvement in conditions, little can be said concerning new operations. July production of placer gold figured at \$127,620, of which 96½% was recovered by the three boats of the Tonopah Placers Co., and the one boat of the French Gulch Dredging Co. Placer bullion here averages about \$16 per oz.

## Teller County

GOLD COIN (Goldfield)—Water level is lowering in the Gold Coin shaft and 12th level will soon be recovered.

MARY McKINNEY (Anaconda)—Promising strike made by lessees in Block 34, in shallow shaft near summit of Gold Hill.

NEVILLE MILL (Altman)—Plant on property of Free Coinage Gold Mining Co. on Bull Hill, is being remodeled and treatment capacity will be increased. Foundations for new machinery laid and machinery purchased. Plant will probably be in operation sometime in September.

DILLON (Goldfield)—Sinking of three-compartment shaft by Granite Gold Mining Co. is proceeding at rapid rate. Estimated that depth gained in August will be almost 80 ft. The rock has recently been hard but is now becoming softer and more rapid sinking is being accomplished.

VINDICATOR (Independence)—New concentrating mill now under construction will be operated by electricity. Power will be supplied by Arkansas Valley Railway, Light and Power Co. and will be delivered to Vindicator transformer station at pressure of 20,000 volts. Vindicator contemplates early installation of large motor-driven air compressor.

DEEP DRAINAGE TUNNEL—New water courses recently cut resulted in increased flow. On Aug. 1 this was 7590 gal. per min., now increased to almost 10,000 gal. per min. Soft and caving ground has recently hindered rapid driving. At present two shifts are kept at work. Machinemen and helpers break ground on one shift and muckers and trammers clean out waste on second shift. Soft ground being timbered with square sets to avoid chances of further caving.

## MINNESOTA

### Cuyuna Range

1914 CUYUNA TONNAGE—Unless conditions change materially toward close of the season, it is unlikely that 1914 Cuyuna Range shipments will exceed 1,000,000 tons. Of this amount, Kennedy will ship 180,000 and Armour No. 2 about 240,000. Remainder will be split among Rowe, Thompson, Cuyuna-Mille Lacs and Ironton. Pennington-pit and Armour No. 1 have not started shipping.

**Mesabi Range**

**SPRUCE** (Eveleth)—Cave-in at No. 1 shaft resulted in death of one laborer, Aug. 26, being first fatality at mine in three years.

**MISSOURI  
Joplin District**

**COMMERCE ROYALTY & MINING CO.** (Miami, Okla.)—Rich vein of blende encountered in shaft at 140-ft. level.

**MORNING HOUR** (Yelville, Ark.)—Operations resumed after lengthy shut down, due to low ore prices. Week-end run produced car of concentrates.

**OTIS MNG. CO.** (Joplin, Mo.)—Operations now carried on from two shafts, with double crew employed. Two weeks' operations produced three 60,000-lb. cars of blende.

**MOORE TRACT** (Galena, Kan.)—Subleases awarded by T. B. Carpenter, holder of first lease, and many companies soon to start work. One shaft now in ore at 65-ft. level.

**J. M. SHORT AND HERMAN JONES** of Joplin are sinking shaft at Neck City, Mo., to reach good strike made at 135-ft. level. Property near Quick Seven mine, famous zinc producer.

**AMERICAN L. Z & S. CO.** (Aurora, Mo.)—Two strikes made in local field by this company, one on Terre Haute land and other on lease of Tooker tract. Both at deep levels.

**F. C. WALLOWER OF WEBB CITY, Mo.**, is erecting 350-ton concentrator at Monticello mine, Prosperity, Mo. Will have 400-ton hopper. Mine is on Connor land. Operations will be conducted at 190-ft. level.

**PAUL & SONS** (Granby, Mo.)—Rich lead strike is being worked by this company on Granby Mining & Smelting Co.'s land. Drifting from 90-ft. level uncovered one of the best finds ever made in local field. Ore assayed as high as 84.8%.

**FOLMER TRACT** (Galena, Kan.)—Lease taken by Arbuthnot Bros., of Webb City, Mo., who will prospect at deep level. Only shallow runs worked heretofore. A. J. Burnham, formerly superintendent of Oronogo Circle mine in charge. Extensive prospecting campaign planned.

**CENTURY MNG. CO.** (Joplin, Mo.)—Company has leased Prairie Chicken mine, including 40-acre tract, adjoining Lockie land which it now is working. Prairie Chicken was one of greatest producers in district and Century company believes good deposits were never touched.

**MONTANA****Madison County**

**MINES CLOSED DUE TO WAR**—Moffett mine in Cole Cañon, Eastern Pacific, above Virginia City, and many other copper and silver mines in district are closed, due to refusal of smelting works to accept ore for treatment during present period of curtailment.

**Silver Bow County**

**BUTTE & SUPERIOR COPPER CO.** (Butte)—Monthly report was filed in Federal court, Aug. 20, in compliance with order of court made last November in suit of Minerals Separation Co. against Butte-Superior. According to report, 29,652 tons was treated by flotation, at cost of \$3.08 per ton. Concentrates amounted to 7207 tons, assaying 54.93% zinc, 26.473 oz. silver and 0.0547 oz. gold.

**NORTH BUTTE MINING CO.** (Butte)—Speculator mine, principal property of this company, was shut down Aug. 23 for an indefinite period, to make needed repairs at the mine. All told, about 500 men will be laid off, while balance of regular crew will be employed in retimbering about 300 ft. of Speculator shaft. Various other repairs will be made during shut down. This will reduce amount of ore sent to Washoe smelter by about 750 tons per day. Since general curtailment was put into effect, mine has been running at practically 60% of normal output, which in round figures is 2,000,000 lb. copper per month.

**BUTTE MINE WORKERS' UNION** (Butte)—At regular meeting, held Aug. 24, union went on record as favoring suggested plan that all mine employees wear button of new organization. Volunteer committee of 40 men was accepted to see action carried out. Committee, appointed to wait on management of various Butte mines, regarding safety and sanitary conditions in mines, reported that managers' attention was called to some faults in enforcement of regulations. Committee also reported having presented several other propositions to managers which it is hoped managers will agree to.

**MOUNTAIN VIEW MINE** (Butte)—At 5 p.m., Aug. 20, fire was discovered near air shaft of this mine, property of the Anaconda company. Owing to prevailing high wind, fire made rapid progress and became difficult to handle. Engine room, ore bins, dry house, headframe and quantity of timber were destroyed, causing damage to amount of \$50,000, which is partly covered by insurance. Fire reached three or four sets down the shaft before it was under control, and for time it was feared that it might reach underground levels and spread into levels of adjoining mines. These were immediately closed down and the men hoisted to surface. No one was hurt. Mountain View mine has been closed for five months, pending repairs to main shaft. Hoisting engine damaged by fire and put out of commission. New fireproof buildings will be erected and temporary hoisting engine will be installed at shaft. It has been said that fire may have been caused by sparks from passing engine, which, fanned by the high wind, started the blaze. All men laid off during fire in the adjoining mines went back to work following morning.

**BULLWHACKER COPPER CO.** (Butte)—President Patrick Clark has issued statement to stockholders in which he explains attitude in recent transactions in court and elsewhere, affecting affairs of company. Clark, through Clark Bros. and Klein Trust Co., of Spokane, advanced from time to time money to carry on operations at mine and mill up to total of about \$125,000. When trust company demanded payment of both principal and interest on notes, company could not even pay interest and was unable to borrow sufficient funds to carry on operations. Mr. Clark has made arrangements for auditing company's books, a summary of which

will be sent to all stockholders. Stock is nonassessable and cannot be made assessable without unanimous consent of stockholders. To do this and to give all stockholders chance to subscribe to fund for paying off indebtedness and continue operations, he suggests that all owners of stock endeavor to have same transferred on the company's books to their own name and give their proper address. Also that stockholders appoint committee to call for meeting and at meeting arrange that stockholder pay his proportion of indebtedness. Mr. Clark expresses faith in Bullwhacker and believes that with completion of mill, property will soon enter ranks of dividend payers.

**NEVADA****Elko County**

**MIZPAH CONSOLIDATED** (Mizpah)—Tunnel has been driven 1365 ft. to cut Nevada Northern vein. Oreshoot has been cut at 800 ft. from portal.

**NEVADA MINING, MILLING & POWER CO.** (Contact)—A 100-ton leaching plant will be built, it is stated. Electric power may be transmitted from Snake River Valley.

**ELKO-JARBIDGE GOLD MINING CO.** (Jarbridge)—Main tunnel cut shoot of good-grade gold ore at point 125 ft. from portal. About 1000 ft. of development work done.

**Esmeralda County**

**GOLDFIELD MERGER MINES CO.** (Goldfield)—New pumps will be installed in St. Ives shaft. Centrifugal pump of 500 gal. per min. capacity will raise water from sump at 1800-ft. level to 1325-ft. level, and from there to surface, water will be raised by triplex pump.

**JUMBO EXTENSION** (Goldfield)—During 1913 a total of 3564 ft. of development work was done at a cost of \$6.28 per ft. Milling costs were \$3.65 per ton, including freight and treatment. During first five months of 1914, development work was 1698 ft. at cost of \$5.72 per ft., and 8653 tons of ore were produced at profit of \$53,343. Milling cost at Bonnie Clare mill, \$3.15 per ton. Agreement is now in operation with Goldfield Consolidated to mill 100 tons per day at cost of \$3 per ton.

**Humboldt County**

**DRILLING FOR POTASH** will be done by United States Geologic Survey in Black Rock Desert near Gerlach, on line of Western Pacific, it is stated. Thought that potassium chloride will be found; at upper end of desert, potassium nitrate is found in almost pure state.

**HATCH LEASING CO.** (National)—Lease on Jumbo and Combined lode claims of National Consolidated Mining Co. secured and crosscutting under way.

**LEONARD CREEK PLACER MINES** are causing considerable excitement. About 50 men are washing gold, and much property has changed hands.

**ROCHESTER CONSOLIDATED MINING & MILLING CO.** (Rochester)—Excavating for new mill will commence at once, it is stated. Water-supply line is half completed.

**Lander County**

**DISCOVERIES AT MCCOY** of lead-silver and gold-bearing veins have been made. District heavily covered by debris, which makes prospecting difficult and expensive.

**RUBY SILVER MINING CO.** (Battle Mountain)—Winze from upper tunnel, 110 ft. deep, is in good-grade ore for total depth. Raise being lifted in ore from lower tunnel to meet this winze. Lower tunnel will also be driven; this is expected to increase water supply. Large-size Denver quartz mill will be installed in milling plant, recently completed. New pipe line laid to supply mill with additional water.

**Lincoln County**

**GOLD STRIKE EAST OF POCHE** has been made. Many claims staked and new camp named Gold. On property of Cowan & Kennedy, 8-ft. shoot of ore assaying \$16 in gold and \$1 in silver been opened in 32-ft. shaft, it is stated. Option taken on this property by Eastern men, and contract let for 200 ft. of sinking and 100 ft. of drifting. Gold is 23 miles east of Pioche.

**Lyon County**

**BLUE JAY** (Yerington)—Hoist installed and stoping under way on 100-ft. level; 300-ft. tunnel being driven to connect with shaft. Shipping will begin soon.

**NEVADA-DOUGLAS** (Ludwig)—Recent development on 100-ft. levels of Casting Copper and Ludwig mines opened ore of shipping grade. Leaching plant siding is being built, and grading for plant and ore bins will commence at once, according to statement of A. J. Orem, president of company.

**Nye County**

**DECREASE IN TONOPAH PRODUCTION** is due to suspension of milling operations of North Star, MacNamara and Merger Mines Co. Work also stopped at Cash Boy and Umattilla. Silver bullion produced by Tonopah Mining Co., Tonopah Belmont, West End and Jim Butler is being stored; gold bullion is sold.

**ROUND MOUNTAIN MINING CO. VS. ROUND MOUNTAIN POWER & WATER CO.**—A compromise may be made in this injunction proceeding and the case settled out of court.

**TONOPAH EXTENSION MINING CO.** (Tonopah)—Capacity of milling plant will be increased by 100 tons daily; extensive improvements now under way. Mill building increased in size; 10 stamps, tube mills, agitators and thickeners will be installed. New bullion house, blacksmith shop and hoist house built, a 150-hp. Nordberg hoist ordered, and a 60-drill compressor received. About 70% of ore now being milled is from development work on 950-, 1020-, 1100- and 1170-ft. levels.

**Storey County**

**CROWN POINT-BELCHER** (Virginia City)—Water in joint incline lowered 15 ft. recently, making total of 95 ft. recovered below 1600-ft. level. About 100 tons of ore per day being hoisted from these two mines.



**NEW JERSEY**

**BASIC ORE MINING CO.** (Buttville)—Plant at Dahlke iron mine is closed. No market for 100,000 tons of ore on hand. Suspension will throw 100 men out of work. Company owns Pequest furnace, which will be dismantled.

**NORTH CAROLINA**  
**Montgomery County**

**STEELE MINE**—A plant is being erected to treat the dumps and consists of roaster and amalgamator. It is reported that the mine will be unwatered and developed.

**COGGIN MINE** (Eldorado)—The mill is again in operation after a three weeks' shutdown on account of burning out the armature coils of the generator that supplies power for driving part of the mill machinery.

**OREGON****Baker County**

**ANTICIPATING** that diversion of water of Snake River through big tunnel at Ox Bow power plant will uncover gold-laden gravel on the river bottom, many old-time placer miners are gathering at and near Copperfield, in this county, awaiting the opening of the big tube. The gravel and sand of Snake River are known to be rich in gold and black sands, but the gold is fine and difficult to save. It is thought, though, that larger gold will be found in river bottom, when the water is diverted.

**Douglas County**

**PLATINUM ORE ON ROCK CREEK** has been found and samples of ore are now being assayed.

**Grant County**

**BEN HARRISON** (Granite District)—Baker County mining men are of the opinion that this mine is to be sold to the United States Smelting, Refining & Mining Co., which is now operating the Rainbow mine in the Mormon Basin. Experts employed by the smelting company have recently shipped out 6000 lb. of samples from the mine.

**UTAH****Beaver County**

**THERE IS EXCITEMENT AT FORTUNA**, a new gold camp near Sheep Rock mine, in Bald Hills, at base of Tushar Mountains, in the Newton mining district. A number of ledges opened and reported to pan free gold. Camp is 12 miles northeast of Beaver City.

**NOONDAY** (Milford)—Word received to resume work at this property, near Old Cave mine.

**LEONORA MINING & MILLING** (Milford)—Ore opened recently is being developed. Mine is in the Star district.

**CAVE** (Milford)—Lease was recently taken on this property by J. S. Wilkin, superintendent at the Moscow, and associates.

**MONITOR** (Milford)—Settlement received on recent shipment gave net returns of \$14 per ton. Ore carries gold, silver and lead. Property is about half a mile southeast of Moscow.

**SHEEP ROCK** (Beaver City)—Ore carrying gold and silver being sacked for shipment and five-stamp mill is running. New ore reported to have been opened on 300 level. Twenty men are employed.

**SOUTH UTAH** (Newhouse)—Limited tonnage of high-grade copper ore recently mined. This occurs in small pockets and fissures in monzonite, consisting chiefly of chalcopryrite and tetrahedrite. Small force only being worked between 500- and 600-ft. level. No work being done in other parts of mine or at mill.

**MOSCOW MINING & MILLING** (Milford)—Drifting from bottom of new working shaft at east end of property has cut silver vein productive in upper workings. Drift is on the 800 level and out about 450 ft.; 3 or 4 in. of ore opened, and will be followed upward on bedding. On pitch of ore-shoots, this will give about 425 ft. below old stopes. Ore makes at intersection of mineralizing fissures with certain limestone beds, and rakes to northeast. Prospecting will be done for back vein, which is 50 ft. in footwall of silver vein. New shaft is double compartment and manway, paid for by mining sufficient ore from old workings, without crowding production. Shaft will obviate much rehandling of ore. Working forces were reduced to 13 men, but 50 men were added Aug. 22, as result of improved conditions in metal market.

**Juab County**

**CENTENNIAL-EUREKA** (Eureka)—Vein carrying gold has been opened in work on ledges above shaft. Assays up to 2 oz. gold obtained. Find will be thoroughly prospected.

**CHIEF CONSOLIDATED** (Eureka)—Report for six months ended June 30, 1914, shows 23,739 tons of ore shipped, which brought net returns of \$183,387. Net profit for half year, after payment of dividends and all charges, was \$57,610. Development amounting to 3350 ft. was done.

**GRAND CENTRAL** (Eureka)—Mine in good condition and shipments from 36 to as high as 60 cars per month have been made this year; output for first six months was 289 cars, about 14,000 tons of ore. At special directors' meeting, Aug. 4, it was decided to increase working forces at mine to normal, and to resume work at the Gold Chain soon.

**MAY DAY** (Eureka)—New body of lead-silver ore being developed along main tunnel level is being further opened, though no shipments are being made at present, owing to condition of metal market. Ore is above that mined by Kitt-Mitchel lease in early part of year. Some zinc ore opened below lead deposits in this neighborhood. Small cyanide mill operated by Griggs, Carter & Castleton is handling fair tonnage.

**EAGLE & BLUE BELL** (Eureka)—High-grade galena ore found to continue from 1450 level down to 1600, lowest level. Drifting in ore being done from bottom of winze sunk from 1550 to 1600. Ore ran well in silver and lead. Preparations being made to sink main shaft to 1700 from 1550; this work will be started as soon as word is received from managing director in Boston. With this done and connections made with winze, ore can be sent to the surface without re-handling.

**Salt Lake County**

**BINGHAM-NEW HAVEN** (Bingham)—Mine and mill are being put in shape for normal production, and new flumes built to carry off tailings.

**DIPPER GOLD MINING & MILLING** (Alta)—Bond and lease taken on this property by Evans & Shields. Ground adjoins Wasatch-Utah, near mouth of Little Cottonwood Cañon.

**WASATCH MINES** (Alta)—Lessees in tunnel of old Columbus Consolidated have 100-ton shipment ready. Some ore recently opened in old Flagstaff ground owned by this company.

**ALTA CONSOLIDATED** (Alta)—Ore being mined from east drift on tunnel level, where it has been followed 55 ft. Three cars lead-silver ore were shipped recently, another in transit.

**MICHIGAN-UTAH** (Alta)—Settlement received on 108 tons of ore mined by lessees on City Rocks. Settlement also been made on two other shipments. Tramway has been repaired, and is again operating.

**SOUTH HECLA** (Alta)—Shipments of 35 to 40 tons of ore daily being made. No effort to crowd production. Ore coming from new body opened for several hundred feet above tunnel level carries silver and lead principally.

**OHIO COPPER** (Bingham)—New coarse-crushing equipment is in operation and showing good results. Further additions to plant will be made. Fine slimes are treated in separate building. About 2300 tons daily being treated.

**Tooele County**

**NEW STOCKTON** (Stockton)—Eagle-Campbell-Mills lease is making shipments from stopes on 500-ft. level. Material carries lead and silver. Some jigging being done.

**DULUTH & UTAH DEVELOPMENT** (Stockton)—Company's property recently purchased by Bullion Coalition and dividends or distributions from money received have been made to stockholders; in April, 4½c. per share, and on Aug. 13, 7½c. per share. Further distributions due after final payment is made.

**SOUTH DAKOTA****Lawrence County**

**HEIDELBERG** (Two Bit)—Company secured ample subscriptions for treasury stock to provide funds for further development. Stock all sold in Deadwood. Shaft work commenced.

**RATTLESNAKE JACK** (Galena)—With receipt of nine motors and duplex classifier this week, practically all machinery for cyanide mill under construction was delivered except motor and second classifier. Mine work showing well.

**ORO HONDO** (Lead)—Auxiliary hoist being installed on 1000-ft. level to facilitate sinking main shaft, now 1150 ft. deep. Several houses being constructed, for residence of superintendent, bunk house, boarding house, etc.

**CANADA****Ontario**

**BEAVER** (Cobalt)—Work in mine, closed down three weeks ago, again resumed.

**CROWN RESERVE** (Cobalt)—Mine shipped this week 55,000 oz. silver to London market, to be followed by another consignment soon.

**BUFFALO** (Cobalt)—Three drills are in operation underground. Final clean-up is being made at high-grade mill preparatory to closing down.

**MOND NICKEL CO.** (Sudbury)—Mine practically closed down owing to the difficulty in marketing ore. Just reorganized and registered in England with nominal capital of £1,700,000 in £1 shares.

**TOUGH OAKES** (Kirkland Lake)—This company has made another payment of \$200,000 of the amount due on the purchase money. Force has been reduced to 60 men, but there are still 200 men at work.

**DOMELAKE** (Porcupine)—Reported that No. 1 vein, drifted on for 70 ft. at 180-ft. level, shows width of 9 to 11 ft., with ore averaging \$16. No. 3 vein has been opened up for 200 ft. at 300-ft. level, where 2½ ft. of ore is reported to average \$28.

**MEXICO****Chihuahua**

**BATOPILAS MINING CO.** announces that its staff of Americans left El Paso for mines, Aug. 27, in charge of John R. Harbottle, who has been appointed general manager. More active operations will now be carried on, although business has been operated on small scale under two of its most trusted Mexican employees since former American staff left in September, 1913.

**Sonora**

**W. C. LAUGHLIN CO.** (Nogales)—On June 26, auto truck carrying bullion was attacked near La Colorada, Sonora, en route from San Javier, by Mexican bandits, and mill superintendent Thomas Farrell, formerly of Dolores, was killed. On Aug. 6 another bullion train was attacked by Yaqui Indians near La Colorada, killing Arthur Squires, an employee, and securing 39 bars of bullion valued at \$21,000. Since this, Indians have raided American owned property of Toledo on Yaqui River. Due to inability of mine owners to get supplies through territory controlled by Indians, business is at standstill.

# The Market Report

## METAL MARKETS

NEW YORK—Sept. 2

The Metal Markets are still in a disturbed and unsettled condition. Some of the minor metals are holding sharp advances, due to the war conditions abroad.

### Copper, Tin, Lead and Zinc

**Copper**—The situation remains unchanged. The refineries are beginning to feel the diminished supply coming from the mines.

Base price of sheet copper is 18c. per lb. for hot rolled and 19c. for cold rolled. The usual extras are charged, and higher prices for small quantities.

Exports of copper from New York for the week were 6001 long tons. Our special correspondent gives the exports from Baltimore for the week at 525 tons.

Exports of copper in all metallic forms from the United States in the fiscal year ended June 30, were 435,175 long tons; an increase of 57,705 tons over 1912-13. Exports of copper ore and matte in 1913-14 were 71,410 tons, or \$3,257,089 in value.

Imports of copper in metallic form in the fiscal year ended June 30, 1914, were 125,686 tons; in ore and matte, 50,121; total, 175,807 long tons.

The London correspondent of the "Boston News Bureau" reports that there is very little to tell about copper. The London Metal Exchange is closed and the authorities ruling it have forbidden the furnishing of prices to the newspapers—a very wise step, seeing that many contracts are based upon paper prices and that today everything is at sixes and sevens. There is not much doing in manufactured material, but one small but comforting sign is that the government has begun to allow the movement of stuff intended for government use, and has permitted shipments of sheets, tubes, etc., for India and Australia.

**Brass Prices** are announced by the American Brass Co. as follows, to date, from Sept. 1: Sheets, high brass, 14½c. net per lb.; low brass, 15½c. Wire, high brass, 14½c.; low brass, 15½c. Rods, high brass, 14½c.; low brass, 16½c. Tubes, brazed, 18½c.; open seam 18½c. Angles and channels, 18½c. Scrap allowances are 8½c. net per lb. for high brass and 9½c. for low brass.

**Tin**—Supplies have been coming forward more freely.

It has been announced that the postponed Banka tin sale was to take place Sept. 3. The tin offered is about 2500 tons, at a limit of 25 florins.

**Lead**—Business in this metal has been in reduced volume but prices have been held firmly.

**Spelter**—The foreign demand appears to have culminated on Aug. 26, at which time as high as 6.10c., St. Louis, was paid for a lot for export, while at the same time American consumers were able to buy at 5½c. American consumers, however, were at no time on the recent upward movement active buyers. On the contrary, they were supposed to have overbought their immediate requirements at the low prices of last July and earlier, the mid-year statistics strongly indicating such a position. A confirmation of this suspicion developed last week in the overtures made by some consumers for the resale of round lots, they being attracted evidently by the fine profit offered by the sharp rise. These offers, together with the halt in demand from abroad caused the market to soften, and from day to day the metal was offered down, without there being many acceptances. Indeed, the volume of business during the week has been light. At the close spelter was freely offered at 5.75c. This recession is regarded, however, as only temporary, inasmuch as a further demand from abroad is expected. We have heard of some new inquiries from distant countries. Some sales of brass special and intermediate spelter are reported at fancy prices, while high-grade spelter fetches in the neighborhood of 10c. per pound.

## Other Metals

**Aluminum**—The market is still quiet, with only moderate transactions, and deliveries chiefly on contract. Prices are quoted at 20@20½c. for No. 1 ingots, but are rather nominal.

**Antimony**—The market is quiet, but strong. Only a small business is reported, but some scarcity is apprehended and stocks are firmly held. Ordinary brands—Chinese, Japanese, etc.—are quoted at 12@13c. per lb. Cookson's is held at 15½@16½c., and 14½@15c. is asked for other special brands.

**Quicksilver**—The market is strong and rather excited, though prices have eased off a little from the extreme high point. The present quotation is \$75@85 per flask of 75 lb., New York.

## Gold, Silver and Platinum

**Gold**—As heretofore noted, the Bank of England has made arrangements to buy gold to be deposited to its credit at Ottawa, Canada. S. Montague & Co. write from London, Aug. 20: "The Bank of England has extended the purchase of gold abroad against payment in this country to another British possession besides Canada. The Bank is prepared to purchase gold tendered in British South Africa, and will make advances to the extent of 97% of the value on the basis of 77s., 9d., per ounce standard. The balance will be adjusted on the arrival of the gold in London."

Imports of gold in Great Britain seven months ended July 31, were: £35,488,752; exports, £25,134,365; excess of imports, £10,354,387, against £11,760,064 last year.

**Platinum**—The situation is not materially changed. The future is uncertain, as it is difficult to say what will be done when present stocks are exhausted. Dealers ask, for immediate delivery only, \$50 per oz. for refined platinum, and \$57.50 per oz. for hard metal.

**Silver**—The market has been sustained abroad chiefly by mint orders. The break on Aug. 28 in the price of silver was caused by the arrival and offering of an unusually large volume of silver from the United States. Price closes today (Sept. 2) fairly steady.

The London quotations for the week have been 25d. on Aug. 27; 23½d. Aug. 28; 23½d. on Aug. 29; 24¼d. on Aug. 31; 24d. on Sept. 1; 24d. on Sept. 2, the closing.

## DAILY PRICES OF METALS

NEW YORK								
Aug. Sept.	Sterling Exchange	Silver, Cts. per Oz.	Copper		Lead		Zinc	
			Electrolytic, Cts. per Lb.	Tin, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
27	*	55	*	†40	3.90	3.70	6.00	5.85
28	*	53½	*	†40	3.90	3.75	6.15	6.00
29	*	53	*	†40	3.90	3.70	6.00	5.85
31	*	53½	*	†39	3.90	3.75	6.10	5.95
1	*	53½	*	†38	3.90	3.70	6.00	5.85
2	*	53½	*	†37	3.90	3.70	5.95	5.70

\*No quotations. †Nominal.

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, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.



Shipments of silver from London to the East, Jan. 1 to Aug. 20, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£4,639,000	£4,454,500	D. £184,500
China.....	542,000	42,000	D. 500,000
Total.....	£5,181,000	£4,496,500	D. £684,500

In Washington, Aug. 28, the United States Mint bought 200,000 oz. of silver at 53.10c. per oz., delivered at San Francisco.

Imports of silver into Great Britain seven months ended July 31, were valued at £7,061,279; exports, £8,491,478; excess of exports, £1,430,199, which compares with an excess of imports of £723,913 last year.

Gold and silver movement in the United States seven months ended July 31, as reported by the Bureau of Statistics, Department of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports.....	\$72,388,585	\$117,643,959	\$38,258,234	\$29,463,126
Imports.....	35,769,107	34,135,137	20,930,629	13,828,568
Excess, exports...	\$36,619,478	\$83,508,822	\$17,327,605	\$15,634,558

Exports of merchandise for the seven months were valued at \$1,200,925,440; imports, \$1,141,094,215; excess of exports, \$59,831,225. Adding the excess of exports of gold and silver gives \$158,974,605 as the total export balance.

**Zinc and Lead Ore Markets**

**JOPLIN, MO.—Aug. 29.**

Blende advanced another \$2 on high, closing at \$53, the assay base \$48@50, the metal base \$47@48 per ton of 60% zinc; calamine base \$24@27 per ton of 40% zinc. Average of all grades of zinc \$45.20 per ton. Lead continues unchanged at \$46 per ton of 80% metal contents, and the highest price paid was \$46.55 per ton; the average, all grades, is \$45.80 per ton.

Sellers held until Friday and some Saturday for an assay base of \$54, but buyers declined to offer over \$50, and the sellers capitulated tonight, with the market looking easier for next week. If sellers are not ready to sell on Thursday they will need to hunt the buyers, hereafter.

**SHIPMENTS WEEK ENDED AUG. 29.**

	Blende	Calamine	Lead	Values
Totals this week.	9,259,060	1,016,440	1,578,260	\$268,910
Totals this year.	355,128,720	26,569,460	60,340,750	\$8,934,090
Blende value, the week,	\$218,730; 8 mos.,			\$6,893,950.
Calamine value, the week,	\$14,040; 8 mos.,			\$305,130.
Lead value, the week,	\$36,140; 8 mos.,			\$1,435,010.

**PLATTEVILLE, WIS.—Aug. 29**

The base price paid this week for 60% zinc ore was \$49 per ton. The base price paid for 80% lead ore was \$45 per ton.

**SHIPMENTS WEEK ENDED AUG. 29**

	Zinc ore, lb.	Lead ore, lb.	Sulphur
Week .....	3,327,600	58,000	797,000
Year .....	102,025,650	3,578,500	24,641,570
Shipped to separating plans during week, 4,937,420 lb. zinc ore.			

**IRON TRADE REVIEW**

**NEW YORK—Sept. 2**

The condition of the iron and steel trades just now is uneven, but the outlook is not discouraging.

While buyers do not seem disposed to take on new commitments very freely, specifications on contracts are on a good scale and mills continue to run on about the same proportion of capacity as last week. The smaller number of new orders seems to be largely due to disturbed financial conditions; this being especially the case with structural steel. A number of contracts on buildings have been held up or postponed for this reason.

While there are large expectations for export trade, little has actually developed so far. There is a good deal of inquiry, but not many actual sales, nor can much be expected until conditions improve abroad.

Pig iron is quiet and rather dull. Sales this week have been chiefly of small lots for early delivery.

In the complaint filed by the Low Moor Iron Co. and others against the Chesapeake & Ohio and other railroads, complaining of discrimination in rates, the Interstate Commerce Commission has ordered reductions in the rates on pig iron from Low Moor and other points in Virginia to Baltimore, Philadelphia, New York and Boston on and after Oct. 15. The new rates to be to Baltimore \$2.25, to Philadelphia, \$2.75, to New York, \$3, and to Boston, \$3.25.

It is announced that the Tennessee Coal, Iron & R.R. Co. will shortly put one of its blast furnaces at Ensley, Ala., on ferromanganese. The company has a stock of Indian and Brazilian ores on hand.

**PITTSBURGH—Sept. 1**

The market continues very quiet here so far as new business is concerned. Specifications on contracts are coming in fairly well and the mills continue running at about the same rate as they have done for two weeks past. One exception, perhaps, is with the tinplate mills which are running just now at a higher rate than most others. The anxiety as to the supply of tin has largely passed away and the metal can now be had at reasonable prices, with the prospect that there will be no interruption in the supply.

Additional orders have been received for 1000 tons of wirerods for export to England. Other inquiries are pending, but the export business is in some doubt at present on account of high insurance rates, the difficulty in securing tonnage and also the financial disturbances preventing arrangements for payment.

The advance in steel prices from the very low level of two or three months ago is firmly held. These advances have been \$2 a ton in bars, plates, shapes and wire and \$4 in sheets. They have not been due so much to the war, and would probably have been made even if war conditions had not intervened, although the resulting uncertainties have helped to maintain them. The fact is, that advances were due and it is pretty certain that they have not in any degree checked buying.

The falling off in new orders, especially for structural material, is due largely to financial conditions and to the uncertainty as to the future.

**Pig Iron**—The market continues rather slow and sales for the week have been mainly in moderate quantities. W. P. Snyder & Co. report the August average for bessemer iron at \$14, and for basic, \$13 at Valley furnaces. There has been no change in these averages for five months now, an unusually long period. Foundry iron shows very little change. Quotations are \$14 for bessemer, \$13 for basic, \$13@13.25 for No. 2 foundry, all at Valley furnaces, 90c. higher for Pittsburgh delivery.

**Ferromanganese**—Quotations for resale lots have fallen from the extraordinary figures lately given although as high as \$100 per ton is said to have been paid. Supplies of English metal are now being received and it is expected that contract deliveries will be resumed.

**Steel**—No changes are reported, and prices continue at about the same level as last week.

**COKE**

**Coal and Coke Tonnage of Pennsylvania R.R. lines east of Pittsburgh and Erie, seven months ended July 31, short tons:**

	1913	1914	Changes
Anthracite .....	6,138,175	6,347,822	I. 209,647
Bituminous .....	28,833,947	27,521,539	D. 1,312,408
Coke .....	8,569,978	6,075,020	D. 2,494,958
Total .....	43,542,100	39,944,381	D. 3,597,719

The total decrease this year was 8.3%, the larger part of it being in coke.

**Exports and Imports of Fuel in the United States, six months ended June 30, in long tons:**

	Exports		Imports	
	1913	1914	1913	1914
Anthracite.....	2,067,930	1,872,477	30	7,233
Bituminous.....	8,031,888	5,749,132	724,614	668,764
Coke.....	489,920	350,812	33,121	52,504
Bunker coal.....	3,732,403	3,852,889	.....	.....
Total.....	14,322,141	11,825,310	757,770	728,501

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The greater part of the trade, both imports and exports, is with Canada.

**CHEMICALS**

**NEW YORK—Sept. 2**

The general market is still disturbed and uneasy. Business in heavy chemicals is not active and prices are unsettled.

**Arsenic**—The market is quiet, with moderate sales. Prices are a shade weaker at \$4.25 per 100 lb. for both spot and futures.

**Copper Sulphate**—Business continues on a moderate scale, but steady, with unchanged prices. Quotations are \$4.50 per

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments.	2,069,960	1,279,537	585,387	1,114,758	2,879,396
Anaconda.	23,800,000	22,900,000	23,500,000	23,800,000	.....
Arizona, Ltd.	3,286,000	3,570,000	3,092,000	3,742,000	3,300,000
Copper Queen.	7,637,042	7,562,723	8,388,203	7,613,719	7,817,318
Calumet & Ariz.	5,875,000	5,450,000	5,495,000	4,630,000	5,940,000
Chino.	5,399,814	5,926,591	5,496,875	5,486,419	.....
Detroit.	1,973,725	1,790,926	2,105,034	2,129,100	1,966,526
East Butte.	1,546,180	1,178,000	1,179,762	1,215,323	.....
Giroux.	287,980	45,948	429,553	425,000	.....
Mason Valley.	1,250,000	862,000	916,000	950,000	.....
Mammoth.	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con.	5,218,257	4,880,043	4,959,589	4,483,175	.....
Ohio.	597,520	610,518	625,000	605,000	.....
Old Dominion.	2,997,000	2,779,000	3,302,000	2,937,000	2,962,000
Ray.	6,036,908	6,089,362	6,300,847	5,941,567	.....
Shannon.	1,082,000	1,012,000	1,056,000	1,049,227	1,084,000
South Utah.	406,381	247,641	55,394	62,990	.....
Tennessee.	1,262,184	1,370,800	1,336,950	.....	.....
United Verde*.	3,100,000	3,000,000	3,100,000	2,900,000	.....
Utah Copper Co.	12,323,493	12,739,757	13,208,483	12,870,063	.....
Lake Superior*.	11,000,000	13,000,000	12,500,000	16,000,000	.....
Non-rep. mines*.	8,200,000	8,000,000	8,200,000	8,000,000	.....
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	.....
Total prod. ....	109,649,444	108,644,846	110,082,077	.....	.....
Imp., bars, etc. ....	22,676,605	17,043,191	19,081,487	23,885,521	.....
Total blister ...	132,326,049	125,688,037	129,163,564	.....	.....
Imp. ore & matte.	7,029,646	10,400,122	10,586,506	9,157,540	.....
Total Amer. ....	139,355,695	136,088,159	139,750,070	.....	.....
Arrivals—Europe†	17,572,800	17,299,520	13,558,720	19,040,000	.....

† Does not include the arrivals from the United States.

100 lb. for carload lots, and \$4.75 per 100 lb. for smaller parcels.

**Nitrate of Soda**—Conditions are unchanged, and the market is rather quiet. Current quotations are 2.15c. per lb. for spot, 2.12½c. for September, 2.10c. for October, 2.05c. for November and December, 2.02½c. for 1915 deliveries.

The Chilean Congress has authorized an appropriation for government loans to producers, in order to prevent the closing of some works.

PETROLEUM

Exports of mineral oils from the United States in July were 230,269,485 gal. For the seven months ended July 31

the exports were 1,132,824,757 gal. in 1913, and 1,348,173,519 in 1914; an increase of 215,348,762 gal., or 19% this year.

OTHER ORES

The Carnegie Steel Co.'s new schedule, dated Aug. 5, gives prices per ton of 2240 lb. for domestic manganese ore delivered at Pittsburgh or Etna, Penn., or at South Chicago, Ill., as follows: 49% metallic manganese, 26c. per unit; 46 to 49%, 25c.; 43 to 46%, 24c.; 40 to 43% manganese, 23c. per unit.

Prices are based on ores containing not more than 8% silica or 0.20% phosphorus, and are subject to deductions as follows: For each 1% in excess of 8% silica there shall be a deduction of 15c. per ton; fractions in proportion. For each 0.02%, or fraction thereof, in excess of 0.20% phosphorus there shall be a deduction of 2c. per unit of manganese per ton.

Ores containing less than 40% manganese or more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at the buyer's option.

Settlements are based on analysis of sample dried at 212° F., the percentage of moisture in the sample as taken being deducted from the weight.

Company	Assessments		
	Delinq.	Sale	Amt.
Alameda, Ida.	Sept. 5	Sept. 29	\$0.005
Alta, Nev.	Aug. 18	Sept. 11	\$0.03
Andes, Nev. (post.)	Aug. 28	Sept. 18	0.03
Aurora-Sampson, Ida. (post.)	July 18	Sept. 18	0.002
Big Elk, Ida.	Aug. 25	Sept. 25	0.001
Black Bear, Ida.	Sept. 1	Oct. 1	0.01
Blue Star, Ida.	July 28	Sept. 25	0.03
Cons. Imperial, Nev. (post.)	Aug. 27	Sept. 18	0.01
Con. Virginia, Nev.	Sept. 3	Sept. 24	0.10
Eagle Mountain, Ida.	Aug. 22	Sept. 22	0.001
Emerald, Utah.	Aug. 15	Sept. 12	0.0033
Great Western, Nev. (post.)	Aug. 25	Sept. 15	0.01
Huron, Mich. (Iron)	.....	.....	3%
Hypothek, Ida.	Aug. 17	Sept. 15	0.01
Idaho & Los Angeles, Ida.	Sept. 7	Sept. 25	0.005
Idaho-Nevada, Ida.	Sept. 7	Oct. 1	0.001
Laclede, Ida.	Aug. 21	Sept. 14	0.005
Lehi Tintie, Utah.	Aug. 12	Sept. 17	0.0025
Lucky Calumet, Ida.	Aug. 21	Sept. 21	0.005
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Sept. 21	0.01
New Hope, Ida. (post.)	July 13	Sept. 11	0.002
North Star, Ida.	Aug. 8	Sept. 10	0.0015
Ophir, Nev. (post.)	Aug. 31	Sept. 24	0.10
Oreano, Ida. (post.)	July 24	Sept. 25	0.002
Plutus, Utah.	Aug. 28	Sept. 15	0.002
Sandstorm-Kendall, Nev.	Aug. 10	Sept. 14	0.01
Sierra Nevada, Nev. (post.)	Aug. 28	Sept. 18	0.10
Tintie Standard, Utah.	Aug. 10	Sept. 14	0.005
Torino, Ida.	Aug. 10	Sept. 10	0.001
Utah Metal, Utah.	.....	Oct. 1	0.05

Monthly Average Prices of Metals

Month	SILVER					
	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	26.887	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	26.609	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	63.078	60.640	.....	29.088	27.986	.....
October	63.471	60.793	.....	29.299	28.083	.....
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.

Month	TIN			
	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	150.702
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	.....	193.074	.....
October	40.462	.....	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.

Month	SPELTER					
	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	5.562	5.508	5.412	20.706	.....
September	5.694	.....	5.444	.....	21.148	.....
October	5.340	.....	5.188	.....	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.

Month	COPPER					
	New York		London			
	Electrolytic	Standard	Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71.741	64.304	77.756	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.

Month	LEAD					
	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	.....	4.579	.....	20.648	.....
October	4.402	.....	4.253	.....	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.

Month	PIG IRON IN PITTSBURGH					
	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	\$18.15	\$14.94	\$17.35	\$13.25	\$18.59	\$13.90
February	18.15	15.06	17.22	14.15	18.13	14.09
March	18.15	15.07	16.96	13.94	17.53	14.18
April	17.90	14.90	16.71	13.98	16.40	14.10
May	17.68	14.90	15.80	13.98	15.40	14.23
June	17.14	14.90	15.40	13.90	15.10	13.97
July	16.31	14.90	15.13	13.90	14.74	13.96
August	16.63	14.90				



# The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for \$1.33 for \$5, and 100 for \$15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

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