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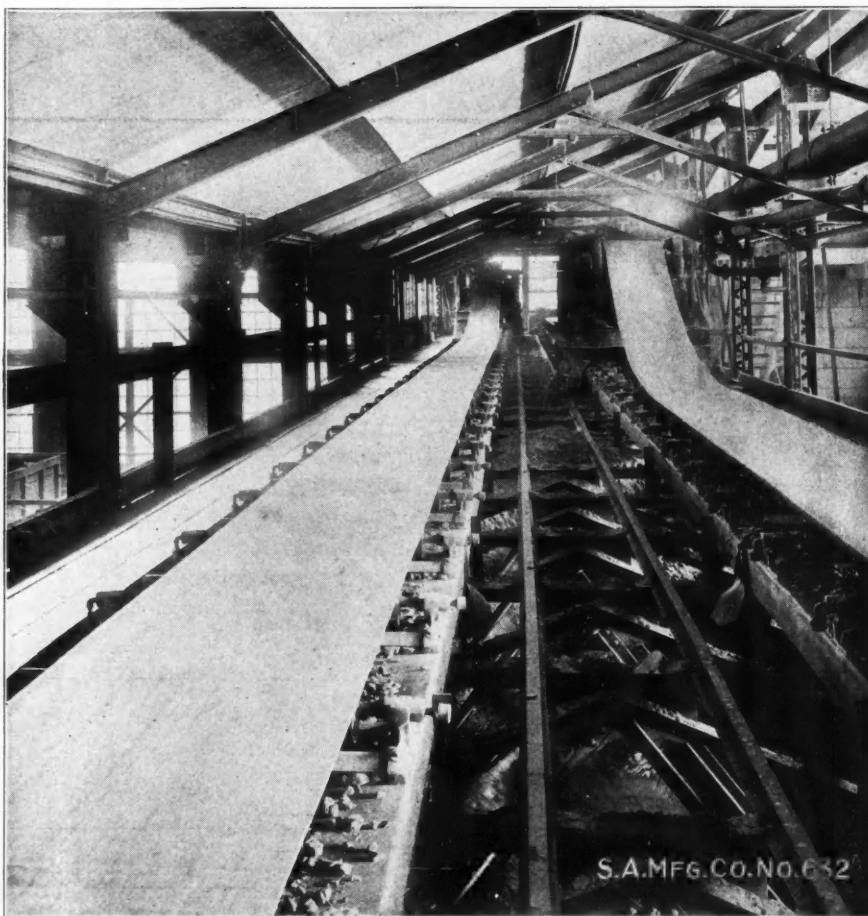


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# Engineering and Mining Journal

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## Copper Operation of Compagnie du Boleo

BY LINDSAY DUNCAN\*

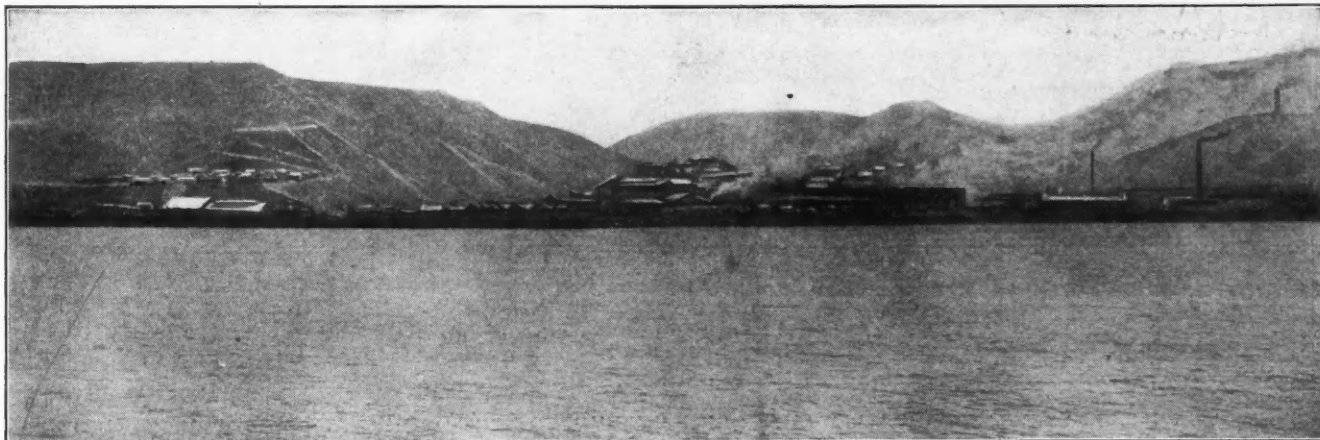
*The isolated situation of the Compagnie du Boleo in Baja California has forced the company to depend on its own resources. Noteworthy results have been gained in solving many problems in the face of difficulties. The copper ore is easily mined and crushed and is self-fluxing, the fines being briquetted before smelting. Slag is granulated and dumped in the sea. The harbor at Santa Rosalia is modernly equipped for handling ocean freight.*

IT was recently my privilege to spend several months at the mines and smeltery of the Compagnie du Boleo at Santa Rosalia, Baja California, in connection with certain proposed changes in their smelting

boarding, I was assured by the captain that I would be uncomfortable and discovered that the commander knew his ship, so that, when Santa Rosalia was sighted on the morning of the sixth day, no regrets were felt.

The central portion of the peninsula of Baja California is an arid and rugged region, volcanic upheavals apparently having alternated with long periods of subsidence and sedimentary deposition. In general appearance it somewhat resembles the country around Great Salt Lake, except that the coloring is much more vivid. The prevailing rocks are sandstone, pumice and obsidian, and, due to the small rainfall, which averages only 0.4 in. per annum at Santa Rosalia, the vegetation is scanty, the most prominent growth being the giant cacti, which grow 20 or 30 ft. high.

Owing to the scarcity of water and the frightfully broken terrain, prospecting is a matter of great diffi-



SANTA ROSALIA FROM THE SEA SHOWING PLANT OF CIE. DU BOLEO IN BAJA CALIFORNIA

methods. But little has been written about this plant in technical literature, and, as it is unique in many ways, a description may be of interest.

Santa Rosalia is about half way down the peninsula on the Gulf side and is almost exactly opposite the port of Guaymas. There are two ways of reaching Santa Rosalia: Either by rail to Guaymas, via Tucson and Nogales, and then crossing the Gulf in a gasoline launch, or else by steamer from San Pedro or San Francisco. The latter method is less used but, in revolutionary times, more certain and was the one selected by me, who was fortunate enough to secure passage at San Pedro upon a small tramp steamer bound from Puget Sound to Santa Rosalia with mine timbers. On

culty, and but little has been attempted. In most places the mountains rise directly out of the sea and attain a height of several thousand feet, although at Santa Rosalia the range is not so high and is broken by several cañons.

The climate is mild and agreeable most of the year, but during the four summer months too warm for comfort, an electric fan being essential for a night's sleep.

The harbor of Santa Rosalia is formed by two breakwaters built of massive blocks of slag. Modern machinery for loading and discharging cargoes has been installed, consisting of double tracks along the breakwaters, traveling cranes, pan conveyors for coke, motor-driven pumps for fuel oil, and conveying apparatus for loading floating timbers into railroad cars. Ocean-going steamers can moor directly alongside of the break-

\*Nevada Consolidated Copper Co., McGill, Nevada.



waters. Needless to say, the harbor facilities form a refreshing contrast with the remainder of the West Coast ports.

The town of Santa Rosalia is divided into three portions, known locally as Francia, El Pueblo and Mexico. Francia contains the hospital, administration buildings and the residences of the French staff. El Pueblo contains the stores, hotel and Mexican quarters, while Mexico is the military post. El Pueblo is at the mouth of a cañon, with "Mexico" on a plateau to the south and Francia on a plateau to the north. The smeltery is built on a narrow flat between Francia and the harbor.

The European quarters are carefully designed for tropical conditions, with high ceilings, verandas on all four sides, many windows and transoms, and separate buildings for the kitchens.

Due to the scarcity of water none of the houses are piped and the allotted water is distributed early each morning by tank carts. This method of water delivery obviates the necessity of alarm clocks, as the water boys not only shake the entire house when delivering the water but also make noise enough to awaken the most persistent sleeper.

Salt water is used for sprinkling the streets, slag granulation, furnace water-jackets and for circulating water in the power-house condensers.

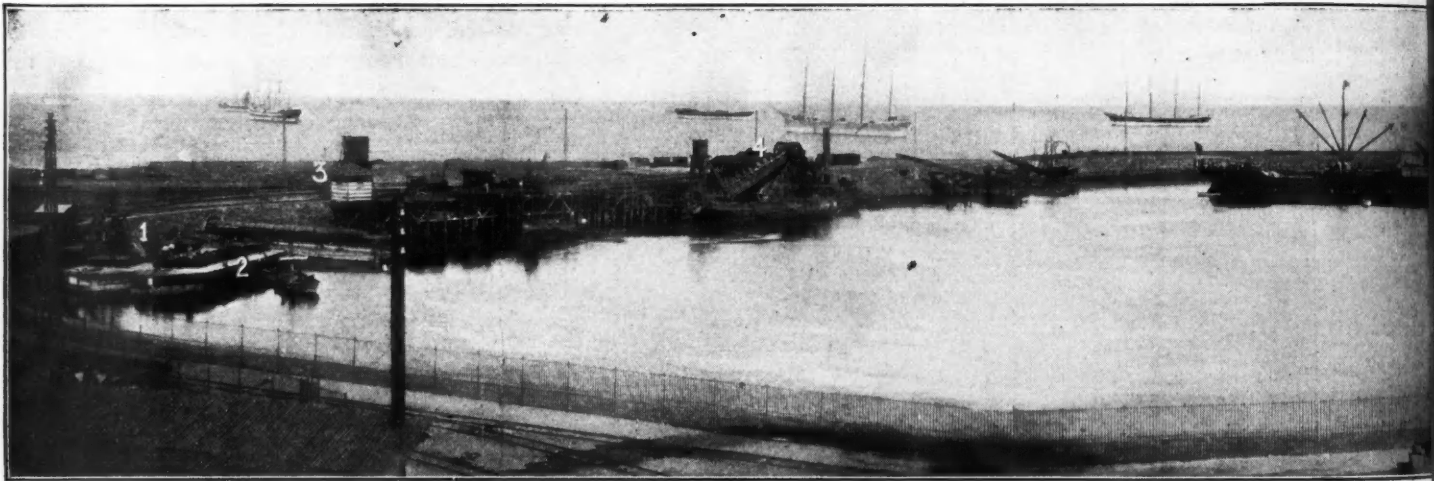
There are fully 10,000 people dependent upon the operations of the Boleo company, and it is necessary to

Mexican bakers carefully trained in years past by some skilled Frenchman. This is celebrated along the entire West Coast. In fact, Santa Rosalia bakers have established shops at several of the West Coast ports which are second in excellence only to the parent shop at Santa Rosalia.

Due to its isolated situation the Boleo company has had to depend upon its own resources to a great extent. Astonishing results have been obtained in training native craftsmen; skilled Mexican brick-masons, machinists, pipe-fitters, metal-workers, electricians, locomotive engineers, and power-house operators are now very much in evidence.

The five copper-bearing veins of the Boleo orebody outcrop on the western slope of a low range of hills five or six kilometers from the coast. Only the three upper veins have been worked to date. The ore dips toward the coast and presumably extends under the Gulf. Although the mines have been worked by their present owners for about 30 years, they show no signs of exhaustion. As is usually the case, the grade of the ore is somewhat lower than in past years but still runs about 8% Cu in the dry ore. A typical analysis is as follows: 43.4% SiO<sub>2</sub>, 9.9% Al<sub>2</sub>O<sub>3</sub>, 8.5% FeO, 5.6% MnO, 3.1% CaO, 4.5% MgO, 2.4% S, 9.3% CuO, 13.1% ignition loss, 28.3% moisture.

The ore is exceedingly hygroscopic and, despite the high-moisture contents, scarcely feels damp to the touch.



THE HARBOR OF SANTA ROSALIA IS MODERNLY EQUIPPED FOR LOADING AND UNLOADING STEAMERS. ONE OF

import a large proportion of the food supply from the United States. The only local food products are fish, which are very abundant and palatable, and cattle, which are principally horns, hoofs and hide. However, the company has started ranching on every available spot within a radius of 50 miles, and in view of the poor soil and lack of rain, has accomplished truly remarkable results.

Large acreages of Burbank's spineless cacti have been planted and bid fair to furnish fodder for several thousands of cattle. Blooded bulls are regularly shipped in from the United States to improve the local breed. The poorer animals are being gradually killed for meat and the better ones retained for breeding which insures a better grade of beef for posterity but is hard on the teeth of a non-vegetarian visitor at the present day.

There is a well-equipped bakery where thousands of loaves of genuine French bread are baked each day by

It is very soft and clayey, crushes easily, and, when dried, disintegrates completely. As mined, the largest lumps are scarcely 9 or 10 in. in diameter.

The veins range from 0.60 to 1.30 meters in thickness and are mined by a method similar to that of the "long wall" system used in coal mining. The ore is handled from several shafts by motor-driven hoists and hauled to the smeltery ore bins in 6-ton, hopper-bottom cars, over a 3-ft.-gauge track. The motive power consists of American-built, oil-burning locomotives.

The ore is screened when drawn from the bins, the coarse ore going directly to the furnaces and the fine ore being briquetted. Due to the character of the ore it briquets without a binder. Belt conveyors are used to take the fine ore from the bins to the briquetting machine and to return the briquets.

Coke, coarse ore and briquettes are trammed from the various bins to the furnace hoppers by hand in buggies.



There are five blast furnaces in operation now. Each furnace is equipped with an oil-fired reverberatory settler. The furnace products consist of matte running 63% Cu and black copper running around 90%. The slag is exceedingly viscous, and before the installation of the reverberatory settlers the copper losses in the slag were very serious.

Several of the most famous European metallurgists have declared the ore would not smelt without fluxing. There is no flux available, but by maintaining a narrow smelting zone and a high slag temperature the ore has been successfully smelted for many years.

Matte and black copper are tapped from the furnaces intermittently, but the slag flows continuously through water-jacketed spouts into the settlers. About 500 kg. of copper per furnace per day are recovered by means of these settlers. The slag is granulated after leaving the settlers, run into steel, hopper-bottomed barges, towed out to sea, and dumped. If the sea is too rough, the granulated slag is stacked by means of a Bleichert tramway.

The home offices of the company are located in Paris, and the director general, M. Etienne Michot, handles the Boleo property as well as several other producing mines in different parts of the world. The property of the Compagnie du Boleo is under the direct charge of the resident director, M. Raoul Plouin.

At the beginning of the European war the company

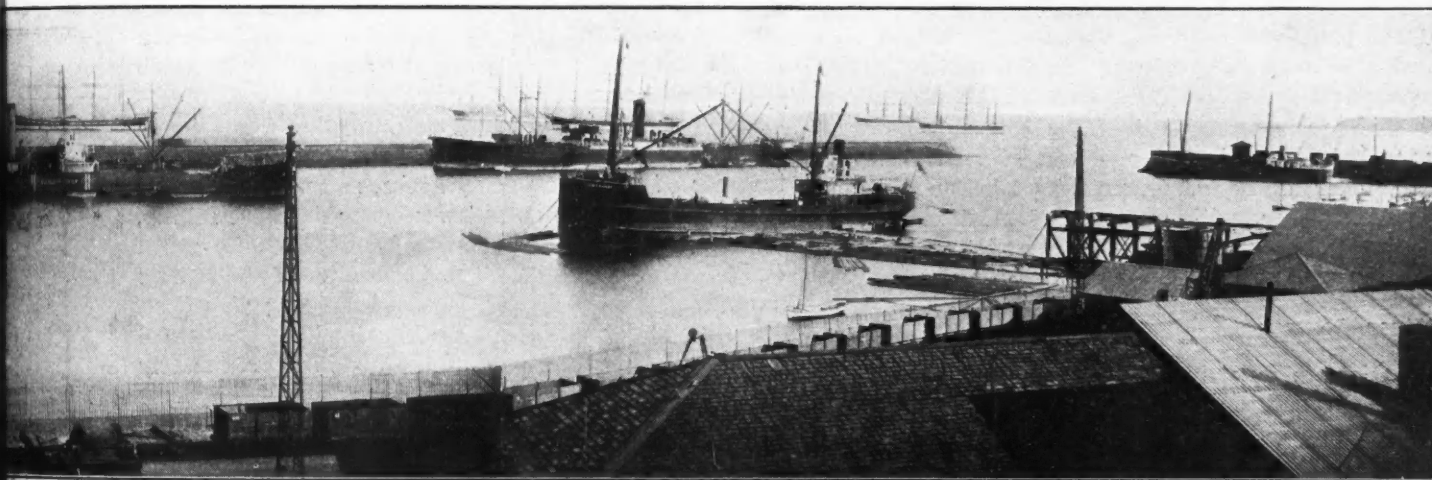
couple of hundred of the Yaqui miners went on a strike for some trivial reason and the Government offered to shoot, and, in fact, nearly insisted upon shooting, a dozen or so of the ringleaders to give tangible evidence of the good feeling existing between the Mexican government and the Boleo company.

One cannot help feeling great admiration for the French spirit which has enabled them to combat and overcome difficulties due to war at home—revolution in the country in which they are operating, irregular transportation, shortage of supplies, lack of skilled labor, and the majority of their technical staff called to the colors. Not only has their production been maintained, but they have planned and successfully carried out very considerable improvements.

### Bauxite for Lining Furnaces

Bauxite can be converted into a refractory suitable for furnaces and crucibles by the following method, according to M. N. Lecegne, in a recent issue of *La Céramique*, republished in *Iron Age*.

A mixture is prepared of one part of anthracite and three parts of bauxite of average composition, and in the state of moisture in which it comes from the quarry. The mass is charged into a furnace lined with refractory material (preferably fused bauxite) and previously heated up with anthracite. Air is blown through



THE BREAKWATERS IS SHOWN WITH (1) SLAG DISCHARGE LAUNDER, (2) SLAG BARGES, (3) SCALE HOUSE (4) DREDGE

was put to the serious disadvantage of having a large majority of its technical staff drafted into the French military service. A framed list of those called hangs upon the wall of the plant office with "Mort sur le champ d'honneur" inscribed after a pathetically large number of the names.

Taken as a whole, the plant is exceedingly interesting to an American engineer in that it represents European design embodying a certain amount of American practice and is adapted to Mexican conditions.

It is the only important copper mine which has operated continuously throughout the recent turbulent times in Mexico. This is due partly to its geographical location, but largely to the diplomatic skill and tact which the French management have displayed in their relations with the various Mexican officials. In fact, the friendship of the Mexican government is at times somewhat embarrassing, as upon one occasion when a

the charge at an initial pressure of about 40 in., water gage, rising afterward to as much as ten times that pressure, according to the depth of the charge, though 160 in. of pressure is the usual maximum.

The temperature rises quickly, and the sudden vaporizing of the water in the bauxite causes the latter to break up and granulate, while the aluminum carbide which is produced burns and raises the charge to over 3000° C. of incandescence. In consequence, the silica is volatilized and the iron, reduced by the action, is expelled by the air blast as a shower of sparks which, in contact with the outer air, are transformed into magnetic oxide. The air blast is continued, to burn off the surplus anthracite and cool down the fused mass, which can then be discharged from the furnace and ground, mixed with crude or calcined bauxite as a binder, molded, dried and fired in the same way as calcined bauxite.

## Milling Practice at McIntyre Mine

A review of the past and present milling practice at the McIntyre is given in a recent paper<sup>1</sup> by A. Dorfman, the superintendent of the McIntyre mill in the Porcupine gold district of Ontario, Canada.

About 80% of the ore now milled consists of gray schist, heavily mineralized with pyrite, with a small percentage of quartz. There is also a quartz ore and a basalt ore. The principal associated minerals are ferrodolomite, forming as high as 80% of the gray schist; pyrite, from 5 up to 20%; also sericite, leucoxene and chlorite. The gold occurs as free grains in the quartz, from extremely fine up to fairly coarse particles; occasionally as fine films in unmineralized schist; but mainly in association with iron pyrite.

The first mill was designed to treat ore mined at or near the surface, consisting mainly of quartz containing free or visible gold, which it was desirable to treat by amalgamation and concentration. A 10-stamp mill and concentration plant was erected, the capacity being 50 to 60 tons per 24-hour day. Crushing to pass a 20-mesh screen, 80% of the contained gold was recovered by amalgamation, and from 10 to 15% by concentration. After two months of operation less and less gold was obtained on the plates and the ratio of concentration decreased from about 32 to 1 until it finally reached 15 to 1, with a consequent accumulation of a large quantity of concentrate requiring special treatment. During the last six months of the 14 months that the plant was operated, about 61.2% of the contained gold was recovered by amalgamation, 24.8% by concentration, and 14% remained in the mill tailing.

Cyanide tests on table tailing, that assayed \$1.35 per ton before leaching, showed 45c. still remaining in tailing after 72 hours' treatment. Similar tests on table concentrate, with strength of solution varying up to 10 lb. KCN per ton, gave not more than 30 to 45% extraction even in several days of leaching.

### FINE GRINDING NEEDED FOR HIGH EXTRACTION

Experiments involving fine grinding and agitation indicated that all the gold in McIntyre ore may be dissolved in a cyanide solution, which rule should hold in regard to ore mined at other properties in the neighborhood. Samples of \$10 ore were ground to pass an 80-mesh screen, and separate tests were made of several grades of fineness. By agitation with cyanide solution for 48 hours a 96% extraction was obtained on material coarser than 150-mesh; while after 40 hours' agitation of material finer than 200-mesh it was found that 99.7% of the gold was dissolved. A concentrate assaying \$40 gold per ton was ground in a pebble mill, in contact with a 5-lb.-per-ton cyanide solution, until all sulphides were finer than 200-mesh, the results showing that an extraction of 95% of the contained gold was possible.

In the present milling practice the run-of-mine ore, the specific gravity of which varies from 2.65 to 2.90, is crushed by a coarse breaker to 3-in. size, further reduction to a maximum of 1½ in. being obtained by rolls. The roll product is fed to Hardinge ball mills that crush to 10-mesh, and this product passes to pebble mills work-

ing in closed circuit with Dorr classifiers. This arrangement reduces practically all the sulphides (of relatively high specific gravity) to finer than 200 mesh, material of that size constituting about 80% of the final product of the pebble mill. A ball mill and a pebble mill, counted as one grinding unit, crush from 150 to 200 tons per 24 hours, according to the size of final product desired. With the higher tonnage, tests have shown the final pulp to contain only 67% of material finer than 200 mesh.

### WASHING RESULTS DEPEND ON NATURE OF PULP

Simultaneously with the crushing and grinding of the ore it is agitated with a cyanide solution containing from 0.6 to 0.75 lb. NaCN per ton of solution. The overflow solution from the primary thickener carries from 77 to 80% of the dissolved gold and goes directly to the precipitation department. The pulp is washed in counter-current decantation tanks, each set treating pulp from one grinding unit. For efficient washing, the design and operation of the tanks must suit the class of ore. Tests showed that in 3½ hours quartz will settle to a pulp containing 35% moisture, gray schist to a 51% moisture pulp, quartz porphyry 60% and sericite 64% moisture. After 18 hours, sericite schist pulp still contains 47% moisture.

The first thickeners installed at the McIntyre were 11 ft. deep. The last two units erected are only 7½ ft. deep and are doing much better work than the deeper ones. It is also noted that while thickeners 32 ft. in diameter will settle 175 tons of ore in 500 tons of solution per 24 hours and yield a clear overflow, the tanks 30 ft. in diameter will handle only 140 to 150 tons of the same ore in the form of a similar pulp.

During a period of 8 months, when operating at the rate of 400 tons per 24 hours, some average costs per ton of ore were as follows: Crushing and rolling, 7.05c.; ball mills, 14.82c.; classifiers and tube mills, 16.75c. The supplies used per ton of ore treated are: Cyanide, 0.35 to 0.45 lb.; lime, 2 to 2½ lb.; zinc dust, 0.40 to 0.42 lb.; pebbles, 4 to 5 lb.; and steel balls, 0.6 to 0.8 lb. The total cost of milling is approximately \$0.88 per ton.

## Chino Quarterly Report

Chino Copper Co. in its 23rd quarterly report, covering the second quarter of 1917, shows an increase of product over the first quarter of 1,321,482 lb. By months the production of copper contained in concentrates was: April, 6,368,874 lb.; May, 6,984,457 lb.; June, 7,193,262 lb.; total, 20,546,593 lb., a monthly average of 6,848,864 pounds.

The total amount of ore treated was 856,600 tons, an average of 9413 tons per day. The average copper content of the ore was 1.704%, compared with 1.6022% for the first quarter, an increase of 0.1018%. The recovery averaged 23.986 lb. per ton of ore treated.

In addition to the copper recovered by milling, there was produced 1,370,668 lb. of copper from shipping ore and 26,833 lb. of copper from precipitates, making a grand total of copper produced of 21,944,094 lb. The net earnings for the period amounted to \$2,992,071 from which dividends amounting to \$2,174,950 were paid, at the rate of \$2.50 per share.

<sup>1</sup>Bulletin 64, Can. Min. Inst., August, 1917.



## Stope Measurements at Messina\*

*A method of making and plotting a survey of the stopes in a South African mine. Use of hanging compass proves simple and accurate in the surveying of stopes in which the use of a transit is awkward or impossible on account of narrow or low quarters. A page from a notebook shows how notes are kept.*

**C**ERTAIN of the stopes at the Messina copper mine in the northern Transvaal presented difficulties in surveying by ordinary methods, and a special procedure was devised.

The orebodies in these stopes are irregular, almost vertical shoots of large cross-section. In some of the stopes a horizontal slice 7 or 8 ft. high is removed and the cavity filled with waste rock, while in the remainder a shrinkage method is used. In both cases the problem is similar.

Prior to stoping, winzes are sunk through the ore to act as airways and waste chutes, and, as the ore is stoped, double-compartment crossed chutes are carried through the filling as nearly vertical as possible—one compartment being used as an ore chute, and the other as a manway. A space of about 18 in. is usually left above the filling, through which it is possible to crawl and reach the back. The ore is generally too soft to stand without temporary timber supports, and these are very numerous in heavy ground.

The first slice (sill) of any stope is horizontal, but the back often becomes inclined as stoping proceeds and may vary considerably in elevation. It was considered that only methods that gave accurate horizontal cross-sections (contours) of the shoots at regular intervals would be satisfactory.

### HANGING COMPASS USED FOR TAKING BEARINGS

Methods involving the use of a theodolite were discarded on account of frequency of insufficient height to work the instrument with the ease and rapidity necessary for economic stope measurement; trouble due to interference by timbers; difficulties incidental to connecting stope surveys with development surveys through long, narrow passes; and necessity of using, as assistants, Kafirs who could not be trusted to work reliably at more than, say, 20 ft. from the observer. In the method finally decided upon, the hanging compass and clinometer are used for the traverses and the polar protractor for details. The general procedure is as follows:

Copper nails with numbered tags are driven into the timbers generally at a corner at the bottom of the manways of the chutes. The nails are tied in to the survey of the level and their elevations determined. In the stope any convenient pass is taken as a starting point. A copper nail (numbered) is driven into the timbers in the same relative position as the nail below, and the distance between the nails measured. The passes can usually be treated as vertical; any deflection is easily determined by the use of a plumb-line or clinometer and compass.

From the upper nail, stout twine 100 ft. or more in length is ranged round the stope as a closed traverse or to the reference nail in the next convenient pass. Supports for the string are provided by means of ordinary nails driven into the timbers, wedges driven into cracks in the rock or long pegs driven into the day's drill-holes.

Supports are considered stations, and the lines are deflected as much as necessary to give the most effective positions. Between stations the lines are drawn taut, care being taken that they foul nothing. The stations may be as close together as necessary, but should not be more than 25 or 30 ft. apart, in order to avoid excessive sag and to keep at a minimum the effect of any error made in reading, or due to local attraction.

The compass is hung on the line at a convenient point, with the zero (north) in the direction the traverse is being run. When all steel, such as hammers, drills, shovels, picks, etc., has been removed 20 ft. from the instrument, the north end of the needle is read as a continuous bearing to  $\frac{1}{4}^{\circ}$ . Steel-buckled belts are avoided, but it is found that the nails in mine boots cause no apparent deflection if the feet are kept vertically below the compass or in line with the needle.

After removing the compass, the clinometer is hung at each end of the line in turn, about 18 in. from the supports, and both readings of inclination noted. There is a difference between the readings due to sag, varying with the tension of the string and the distance between stations.

### POLAR PROTRACTOR FOR CROSS-SECTIONS

Local cross-sections of the stope are then taken by means of the polar protractor. This instrument, though simple, is little used by mine surveyors, and the modified form adopted warrants description:

A circular piece of 16 S.W.G. sheet brass, 8-in. diameter, is marked on one side at every  $5^{\circ}$  from  $0^{\circ}$  to  $360^{\circ}$  in cyclic order. The first and fourth quadrants have the central portions removed, and from  $180^{\circ}$  to the center a slit is cut which is just equal in width to the diameter of the string used (See Fig. 1).

The protractor is placed in position by passing the slit over the string, when it will hang in a vertical plane which is at right angles to the vertical plane of the traverse line, and the zero of the protractor will be vertically over the string at its center. Any tendency of the protractor to slide along steep lines is easily counteracted by the compass clips.

The cross-sections are taken at every significant change in the shape of the stope. The protractor is hung on the line so that the graduations face the observer, who looks in the direction of the traverse. The ring of a linen tape is fastened by a spring hook to the end of a light extensible rod, and by means of the rod an assistant holds it, in turn, on the salient points in the cross-section desired. The tape is drawn taut, the observer reading the inclination and length of the offset, keeping the tape in the correct plane by noting that it is parallel to the protractor. The offsets are limited in length on account of sag, the difficulty of adhering to cross-section plane, and magnification of errors due to reading it. They should not ordinarily exceed 12 ft. The distances of the cross-sections along the traverse

\*A paper by William Whyte, presented at a meeting of the Institution of Mining and Metallurgy, Apr. 19, 1917.



line are noted, and for this purpose it is convenient to lay previously a special draft tape along the line, with its end fastened to the point of commencement.

The field notes of a typical survey which need no explanation, with the exception of the cross-section notes, are appended. In these the encircled figure at the commencement of each line is the distance along the traverse line at which the particular section was taken; the figure before each bar is the inclination of the offset, while the figure following the bar is the length of the offset; thus,  $120/5\frac{1}{2}$  means that, at an inclination of  $120^\circ$  on the polar protractor, the offset is  $5\frac{1}{2}$  feet.

In the office the inclined traverse lines are reduced to their horizontal and vertical components by the slide rule, using the mean vertical angle. The horizontal distances are determined to  $\frac{1}{4}$  ft., and the vertical to 0.1 foot.

Working from the starting point, the elevation of each station is calculated, and if the survey has been closed or tied to other known points, one check on the accuracy of the work is obtained. (Note point D in field notes.)

The results of three calculations, horizontal and vertical components, and elevations are entered in specially reserved columns in the field book. The work is completed graphically, and no other calculations are made.

The graphic records are drawn to a scale of 1:250 on sheets of good-quality tracing paper, foolscap size, and filed in ordinary end-opening folders, each folder being reserved for one stoppe. Coördinate lines are drawn on the sheets, and care is taken that they occupy the same relative position on each sheet in any one folder. They will then register when bound and allow comparison of adjacent contours.

The known reference points are plotted or traced on one of the sheets (known as the key plan) and from these the traverse is plotted by protractor with the compass bearings corrected to true meridian; if the work has been properly done, there should be no material difference in the closures. The traverse is plotted in elevation near the top of the same sheet, using the calculated elevations and horizontal lengths, and working from a datum. Lines are drawn in colored inks (alternately red and yellow) parallel to the datum line, 5 ft. apart to scale, and numbered according to the elevations they represent.

#### METHOD OF PROJECTING CROSS-SECTIONS

The distances at which the polar protractor was placed are scaled along the elevation of the traverse lines, and through these points short vertical lines are drawn. Short lines are also drawn at right angles to the traverse lines, through the projected positions of the points on the plan. These operations give lines which are the traces of the planes on which cross-sections were taken.

In the elevation the cross-sectional planes are rabatted upon the planes of the traverse lines, and the cross-sections are plotted in correct relative position. This is done by means of a paper protractor, marked similarly to the polar protractor, with a  $1\frac{1}{2}$ -in. square cut out of the center (Fig. 1).

As an example: In the plan of the traverse (Fig. 2), let  $\alpha\text{-}\beta$ , perpendicular to  $H\text{-}J$ , represent the plan of the cross-section plane at 12 ft. along the line  $H\text{-}J$ , and in the elevations let the vertical line  $\alpha\text{-}\beta$  represent the elevation of the same plane. Let the plane  $\alpha\text{-}\beta$  be revolved

(rabatted) in a cyclic direction through  $90^\circ$  about its intersection  $o$  with the vertical plane through  $H\text{-}J$ , as an axis, when it will be coincident with the plane  $H\text{-}J$ , and, in elevation, with the plane of the paper. If the outline of the cross-section is now plotted, it appears as shown around  $\alpha\text{-}\beta$  in elevation, where the intersection of  $H\text{-}J$  and  $\alpha\text{-}\beta$  represents the center of the polar protractor and  $\alpha\text{-}\beta$  the 0-180 axis.

The protractor is centered on the intersections of the vertical traces of the cross-sections with the elevation of the traverse lines, and cross-section outlines directly plotted with a scale. This completes the key plan, on which the date of survey and names of party are noted.

Contours are plotted on individual sheets and are taken at the 5-ft. intervals marked on the elevation of the traverse. The sheet of the contour to be plotted is fitted over the key plan with the aid of the coördinate lines, and the data on the lower sheet are read through the transparent paper.

As the superimposition of the contour sheet, Fig. 3, over the key plan, Fig. 2, would present considerable

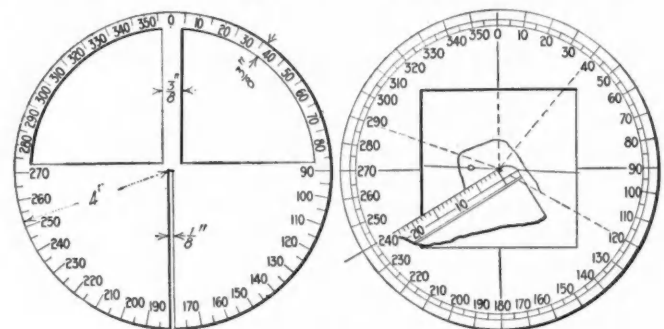


FIG. 1.

CROSS-SECTION POLAR  
PROTRACTOR  
Scale:  $\frac{1}{8}$

PLOTTING PROTRACTOR  
Opening full sizes; circle reduced;  
showing cross-section plotted at 18 ft. on line G-I  
(Fig. 2)

difficulty in the reproduction of the drawings, the effect of such superimposition is indicated by showing the contour on the key plan, and vice versa, in dotted lines.

The distance from the vertical axis to the outline of any cross-section is measured with a pair of dividers along the line representing the elevation of the contour and transferred to the line representing the trace of the cross-section plane on the plan. This fixes one point on the contour, and the other points cut at that elevation are obtained by a repetition of the process. A free line drawn through the points represents the contour.

Measurements taken with the polar protractor to the left of the vertical axes of the cross-sections must be plotted on the left-hand side of the traverse lines looking in the direction of the traverse and vice versa.

Difficulty is at first sometimes experienced in finding the correct lines to use and care is necessary, but remarkable dexterity is soon attained. The completed sheets are filed in the covers in order, with the highest contour on top.

The only method, so far as I am aware, comparable in accuracy with the one described, is by means of a theodolite from a coördinated point, after which the calculated positions of the points are plotted and contours drawn by interpolation; but, as already explained, this method is not practicable in the filled stopes for which the polar-protractor method was particularly devised.

In open stopes of considerable height and width, where comparatively long sights are possible and where the whole working may be commanded from one or two settings of the instrument, the theodolite method is preferred, as the polar protractor and compass used as described are not economical in time. Between the two extremes are a variety of stopes where the method adopted is a matter of individual judgment, but it is note-

Semi-permanent fixtures of iron, such as pipes and rails, interfere with the free use of the hanging compass, and where such are common in the stopes, they render the method inapplicable.

An attempt is made to read the magnetic bearing of the traverse lines to  $\frac{1}{2}^\circ$ , but as the reading has frequently to be made by the bisection of the movement of a swinging needle, it is probable that errors of  $\frac{1}{2}^\circ$  occur. On account of the short average length and comparatively large number of traverse lines and the short total length, the final error introduced by these differences is not great. In plan the traverses frequently close with no apparent error and almost invariably within a foot to scale. In elevation the calculated closure is generally within 0.2 ft., and with special care it is not difficult to obtain an exact check.

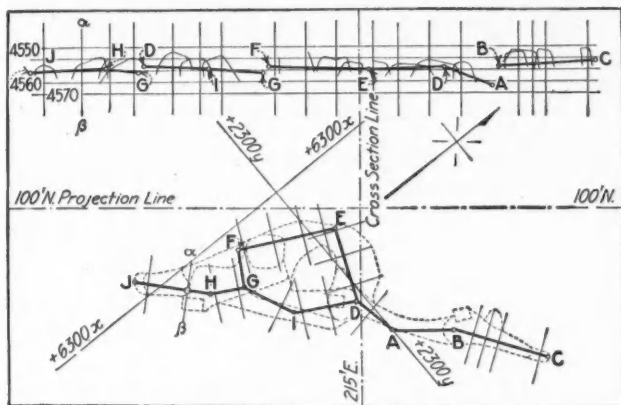


FIG. 2

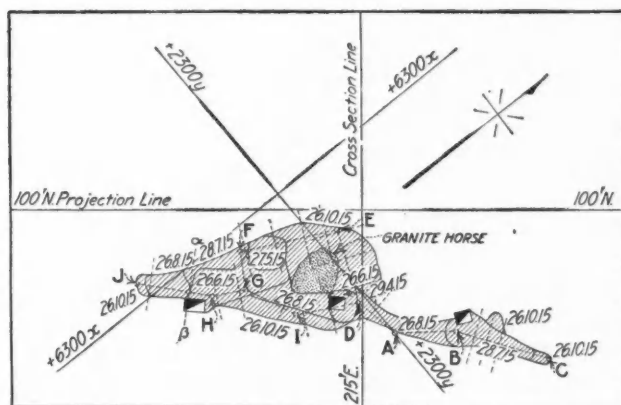


FIG. 3

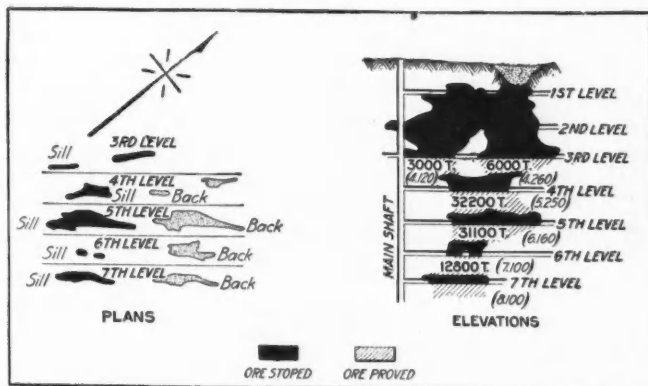


FIG. 4

RECORDS OF THE STOPE SURVEY

Fig. 2 shows the key plan of a stope with corresponding section; Fig. 3 shows Contour 4560 of the same stope; Fig. 4 shows projection and contours of a portion of the Bonanza orebody, Messina mine, and illustrates the irregular cross-section and ore-reserve calculation

worthy that wherever possible the compass-protractor method is used and that the two methods are found to be interchangeable without difficulty.

SOURCES OF ERRORS IN SURVEY

Errors may occur when offsetting with the aid of the polar protractor on account of departure of the 0-180° axis from the vertical; departure of the protractor from a plane perpendicular to the vertical plane of the traverse line; increase in the sag of the string due to the weight of the protractor; or sag in the offset tape. A few experimental plottings will show no serious effect due to departure from planes up to a deflection of, say, 5 degrees.

Small errors due to sag are negligible, but when the total sag is equal to or more than 6 in., it is measured by noting the difference between the height of the string at the offset point before and after the protractor is placed in position, and during plotting the center of the protractor is displaced an equivalent amount. This error is only important on unusually long or slack lines and could be reduced by using a protractor of lighter metal.

Sag in the offset tape causes the inclination shown by the end of the tape at the protractor to differ from that of the straight line joining the end points. It is minimized by the use of a light tape with high tension, but is never entirely eliminated and must be kept small by a limit on the length of the offset. As previously stated, the offsets do not ordinarily exceed 12 ft., which, even with an error of inclination as great as 5°, gives a displacement of only one foot.

VERTICAL PROJECTIONS FROM SURVEY.

Section lines are drawn at right angles to each other on the general plan of the mine, through the center of the main shaft, to represent the planes of the vertical projections, one of the lines being parallel to the average strike. Every key plan and contour sheet has lines drawn parallel to these, with their distances from the original section lines noted. The positions of the limits of the oreshoot on the contour sheets are readily transferred to the vertical projection, with the aid of these lines and a pair of dividers.

A modification of this method is used in practice for the construction of the longitudinal projection. On a sheet of paper similar to the key plan, corresponding cross-section and elevation lines are drawn. The section line of this sheet is fitted over that of the key plan, and by sliding the sheet to and fro, the elevation of the highest point of each of the local cross-sections is brought, in turn, over its position on the plan and marked. The junction of the points thus obtained gives the projection. This method is more accurate than the

one first described, as it takes account of work done above the elevation of the highest contour.

For the cross-section the contour sheets are used. In order to obtain this section relatively correct, a continuous line as irregular as necessary is drawn on the longitudinal projection to represent a plane at right angles to that of the projection, along the center of the oreshoot. The intersections of this and the elevation lines are projected on the contour sheets and give lines along which the measurements are taken.

ESTIMATION OF TONNAGE BROKEN AND ORE RESERVES

The calculation of the volume excavated is made by using the ordinary prismoidal formula,

$$V = \frac{h}{6} (a + b + 4m)$$

in which  $V$  = volume,  $h$  = height,  $a$  and  $b$  = end areas, and  $m$  = middle area. Alternate contours are used to

26-10-15. Bonanza (Hanging Wall), Slope No. 6-160. A. S. Corbett and J. W. Walsh, Surveyors.

Traverse	Magnetic Bearing	Vertical Angle	Measured Length	Horizontal Length	Vert. Component and Elevation	Construction Notes
				(O B 33) O B 35 to A	- 4567.7 + 1.0	
A-B	53 1/2	R 17-36 R 17-24	28 1/2	25 (A)	- 4566.7 + 7.8 - 4558.9	
B-C	72 1/2	R 2-48 R 3-24	40	40	+ 2.2 (8) 270/51, 310/61, 20/6, 110/4	
A-D	275 1/2	R 21-30 R 21-48	21 1/2	20 1/2 (A)	- 4556.7 (13) 270/12, 300/10, 0/5, 20/5, 120/24 - 4566.7 (19) 210/54, 330/64, 15/34, 110/34 (37) 230/24, 330/34, 0/34, 150/3	
D-E	310	F 2-48 R 2-24	31 1/2	31 1/2	+ 8.1 (14) 230/4, 320/4, 0/4, 40/4, 130/9 - 4558.9 - 1.4 (6) 110/15, 90/11, 0/3, 290/5, 210/10	
E-F	223 1/2	R 0-48 R 1-30	41 1/2	41 1/2	- 4560.0 (19) 105/164, 90/12, 0/1, 290/2, 240/5 (20) 120/84, 80/7, 0/3	
F-G	186 1/2	F 7-36 F 6-48	16	15 1/2	+ 0.8 (4) 90/1, 35/3, 320/4, 290/8, 250/9 - 4559.2 (14) 100/54, 50/54, 0/4, 310/74, 290/8 (28) 105/94, 10/7, hole, top inaccessible (29) 140/2, 20/5, " " "	
G-H	289 1/2	R 5-36 R 6-0	14 1/2	14 1/2	- 4561.2 + 1.5 (23) 255/164, 270/114, 290/8, 0/8 - 4559.7 (22) 230/64, 290/4, 0/4	
H-I	345 1/2	F 2-0 F 1-0	31 1/2	31 1/2	- 0.8 (10) 290/6, 300/3, 0/2, 60/11, 110/114 - 4560.5 (26) 220/54, 290/34, 0/24, 70/4, 120/7	
I-J	85	R 2-48 R 3-36	23	23 (G)	- 4561.2 + 1.3 (18) 120/9, 40/4, 0/5, 290/84, 240/72	
J-K	44	R 2-12 R 3-00	27	27	+ 1558.7 (2) 115/54, 40/34, 0/4, 290/84, 240/84 (15) 290/8, 310/64, 0/7, 60/72, 100/8	

COPY OF FIELD NOTES OF STOPE SURVEY

give the end areas of a series of prismoids, the heights of which are twice the contour distances. The result, obtained as cubic feet of solid excavation, is converted to tonnage by a predetermined factor.

In the case of stopes where this method is used for contractors' measurement, contours must be made at 2-ft. intervals if the excavation is irregular and small.

The ore reserve is calculated in the following manner where the ore occurs as a shoot:

The portion of the shoot remaining between the rail elevations of any two adjacent levels is considered as a block. The cross-sectional area of the sill of the upper level, corrected for any unprofitable ore which has been mined and which will probably be avoided in stoping from below, is taken as the area of the top of the block. The contours of the stope below the block are examined, and the area of the highest contour which represents the full cross-section of the shoot is taken as the bottom area. The height of the block is the difference between the elevations of the end areas.

The ordinary prismoidal formula is of no service in calculating this volume, as the middle area is indeterminate, and the formula,

$$V = \frac{h}{3} (a + b + \sqrt{ab})$$

is used, in which  $V$  = volume;  $h$  = height,  $a$  and  $b$  = end areas,  $m$  = middle area. To determine the actual contents, the volume already stoped above the elevation taken as the lower end of the block is deducted from the result.

Ore is taken as proved where both ends of the block are fully exposed and there is reasonable evidence of continuity. This is generally provided by a winze through the center of the orebody, but local experience must always be a large factor in the classification.

EXAMPLE OF ORE RESERVE CALCULATION

Block No. 5=260 Bonanza, 4th to 5th Levels

- (a) Area 4th level sill, 2,675 sq.ft. at elevation - 4,410 ft.
- (b) Area 5th level back, 7,996 sq.ft. at elevation - 4,488 ft.

$$h = (- 4,488) - (- 4,410) = 78 \text{ ft. } \frac{h}{3} = 26 \text{ ft.}$$

	(a)	2,675	Log.
	(b)	7,996	3.4273238
			3.9028728
			2) 7.3301966
	$\sqrt{ab}$	4,625	3.6650983
	$(a + b + \sqrt{ab})$	15,296	4.1845779
	$\frac{h}{3}$	26	1.4149733
	(V)	397,696	5.5995512
Stoped above - 4,488 ft. ....		1,696	
Ore reserve (cu.ft.) .....		396,000	5.5976952
Factor .....		12.3	1.0899051
Ore reserve (tons) .....		32,200	4.5077901

The average grade is determined volumetrically. The (square feet  $\times$  assay) of each end of the block is treated as an end area in the above formula, which now gives as  $V$  (cubic feet  $\times$  assay); from this result the grade of the block is obtained.

Mining in Rhodesia

The 22nd annual report of the Rhodesia Chamber of Commerce, covering the year 1916 shows that the total mineral production for the year was 930,356 oz. fine gold, an increase of 15,327 oz. over 1915; 200,676 oz. silver; 3521 tons copper; 3.63 tons tin; 2.59 tons wolframite; 38 tons antimony; 6157 tons asbestos; 88,871 tons chrome ore; 5837 tons iron ore; 491,532 tons coal; 1021 carats diamonds. The total value of the mineral production for 1916 was £4,829,704, an increase of £430,630, or 9.7%, over the previous year.

The average number of negro laborers employed during 1916 was 40,214, an increase of 2298 as compared with 1915. Of the number for 1916 there were 36,347 employed at gold mines and 3867 at coal and other mines. The number recruited during the year for mine labor was 2488. Deaths were 1083, and 2.35% of the men deserted. The deaths for two years past were:

	1915		1916	
	Total No.	Per 1,000	Total No.	Per 1,000
From disease .....	832	21.94	911	22.48
From accident .....	159	4.19	172	4.24
Total .....	991	26.13	1,083	26.72

About one-half of the laborers employed were natives of Rhodesia. About 25% were from Nyassaland and 20% from Portuguese East Africa.

DIAMOND YIELD OF THE SOUTHWEST TRANSVAAL for the five months ended May 31 was 24,910 carats. The largest mine is the Italie. Others, but far behind, are the Kameelkuil, the London and the Bloemhof.



## Engineers' Part in the War

*To wage the war with the highest efficiency the armies must be so organized, both at the front and behind, that each man shall be doing the work that his training has best fitted him for. Modern warfare calls for the application of the principles of all branches of engineering. The United States, by reason of its large reservoir of skilled specialists, can bring into the struggle a most efficacious aid.*

CAPTAIN Gustave P. Capart, of General Pétain's staff, who is now in America, recently expressed his views on the engineer's part in the war in a communication to Secretary Baker. The following summary of Captain Capart's observations has been released for publication:

We are waging in reality a war of engineers and of primary materials necessary to equipment and to transportation under the best conditions. Today a nation which enters the strife must make its appeal to its human material and put to work all the vital forces of the country. That is why the industrial organization of the armies is indispensable. It is essential for avoiding waste of material and human energy. Before everything it is necessary to obtain a good alignment of men. To insure this the largest number possible should be left to work at their specialty or placed in the formation that agrees with their aptitudes. This applies to the fighting troops as to the supporting bodies. A salutary emulation and a certain point of professional honor are also developed by such specialization. To be convinced of this it will suffice to review the corps of the armies as they are now organized.

### HIGHLY DEVELOPED TRANSPORT SYSTEMS

The modern battle is a problem of roads and of transport. The railways and roads may be compared to a system of arteries for the army. A constant growth of the network of railways in the zone of the armies is necessary for the rapid provisioning of troops in food and munitions, for their removal from one point of the line to another, for the entry into action of heavy artillery mounted on trucks, etc. It follows that the maintenance of these lines and the construction of extensions daily become of greater importance on account of the constant augmentation of traffic. In both cases the employment of a large and highly trained personnel is required for the laying of tracks, for the repair shops, and to handle construction material.

The means of transport are numerous and varied. All of the systems known to the engineer have been adopted progressively. Narrow-gauge railways have become of common usage. Cableways and telpherage systems have given extraordinarily valuable service on the front. One installation of this kind has effected an economy of 600 mules per day at one point on the French front and the Italian army employs similar installations with success. The automobile, with its camions and tractors, plays a rôle that daily becomes more important. The thousands of drivers, mechanics and repair men now constitute an important unit of the army.

The great distribution systems for electric light and power in the zone of the armies also compel attention. These supply the headquarters, cantonments, artillery, repair shops, hospitals, air service, etc. The mechanical services are developing constantly. The employment of compressors, rock drills and trenching machines has required an increasing number of skilled workmen. In the zone evacuated by the enemy, an immense amount of restoration must be undertaken and a skilled personnel for rebuilding bridges and constructing military works is necessary.

Great shelters, in reality subterranean buildings, are built by company units as skilled as the contractors' forces that construct subways in New York. These units excavate, timber, do the concrete work and leave the shelters complete. Water supply is a necessity that is given great attention in the modern battle, and its organization should be constantly improved. To supply the armies with lumber and timber there has been organized a nearly perfect forestry service. The telegraph and telephone service naturally occupies a place of the greatest importance and constitutes the nervous system of the battle.

### SPECIALIZATION IN THE COMBATANT UNITS

In the combatant units the useful effect of specialization is also felt. In aviation, whose scope is constantly widening, airplanes have successively appeared for scouting and photography, for combat and bombardment, for directing artillery fire and for the infantry. Each requires its own trained corps and schools, besides a multitude of mechanics to maintain the airplanes.

In the infantry specialization is pronounced. There are grenadiers, signal men, machine-gun operators, *ravitailleurs*, trench-mortar operators, etc. This has led to the highest efficiency of combatants. In the artillery the great specialization is well known, such as in the directing of artillery fire, and the sections of cartographers. In passing we may call attention to the trench artillery so important in this war. In the engineering corps, mining, bridge construction and trenching operations are today all works requiring special units.

Better than any other country, the United States will be able to constitute an army conceived on a logical and rational plan, thanks to its immense reservoir of manpower and to its highly developed industries. The military instructions of specialized regiments may be extremely limited and numerous regiments may be made ready in a very short time. The American Government has comprehended fully the importance of organization along these lines. The expedition of specialized regiments responds to urgent military needs, and it reflects one of the aptitudes of the country where you pass so rapidly from project to realization.

The specialized American troops, who are going to France, will at the same time be the pioneers of American industry over there and will prepare the ground for the economic war which will be waged against the Central Empires tomorrow. A flow of business between America and her allies should be the result of the present coöperation, and the French industries that formerly

used machines from Germany will in the future get them from America.

Thanks to her industries so powerfully developed and equipped, the United States can bring to the great struggle a most efficacious and precious aid. She can rapidly find the skilled personnel so necessary. That which has been done in the formation of specialized railway regiments should likewise be done for the automobile-transport service (both drivers and mechanics are required), for the water-supply service, forestry, electrical and mechanical service, and, again in the combatant units, for the aviation where an élite corps of pilots and mechanics is required, and for the artillery with units of field, trench and truck-mounted guns.

All of these services imply an immediate and effective intervention of the American nation in the war while it is organizing and training its great combatant army. To obtain the highest efficiency it is indispensable that these various specialties be emphasized in distinct militarized organizations, each known by its distinctive title such as "Forestry Service," "Water-Supply Service," "Roads Service," "Railway Service," etc.

The preceding roughly sketches the industrial organization of an army. The art of the engineer is also exercised in the technical organization. It seems strange, although really logical enough, to find consulting engineers on the General Staff along with the tacticians. Technical and industrial problems arising for solution become more numerous every day. We will give two examples:

#### RAW MATERIALS AND COÖPERATION

One of the most important technical questions demanding solution today is that of coöperation (*liaison*) of troops in battle, since it is this which permits successful maneuvering. Today, in order to arrive at a sure and rapid coöperation between the different divisions, appeal is made to all the means of science—mechanical, optical, acoustic, electrical. Apparatus and method have had an extraordinary development, thanks to the impulse given them by military engineers who have devoted themselves to this arduous task.

The second is that we are waging a war of primary materials, as we have said. Steel, wood, coal, magnets, iron, wheat, essences, oil, etc., are the materials without which it is no longer possible to make war. The creation of bureaus of statistics makes it possible to ascertain in advance the crises that may threaten in one or another material on which the conflict depends and to find a way of avoiding the danger as soon as it arises. Tabulations such as that of the number of projectiles fired against the front of an army are important and instructive. Industrial methods applied to war make it possible to escape many difficulties and surprises.

#### SCHOOLS IN THE FIGHTING ZONE NECESSARY

One of the most important questions today is that of establishment of schools of every kind in the fighting zone. Modern war being a perpetual evolution, it is indispensable to continue schooling as a campaign goes on. Both for actual combatants and for troops in the rear there must be provided centers of instruction in different specialties—schools of coöperation (*liaison*), for grenade-throwers and *mitrailleurs*, for miners, avi-

ators, pilots and observers, schools of listening (*écoute*), centers for the study of war and for artillery study. Such schools will render the greatest service if they are conceived in a practical spirit.

To sum up, the United States finds itself in a privileged situation to create an army comprising every branch of the service. It will be in a position to turn away from the old prejudices concerning military matters and to profit by the experience that the other belligerents have gained. The organization of an army may be conceived of as resembling that of an immense industrial enterprise, and the experience of three years of war has demonstrated that it is of the greatest importance to develop the training schools and extend further the system of specialization.

### Manganese Mining Active

Secretary Lane in a recent interview called attention to the response of the miners of manganese to the country's need. "Modern steel-making demands manganese," he said, "and the shortage of a domestic supply of this ore has been a matter of concern to those of us who wish America to be industrially independent. But now the war requirements for steel have been realized by the manganese operators, for reports already received in the Department of the Interior show that shipments of high-grade manganese during the past six months aggregate 28,345 tons, or nearly 10% more than the tonnage for the whole of 1916, which amount in turn was three times the 1915 shipments. Shipments are reported from 10 states, but in Montana alone the shipments since last January largely exceed the shipments for the whole United States in 1915.

"The manganese situation therefore is most encouraging, and the Geological Survey estimate for the whole year is 80,000 tons of the high-grade ore. This, however, is less than 20% of the present large demand of the steel industry. It is significant that the shipments of lower-grade manganese ore likewise are record-breaking, the six months of 1917 considerably exceeding the 12 months of 1916, and the present rate of production promises an even larger tonnage for the remaining six months. This gratifying activity in the mining of so essential an ore seems to be largely the result of better financing and better engineering of the industry."

### Utah Copper Quarterly Report

Utah Copper Co., in its 37th quarterly report, covering the second quarter of 1917, shows an increase of product over the first quarter of 13,517,149 lb. By months, the production of copper contained in concentrates was: April, 17,231,512 lb.; May, 19,262,856 lb.; June, 19,909,097 lb.; total, 56,403,465 lb.; a monthly average of 18,801,155 lb. In addition, 441,594 lb. was contained in ore shipped direct to the smelters, making a total gross production of 56,845,059 pounds.

A total of 3,298,400 tons of ore was treated, 920,500 tons more than during the first quarter. The average grade of ore was 1.3881% Cu, a decrease of 0.0419%. The average recovery was 61.59%; net profits were \$7,246,318, dividends having been paid to the amount of \$5,685,715, or \$3.50 per share.

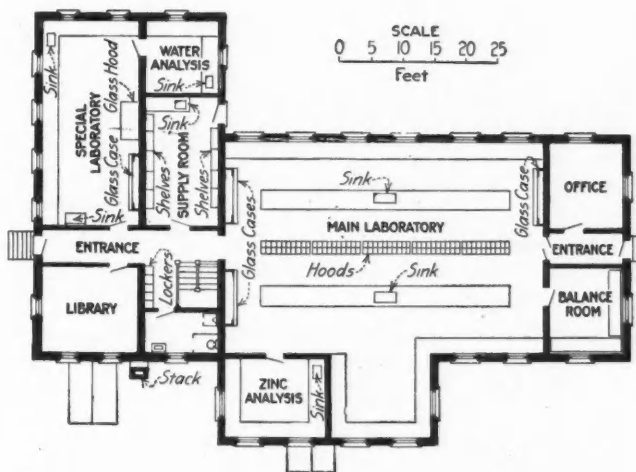


## New Jersey Zinc Co.'s Franklin Laboratory\*

The Franklin laboratory of the New Jersey Zinc Co. was designed mainly for the analysis of the products from the two concentrating mills situated at Franklin and Sterling Hill, New Jersey, the most important determinations being the zinc, iron, manganese, lime and silica contents and moisture of the ores. Within the last four years, however, it has been found advisable to examine most of the supplies, and therefore additional space and equipment were allotted for the examination of such substances as oils, greases, soaps, alloys, fuels, paints, explosives and water.

The building as shown in elevation and plan consists of a main or routine laboratory, an experimental laboratory, a water-analysis room and the other accessories such as stockroom, library, sampling and drying rooms and office. The main laboratory is further divided into a balance room and zinc-analysis room.

As the greater part of the determinations are volumetric, good light is an important factor, and with this in view the interior walls of the building were constructed of white enameled brick laid in Keene cement. These also have the additional advantage that they give a clean



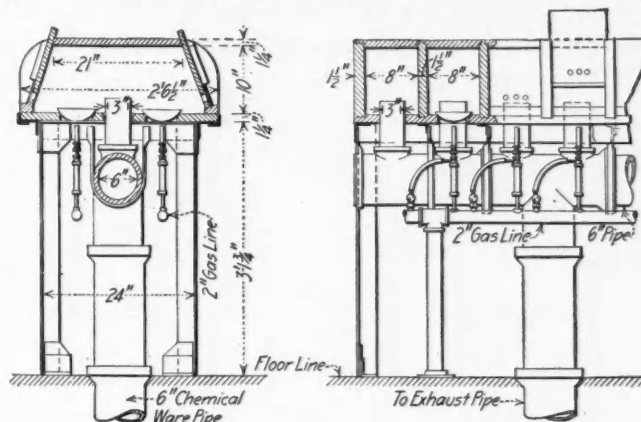
ELEVATION AND PLAN, FRANKLIN LABORATORY

and attractive appearance to the room. The windows are large, being 76 x 44 in., and even on dark days the light is good throughout the laboratory. Zinc titration requires a constant light and as, on many days, especially in winter, the light is variable, two Artificial Daylight lamps were installed and it has been found that they meet all requirements. They also make it possible to carry out titrations at night if necessary.

On referring again to the plan of the building, one can obtain an idea of the arrangement of the desks, sinks, cases and hoods. These have all been designed

\*A paper by D. Jenkins to be presented at the St. Louis meeting of the A. I. M. E. in October, 1917.

with the idea of expediting the work as much as possible with the least confusion. The hoods at the center and running the whole length of the room were designed by R. M. Catlin, and are unusual in construction. They consist of a series of small compartments, there being in this case 50. Each compartment is about 27 in. long, 8 in. wide and 8 in. high, and is made of Alberene stone. Each accommodates two sand baths, and all the gases arising from evaporation are taken off at the center of the hood and conducted outside of the building by means of a slight vacuum produced by an air aspirator placed in the mouth of a 6-in. Orangeburg fiber pipe. One aspirator exhausts the gases from 10 compartments. Each



DETAIL OF MAIN LABORATORY HOODS

compartment is supplied with two sliding doors which fit into grooves cut in the sides of the hood. By means of a notch cut in these grooves, the doors may be partly opened if necessary. Heat is furnished by means of a series of bunsen burners placed under each sand bath. A better idea of the construction of the hoods may be obtained from the illustration.

In the old laboratory great difficulty was experienced in keeping the wooden floor in good condition, so in the new building the wood was treated with aniline black and up to the present the floors have remained in excellent condition despite the fact that in many places they have been subjected unintentionally to the action of concentrated acids.

Adjoining the main laboratory is a room set apart for zinc titration only. This arrangement has many advantages, the chief being that the atmosphere of the main room is not contaminated with ammonia fumes, as all zinc titrations are made in ammoniacal solutions. The ventilation of the zinc-analysis room is taken care of by means of a small fan.

The balance room also adjoins the main laboratory. The slabs on which the balances rest are supported by concrete piers which do not connect with the building. This removes annoyance due to jars. The room was built large enough to accommodate the filing case for the samples, which adds to the convenience of the work because the samples are readily accessible in case results are to be checked.

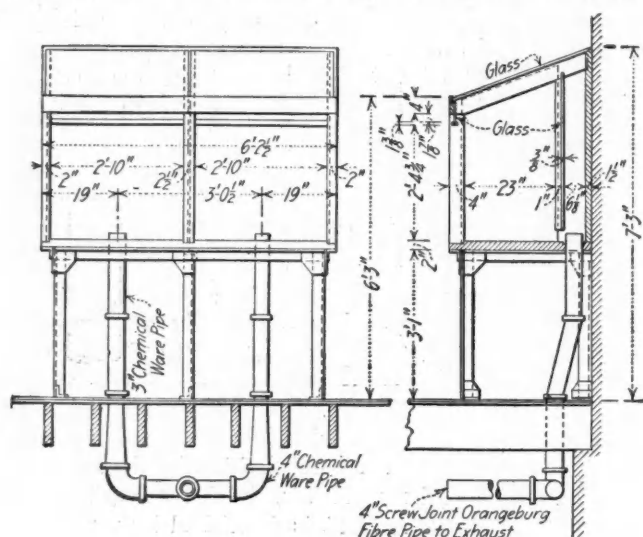
The experimental laboratory is provided with a hood somewhat similar to those in use in the Bureau of Standards. It is constructed of Alberene stone and wire glass. The top and sides being of glass makes the hood very light. The hood is downdraft, being exhausted by an aspirator similar to the one operating the hoods in the main laboratory.



The experimental laboratory is equipped to make any analysis of the supplies furnished for the plant that may be required. Gas is used for general heating purposes, but electric hot plates or multiple-unit furnaces are employed where it is possible to use them. For drying purposes Freas electric ovens have been installed, and for electrolytic work a Veit apparatus has been provided.

As the supervision of the town water supply is entrusted to the laboratory, it was found advisable to fit a room for carrying out both the chemical and bacteriological examination of the water. Equipment is of the usual nature required for such work, consisting of a sterilizer, incubator, refrigerator and the other accessories.

This covers, in general, the principal features of the building, but before closing I would like to call attention



HOODS FOR SPECIAL LABORATORY

to the size and location of the stock room, which is so situated that it is central to both the main and the experimental laboratories.

The library, also, is easily accessible from both laboratories and is so furnished that the men can calculate and keep their records in this room and not have them distributed, as is the usual custom, throughout the whole building.

The rooms for drying and grinding the samples are in the basement and are equipped with hot plates, bucking board and grinder. Only the small samples are handled in these rooms, as the sampling and grinding of the large samples is carried out at the sample houses situated near the different mills. The basement also affords ample room for storage and packing. A Barnstead still of about 5-gal. capacity per hour furnishes distilled water, which is distributed to all parts of the building by means of block-tin pipes. An adequate wash-room and individual lockers are provided for the men.

## Inflammability of Mixtures of Gases

An investigation was undertaken by the U. S. Bureau of Mines to determine the limits of complete inflammability of mixtures of mine gases and of industrial gases with air. In *Technical Paper 150*, George A. Burrell and Alfred W. Gauger summarize the results of experiments with gasoline vapor, ethane, methane, natural gas, acetylene, artificial illuminating gas, hydrogen, carbon monoxide, and blast-furnace gas.

When enough of the combustible gas is present to permit combustion to spread through the mixture from any point of ignition, then propagation of flame takes place from layer to layer, without the continued presence of the source of heat that started the inflammation. It was found that the limits of complete propagation were affected to some degree by the conditions of experiment. In general, when ignition occurs from the bottom upward, the limits are slightly lower than when it occurs from the top downward.

The results obtained for the limits of complete inflammability of mixtures of different gases with air were as follows: with gasoline vapor, gas mixture in air 1.5 to 6%; ethane, 2.5 to 5%; methane 5.5 to 14.5%; natural gas, 5 to 12%; acetylene, 3 to 73%; artificial illuminating gas, 7 to 21%; hydrogen, 10 to 66%; carbon monoxide, 15 to 73%; and 36 to 65% with blast-furnace gas.

## International Nickel Co.

The International Nickel Co.'s report for the quarter ended June 30, 1917, shows total income amounting to \$4,457,862. The principal items, compared with the corresponding period of 1916, are shown below:

### INTERNATIONAL NICKEL CO.'S FINANCIAL REPORT

	1917	1916
Total income	\$4,457,862	\$4,025,396
Administration and general expense	896,368	222,422
Net income	3,551,494	3,802,974
Depreciation and mineral exhaustion	487,678	497,400
Profits	3,073,816	3,305,574
Preferred dividend	133,689	133,689
Balance	2,940,127	3,171,885

The balance in the 1917 quarter is equal to \$1.75 per share on the common stock, and for the 1916 period is equal to \$1.89 per share.

The earnings for this quarter in 1917 show a smaller balance for the common stock, due very likely to the larger taxes the company has had to pay in the United States and Canada. The reserve for taxes in the current report is contained in "Administration and General Expense" item of \$896,368; this amount being equal to more than four times the amount of \$222,422 noted for the corresponding quarter of 1916. The great amount of the increase is a reserve against taxes.

The production in the year that ended March 31, 1916, was about 60,000,000 lb., and as the plant, except the one at Bayonne, N. J., had been running at about the same capacity, production for the quarter ended June 30, 1917, can be estimated at about 15,000,000 pounds, since it is not possible to approximate the loss occasioned by the strike.

Work on the new refinery at Port Colborne, Ont., is progressing favorably, and according to the president's last statement to the stockholders, the new plant will be ready for production by the beginning of 1918. The initial production of this plant is placed at 20,000,000 lb. per year, increasing the output one-third, and bringing the total capacity to 80,000,000 lb. per year.

The balance sheet for June 30, 1917, shows some important changes compared with the annual balance sheet of March 31, 1917. The property account on June 30 was \$46,124,208 compared with \$45,169,973 in March, an increase of about \$1,000,000. The general surplus on June 30 was \$5,858,759, a decrease of \$418,346 from the \$6,277,105 noted on March 31.

## Future Treatment of Tailings\*

*Mill tailings should be stored for future treatment and in such a way that widely different grades are not mixed together. Thus, as processes of recovery improve, portions of dumps may be worked over without necessitating the handling of a large tonnage of worthless material.*

**I**N EARLY milling methods little attention was given to the care of tailings. It was thought that if the mill could be built by a stream where their final disposal could be forever lost sight of, it was highly desirable. What was lost in these rich tailings can now be appreciated. Fortunately for many, the depositing of tailings in these streams was finally prohibited by the state legislatures. Those milling companies that seemingly were not so favorably located, or the companies that were forced to discontinue the pollution of the streams, have found themselves in the possession of tailings that are of great value, due to the new methods of concentration and of recovery.

The problem of future treatment of present mill tailings is more difficult for the future metallurgist and mill man on account of recent advancement in milling methods; yet relatively the valuable content that still remains may have proportionately greater value as mines become exhausted. If the residues from modern concentrators are not isolated by segregation they will often be forever lost on account of admixture with valueless material.

### SEGREGATION OF TAILINGS AT ANACONDA

The Anaconda Copper Mining Co., in 1901, made arrangements to segregate the fine slimes from the sands, supplementing the arrangement which their new plant afforded in saving all of the tailings instead of allowing a portion of them to go down Warm Springs Creek. It was realized, in starting this new concentrator, that these slimes were of great value on account of the copper content, so ponds were made, 300 x 600 ft. and about 14 ft. deep, to settle the fine material and decant the water. The ponds were operated intermittently; as soon as loaded they were drained and excavated by dragline bucket. The discharge from the bucket was piled along the side of the pond. Part of this slime was made into blast-furnace bricks and smelted, and the remaining portion stored for future treatment. The effect of saving these slimes for the last 16 years at the Washoe Reduction plant has resulted already in the recovery of millions of pounds of copper with many millions more yet unrecovered. The present slimes flotation plant at Anaconda, working on these particular slimes, recovers more than 1,000,000 lb. of copper per month.

The Chino Copper Co. segregated the tailings from its mill at Hurley and now has a retreatment plant handling 1000 tons per day, with further extension under construction. There are other companies that

have segregated their tailings to some extent. There are millions of tons of sulphide tailings that are now becoming slowly oxidized, and cannot be treated without installing expensive grinding machinery plus the flotation equipment; if the more valuable slimes had been segregated, millions of pounds of copper could easily be recovered by the simple flotation methods of today, as illustrated by the Anaconda and Chino practice. The sands, which are of lower value, would oxidize faster without the slimes and become available for leaching where coarse material is desirable.

### STORE MIDDINGS SEPARATELY FROM GENERAL TAILINGS

There are concentrators where some portion of the middlings cannot be brought to grade or made a marketable product. These should be stored separately and not mixed with the general tailings. It has not been practicable to recover the oxides and carbonates that are mixed with the sulphide tailings. J. M. Callow's filming experiments, which he has so carefully described<sup>1</sup>, point out what may be expected. There are millions of tons of tailings, however, whose oxide and carbonate content is even less than the tailings thrown away by the present filming process, and it would seem that enrichment for future treatment should be made if possible. Mr. Callow has made the following statement of his views on what may be expected as to recovery from tailings:

In the treatment of complex ores, such as those carrying lead, zinc and iron, and in copper ores containing both sulphides and oxides of this mineral, present methods of recovery are still in embryo, and such tailings must inevitably carry an appreciable portion of the original contents of the ore, in the complex zinc, lead and iron ores especially. Sixty and 70% zinc recovery is often considered passable work, the rest of the zinc being either entangled or in some other way combined with the iron and lead which future inventions will no doubt show us how to recover. In the copper ores, flotation has added greatly to past recoveries, but only in the recovery of sulphides; the oxides are still an unavailable asset, which in due time will undoubtedly be recovered by improved methods of extraction.

In laying out a system for impounding tailings the plan hitherto has been to impound them without any discrimination as to their values. In some ores it has been found that the principal values lost lie with the sands, and in others, with the slimes; so that a segregation might well be practiced.

As an illustration, assume the accumulative analyses of the tailings from one of the great copper concentrating mills where the process consists of tabling and flotation, making a total extraction of 82%. The total copper in the various screen sizes is given in the table.

Mesh	SCREEN ANALYSIS OF GENERAL TAILINGS				
	Ind. Wgt. %	Cum. Wgt. %	Sulphide Cu Content	Oxide Cu Content	Total Cu Content
+ 48	1.6	1.6	0.009	0.002	0.011
+ 65	16.2	17.8	0.030	0.021	0.051
+ 100	11.2	29.0	0.016	0.012	0.028
+ 150	11.0	40.1	0.019	0.016	0.035
+ 200	8.0	48.2	0.013	0.013	0.026
-200	52.0	.....	0.051	0.188	0.239
	100.0		0.136	0.252	0.390

On such tailings it is possible with a Dorr classifier to separate the sands from the slimes; the slime tailings may be divided again into two parts by deflocculating and decanting, making a fine crystalline mineral and a decanted slime. It is my belief that the decanted material will carry an enriched amount of oxide copper, as

\*Abstract of a paper by F. E. Marcy to be presented at the St. Louis meeting of the American Institute of Mining Engineers in October; it was originally presented at a meeting of the Utah Section on May 23, 1917.

<sup>1</sup>"Bulletin 122," American Institute of Mining Engineers, February, 1917, p. 245.



compared with the general mill tailings, by two or three times. While it may not be possible with the present means to make a satisfactory and marketable concentrate, it would appear desirable to store separately rather than to mix with the impoverished tailings which might carry only 0.15% Cu, and hold such segregated material until metallurgy has advanced or the market is such as to make it profitable to treat it. This is what some preliminary experiments seem to show. To re-treat 15 or 20 millions of tons of unsegregated tailings in which a large portion carries only 0.12 to 0.15% is no easy problem for the future metallurgist.

There are many milling plants that treat complex ores which carry lead, zinc and copper, and it is not possible to make a satisfactory extraction of all of these. In such plants the extent to which enrichment and segregation of tailings can be carried on is limited only to the extent in which the expenditure seems desirable in the way of a future investment. Whether there ever will be a better opportunity for segregation, or greater ease of separation of these values, and whether it can be done at a lower cost than when the tailings were produced, remains to be seen. Fresh and loosely combined material is always the most desirable.

In general, tailings that contain probable recoverable values should not be allowed to accumulate over large areas or in horizontal layers. Tailings from our first work in concentration generally contain the greatest values. Such tailings should be stored, if possible, so that those that are richest and most easily recoverable can be worked first, thus avoiding handling much worthless material when re-treatment is commenced. It is certainly not desirable to pile the present low-grade tailings coming from mills where 90-95% recovery is made upon tailings from which only a 65% recovery was made.

I believe the segregation of tailings can be advantageously accomplished in many instances, so that the weathering action will oxidize them for the ordinary leaching. The piling of tailings, so that the maximum oxidation can take place, and the elimination of all colloidal and talcy material would seem desirable, and a greater total recovery could be made by leaching and precipitation with iron.

### Welfare Work at Rio Tinto

The Rio Tinto Co. has had in progress of establishment for several years an extensive system of welfare work, which embraced not only improved housing but various forms of recreation and of bonuses. Commenting on this work at the recent 44th general meeting of the company in London, Chairman Fielding said:

"A substantial bonus was given at the close of 1916 to all the workmen as well as to the salaried staff of the company, and the shareholders are now informed that, should the affairs of the company in any of the coming years show a profit considerably in excess of the normal, the board proposes in such years to set on one side a good round sum to be employed on the welfare and well-being of the workmen in Spain.

"While on this subject, I would like to inform the shareholders that we have already commenced an improvement in the housing accommodation for the workmen at the mines, and propose gradually to further im-

prove the miners' cottages. We are in this respect already equal to any other mining enterprise in the Peninsula, but the directors are sure that the shareholders will wish that we should be well in advance in all matters affecting the comfort, health and happiness of our people.

"During recent years, we have been further developing our hospitals and medical service, and have established outdoor places of recreation, in which bands play on certain evenings, at our various towns. Last summer, two large swimming baths were built at the chief town of Rio Tinto for the workmen. The establishment of these first baths was such a great success that we have decided to build some more at our other large mining towns. We propose to further develop such social amenities at the mines.

"At Huelva, where the engineering workshops and repair establishments are situated, and where the men employed in shipping the mineral reside, we are laying out a model workmen's town with gardens, and are already commencing to build houses for our own workmen, who have hitherto had to live in the crowded town where the rents are exorbitant and accommodation inferior."

### United States Production of Barytes

For the first time in the history of the industry the value of domestic crude barytes marketed in the United States passed the million-dollar mark. The domestic manufacture of barium chemicals has been established and put on a firm foundation in the last two years, according to J. M. Hill, who has lately reported on this industry to the United States Geological Survey.

The manufacture of lithopone and ground barytes has also been further expanded. An important feature of the growth in 1916 was the shifting of the largest state output from Missouri to Georgia, followed by the entrance of Colorado and Nevada into the list of barytes-producing states. The average market price of crude barytes in 1916 was \$4.56, as compared with \$3.51 in 1915, an increase of about 30%, which was no doubt brought about by a greater demand and keener competition among buyers.

The value of the barium products made in the United States in 1916 was over 8½ million dollars. The apparent consumption of barytes in the United States in 1916 increased practically 100% over that in 1915, due not only to the demand of the new barium chemical industry in this country, but also to increased manufacture of lithopone, used principally in making rubber goods and as a pigment in "flat" wall paints, also in making enamel, calcimine and paper. There was a greater use of ground barytes in the rubber industry. The barium chemicals have many uses, the largest consumption being that of barium binocide in the preparation of hydrogen peroxide.

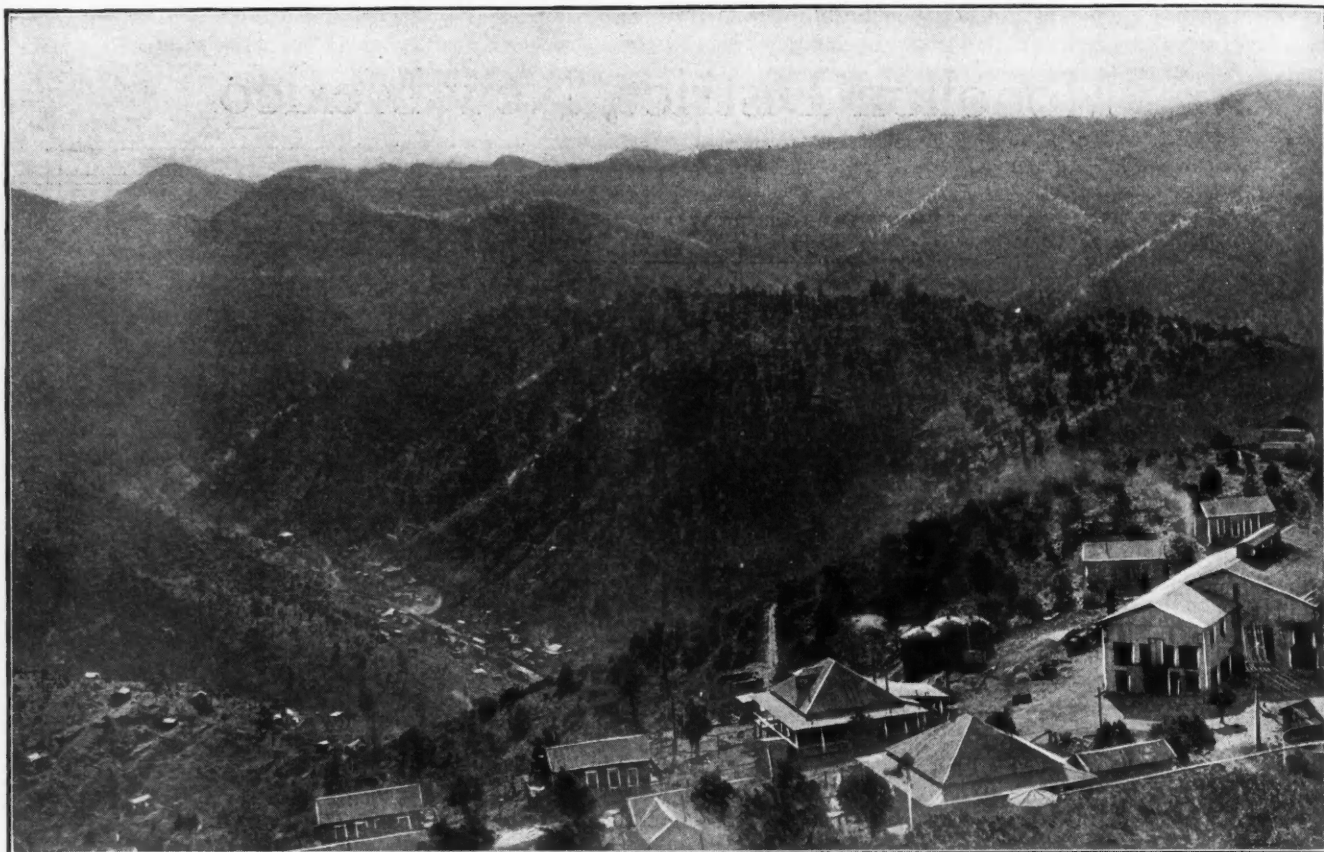
The production of barytes during 1916 amounted to 221,952 tons, as follows: Alabama, 7631 tons at an average price of \$3.56; Colorado, 481 tons @ \$6.25; Georgia, 104,784 tons @ \$3.83; Kentucky, 11,068 tons @ \$4.97; Missouri, 58,223 tons @ \$6.27; North Carolina, 878 tons @ \$3.70; Tennessee, 32,416 tons @ \$3.85; other states, 6471 tons @ \$5.01.



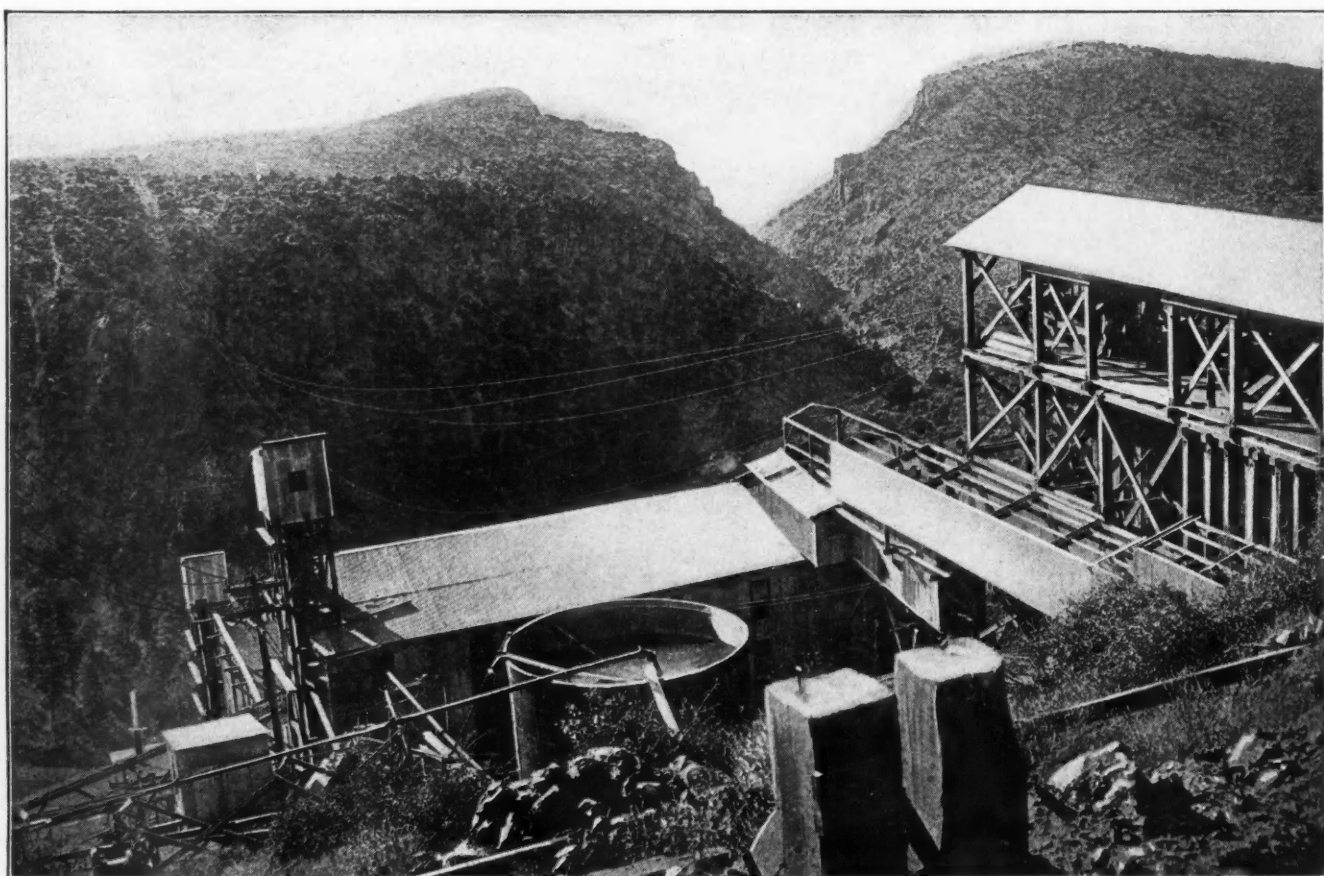
# Mogollon District, New Mexico



MINE AND CYANIDE MILL OF SOCORRO MINING AND MILLING CO., SHOWING AERIAL TRAMWAY FROM THE PACIFIC MINE



PANORAMIC VIEW IN MOGOLLON MOUNTAINS, SHOWING POWER PLANT, OFFICES AND BUILDINGS OF SOCORRO CO.'S PLANT, AND BEYOND, ON THE ROAD TO SILVER CITY, THE DEADWOOD MILL OF CLEVELAND & CO.

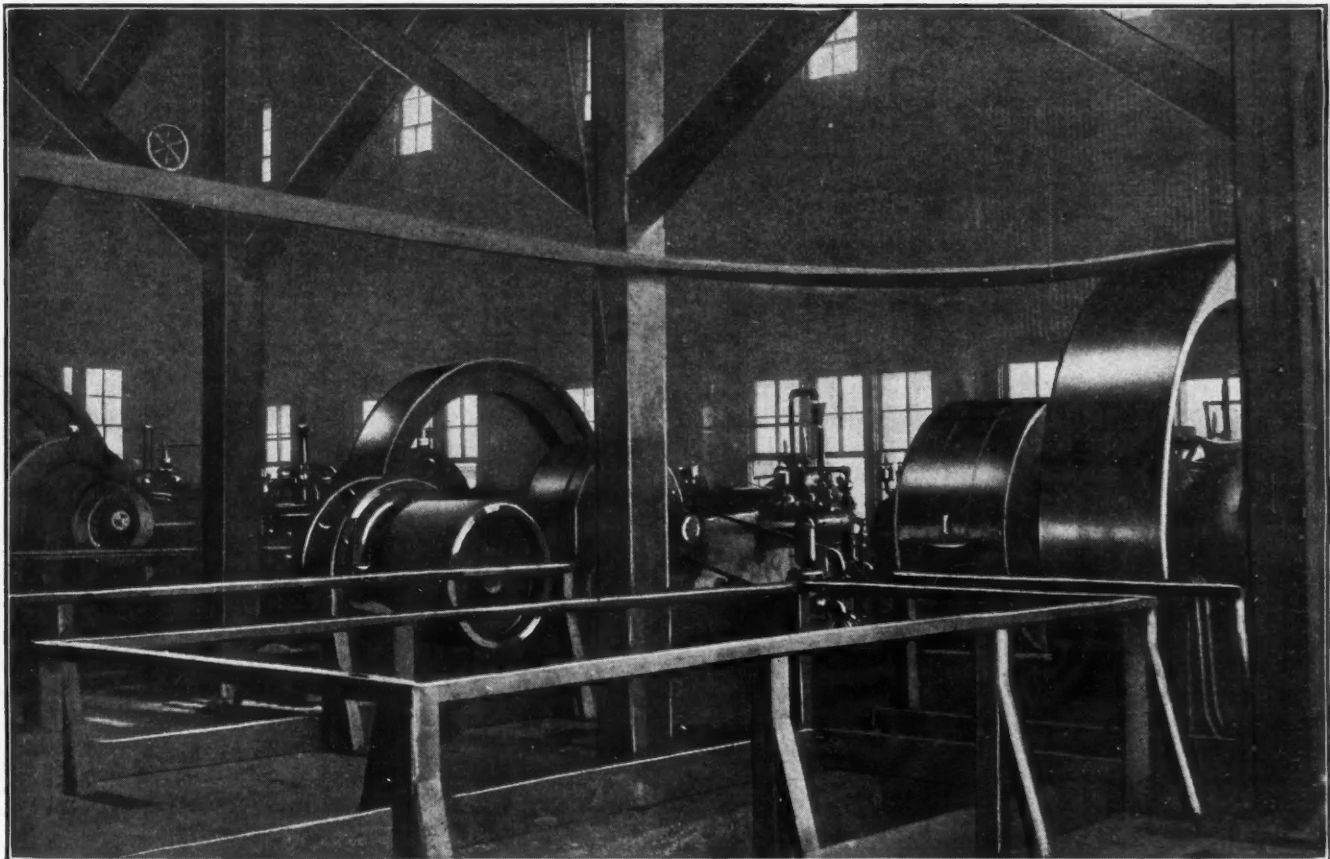


VIEW OF UPPER SECTION OF MILL BELONGING TO THE SOCORRO MINING AND MILLING CO., SHOWING AERIAL TRAMWAY TERMINAL FROM PACIFIC MINE





MINING AND MILLING CO. IN FOREGROUND. IN THE DISTANCE ON THE RIGHT IS SHOWN THE MOGOLLON MINES WEATHERHEAD. IN THE CANYON ON THE LEFT, PART OF THE TOWN OF MOGOLLON MAY BE SEEN



DE LA VERGNE OIL ENGINES IN THE SOCORRO POWER PLANT—THE MOGOLLON WAS ONE OF THE FIRST MINING DISTRICTS TO USE OIL ENGINES



# A New Ideal for the Labor Unions

SPECIAL CORRESPONDENCE

*The nature of labor conditions in the Butte district forced the adoption of the rustling card system. Hostile attitude of discontented element tends to make the mines less safe. Labor unions based on proper ideals would benefit both the men and the employers.*

THE situation in our industrial world, as typified by conditions in Butte, is an outgrowth of too much bad unionism, too much prosperity and a lack of proper authority. Under the old contract between the operators and the Western Federation of Miners the operator was restricted to employing only members of that organization. The only discipline that he could use was to discharge a man. This meant that that man could not again secure work at that particular shaft or mine until the next month. Only on rare occasions and for exceptionally good reasons was any man blacklisted from a mine. The excuses for discharge were many and often trivial. Smoking was one of the principal reasons. A boss who smelled tobacco smoke when entering a stope was supposed to discharge the smoker if he could identify him or else discharge all the men in that stope. If a man was caught sitting down, or resting—"taking five," as it is called—he was "sent up." Any excuse could be used and many a man was sent to the top on suspicion that he might have done something wrong or not have been working hard.

The natural result was that as a man might lose his job any day he felt that his work was only temporary at best and many of the men became hardened to the process of being fired and hired again and had no feeling of loyalty to the company or to that mine. The union officials did not care, as long as they received the dues and assessments.

The men hated the union officials who came to each mine once a month to inspect the union cards. If the card showed no dues paid for the month, the owner of that card was sent home and could not work in the mine until he had paid up. The mine operator had no say about it, but in certain cases the foreman would use this as an excuse for not letting the man come back. Of the two evils, as they were considered, the men liked the mine officials better than they did the union officials. The result, however, was that a man did not care much whether he was fired or not; for he could go to one of the other mines and, after rustling a day or so at several mines, would soon be taken on.

## ORIGIN OF THE RUSTLING-CARD SYSTEM

Sometimes a man working in a hot place, on a job where he had to work hard, or with a shift boss whom he disliked, would "rustle" at another mine to try to get a better berth. He might succeed in being hired and would go to work for a day, sending word to the first mine that he was sick or went to his cousin's funeral, or any old excuse. He would try out the new job and, if he liked it, keep on; if not, he would then go back to his first job or rustle again. This kind of work was common

in Butte, and the Anaconda Copper Mining Co. tried to remedy it with the "rustling card." This system means that in order to get a job a man must first go to a central office and register. He was then given a rustling card and started to one of the twenty or more shafts to try and get on. On being hired by one of the foremen, his card was taken up by the timekeeper and returned to the central office, and the man could not get it again until the next month. Butte always paid the top wages and was noted for the small amount of work a man could do and "get by with." It had a large number of what were called "ten-day" men, so it was rather easy to get on.

Everyone knows what happened to the Western Federation, brought about by the many and heavy extra assessments that were necessary to enable the Federation to finance strikes all over the country. The Butte miner got nothing in return for these assessments. Nowhere in the country has the miner been treated more as a hand and less as a man than in Butte. Notwithstanding these conditions, in case of fire or accident there were many who showed true loyalty.

## UNRULY ELEMENT A SOURCE OF DANGER TO ALL

Judging from reports in the newspapers and in the *Engineering and Mining Journal* the recent disastrous fire in Butte was caused by an action typical of the attitude of so many men in Butte. A man was told by his boss not to put his light in a certain place. Undoubtedly he said, "All right," and as soon as the back of the boss was turned, put his light in the same place where it was before. As a result all mine managements were blamed, even by prominent people. The mine management may have been to blame for something that was not published, but the system which causes lack of respect for authority is more to blame than any man. A hoisting engineer who goes to sleep and allows a cage to go to the sump is fired, but this does not mean that he is discharged from the engineers' union. It means he loses employment at that mine and can go to another. The union still protects him and insists that he be given work as an engineer. What is the answer? He scoffs at the authority that is not able to see its orders fully carried out.

## GOOD DISCIPLINE AN ESSENTIAL OF SUCCESS

There must be authority in every organization and strict obedience to orders must be observed in industry as well as in the army if successful operation is to be attained. Can an organization of soldiers pass judgment on the orders of their officers and still expect to win? Can a union of soldiers fix the hours, the wages, and the methods of operation and still maintain an effective organization? Can an army succeed whose only method of discipline is to discharge a soldier? There must be a head to every organization and that head must be obeyed. The more dangerous a vocation, the more essential is strict obedience. The greatest good that will come out of this war will be that men will learn that they must obey and respect authority.

Authority is given to those who have shown by their actions and training that they are worthy of it. Who decides on the placing of authority? Men who by their own actions have shown they are fit for this decision, have won the confidence of their associates and so obtained their preferment. Many such have come from the ranks of the manual-laboring men. It is no more possible for all, or for the majority, of men in authority to come from this class than it would be for all of the officers of an army to come from the ranks. To enter an officers' training corps a man must show that he is fit mentally to become an officer; when he has done so, then he is trained to be an officer.

Our soldiers will be taken care of. They will be clothed, fed, sheltered and supplied with arms. This will not be done by a union or by men selected by themselves, but by the men who have been selected by a large number of our people to direct and appoint those in authority. The same system must exist in civil life. The officers of an industrial organization must take care of their men. A corps of soldiers who are not well taken care of, have not clothes, things to eat, good arms, and a comfortable confident feeling that they are led by competent officers, cannot fight as those that are. Neither can the workers work unless they are so taken care of. As long as they are wrangling among themselves over wages, conditions, and their environment, they will not be good workmen.

#### PERSISTENCE OF THE GRIEVANCE HABIT

Two years ago the workman was asking for more money. He has more than he ever hoped to get now but is no better satisfied nor will he be as long as his mind continues to dwell on the grievance which he thinks, or is led to believe, that he has. The United States elects a president every four years. So far no man has governed the country for more than eight years. A president to be successful must meet the views of both parties to a great extent. A leader of a union should do the same and if he cannot get along without continually having strikes, another leader should be elected. How are the leaders of unions selected? Are they elected by a fair system of balloting or do they secure their election by methods similar to those used by the ill-fated General Diaz of Old Mexico?

What are the objects of the unions? Are they to help the men in their daily life or simply to secure or attempt to secure higher wages, shorter hours and less work for their members? Are these the ideals of labor? Is there any tangible result, any permanent monument that the unions can point to and say, "This was created by us for the benefit of our members"?

The rulers of the Germans say, "Our system is correct and we must win because our people are better off than the people of the rest of the world." But to be a German you must obey what the Kaiser dictates and then you will be better off only because you must not even think you are not. Is not this the same principle now governing many unions? Do not the union leaders say to the workman: "You must be a union man! You must acknowledge that the unions give the only way to secure happiness! Leave all of your interests entirely in our hands and we will protect them! We will see that the open shop is done away with and that a man can not work until he acknowledges our control!"

This is a wrong principle but there is a right one. There is a place for the unions in our daily life and that place is not tearing down our industrial organization but in helping to build up a larger and stronger system of industry. With the large sums of money taken in by the unions, great good can be done. Take the question of the health of the miner. If the unions would use their funds to erect a sanitarium, such as the world has never seen, where men could go and get well it would be worth while.

#### A HINT TO THE LABORING MAN

Suppose the unions say, "We will organize an employment office so that if a man loses his employment we will secure a new place for him and in the meantime give him enough to live on if he is needy or unfortunate. We will see that each man secures the position or work for which he is best adapted. We will employ the best experts in the world to find out what each man can do best and try to locate him in that place. By these means we will make the advantages of our unions so apparent that men will wish to be members and not be forced to join. Then we will be in a position to say to those desiring to join us:

"Men, you must show that you are good workmen, for no slackers are members of our union. After working a year for one organization bring us a credential from it showing you know how to do something well and we will let you join and receive the benefits that unionism means. We have a standard to maintain and you must not fall behind."

This will mean that every union man will be sought by employers of labor. That capital will come to organized labor and say, "We want so many of your men." A laborer will be proud of the fact that he is a good workman and the union will be prouder of the fact that the best men are union men and only the slackers are non-union.

Shops will employ all the union men they can secure and only fill up on the slackers. Open and closed shops will be things of the past. The great majority of men will be union, not because they have to be, but because they want to be. The engineer who goes to sleep will feel that in losing his place as a union man he has lost more than a temporary job. This spirit will so pervade the men that they will feel it a greater disgrace to lose their standing in the union than anything else.

What the unions have sought is typified by the relation of the locomotive engineer to the railroad. The engineer is employed by the master mechanic. He is given a locomotive by this department. With this he is turned over to the train-operating department and it gives him his orders. He makes his run and turns back his locomotive to the mechanical department. He can be discharged only by the master mechanic or his superiors. The unions desire to be in the position of the master mechanic. To attain this result they must first demonstrate that they can handle such authority as the master mechanic has and for which he has proved that he is capable.

When unions can show that they merit authority and confidence, then their place will be established in the industrial world. The place of the unions is between capital and labor, helping each and not injuring both.



## Report of Copper Production

This table is compiled from reports received from the respective companies (except in the cases noted by asterisk as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

	April	May	June	July
Alaska shipments .....	10,585,518	7,146,824	7,714,928	8,116,538
Arizona:				
Arizona Copper .....	5,000,000	5,200,000	4,800,000	.....
Cons. Ariz. Smelting .....	1,650,000	1,650,000	1,600,000	1,550,000
Inspiration .....	11,400,000	11,900,000	11,150,000	nil
Miami .....	5,364,000	5,112,000	5,349,000	nil
Old Dominion .....	3,516,000	4,430,000	3,965,000	nil
Ray .....	7,902,724	8,815,281	7,614,114	7,808,766
Shannon .....	924,000	964,000	956,000	nil
Other Arizona .....	26,995,962	25,954,310	24,232,675	20,032,410
California:				
Mammoth .....	1,850,000	2,000,000	1,800,000	1,750,000
Michigan:				
Calumet & Hecla .....	14,347,181	14,450,011	13,347,525	11,933,433
Other Lake Superior* .....	9,000,000	8,500,000	8,000,000	.....
Montana:				
Anaconda .....	29,300,000	28,400,000	20,400,000	12,400,000
East Butte .....	2,081,080	2,008,060	1,519,240	nil
Nevada:				
Mason Valley .....	1,300,000	1,528,813	1,465,000	1,316,725
Nevada Cons. .....	6,727,192	7,239,978	6,850,186	7,253,337
New Mexico:				
Chino .....	6,368,874	6,984,457	7,193,262	7,343,757
Utah:				
Utah Copper .....	17,231,512	19,262,856	19,909,097	18,127,154
Eastern smelters* .....	2,386,855	2,521,800	2,200,000	.....
Total reported .....	163,930,898	163,068,390	150,066,027	.....
Others, estimated .....	24,755,000	24,682,420	22,182,000	.....
Total United States .....	188,685,898	187,750,810	172,248,027	.....
Imports, ore and concentrates .....	18,250,215	16,820,020	15,607,586	.....
Imports in blister, etc. ....	29,824,141	32,026,855	45,100,414	.....
Grand total .....	236,760,254	236,597,685	232,956,027	.....
British Columbia:				
Canada Copper Corpn. ....	352,732	270,816	.....	.....
Granby Cons. ....	3,775,140	3,159,284	3,030,929	3,147,886
Mexico:				
Boleo .....	1,653,680	1,929,088	1,740,500	1,411,290
Cananea .....	4,730,000	4,370,000	3,210,000	nil
Other Foreign:				
Braden .....	5,102,000	6,750,000	5,002,000	6,015,000
Cerro de Pasco .....	5,936,000	4,670,000	5,032,000	6,262,000
Chile .....	8,028,000	8,250,000	6,114,000	6,250,000
Cape Copper .....	353,920	396,825	359,350	.....
Kyshtim .....	1,110,000	1,176,000	*1,379,000	.....
Katanga .....	5,070,580	5,643,775	5,246,950	4,850,120

\* Estimated.

The grand total, which in the case of April was 236,760,254 lb., includes, under "Imports in ore and blister copper" the production of such companies as British Columbia, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Cape Copper, Kyshtim and Katanga companies, whose copper does not come here.

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production April to July was 7,180,000; 7,208,000; 5,848,000; and 3,580,000 lb., respectively.

The total production of the United States for the first six months of 1917 was as follows:

January .....	174,658,603
February .....	183,859,588
March .....	192,211,648
April .....	188,685,898
May .....	187,750,810
June .....	172,248,027
Total .....	1,099,414,574

It should be noted that the great curtailment in production owing to the strikes did not commence until July. The total production of United States mines in 1916 was 1,942,776,309 lb., from which it would appear that the production in the first half of 1917 was apparently at only a moderately increased rate.

## United States Steel Corporation

The earnings of the United States Steel Corporation for the quarter ended June 30 were the largest ever reported and exceeded, in fact, those of several entire years in the history of the Corporation. The advance reports made public give the results for the quarter and for the first half of 1917 as follows: The net earning being the amounts remaining after paying operating expenses and ordinary repairs:

	June Quarter	Half Year
Net earnings .....	\$144,498,076	\$257,619,094
Reserved for excess profits tax .....	53,918,872	87,783,872
Net earnings above taxes .....	\$90,579,204	\$169,835,222
Depreciation, sinking fund, etc. ....	\$16,154,151	\$25,944,975
Interest, etc. ....	5,557,517	11,136,955
Total charges .....	\$21,705,668	\$37,081,930
Surplus .....	\$68,873,536	\$132,753,292
Dividends paid .....	27,909,775	60,898,575
Undivided surplus .....	\$40,965,761	\$71,854,717

Dividends for the six months included the regular 3½% on the preferred stock; the regular 2½% and 4% extra on the common stock; and the extra or Red Cross dividend of \$5,083,025 paid in July.

The amounts reserved for taxes are based on careful computations of the taxes that will be levied should the bills pending be passed by Congress.

The statements also said that about \$43,000,000 had been expended during the half-year for improvements and extensions of works, a considerable part of this amount being for the new plant at Duluth. Expenditures for the current quarter will include \$12,000,000 for the new plate mills and other plant at the Fairfield Works of the Tennessee Coal, Iron and R.R. Co., and \$6,000,000 for new shipbuilding plant on Newark Bay.

Another extension planned is a large ship building plant near Mobile, for which land and waterfront have already been secured. Material for this plant will be brought from Birmingham by water, the Warrior River navigation being now open for traffic.

## Antimony in Italy

The total production of antimony ore in Italy, in 1916, was 4334 metric tons, having an average tenor of 19.9%, according to a report published in the *Annales des Mines*. This output was much greater than in 1915, when the ore produced amounted to 555 tons, averaging 24.5%. The high price and strong demand for the metal resulted in more extensive working of the mines of Su Suergas and Corte Rosa, in Sardinia. These, with two or three smaller operations in the district, produced a total of 4197 tons of ore, averaging 19.5% metal. The same causes brought about the reopening of the old mines of La Selva and Cettine de Cortoniano in Tuscany, which report 137 tons of ore of an average tenor of 34.5% metal.

The two old smelteries in Tuscany, idle since 1909, were started up. That at Cettine de Cortoniano made 65 tons of regulus. That at La Selva was not started until late in the year and made only 600 kg. of regulus. The first smeltery treated a quantity of old stock which had been on the dumps since the mine was closed down. The smeltery at Su Suergas in Sardinia turned out 481 tons of regulus and 67 tons of sulphate, a large increase over the previous year.



# Details of Practical Mining

## Testing and Recording the Efficiency of Drills

BY H. H. HODGKINSON

Mine Superintendent, Wharton Steel Co., Wharton, N. J.

There is probably no company in the country that takes more pains to obtain the most efficient and up-to-date drilling equipment than the New Jersey Zinc Co., at Franklin, N. J. It was among the first to real-

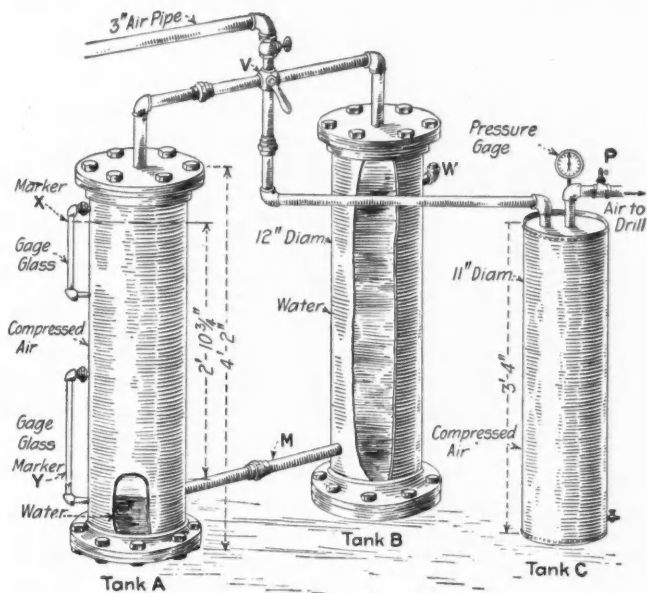


FIG. 1. APPARATUS FOR MEASURING AIR CONSUMPTION

ize that efficiency in mining depends largely on supplying the men with efficient drills—machines which will drill rapidly; whose air consumption is low; whose maintenance is a minimum; and machines which, when put to work, will stay on the job. In the testing and development of drills, the company has gone to considerable expense, and judging from the results obtained, it has unquestionably paid to do so. When a new type of drill is received, every effort is made to get the best results in regard to drilling speed and air consumption that can possibly be obtained from that drill, and in addition the maker is given every assistance possible in his effort to develop a drill to meet the conditions at hand. A drill-testing plant has been established in the mine for the purpose of obtaining accurate results in testing drills. This is situated in an abandoned pump station in the limestone hanging-wall. This white, coarsely crystalline limestone makes excellent ground in which to test the drilling speed of machines, having the ad-

vantage of being more homogeneous than the ore, while at the same time it has about the same drilling speed. The roof and sides of the old pump station afford an ideal place to test drills, making set-ups most convenient. Compressed air is delivered to the station by means of a 3-in. pipe at an average pressure of 95 lb. per square inch. The apparatus used for testing the air consumption of a drill is shown in Fig. 1. It consists of two tanks A and B, both of the same dimensions made by screwing blind flanges to the ends of 12-in. pipe and boring out and tapping the pipes and flanges to make the necessary connections as shown. Tank A is equipped with two gage-glasses upon each of which a marker is placed at an interval of 34 1/2 in. Tank B is filled with water by means of the 1/2-in. pipe W, which is fitted with an elbow and plug to facilitate the refilling of the tank when required. A 1 1/2-in. four-way valve is situated at V, by means of which compressed air is supplied to the small receiver C, alternately from tanks A and B. When tank A starts to supply air, tank B is full of water as shown and the meniscus in the gage-glass is at the lower marker Y; as the air passes out of A, the water in tank B flows through pipe M and rises in tank A until it reaches the upper marker X; in the meantime the volume of water which passed over into tank A has been displaced by an equal volume of compressed air. The valve V is then reversed quickly by means of the lever, and the water gradually returns to tank B, the air displacing the water in tank A until the meniscus in the lower gage-glass reaches the marker Y and so on. The water is colored so that the meniscus is clearly defined in the artificial light. To facilitate the passage of the water back and forth between A and B, pipe M is 2 in. diameter, while the remainder of the piping is 1 1/2 in. The third tank C is a small

### THE NEW JERSEY ZINC COMPANY FRANKLIN, N. J.

#### DRILL RECORD

MAKE: \_\_\_\_\_ TYPE: \_\_\_\_\_ SHOP No. \_\_\_\_\_  
 PURCHASED ON REQ.; A B \_\_\_\_\_ IN SERVICE: \_\_\_\_\_ 191 \_\_\_\_\_  
 CYLINDER DIAM., \_\_\_\_\_ inches PISTON STROKE, \_\_\_\_\_ inches PISTON WEIGHT, \_\_\_\_\_ lbs. \_\_\_\_\_ oz.  
 AVGE. DRILLING SPEED (No date) \_\_\_\_\_ inches per min. AVERAGE AIR CONSUMPTION, \_\_\_\_\_ cu. ft. per min. free FACTOR, \_\_\_\_\_  
 ORIGINAL:— DRILLING SPEED \_\_\_\_\_ inches per min. AIR CONSUMPTION \_\_\_\_\_ cu. ft. per min. free FACTOR, \_\_\_\_\_  
 PRESENT ( )— DRILLING SPEED \_\_\_\_\_ inches per min. AIR CONSUMPTION \_\_\_\_\_ cu. ft. per min. free FACTOR, \_\_\_\_\_

DATE	WORKING PLACE		DRILLING TIME		NO. HOLES DRILLED	FOOTAGE DRILLED	DRILLING FT. PER MIN.	MATERIAL DRILLED	PCS. DRILL STEEL USED					HRS. REPAIR LABOR		REPAIR PARTS (Maker's Symbols)		M'T'CE CHARGES		
	Lev.	Loc.	Hrs.	Min.					1st	2nd	3rd	4th	5th	Special	\$2.25	\$1.00	SUPPLIES	WIRE LABOR	MACH. SHOP LABOR	
Brought Over																				
1st DAY																				
2nd DAY																				
3rd DAY																				
4th DAY																				

FIG. 2. FORM FOR RECORDING AIR CONSUMPTION AND DRILLING TESTS

wrought-iron receiver which acts as an equalizing reservoir and supplies air to the drill at a more constant pressure and in addition catches any water in the air, or water which might have possibly come over from tanks A or B in case the four-way valve has not been

closed properly, thus preventing the water from reaching the drill. This tank makes it possible to read the pressure gage mounted at the top of the tank more accurately, as the indicator of the gage does not flutter with each movement of the valve of the drill, as would be the case if it were not in the system. At the bottom of tank C is a small pet-cock to drain any water so that the volume of the receiver is not cut down, in addition to keeping it away from the drill. At P another small pet-cock is inserted for the purpose of raising or lowering the water in the tanks to the markers in order to start a test.

By using these tanks in testing a drill, the volume of compressed air is kept constant for each run, while the time, inches drilled and air pressure are the variables; that is, five tanks of compressed air are supplied for a run which is equivalent in this case to 11.38 cu.ft. The time required by the drill to consume this amount of air, the inches drilled and also the pressure in pounds per square inch are recorded. A 1½-in. raised-center cross-bit is the standard used for testing purposes, and the condition of the bit at the end of each run is noted

occupying his time, which can be used to better advantage elsewhere. The brown record is filed at the mine for reference, while the blue one is forwarded to the office where a permanent record is kept of each drill from day to day, by means of which one can tell at a glance how much work each is doing, the maintenance cost, also the repair parts, and if the drill is idle, the reason for its being so.

### Rapid Drifting at Jerome, Ariz.

BY AXEL PETERSON

General Foreman, Arkansas & Arizona Copper Co., Jerome, Ariz.

During June, 1917, the 1601 drift on the 16th level of the Arkansas & Arizona mine at Jerome, Ariz., was advanced 535 ft. The formation was diorite for 300 ft. and medium-soft Yavapai schist for the remainder of the distance. All the ground was hard enough to stand without timbering. The diorite drilled much more slowly than the schist, but was blocky and broke better.

The drift was carried 5 x 8 ft., and an average of sixteen 8-ft. holes were drilled each round. The drilling was done with two No. 148 Super-Leyner drills, using 1½-in. steel, and mounted on a crossbar. Air was delivered to the drills at a pressure of 110 lb. The drills gave perfect service, and not a minute's time was lost on their account; the only parts replaced during the month were three water tubes. Three shifts per day were worked, and each shift drilled and shot a round. The crew on each shift consisted of three machinemen, three muckers and two trammers, and besides there was a foreman and two track and pipe men on the day shift, making a total of 27 men. An

STOPE		LEV.		HOLES		FEET		HRS		REP. LAB		DRILL STEEL USED						MAKE		TYPE		PIL'G																																																											
JAN.	SEP.	0	0	0	0	0	0	*	R	H	1st	2nd	3rd	4th	5th	6th	1	2	1	1	1	1	1																																																										
1000	959	80	800	908	150	800	1020	200	864	1141	309	800	1190	350	400	438	1239	450	360	1292	450	290	1440	600	229	1483	850	178	1650	600	90	1644	700	4	1697	750	139	1797	850	291	1855	900	348	1908	850	401	1983	1000	481	2017	1050	535	2071	1100	612	2125	1160	569	2226	M.D.	716	2333	LONG.	763	2405	RISE	812	O.C.	D.V.T.	ORE	LIME	ON'S	PEG	GAN	FELD	STY	BN	CTB.	IDLE	BAN	CLG
DRILL RECORD		NO.		DISCH'D.		SENT MACH. SHOP.		REP. PARTS.		REMARKS.		N		O		W		F.W.		M.W.		N		O		N		S		E		W																																																	
JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960																											

FIG. 3. TICKET FORM FOR SHIFTBOSS' DRILL REPORT

as being either fine, good, fair or poor. Good results cannot be obtained when the drill bits are poorly made. The air consumption and drilling tests are recorded as shown in Fig. 2. The factor obtained in the last column is of great value in comparing different types of drills.

In addition to the care in testing drills when first received, the company has gone further by keeping a daily record of each machine. A report is made out by the shiftbosses, who punch the slip, shown in Fig. 3, in the proper squares by means of a railway ticket-punch. These records are punched in duplicate, one brown, the other blue. Little writing is necessary in making a report for a drill, and a complete record is given of the number of holes and the feet drilled, the drilling time in hours and minutes, the hours of repair labor for repairman and helper, and the number of drill steels of each length used. The number of the stope and of the level are also punched, in addition to whether the drill is working in a drift, raise, stope, chute, longitudinal stope, pillar, block-holing or open-cut. The material being drilled is recorded by punching squares for ore, limestone, garnet, gneiss, pegmatite or feldspar as the case may be. If the drill is not in use, idle, broken or cleaning is punched. This small slip makes a valuable record of each drill without burdening the shift boss with a lengthy written report and

average of 30 cars (19 cu.ft. each) was mucked each shift; the smallest number ever handled on any one shift was 24 and the most 42. The distance trammed was 1500 ft. at the start, and of course increased with the advance to the maximum of 2035 feet.

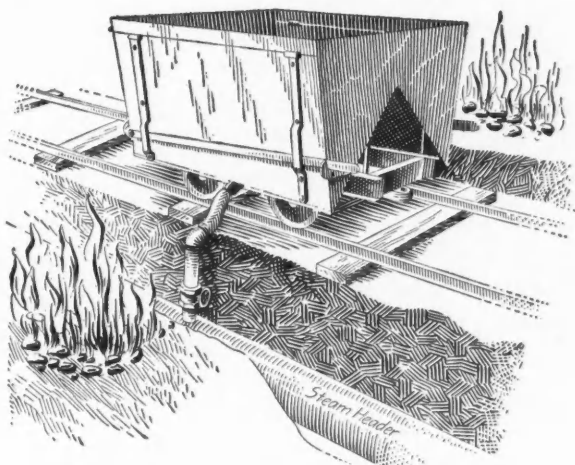
The order of work was for the machinemen to muck back a space about 6 ft. long at the face, and down within 1 ft. of the bottom; then they set up the drills and put in 13 holes. By the time that was done the muckers had the muck all out, and the drills were then torn down and reset in the bottom and three mucker holes drilled. A 40% gelatin powder was used, and the average charge took 75 lbs. Ventilation was secured with a No. 5½ Roots blower running as an exhauster, and sucking through 3500 ft. of 15-in. and 12-in. pipe. Five minutes were usually sufficient to clear the fumes from the face so that all holes could be reloaded and shot which had not broken at the first shooting; and 15 min. always cleared the drift completely so that the succeeding shift could begin work. The Miami wage scale was paid, and the men received \$5.40 per shift with a 50c. bonus to each for every round shot on his shift; also a bonus of \$6 per ft. for every foot over a 12-ft. per day average for the month was distributed to the full gang on the basis of number of shifts worked. No bonus was paid to any man who quit or was discharged during the month, but the full amount earned



was distributed to the men who were on the job at the end of the month. Needless to say, it was a steady crew. Ninety rounds were shot during the month, for an average advance of 6.1 ft., and 27 men participated in the bonus which totaled \$1120. The total labor cost was \$8.10 per ft. of advance.

### Thawing Ore in Open Cars

Thawing ore that has been frozen in an open ore car is sometimes necessary. The illustration shows one method of accomplishing this. Steam at about 25 lb. pressure is admitted through the opening at the door on the side of the car (the car in question being a wooden side-dump gondola) and allowed to stay in this position for about five minutes and then moved along the car a couple of feet and the operation repeated.



ARRANGEMENT FOR THAWING ORE IN CARS

After the main mass has become fairly well thawed, coal fires lighted at the side of the track materially assist in keeping the ore in the car above freezing temperatures. The fire must be back far enough to preclude any possibility of setting fire to the car. With no wind blowing, this system proved very effective at a temperature of about zero. Steam pressure greater than 25 lb. will, of course, produce quicker results than steam at a lower pressure, or will produce the same results in colder weather.

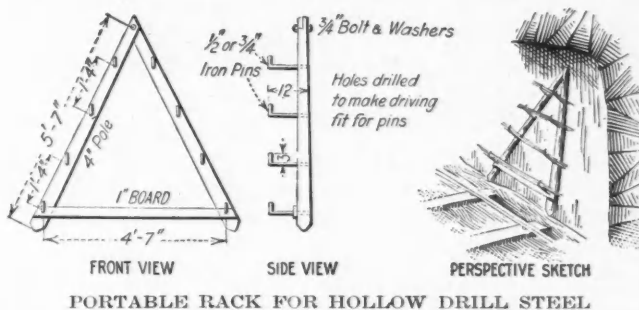
### Noiseless Blasting

Although Maxim has not yet invented a "silencer" for use by those engaged in blasting rock, it is possible to split rocks noiselessly, according to *Engineering and Contracting*. This can be done in several ways, one of which consists in drilling holes about 2½ or 3 in. in diameter and filling them with small lumps of freshly slacked lime. The drill hole is filled a foot at a time, and water poured in to fill the voids, then another foot of lime and more water, and so on up to within the upper sixth of the hole. The top part of the hole is then filled with tamping, well rammed. In less than a quarter of an hour the rock begins to crack. The holes must be speedily loaded and workmen must remain away from them, for the tamping is occasionally blown out with a great deal of force. Building and machinery foundations may be removed in this manner without endangering nearby structures.

### Underground Drill Rack

The use of hollow steel in rock drilling has brought with it many disadvantages, one of which is the tendency of the water hole to become plugged with sludge and grit. When this happens it causes a delay to the miner, who usually tries to clear the hole and use the drill if possible. When he is not successful, which is usually the case, it means that the drill can not be used until it has been returned to the blacksmith shop, cleared and sent down again. When a large number of drills are to be sharpened, the fact that a drill is plugged but not dulled will escape the notice of the man at the forge; and the result is an entirely superfluous re-sharpening and re-tempering of the steel. Such complications add to the expense of operating rock-drills when this kind of steel is used.

There are various ways by which hollow steel is caused to become plugged. The chief one is the manner in which it is handled underground. A trip through the mine will show a surprisingly large number of drills lying around in the dirt. This affords an excellent opportunity for material to lodge in the hole, causing it to choke. Miners, for convenience, will stand their drills in a row along the wall, thereby facilitating the entrance of dirt in the end standing on the ground. It would seem impossible to prevent this evil unless suitable racks are provided. Many types of racks are in use but most of them are permanently fixed in one place. This is a disadvantage in drifting operations in which the miner



PORTABLE RACK FOR HOLLOW DRILL STEEL

gets farther away from his drill rack as the drift advances. If a new rack is not built in a more accessible spot, he will keep his drills nearer his machine any way, and they will soon be lying around or standing up in the dirt again.

To overcome the difficulty, the rack shown in the illustration was designed. It consists of two poles fastened together at the top with a bolt and properly distanced at the base by a board. The iron pins on which the drills are supported are driven into holes previously bored in the poles and can be made of scrap material. The distance board at the base has a large hole bored at each end, which permits the board to slip down over the bottom pins of each pole.

The whole rack can be easily and cheaply built and may be taken apart by removing the bolt and slipping off the baseboard. This makes it a one-man job to move from one place to another.

A glance at the sketch will show that drills of different lengths may be kept separate, and the bits and shanks can be inspected without picking up each drill. This saves time for the miner and facilitates the work of the nipper or any other man responsible for the distribution and care of drills.

## Events and Economics of the War

Riga has fallen to the Germans, the ease with which the seaport was taken emphasizing the Russian disorganization. A monarchistic plot to seize the Russian cabinet failed. A wide breach has been made in the Austrian lines by the Italians who are pushing ahead slowly down the Brestovizza Valley and on the Carso Plateau. Germans are reinforcing the Austrians. Pola, the Austrian naval base, has been shelled from the Adriatic by the Allied fleet. In France, the British lines have been advanced at St. Julien but otherwise the western front is quiet. The British Trade Union Congress now in session, voted overwhelmingly against sending delegates to Stockholm. Canada has passed a military-service act providing conscription.

In the United States, President Garfield of Williams College has been appointed fuel administrator. Price of wheat was fixed at \$2.20 per bu., Chicago. Food stocks in the country were estimated on Aug. 31 by means of inventories taken in 44 representative counties. "Confiscation of wealth" by excessive taxes on profits has been defeated in the Senate. Movement to cantonments of the draft army's first contingent was begun on Sept. 5.

### Ford Making Airplane Cylinders

Henry Ford is quoted in a recent interview as saying:

"I cannot see that any great harm has come in waiting until now with our war preparation. Things have moved so fast in a mechanical way since this war began that many things that were new three years ago are out of date now. We are making 200,000 airplane cylinders of steel for the Government, to be delivered at the rate of 1000 a day. We have just developed a way of making a cylinder of solid steel cheaply. We are glad to help the Government and would help even more if called on. We are glad to help in the fight to stamp out militarism; we feel that we are doing that in producing the cylinders and would produce 5000 or 10,000 a day if called upon."

### Consumers Urged To Use Less Coal

An appeal to coal users to consume less is made in a bulletin issued by the Chamber of Commerce of the United States. Consumers are given the following specific advice: Inquire into the methods employed by your fireman and consider them as compared with the ones suggested by the Bureau of Mines; learn what plants in your locality secure the best results from coal; endeavor to have the wasteful users of coal profit by the best experience of the locality; improve all local methods by consultation with the Bureau of Mines and study of the stoking methods recommended by the Bureau; buy your coal as near home as possible.

The Bureau of Mines has made a study for years of stoking methods. Elaborate investigations and experi-

ments have been conducted, the results of which are available to every user of coal. The Director desires that all consumers call upon this division of the Government for advice and assistance. The Bureau has analyzed samples of coal from all sections of the United States, and is already prepared to give information regarding the best uses to be made of different kinds and grades.

In the past, if the available supply of coal was insufficient for all needs, new mines could be opened. Today men are not available for this purpose. Moreover, one effect of price-fixing may be reduction in output.

### Embargo Heavier on Exports to European Neutrals

The existing embargo on exports to European neutrals was extended on Aug. 30 to include all supplies that, either directly or indirectly, may be of benefit to the enemy. The control of such exports is in the hands of the Export Council. Coin, bullion, currency, and evidences of debt are now included in the list although they are not to be put under the licensing system unless the Secretary of the Treasury so orders.

In a separate section of the President's proclamation on the extension of the embargo, the number of articles already requiring licenses for export to all other countries of the world is increased. The most notable additions are cotton, sugar and lumber. The distinction made between neutral countries adjacent to the Central Empires, on the one hand, and the remaining neutrals and the Allies on the other, foreshadows a policy of strict rationing for the former.

### The New Fuel Administrator

While Dr. Harry A. Garfield, president of Williams College, who has been appointed by President Wilson to carry out the provisions of the Food Bill with regard to the control of fuel, does not claim to be thoroughly versed in coal-mining technic, he is not without experience in the industry. In 1901-2 he directed the organization of the Lake Erie, Alliance & Wheeling Coal Co., which opened up 8000 acres of virgin coal land in Ohio. He later negotiated the sale of the property to the New York Central Railroad.

Dr. Garfield is the son of James A. Garfield, the twentieth president of the United States. He was born at Hiram, Ohio, in 1863. He was graduated from Williams College in 1885, and holds degrees from Princeton, Dartmouth, Amherst and Wesleyan. Much of his career has been devoted to pedagogical pursuits. He occupied the chair in politics at Princeton for five years prior to his election as president of Williams College.

The new fuel administrator practiced law in Cleveland from 1888 to 1893. For many years he has been



prominent in the affairs of that city. He has served as president of the Cleveland Chamber of Commerce and of the Cleveland Municipal Association. When asked to outline his plan with regard to coal, Dr. Garfield declared he was too busy fixing the price of wheat to do so. He said:

"All the machinery given to me will be used to enforce the prices named by President Wilson. Our purpose will be to secure all the benefits contemplated in the act and the fuel control put into force will insure a reduction to the consumer. Any person who thinks this will not mean a reduction in retailers' profits will find he is mistaken."

## Defense Council Seeks I. W. W. Probe

As a result of I. W. W. agitation, the Council of National Defense has issued the following statement:

In accordance with the determination of the Government to omit nothing which might aid in the adjustment of the social disturbances of every character throughout the country, the Council of National Defense and the Advisory Commission in joint session have passed a resolution asking the President to designate a new commission to have as its special field the investigation of the type of disturbances best represented in the public mind by the I. W. W. agitations in the Western States. The proposed commission would have the authority and support of the President to investigate and report on such agitations and labor disturbances related thereto.

The resolution had the unanimous support of the members of the two bodies. It was originally suggested by Commissioner Samuel Gompers, who was instrumental in framing the recent agreement for settling shipyard strikes through an adjustment commission, and who has been active in working toward a solution of all outstanding labor problems.

It is felt that the suggested commission, going from one state to another representing the National Government, perhaps meeting in each instance the governors of the states with the view to lending sympathetic counsel to the state governments and dealing with both employers and employees in a conciliatory spirit, would go far toward discovering the real causes of this particular manifestation of social discontent and assist further in the adjustment of the whole industrial situation.

## Price of Wheat Fixed

The wheat price-fixing commission headed by Dr. Harry A. Garfield has fixed \$2.20 a bushel as the basis price of the 1917 wheat crop. The price, which is equivalent to \$12.50 per bbl. for flour at Chicago, is based on Chicago delivery and will be paid by the Food Administration for No. 1 northern spring wheat purchased for the United States and the Allies. The basis price in the New York district will be 10c. higher. This is thought to be acceptable to producers. However, the Administration has the power to enforce it in any case, through the licensing system. Millers and wholesalers are to be brought under this system at once.

Regulations governing flour milling became effective Sept. 1. Until terminated by 30 days' notice from the Administration the flour mills, which are all licensed if of over 100 bbl. daily capacity, are allowed a maximum profit of 25c. per bbl. on flour and 50c. per ton on feeds. Cost is figured on actual production and market and does not include interest on investment.

Beginning Oct. 1, sugar refiners are requested by Food Administrator Hoover to sell cane refined sugar at about the same price as beet sugar, which is 7½c. per lb. for granulated.

## Canada Cuts Munitions Output

TORONTO CORRESPONDENCE

The Imperial Munitions Board at Ottawa has been advised by the British Minister of Munitions that the increased capacity for producing shells in England makes it unnecessary to maintain the Canadian output on the present scale. Certain lines are to be discontinued and others produced in lessened quantities.

The effect of this policy has already been experienced in the decrease in orders and the cessation or curtailment of work in many plants in Ontario that are engaged in such manufacture. The number of men and women employed in the munitions industry in Canada was recently estimated at 200,000. Many of these are now being laid off and it is expected that the number will reach 75,000. Many of the large firms engaged in munitions work are reverting to their former activities and others are engaging in new lines of industry.

## Embargo on Sulphur

An embargo has been placed on exports of sulphur to Canada, that the supply for war needs of the United States may not be unduly depleted.

Sulphur, classified with explosives, is included in the list of commodities for which export licenses are required. No shipments will be licensed, it is said, until Canada has presented complete estimates of the requirements of Dominion news-print makers and of the needs of explosives factories.

The greatly decreased imports of Spanish pyrites has increased the demand for sulphur from the Louisiana and Texas deposits. Sulphuric acid must be had for explosives and many other essential materials, and while pyrite deposits in the United States are numerous, recourse must be had to southern sulphur until new pyrite mines can be developed or the output of the older mines increased.

## Coal Men Organize

Operators from all the bituminous coal producing states met in Washington recently and organized the National Coal Operators' Association to promote united effort on the part of the coal producers and co-operation with public officials, especially during the war emergency. Delegates were present from state and other organizations representing 700 operators whose annual production aggregates 200,000,000 tons.

An executive committee was named as follows: H. M. Taylor, for Missouri; Rembrandt Peale, Central Pennsylvania; W. K. Field, Western Pennsylvania; Howell J. Davis, Tennessee; F. C. Honnold, Illinois; A. M. Ogle, Indiana; George H. Barker, Ohio; J. J. Tierney and J. H. Wheelwright, West Virginia.

Among the objects of the association, besides co-operation with the Government, are conservation of coal by increasing the yield of the mines, prompt observance of state and national laws, installation of uniform cost-keeping methods and improved accounting systems, and promotion of proper relations between producers and carriers. It is announced that no part of the organization's machinery is to be used for the regulation of production or control of prices.

## Federal Ships To Move Nitrates

To facilitate the movement of large cargoes of nitrate now held up in Chilean ports as well as to help in building up trade, the United States Shipping Board has decided to put five cargo ships, of 5500 tons each, into the South American service beginning Oct. 1, which are to sail fortnightly. They will run between New York and Valparaiso via Panama, with stops at the chief intermediate ports.

These vessels were being built by W. R. Grace & Co., which firm is prominent in the West Coast trade, and were among the ships recently commandeered by the Government to speed construction. Their movements will be controlled by the Government, though they will be operated by the Grace company under charter. Freight rates to be fixed by the Government will be effective on this line, at least as far as nitrates are concerned, it is said. At present much nitrate is held in South American ports because of excessive rates.

As the trip from New York to Valparaiso takes 18 days, it will be possible to reach Buenos Aires from New York by this route in less than 20 days, using the Trans-Andean Ry. from Valparaiso, a trip of about 40 hours. It is said that the sailings of these vessels will alternate with those of the regular fortnightly line to Buenos Aires, thus giving a weekly service thither from New York.

## "Car Shortage" Cut Three Quarters

Fairfax Harrison, chairman of the Railroads War Board, authorizes the statement that the excess of unfilled car requisitions over idle cars, or what is ordinarily but inaccurately termed car shortage, was only one-fourth as great on Aug. 1, 1917, as on May 1, 1917.

The excess of unfilled car requisitions on May 1 was 148,627; on June 1 it was 106,649; on July 1 it was 77,682; and on Aug. 1 it was 33,776.

This has been done at a time when the railroads are supplying from 15 to 20% more freight service with the same number of cars than was being given this time last year.

## Colorado Coal Men Protest

After an all-day conference at Denver on Aug. 30 of representatives of 210 Colorado mines, a committee of mine owners left for Washington, instructed to inform Dr. H. A. Garfield, Coal Administrator, that the new Government prices are confiscatory, and if there is to be any price reduction in Colorado the Government must take over the mines.

It was contended by the operators that it would be impossible to operate the mines at the Government scale because of the high cost of production and transportation.

## Fires Threaten Airplane Stock

Big forest fires have been raging in the vicinity of Lolo Hot Springs and along Randolph Creek in western Montana. Millions of feet of timber, including that intended to furnish airplane stock for the United States and its Allies is endangered.

The Government Forest Service has concentrated all available forces in the Northwest to fight the fires. Backfires have been started and trenches dug for many miles. No rain has fallen in western Montana for 65 days.

## Indiana Protests Priority Order

"Priority order No. 1" was issued by Judge Robert S. Lovett, of the War Industries Board, to Pennsylvania R.R. officials, directing roads serving Lake Erie ports to give priority to coal shipments for those ports so as to get all coal possible to northern Michigan and Minnesota before navigation closes. The order was issued at the request of the President to relieve a coal shortage in the Northwest.

The chairman of the Indiana Public Service Commission has protested that, because of this, coal consumers in the so-called central competitive bituminous district in Indiana are facing a serious shortage. Indiana coal operators have been trying to get cars from other roads as a result.

## Work Started on Armor Plate Plant

Ground was broken on Aug. 30 at South Charleston, W. Va., for the new Government armor plate and projectile plant by Secretary Daniels. About \$22,000,000 is to be spent on the 211-acre site on this work. The situation is 200 miles inland to insure safety from attack in time of war. It is near to coal, iron and gas sources. Within two years about 2700 men will be employed there, it is expected. There have been many rumors and some positive assertions, now proved wrong, that this plant would not be built.

## Contracts Signed for Shipyards

The Emergency Fleet Corporation has completed contracts for three Government-owned shipyards, in which fabricated steel merchant ships will be built. The yards will cost \$35,000,000 and will be built by the Merchant Shipbuilding Co., the American International Corporation and the Submarine Boat Corporation. Congress has been asked for another \$915,000,000 to purchase and commandeer materials, plants and ship construction. Contracts have also been drawn for the construction of about 200 vessels in the yards.

## Italy's Giant Airplanes

"Air cruisers capable of carrying 25 passengers are the latest Italian development in aeronautics," according to Major Perfetti, the head of the Italian aeronautic mission to the United States. "These airships are the Caproni triplanes which hold a number of world's records, including the record for useful weight carried—close to five tons—the speed record of 157 miles per hour, and the distance record which was made on a non-stop run of 920 miles in 10 hours. They are equipped with three motors of 700 hp. each."



## Industrial News from Washington

BY OUR SPECIAL CORRESPONDENT

### Work of the Superior Mining Station

To make the steel industry less dependent on imported ores, means will be studied for increasing the output of domestic iron ores at the new Lake Superior station of the United States Bureau of Mines. Dorsey A. Lyon, the Bureau's new supervisor of stations, and Edmund Newton, temporarily in charge of the station until a civil-service examination can be held for the place, have outlined the work to be pursued there.

It will include a study of the character of individual iron- and manganese-ore deposits; ways of improving methods of mining and beneficiation; deoxidation and desulphurization; possible modifications in alloy manufacture; the effect on metals of the addition of manganese alloys; and the production of ferro-alloys in blast and electrolytic furnaces and substitutes for those manufactured at present. Inquiry will also be made into the use of manganese in making steel as well as into the conditions necessary for building up a domestic manganese industry in normal times to compete with our foreign sources of supply.

### Purchasing Commission Organized

Priority shipments of copper, tin and zinc have been placed in charge of Eugene Meyer, Jr., of New York, who will act directly under Judge Robert S. Lovett of the War Industries Board. Mr. Meyer will also superintend the buying of the metals named, acting in this capacity under Bernard M. Baruch, of the newly appointed Purchasing Commission. Upon the former falls the duty of seeing that supplies of copper, tin and zinc required by the Government and the Allies are obtained as needed. Alexander Legge, the general manager of the International Harvester Co., has been appointed chief adviser to Mr. Baruch in his new capacity.

The Purchasing Commission is now sufficiently organized to begin work. It should be emphasized that this commission does no actual buying. Its function is simply to assist in obtaining the materials and to recommend the price to be paid. The regular purchasing officers of the various departments of the Government and of the foreign governments will continue to be the final arbiters on all contracts.

### Decision on Nitrogen Fixation

Southwestern Virginia has been selected as the best site for the fixation of atmospheric nitrogen. Of the \$20,000,000 appropriation the Government will spend \$3,000,000 for a synthetic ammonia plant, employing the process of the General Chemical Co., \$600,000 for a plant for oxidation of ammonia to nitric acid and concentration of nitric acid, and \$200,000 on experiments to develop the Bucher process for the production of ammonia. The sum of \$100,000 is also to be expended on

investigating methods of producing nitrogen compounds used in making explosives and fertilizers.

The synthetic-ammonia plant is to have a capacity of 60,000 lb. of ammonia per 24 hours, and the oxidation plant a capacity equivalent to 24,000 lb. of 100% nitric acid per 24 hours. To avoid delay, priority orders will be issued, so as to secure prompt delivery of materials. The necessary machinery manufactured in anticipation of this decision can be set up as soon as the buildings are erected.

An important part in the investigations prior to the above conclusions was played by a committee selected by the president of the National Academy of Sciences consisting of Arthur A. Noyes, Charles H. Herty, Theodore W. Richards, Leo H. Baekeland, Gano Dunn, Warren K. Lewis, Elihu Thompson, Michael I. Pupin and Willis R. Whitney. The recommendations were strongly influenced by reports made by Dr. Charles L. Parsons and Eysten Berg, who visited Europe and examined the processes in use there.

### Dispute Over Pyrites and Manganese Imports

Irreconcilable differences seem to have sprung up among those most directly interested in the pyrites and manganese situations. Lack of accord has its origin in the question of how much of these minerals should be imported. One faction claims that this is no time to await the outcome of questionable prospecting when the supplies of two such vital minerals are concerned, and would have a considerable amount of shipping allotted to carry manganese and pyrites with the idea of building up reserves in this country.

The other faction is desirous of seeing as little shipping as possible tied up in these trades and would exert great effort to increase the domestic production. It contends that investigations of domestic supplies have demonstrated that the United States can produce much greater quantities of pyrites and manganese than had heretofore been thought possible. It claims that the prospect of obtaining much larger imports has kept capital from entering into the development of such properties, thereby discouraging prospecting. All this is taking out of service a large number of urgently needed ships. It is argued, moreover, that even should the Shipping Board and the British Admiralty designate tonnage for pyrites importations the supply could not be relied upon, as more urgent needs for the shipping are likely to develop at any time.

### Geologists Will Survey Camps

Acting on suggestions from Washington, state geologists will survey the areas covered by the 16 army cantonments. The main purpose is to interpret land forms and underlying rock structures for military ends.

## Editorials

### Price Fixing and Taxation

AS THE debate in the Senate on the revenue bill draws to a close, it is worth while to consider once more some of the broad economic aspects of the problem, although this is in no wise an appeal to the congressional intellect. Any one who has read the Senate debates during the past couple of weeks must have come near, at times, to despairing of the human intellect, as the *Evening Post* remarked a few days ago. Such a waste of time, such a mass of irrelevances, such speaking at random and discussing at cross purposes, such loose statements, such childish misunderstandings, such an advertising of small minds could never have been got together before in the same space. No later than last Monday Senator La Follette shouted in support of his amendment levying a flat tax of 70% on war profits, "It is proposed to take the lives of our boys, the heads of our families and all the people have got, but still to leave the money-making corporations with 30% of their blood profits to add to their normal business profits and to their capital unimpaired."

Some of the governments of Europe, including Great Britain, have not found it expedient to take so large a proportion of excess profits, while those which have done so have paid the penalty for their disregard of economic principles. The revolutionary government of Russia has taxed war profits at the rate of 97% and has learned that this contributes to strangulation of the supplies of the new nation, which above everything else are needed. What our socialistic congressmen are contemplating simply duplicates the experience of Canada, which takes 50% of all profits in excess of 15% on capital and 75% of all in excess of 20%. It has been a constant allegation in Canada that the "profiteers" are let off too lightly. As a matter of fact, however, it has been found that the Canadian excess profits tax is too high; that it has prevented manufacturing expansion, and, for that reason, the Government is likely to modify the tax, having learned that undue severity of taxation has a tendency to curtail productivity and interfere with the success of bond issues. It should be borne in mind that in conducting business at the present time, capital is required to assume extraordinary risks and make extraordinary expenditures, wherefore it must be allowed to retain a fair proportion of the extra profits, else there is danger that many concerns will cease to produce or will cut down their activities.

Exactly the same principles apply in the matter of price fixing. We have seen already, as the result of the arbitrary, drastic and ill-considered reduction in the price for bituminous coal, that there is prospect that coal production will be curtailed owing to checking of

incentive to produce and inability to meet the increasing demands of labor. While, moreover, the operators of certain districts have informed the Government that they cannot afford to operate at the official prices, and that if the Government thinks otherwise it may take over and exploit their mines on its own account. Everybody in possession of his senses knows that the Government could not operate any business as economically as can be done privately.

The British experience has been that complete control of a market is impossible. The British ministries that started out by attempting to fix maximum prices ended by having to name minima. On the other hand, it was discovered that as the Government becomes the chief buyer in any market it is able by virtue of that fact to influence that market powerfully, if not absolutely to control it. This is in conformity with the principles of economics. Referring to Washington, it will be noted that at no time in handling the food situation has Mr. Hoover departed from sound principles. Economic and financial vagaries would not be expected from a man of business of his experience and a philosopher of his high standing. The desire to enter upon economic adventures and experiments has been exhibited mainly by the bureaucrats, commissionaires and the doctrinaires, who would listen equally respectfully to the inventor of a device for perpetual motion or to the promoter of a scheme to make water run up hill.

It is gratifying that in action upon the revenue bill the conservative element of the Senate seems likely to prevail. The war is going to be fought in the mines, the factories and the fields of the United States just as much as it is in Flanders and in France. In order to make things secure in this country, in the rear, economic and financial policies must be framed according to business experience and to the principles of common sense, and new experiments must be tempered with great moderation. Failure to recognize these principles is one of the great troubles, perhaps the greatest, of revolutionary Russia.

### Gold Production of the World

FOR reasons that will be readily understood, it was not possible to give any approximately correct estimate of the gold production for 1916 earlier in the year. At the present time many full returns have been received and a fair approach to correctness can be secured. There are, of course, some gold-producing countries where no accurate returns of production are collected. This is the case in several South American countries, in China and in Mexico. Making these allowances, we find that something over 80% of the



world's gold production is covered by fairly accurate statistics, while of the remainder a considerable proportion can be checked up pretty closely by export and other trade returns. The total output of gold, therefore, can be ascertained within fairly close limits, even if absolute accuracy cannot be secured.

The accompanying table gives the value of the gold won in the world for the three years, 1914-16 inclusive. The figures give the value in dollars of the fine gold reported in each case.

The total production of 1916, as given in the table, was \$470,442,068. This was less than that of 1915 by \$8,110,154, or 1.7%; but it exceeded that of 1914 by \$10,344,640, or 2.2%. The most important gain shown in 1916, as compared with 1915, was of about \$6,000,000 in the Transvaal; but this was offset by decreases of \$8,720,000 in the United States and \$6,980,000 in Australasia. The Transvaal gain was due to intensive work-

GOLD PRODUCTION OF THE WORLD

	1914	1915	1916
Transvaal.....	\$173,176,133	\$186,105,890	\$192,138,770
Rhodesia.....	17,745,980	18,892,959	18,957,310
West Africa.....	8,671,371	8,521,682	7,861,210
Madagascar, etc.....	1,980,000	1,865,000	1,905,000
Total Africa.....	\$201,573,484	\$215,385,531	\$220,862,290
United States.....	\$94,531,800	\$101,035,700	\$92,315,363
Mexico.....	18,185,000	14,950,000	14,150,000
Canada.....	15,925,044	18,977,901	19,162,025
Central America.....	3,500,000	3,575,000	3,605,000
Total North America.....	\$132,141,844	\$138,538,601	\$129,232,388
Russia, including Siberia.....	\$34,458,088	\$35,150,000	\$34,750,000
France.....	1,450,000	1,025,000	950,000
Other Europe.....	2,350,000	1,675,000	1,580,000
Total Europe.....	\$38,258,088	\$37,850,000	\$37,285,000
British India.....	\$12,327,980	\$11,484,169	\$11,184,062
British and Dutch E. Indies.....	4,690,000	4,825,000	4,960,000
Japan and Chosen.....	7,476,500	7,850,000	7,980,000
China and others.....	3,625,000	3,675,000	3,750,000
Total Asia, not inc. Siberia.....	\$28,119,480	\$27,834,169	\$27,874,062
South America.....	\$13,525,000	\$13,750,000	\$13,975,000
Australasia.....	46,479,532	45,193,921	38,213,328
Total for the world.....	\$460,097,428	\$478,552,222	\$470,442,068

ing of mines and a larger supply of labor. The loss in Australasia, on the other hand, resulted from scarcity of labor, from the diversion of capital to other fields and from the absence of prospecting, which has prevented the discovery or opening of new mines to replace those which have been exhausted.

Apparently the war has had little direct effect on gold production. Most of the producing countries are out of the direct track of the conflict. Even in Russia the only effect on gold mining felt was the withdrawal of working forces for the army, and this operated only to a moderate degree. Mexico's activity was diminished by internal troubles entirely. The only countries affected were in Europe, where the production is but small at any time.

The total gold production of the world for 20 years past is given in the second table. As already noted, the total for 1916 was less than that of 1915; but it was greater than that of any preceding year except 1912. It was nearly twice that of 1897, or 20 years

GOLD PRODUCTION FOR 20 YEARS

1897.....	\$237,833,984	1907.....	\$411,294,458
1898.....	287,327,833	1908.....	443,434,527
1899.....	311,505,947	1909.....	459,927,482
1900.....	258,829,703	1910.....	454,213,649
1901.....	210,877,429	1911.....	459,377,300
1902.....	298,812,493	1912.....	474,333,268
1903.....	329,475,401	1913.....	462,669,658
1904.....	349,088,293	1914.....	460,097,428
1905.....	378,411,054	1915.....	478,552,222
1906.....	405,551,022	1916.....	470,442,068

ago. Gold production gained steadily through the 20 years with the exception of the three years, 1899-1902,

when the Boer War stopped production in South Africa. The growth was in part due to the opening of new fields in South Africa, in Alaska and the Yukon, and in the Lena district of Siberia; and in part to the advances in metallurgy, which increased the yield of many older mines and districts and which made possible the profitable working of low-grade deposits.

As usual, it is very difficult to say what proportion of the gold won actually passed into circulation or became part of the world's money stock. The demand for gold was large, as in 1915, and it is probable that a larger proportion of gold than in ordinary years was monetized, or in the form of bullion used to support credit reserves. One consequence of the commercial disturbances caused by war was that an unusual quantity of gold found its way to the United States, which now holds the largest gold reserve in the world—probably the largest amount ever accumulated in any country. Another effect of the war was found in changing routes of gold shipments. Thus a large part of the Transvaal gold, instead of going to London, was shipped to Canada, whence it passed into the United States. The adoption of such unusual channels of transmission has added to the difficulty of tracing the movement of gold. It is possible only to say, as above, that probably an unusual proportion of the gold supply has been used as money or the basis of credit. It is probable also that only a small proportion was used in the arts—much less than in an ordinary year. But the whole question of the disposition of the new gold seems impossible of any exact solution.

## Stocks of Spelter

THE recent decline in the price of spelter has been manifestly due to pressure exerted by holders of accumulated stocks in a market wherein buyers were conspicuous by their absence. The government report respecting the situation at the mid-year showed an increase in stocks, but that revealed only a part of the story, for those figures pertained only to stocks at smelters' works. Besides such stocks there was reason to believe that there were important accumulations in warehouses and, furthermore, it was a fact that certain important consumers had large supplies of unused spelter in their yards. The last condition is one of the explanations of the absence of buyers in the market.

In fact, the accumulation of spelter has been going on ever since the first of this year, and perhaps earlier. At first the smelters did not feel this very keenly, for the freight congestion in the early part of the year obscured the true situation. Manufacturers who failed to receive spelter that they had bought, or considering it advisable to increase the supplies in their yards, kept on buying and thereby kept down the accumulation of spelter in producers' hands. The surplus was accumulating, but temporarily it was to a large extent in transit. When manufacturers began to receive supplies freely, they no longer needed to buy, and then stocks began to accumulate rapidly in smelters' hands.

Since then the zinc market has been governed not so much by cost of production as by the attitude of the holders of unsold stocks. As we have previously pointed out, a price of 8 to 9c. for spelter corresponds probably to 5c. before the war, the increment representing the

increased cost of production or the inflation—or whatever it may be called—in this industry. Certainly, a good deal of spelter that is being produced at present costs considerably more than 7½c. per lb., and with the market at that price zinc may be considered cheap under existing conditions.

## The Flotation Patents

**I**N the bear market of last week a part of the ammunition that was brought up and used against the copper stocks was the great damages for which these companies would be liable for infringement of the patents of Minerals Separation, according to Judge Bourquin's recent decision. This argument failed to take into consideration three important things.

1. Anaconda, Inspiration and that group of copper companies, also Braden and others, are immune, having early taken out a license from Minerals Separation.

2. The Hayden, Stone and Jackling copper companies have not until recently been important users of the flotation process. Their backwardness in adopting that great improvement in the art was long a subject of adverse criticism directed against their technical managements. Butte & Superior is the great infringer, if infringer it be.

3. The decision of Judge Bourquin will probably be appealed. Without venturing to express any opinion as to its merits, not having the full text, we may nevertheless state the case thus: The Supreme Court sustained the Minerals Separation patents upon the use of less than 1% of oil together with a certain kind of agitation. Butte & Superior then reverted to the use of more than 1% of oil and Minerals Separation claimed that that was still an infringement of its patents. Judge Bourquin has upheld that contention. However, this so involves the construction of a decision of the Supreme Court, and is so contrary to the letter thereof, that it is practically certain that the case will be kept open until the Supreme Court has ruled again.

The index for Vol. 103, Part 1, of the *Engineering and Mining Journal* will be mailed with this issue. Any subscriber not receiving a copy of same should notify the subscription department at once.

### BY THE WAY

Long before Bingham became famous as a copper camp and before the U. S. S. R. & M. Co. took over the Old Telegraph mines, hundreds of men had leases in upper Bingham Canyon. Many of these men—good miners too—were not able to do a good job of tool sharpening, and a one-legged blacksmith named Cook added to his income by sharpening them for a nominal sum. As a shop would not pay in itself, Cook had a lease at which he worked when unoccupied as a tool sharpener. The few "white men" on the Old Telegraph "had an eye" on him, as his peg leg made it difficult for him to get up and down the winzes, which always seemed to hold more inducements as good leasing ground than points more accessible to one afflicted as he was. One night he failed to appear after "tally," and a hunt was

instituted for him. Upon a call down the winze where he had been working, an answer was received and a request to "come down." There sat Cook, literally in pieces, his peg leg used as a stull under a rock which would fall if the "stull" were removed, yet perfectly safe as it was. Cook did not try to get out, as he knew help would reach him sooner or later and if the rock fell, he would have to remove it as waste. A sprag was substituted for the "leg," and Cook went home. The "rescuers'" remarks have been deleted by the censor.

*The Reef* is the title of a monthly magazine recently started by the Prevention of Accidents Committee of the Rand Mutual Assurance Co., Ltd., at Johannesburg. It is devoted to the prevention of accidents, first aid and similar work. It lays especial stress on the necessity of instructing the Kafir laborers in the mines.

The Australian authorities are continuing vigorously their attempts to put an end to the activities of the Industrial Workers of the World. According to a cablegram of Sept. 4, three more members of the society at Sydney and 34 at Broken Hill have been sentenced to six months' imprisonment for belonging to an unlawful association.

When a mining engineer is in such straits that necessity bids him try to be versatile, let him also be canny. In trying to land a position that is a little out of his own line he should say as little as possible and be prepared to substantiate that little until the last pay day. Such positions are seldom landed by mere correspondence. Once upon a time (but this is no fairy tale) a young engineer had a job as chemist with an iron company in Michigan. He had chosen iron as his specialty, had married and was happy. When one is a proud daddy, why should he worry over a debt that is being paid off a little each month? But suddenly the iron company went out of business. Wife and kiddy went to visit the old folks while Dave hustled for a new job. At the bank, asking for an extension on the balance of his note, he told of his prospects and asked advice. One opening was available, as chemist for an iron company in the same district; while another vacancy, at a lower salary, was at a mine in Canada where a rarer metal was to be recovered from a troublesome copper ore. The bank advised his trying for the place in Canada. "But," said Browne, "I don't know a thing about nickel and, furthermore, I am without funds to keep me alive until I can hear from the company's head office in Cleveland." The banker replied, "Don't write letters. Go down to Cleveland and get that job. Here is \$100 for expenses. Pay it back as soon as you can." In telling the yarn to a younger engineer and protégé, David H. Browne said, "I obeyed instructions and, when I reached the works, my predecessor had gone, leaving a small boy in charge. The boy asked for instructions, so I told him to keep right on as usual until I got my boxes unpacked and everything arranged for comfort. But I watched that kid out of the corner of my eye and, as soon as he went home that night, I pitched in and practiced the things I had seen him do. After working nearly all night for three nights I felt competent to hold the job."



## Defective Safety Appliances

BY CHESLA C. SHERLOCK\*

Safety appliances to protect workmen from dangerous machinery or to add to their convenience in going about their daily tasks are quite common in the industrial world. These appliances may have been installed in shops and factories because of specific state legislation compelling employers to do so, or employers have installed them on their own initiative because they wish to take every means possible to protect their workmen from injury.

The legal questions involved in the proposition of safety appliances are manifold and intricate, particularly as to the liability of the employer for a defective safety appliance which results in injury to a workman.

### ACCIDENT FROM FAILURE OF HANDGRIP

In an Iowa case it was shown that a railway fireman had relied on the grabiron or handgrip provided by the employer on a locomotive. Taking hold of the grabiron, which was defective, it gave way, causing his injury. He sued the employer company for negligence in failing to maintain the appliance in proper condition.

The court ruled that "the casual connection between the injury and the negligence of the defendant may be proved by direct or circumstantial evidence. If the latter, it must be something more than consistent with plaintiff's theory of how the accident occurred. It must be such as to make that theory reasonably probable, not merely possible, and more probable than any other hypothesis based on such evidence."

In another case, the same court said: "If the circumstances surrounding the case do no more than indicate a possibility of the accident happening because of a defective appliance, or if they are no more consistent with the theory that the accident was due to some defect, but equally explainable on some other theory than the one charged, then plaintiff has not made out his case. The reason for this is that the burden is upon the plaintiff, not only to show some defect for which the master was responsible, but also to show that this defect was the proximate cause of the injury."

Inasmuch as there was a doubt as to whether the fireman's foot slipped off the step before the grabiron gave way, the court refused to allow him to recover for his injuries.

Employers may be of the opinion that this is a very narrow point to make in a discussion of this sort, but that very fact makes it highly important. The law announced is applicable in a multitude of cases quite common in the ordinary daily events of the industrial world.

For instance, in a Missouri case it was held that a master is not only bound to furnish suitable and reasonably safe means and instruments with which the servant is to perform his labors, but he must also maintain them in suitable and safe condition, which requires their continuous inspection, the repair of the defective, and the replacement of worn, parts.

In another Missouri case it was said that making tests, only at intervals of two or three weeks, to determine whether or not a device installed to stop ma-

chinery in which employees have become caught is in working order, may be found to be negligence where the device is of delicate construction and frequent tests have shown it to be out of order.

The Federal courts have held that it is a violation of the Federal Safety Appliance Act for a railroad company to send, as a part of a regular train, a defective car to shops for repair. They have held, however, that it is not a violation of the act for the company to send such cars to repair shops in a train made up entirely of such cars.

A great number of the states have passed their own safety-appliance statutes, which are applicable to all occupations hazardous in nature. It is the duty, of course, of employers to keep posted on their local laws on this subject in order to avoid liability for any contingency that may arise.

The law, having laid down certain rules intended for the protection of workmen in hazardous occupations, is a very jealous mistress in their enforcement. It is the supreme and paramount duty of every employer to keep these safety appliances in the best of working order. The mere fact that an appliance is not in the best of repair seems to be prima facie evidence of the employer's negligence. Unless some peculiar circumstance arises, as was the case in the Iowa case mentioned, such as to raise a doubt, the master will be liable in every instance for damages.

Where the law prescribes a means of safeguarding the interests of the laboring classes and an employer is lax in following the prescribed method, the law has no sympathy for him and will hear no excuses.

## Market for Canadian Mineral Products

TORONTO CORRESPONDENCE

The report of the Special Trade Commission to Great Britain, France and Italy, appointed by the Canadian Government May 9, 1916, has been issued by the Canadian Department of Trade and Commerce. As the result of an extended visit to these countries, and conferences with the commercial organizations and municipal authorities of the leading industrial and commercial centers, the report comprises classified lists of the principal commodities in requisition, or for which markets could be opened.

In Great Britain the commission found that there were on every hand many inquiries for Canadian metals and minerals, the following being the more important opportunities for increased trade indicated.

**Magnesium:** There is every possibility of a permanent and growing trade in this metal, apart from war requirements, as it has been found that it alloys with other metals in such a way as to assure its increasing use in the future.

**Asbestos:** This is one of the leading articles for which inquiries were made and there is no doubt that the development of the trade in this material can be widely extended. British importers require, in addition to the crude article, asbestos sheets, gloves, shingles and every form of manufactured asbestos.

**Antimony:** Great Britain is a large importer of this article and, as Canadian mines are now able to produce an improved quality, there should be an opening after the war for large quantities of metal and oxide.

\*707 Youngerman Building, Des Moines, Iowa.

**Tungsten:** Repeated inquiries were made for this article, either in the form of metal or concentrates.

**Cobalt:** Owing to improved processes for the use of this metal in electroplating and as an alloy with other metals, there was much interest displayed as to the prospect of getting a supply from Canada.

**Mica:** In many centers there were inquiries for mica, but it was stated that the mica powder hitherto shipped had not been satisfactory as it was not ground sufficiently fine. Some criticism was offered as to the quality of Canadian mica, some of the smaller shippers having forwarded goods which had not been properly graded and were generally in bad condition. The Indian mica business is well organized and seems to give complete satisfaction. It was admitted that the quality of Canadian amber mica was second to none, and the opinion was expressed that if exporters would organize a system on the lines of the Indian shippers, a largely increased and profitable trade could be developed.

**Molybdenite:** The demand for this commodity was general, but the Canadian occurrences are widely distributed and to secure the best results the trade would have to be well organized. The high prices now realized make the question of developing the trade worthy of serious consideration.

**Zinc:** Canada has a great opportunity to secure a share of the British demand, as Great Britain is likely to continue to be a good customer when the war is over.

**Nickel:** A demand for nickel, chiefly for the hardening of steel, was found in all the countries visited. Some of the smaller buyers stated that they had difficulties in getting supplies and desired a better medium for obtaining their requirements at more favorable prices. Some of the larger buyers intimated that they would prefer to do business directly with Canada.

#### BRITISH, FRENCH AND ITALIAN MARKETS WERE INVESTIGATED

Other minerals for which the British market seemed to offer some possibilities were graphite, corundum, magnesite and chrome-iron ore. In treating of the opening for manufactures of iron and steel the report devotes much attention to the great demand for wire. This was largely supplied by Germany before the war and there is consequently a great shortage in the supply. On the assumption that there will be a continuance of this condition a favorable opening exists for the furnishing of wire from Canada. A large trade in wire nails is also being established.

In France the commissioners found many inquiries for Canadian metals and minerals; more especially asbestos, antimony, mica, tungsten, cobalt and nickel. French importers were also ready to receive offers of spelter, pig lead ready for rolling, and copper ingots as soon as Canadian manufacturers were prepared to offer them.

The commissioners had only a limited time at their disposal in Italy, but reported important possibilities in that market for Canadian metal and mineral products.

The members of the Commission were James W. Woods, Toronto, chairman; H. Edmond Dupré, Quebec; W. Frank Hatheway, St. John, N. B.; Theodore H. Wardleworth, Montreal; Frank Pauzé, Montreal; and George W. Allan, Winnipeg.

## Methods of Exploring for Oil and Gas

BY GEORGE E. BURTON

Assistant Director, Oklahoma Geological Survey

There are in Oklahoma at present two general methods of exploring for oil and gas—making one or more churn-drill tests at random, and geological examination of the surface. Then, if favorable structure is found, churn-drill holes are drilled.

Although the former method has to its credit a long list of dry holes, the great Healdton pool was discovered in that way. However, the chances are small. The second method has to its credit the discovery of several oil and gas pools, among which are the great Cushing pool, the Blackwell, Ponca City and the new Garber and Billings pools. The churn-drill method of exploration, although it has some discoveries to its credit, is too expensive in proportion to the favorable results obtained to remain in favor much longer.

It is generally conceded by petroleum geologists that the surface in the possible oil and gas territory in Oklahoma has been pretty thoroughly examined, that most of the favorable structures have been located, and that the lands overlying such structures have been pretty well leased up, so it seems that the end of the second method is in sight. The petroleum geologist has been confined to those areas within probable oil and gas territory in Oklahoma where there are what he calls "reliable outcrops." Where sufficient outcrops of these reliable strata occur, the geologist can work out the structure and point out the location of anticlines or other folds.

At shallow depths in these areas there are, no doubt, strata which have considerable horizontal extent, which are deposited horizontally and which could be recognized from the core of a diamond drill. By proper spacing and careful surveying of drill holes, the underground structure could be determined.

#### CORRELATION OF STRATA FROM DRILL CORES

The cost of this kind of exploration is, I think, entirely proportionate to the reward sought. A churn-drill hole costing \$20,000 was drilled to a depth of 3000 ft. in the NW cor. Sec. 30, T. 23 N, R. 6 W, by the City of Enid, Oklahoma. This well is located in an area where there are very few outcrops, and consequently the underground structure cannot be determined from the surface. The sum total of information gained for an expenditure of \$20,000 is that this particular hole is dry. There may be oil or gas within a few hundred feet in any direction from this hole. This method of exploration is obviously too expensive to continue.

As shown by the log of the Enid well, there is at a depth of 830 ft. a limestone 2 ft. thick, which has, no doubt, considerable horizontal extent. The Duluth Diamond Drill Co., of Duluth, Minn., contract diamond and churn drillers, roughly estimate that they could drill with diamond drill to a depth of 1000 ft. at a cost of from \$1 to \$2 per ft. At the maximum charge per foot, 12 drill holes could be put down to the 830-ft. "lime" stratum in the Enid well. By properly placing and carefully surveying these holes, the attitude of this stratum could be determined over considerable area in the vicinity of the Enid well. I want



to point out the fact that these figures are probably extreme. I feel sure that from a core a reliable stratum could be recognized at considerably less depth. This would permit the exploration of a larger area for the same amount of money.

## Reclaiming the Scrap Pile

It has not been so long since most plant managers, superintendents, and owners regarded anything thrown into the scrap-pile as waste, beyond reclamation. Probably two things have contributed more than anything else to change their opinions of waste—war and modern welding processes.

In ordinary times the scrap-pile is a neglected avenue for the escape of profits. Now that war has pushed up the prices of raw material, the American plant owner and factory man have begun to analyze their scrap heaps. Usually they find huge accumulations of damaged or worn machinery, tools, "short ends" and other material that represents considerable profit thrown away. Face to face with labor shortage, metal shortage and the time factor, plant owners are reclaiming these worn and damaged machines and broken tools and putting them back to work earning profits.

Recently an engineer for an oxyacetylene concern made an investigation in a Western mining field. At one big mine he found in the scrap-pile dollies and dies for drill sharpening worth \$9 each that could be welded and put into service at a cost of about \$1 each. The mining company was on the anxious seat, too, as to when it would be able to get more new material. It was found that the scrap heap of one year's accumulation would yield a three months' supply of good material.

At another time the engineer found a year's supply of tram buckets, worth \$40 each, with broken bottoms that could easily be repaired by welding at a slight cost. In addition he found a three months' supply of stamp stems and short ends of tungsten steel, that could be welded. He found crusher plates of manganese steel worth \$20 each, slightly too big for the machines then in use, but which could be cut down by the oxyacetylene process at small cost, and put into service again at a large saving.

The various processes of welding have made it possible to reclaim machines and tools that formerly were sold as waste, and at a fraction of the original cost. Nowadays any kind of metal—steel, iron, both cast and malleable, brass, bronze, copper, aluminum, sheet iron and precious metals such as gold, silver and platinum can be welded and broken parts made as good as new. At a heat of 6300° F., produced by the combustion of acetylene in oxygen, any of these metals fuse and run together, a virtual remolding of the parts.

A railroad company had an accumulation of scrapped driving wheels for locomotives, most of which had cracked spokes. The demand for more rolling stock, caused by war pressure, caused the company to reclaim the wheels. The oxyacetylene welding process did the work, saving the road several thousand dollars and making it much more in profits through putting discarded engines to work.

In one plant, stub ends of nickel anodes, used in electroplating, were sold as scrap at a low price to get rid of them, until it was found feasible to weld them to-

gether and thus use up every bit of the material at an enormous saving. It was like sticking a small piece of soap, left from the old bar, on a new cake and getting 100% use of the article.

A big milling concern rummaged its scrap heap and discovered a quantity of discarded gear-wheels—castings with teeth broken out. At a trifling cost new teeth were fused into the castings, making them good as new and saving the concern an enormous amount of time.

## Imports and Exports of Ferroalloys

Imports and exports of ferroalloys and of special metals and ores in the United States for June, and the fiscal year ended June 30, are reported, as below, in long tons, by the Bureau of Commerce at Washington:

Imports	June		Year	
	1916	1917	1916	1917
Ferromanganese		3,817		73,741
Ferrosilicon	536	869	5,469	8,715
Nickel ore and matte	7,848	3,503	87,700	33,053
Manganese ore	58,143	62,778	492,860	656,088
Tungsten ore		343		3,823
Exports				
Tungsten and ferrotungsten, lb.		172,079		1,784,306
Ferrovandium	60	91	497	1,168
Nickel, nickel oxide, etc.	1,022	804	11,451	13,842

Tungsten and ferrotungsten are given in pounds. They were not reported separately until the last fiscal year. Ferromanganese and ferrosilicon were also not reported separately until last year.

## Chronology of Mining for August

Aug. 1—Frank Little, I. W. W. agitator was hanged at Butte, Mont., by masked men.

Aug. 4—Explosion of gas occurred in No. 7 mine of West Kentucky Coal Co., Clay, Ky., killed a total of 61 men, 84 being rescued.

Aug. 10—U. S. Senate adopted Pittman Bill providing for the leasing of Government lands containing potash and other chemical resources.

Aug. 11—New position of superintendent of experimental station, with headquarters in Washington, created by Director Van H. Manning of U. S. Bureau of Mines, Dorsey A. Lyon being named as the first incumbent.

Aug. 17—New mining experiment stations authorized at Minneapolis for the iron industry and at Columbus, Ohio, for the ceramic industry.

Aug. 19—Arrest by U. S. military authorities of 27 I. W. W. leaders including James Rowan, district secretary at Spokane, who issued orders for a general strike of workers in Montana, Idaho, Washington and Oregon, which threatened to retard necessary war materials.

Aug. 21—President Wilson fixes base price of bituminous coal at about \$2 per ton of 2000 lb., at mouth of mine.

Aug. 24—Dr. H. A. Garfield, president of Williams College named as Coal Administrator.—Price of anthracite fixed at \$4 to \$5.30 (except for buckwheat) according to locality and size.

Aug. 27—Shutdown of Anaconda Copper mines in Butte, Mont., followed closing of smelters by labor strike.

Aug. 30—Price of silver in New York reached 90¢, the highest in 25 years.

## Personals

**Harold C. E. Spence** has left Duncan, Ariz., for Newfoundland.

**W. H. Cunningham** has been elected president of the Lake Superior Corporation.

**Ralph Benedict**, recently with the Sullivan Manufacturing and Drilling Co., is now in France.

**W. E. Firth**, safety engineer with the Midvale Steel Co., Philadelphia, has resigned to take a long vacation.

**J. Parke Channing** recently left New York for Lake Superior, to inspect mining properties, including the Naumkeag mine.

**G. M. North, Jr.**, recently with the Keweenaw Copper Mining Co., as engineer, has enlisted as machinist in the Navy.

**C. Erle Wuensch**, formerly superintendent of the Placerville Gold Mining Co., recently examined mines at Placerville, California.

**Henry Orlando**, owner of the Yellow King mines, South Dakota, has been examining mining property, recently, in Placer County, California.

**William Anthony Burr**, late mill engineer with the Moose Mountain, Ltd., Selkwood, Ont., has set out on a trip to South America and France.

**S. J. White** of the engineering staff of the Quincy mine in northern Michigan is now at the officers' training camp at Fort Sheridan, Illinois.

**Prof. A. J. Houle**, of the Michigan College of Mines, has been engaged in private work at the Shattuck mine, in Bisbee, Ariz., during the summer.

**Jay A. Carpenter**, former superintendent of the Nevada Packard mines in the Lower Rochester district, Nevada, was in San Francisco recently.

**John W. Gebb**, deputy state mine inspector of California, has been giving special attention to mines in the Grass Valley and Nevada City districts.

**M. C. Drake**, recently appointed mining engineer at the Mass mine, in Michigan, has been called to the officers' training camp at Fort Sheridan, Illinois.

**Ward Royce**, lately engineer at the Quincy mine in northern Michigan, went to Fort Leavenworth, Kan., on Sept. 5, as captain of engineers.

**Francis A. Thomson** has resigned from the faculty of the State College of Washington to become dean of the School of Mines at the University of Idaho.

**Mark L. Regna** is one of the volunteer workers on the staff of the Food Administrator. His position is that of chief of the division of commercial relations.

**F. P. Botsford**, general superintendent for Pickands, Mather & Co. at Gilbert, Minn., has been inspecting new methods at mines in the Houghton district of Michigan.

**E. M. Rabb**, superintendent of the Tom Reed mine, Oatman, Ariz., recently inspected the company's property at Gold Reef, San Bernardino County, California.

**W. A. Sanger** and associates, operating the Santa Rosa mines in Inyo County, Calif., have been prospecting for molybdenum ores in Kern and San Bernardino Counties.

**A. E. Place**, a mining engineer recently returned from Mexico, has been prospecting for molybdenum in the desert region between Johannesburg and Wild Rose canyon, in San Bernardino and Inyo Counties, California.

**J. I. Bullard** of the engineering staff of the Quincy mine in northern Michigan, has become superintendent of the Cable Mining Co., a reorganization of the Cable Consolidated Mining Co., at Cable, Deer Lodge County, Montana.

**Edwin Higgins**, mining engineer in charge of safety and efficiency for the California Metal Producers Association has recently been in Amador County and will be engaged in Amador, Calaveras and Nevada Counties in September.

**John Ballot**, president of the Minerals Separation North American Corporation, is now at Houghton, Mich., where the company's mill metallurgist, G. A. Chapman, has been demonstrating the adaptability of the flotation process to the native copper ore.

**J. Leonard Replegle**, chairman of the Wharton Steel Co., has been appointed steel advisor by the war advisory board. He will direct purchases of steel for war purposes and determine the order of priority in filling and shipping war steel. His office will be in the Munsey building, Washington.

**Col. T. C. Roberts**, chief engineer of the United Verde Copper Co., Clarkdale, Ariz.,

is visiting New York City for several weeks, after which he expects to go to South America.

**H. W. Fesing**, of Houghton, has just returned from the Oro Belle mine at Hart, Calif., where he has been inspecting the property with director T. A. Merritt of Duluth.

**Mortimer North**, recently engineer at the Victoria mine in northern Michigan, has been commissioned a lieutenant of engineers and assigned to the duty of raising a regiment of miners for service in France.

**R. M. Edwards**, president of the Franklin and South Lake mines in northern Michigan, has returned from Ulysses, Ida., where he inspected the Kitty Burton mine, which is also under his management.

**W. Elmer Ekblaw**, geologist and botanist of the MacMillan Crocker Land Expedition, arrived in New York on Aug. 30, having returned by a different route from that taken by MacMillan who recently reached Sydney, N. S. He left North Star Bay with Dr. Harrison J. Hunt in December, 1916, and reached South Upernavik in January last. From here Dr. Hunt went on alone as there was not enough food for both. Mr. Ekblaw made his way to the coast and thence to Godhaven, Greenland, in the motor boat of a Danish official. There he was picked up by the relief ship Neptune on which he returned. Mr. Ekblaw is an instructor in the University of Illinois.

## Obituary

**Major Henry Souther**, senior officer, aircraft engineering division, United States Signal Corps, and vice president of the Henry Souther Engineering Corporation, Hartford, Conn., died Aug. 15 in the post hospital at Fortress Monroe, Va., following an operation. He was born at Boston in 1865 and was graduated in 1887 from the Massachusetts Institute of Technology, where he specialized in mining and metallurgical subjects. After studying abroad the manufacturing methods and processes employed in the German iron and steel industry, he entered the employ of the Pennsylvania Steel Co. at Steelton in 1888 and was made assistant foreman the following year. He was engineer of tests for the company from 1896 to 1893, resigning to take a similar position with the Poppe Manufacturing Co., which he held for six years. In 1899 he engaged in business as an independent consulting engineer and established a metallurgical and testing laboratory and did consulting work for the automobile industry. He was president and treasurer of the Henry Souther Engineering Corporation from 1899 to 1909 and became president in 1911; he was vice president and general manager of the Ferro Machine & Foundry Co., Cleveland, from 1913 to the outbreak of the war. Latterly he had charge of the aircraft development of the army and created a corps for the inspection of aircraft. He was a member of the American Society of Mechanical Engineers and was prominent in the Association of Licensed Automobile Manufacturers. He was a founder member of what is now the Society of Automotive Engineers.

## Societies

**University of Arizona**, at Tucson, has completed the work of excavating and laying the foundation of the new mining building. This will be ready for occupancy in 1918 and will cost \$175,000.

**Massachusetts Institute of Technology** has rearranged the regular college course to permit the continuance of courses in army and navy aeronautics and of the school for ensigns begun early in the summer.

**Arizona State Bureau of Mines** has projected a campaign of education for the miner and prospector to facilitate the discovery of minerals. Frequent non-technical bulletins are to be issued as the means to this end.

**American Chemical Society**—A committee has adopted a plan for a memorial to Joseph Priestley, requiring subscriptions of at least \$2000 to provide for a bust portrait of Priestley to be placed as a loan in the National Museum in Washington, and, second, for the award of a gold medal at intervals for superior achievement in chemical research, the recipient to deliver an address before the general meeting of the society.

**Mining and Metallurgical Society**, New York Section, will hold a meeting at the Engineers' Club, 32 W. 40th St., New York, on Wednesday, Sept. 12, at 8 p.m., preceded by an informal dinner at 6.30 p.m. This is the annual business meeting of the Section at which officers will be elected for the ensuing year.

## New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

**Alkali Perborates**—Electrolytic Process of Making Alkali Perborates. Otto Liebknecht, Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Co., New York, N. Y. (U. S. No. 1,235,905; Aug. 7, 1917.)

**Briquettes**—Art of Compressing Fine Ores and the Like Substances into Blocks or Briquettes. Otto Kippe, Osabrück, Germany. (U. S. No. 1,238,022; Aug. 21, 1917.)

**Calcium Hypochlorite**—Manufacture of Calcium Hypochlorite. Gustav Pistor and Heinrich Reitz, Griesheim-on-the-Main, Germany, assignors to the Firm of Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany. (U. S. No. 1,236,978; Aug. 14, 1917.)

**Concentration**—Improvements in or Relating to the Concentration of Ores. Henry Livingstone Sulman, Edwin Edser and Minerals Separation, Ltd., London, England. (Brit. No. 105,627.)

**Copper**—Improvements Relating to the Obtaining of Copper from Its Ores. Alfred Andrew Lockwood, London, S. E., England. (Brit. No. 105,772.)

**Dredge**. Samuel Dickens Waysman, Nome, Alaska. (U. S. No. 1,237,845; Aug. 21, 1917.)

**Drill**—Pressure-Fluid Tool. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Company, Boston, Mass. (U. S. No. 1,236,702; 1,236,703; 1,236,704; Aug. 14, 1917.)

**Drilling**—Rock-Drill Fastening. Charles J. Borgeson, Syracuse, N. Y., assignor to The Pneumoelectric Machine Company, Syracuse, N. Y. (U. S. No. 1,236,664; Aug. 14, 1917.)

**Dust-Separator**. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Company, St. Louis, Mo. (U. S. No. 1,236,805; Aug. 14, 1917.)

**Electrodeposition**—Process of and Apparatus for Densified Electrodeposition. Nathaniel Huggins, New York, N. Y., assignor, by mesne assignments, to Copper Products Company. (U. S. No. 1,236,438; Aug. 14, 1917.)

**Excavating-Machine**. John G. Fogarty, Rochester, N. Y., assignor to John Fogarty Co., Inc., Rochester, N. Y. (U. S. No. 1,236,418; Aug. 14, 1917.)

**Filtration**—Filter-Press and Method of Preventing the Oxidation of the Filtrate in the Containers Thereof. Louis David Mills, San Francisco, Calif., assignor to Merrill Metallurgical Company. (U. S. No. 1,236,737; Aug. 14, 1917.)

**Flotation**—Ore Concentration. Rutherford B. Martin, New York, N. Y., assignor to Minerals Separation North American Corporation, New York, N. Y. (U. S. Nos. 1,236,856 and 1,236,857; Aug. 14, 1917.)

**Flotation**—Concentration of Ores. Arthur Howard Higgins, London, England, assignor, by mesne assignments, to Minerals Separation North American Corporation. (U. S. No. 1,236,933; 1,236,934; Aug. 14, 1917.)

**Manganese**—Depolarizing Agent. Carleton Ellis, Montclair, N. J., assignor, by mesne assignments, to National Carbon Company. (U. S. No. 1,236,693; Aug. 14, 1917.)

**Metallurgical Furnace**. Utley Wedge, Ardmore, Penn. (U. S. No. 1,237,129; Aug. 14, 1917.)

**Potash**—Process for Rendering Available the Potash of Feldspar and Similar Materials. Walter Glaesser, Brooklyn, N. Y., assignor to George T. Bishop, Macedonia, Ohio. (U. S. No. 1,237,197; Aug. 14, 1917.)

**Potash**—Recovery of Potash. Frank G. Breyer, Palmerton, Penn. (U. S. No. 1,236,903; Aug. 14, 1917.)

**Titanic Oxide**—Composite Titanic-Oxide Pigment and Method of Producing the Same. Louis E. Barton, Niagara Falls, N. Y., assignor to The Titanium Alloy Manufacturing Company, New York, N. Y. (U. S. No. 1,236,655; Aug. 14, 1917.)

**Zinc**—An Improved Method of Apparatus for Recovering Zinc from Zinc Bearing Ore. David Benton Jones, Lake Forest, Ill. (Brit. No. 106,050.)



## Editorial Correspondence

### SAN FRANCISCO—Aug. 30

**Acquittal for William S. Noyes**, president of the Presidio Mining Co., was the result of the recent trial, upon instruction of the superior court in San Francisco. The charge of embezzlement of \$5000 was brought by Capt. W. S. Overton, a stockholder, who complained that Noyes had diverted money from the sale of stock to his own use. In the trial in the last of June the directors of the company testified that the money was voted to Noyes for services. Upon that evidence the court could do nothing else than instruct for acquittal.

**Transportation of Mine Timbers** to the mines at Bodie, Mono County, is dependent on the railroad operated by the Mono Lake Lumber Co., the mills of which are 35 miles distant. The company proposes selling the road and equipment and it is stated that the purchasers intend removing the rails. Thomas Cain, mine operator of Bodie, has filed with the Railroad Commission a complaint that the sale and removal of the rails will be a violation of the public utilities act and asks the commission to prevent the sale and compel the Mono Lake Lumber Co. to continue operation, on the ground that this is the only means of transportation of timbers necessary for the operation of his mining property; that the company is a common carrier and should be compelled to continue to serve the public.

**Lincoln Consolidated Mining Co.**, of Amador County, has made application to the commissioner of corporations for authority under the amendment to Sec. 309 of the "blue sky" law, similar to that of the Pinal Dome Oil Co. The Lincoln Consolidated asks authority to distribute \$60,655.50 as a dividend of 10c. per share to stockholders. The company has on hand \$57,000 in cash and \$68,000 in marketable bonds, resulting from payments upon the purchase price of the mining property owned by the company at Sutter Creek, recently sold to Eastern men said to be of the same crowd that purchased the Old Eureka, and who are stockholders in United States Steel. The Lincoln Consolidated includes the Lincoln and Wildman-Mahoney mines, which in the early days of Mother Lode mining were among the great gold producers of California. Within the past four years an effort was made to reopen this property with apparent success; but the problem of handling the large volume of water was said to be beyond the resources of the company and development was discontinued and the mine closed down. Enough work was done, however, under the management of W. J. Magee, of Sutter Creek and San Francisco, now assistant U. S. Treasurer at San Francisco, to make the present physical showing which induced the sale of the property. The mines adjoin the Old Eureka on the north and are in such position that the two properties could be operated under one management.

**New Drilling of Oil Wells** is evidently decreasing. In the week ended Aug. 11, only 5 new wells were started. In the preceding week the number was 6. The State Mining Bureau attributes the present inactivity to the difficulty in obtaining material, particularly casing. No doubt this is true, to a great extent; but it is hardly likely that it is the whole reason. The unsettled condition of national legislation has much more to do with the inactivity in oil-well drilling and operation than is generally supposed. The price of crude oil at the wells is increasing. The Standard Oil Co., the largest buyer of crude, has been setting a rapid pace in the bidding for oil in the fields, and apparently has been striving hard to increase production by advancing prices paid at the wells. This action of the Standard is rather a puzzle to some of the producers who are not quite sure what the result will be, whether the increasing prices will prevail for a period long enough to induce them to increase their investment, or whether after the Standard and other large marketers shall have obtained a desired amount of oil the price may drop. These large concerns, which produce, refine and market crude oil and byproducts, make the price at the wells. Supply and demand has not in the present crisis a great deal to do with it. To be sure the production is not great enough at present and has not been

for several months to insure an increase in stocks on hand, but even this condition of the oil industry does not wholly control the price. The fear of untoward legislation respecting the Federal oil land reserves has been the greatest influence in retarding new drilling and production.

**Safety Appliances for Gold Dredges** were studied by Inspector F. L. Lowell for the Industrial Accident Commission, prior to the preparation of the "Tentative Safety Rules for Gold Dredges in California," recently published in full in the "Journal." Mr. Lowell incorporated his observations and suggestions in a bulletin, No. 5, just issued by the commission. At the time of Mr. Lowell's visits there were 58 gold dredges actively operating in various parts of the state. Since then one has been dismantled and there are others which have practically worked out their fields and will no doubt be dismantled within the next year or so. But other dredges are in the course of construction and the number will remain about the same probably for the next two or three years, and if conditions improve so that material may be obtained promptly and at less cost than has prevailed recently, there should be a noticeable increase in gold dredges. The bulletin is well illustrated with photographs showing various safety equipment on dredges, particularly in the American River and Yuba River fields. The various appliances for safeguarding dredges are mostly fine examples of safety appliances and the suggestions made in the bulletin are worthy the attention of all superintendents and dredge-masters. In the initial organization of mine inspection by the mines department of the commission some criticism was offered because the commission did not immediately apply inspection to dredges. The organization at that time was new and in some respects working under inadequate laws. The inspectors were unacquainted with conditions and it was necessary to undertake no more work than the prescribed number of inspectors could take care of properly and with a measure of satisfaction to mine owners and operators. Altogether, the mine inspection department of the Industrial Accident Commission has become a useful adjunct to the commission and of great benefit to those employed in the mining industry of this state.

### BUTTE—Aug. 31

**The Shut-Down at Butte**, in spite of all the efforts on the part of the mining companies and the conservative element of the workingmen to turn the mining industry of Butte back into its normal channels after a long and costly interruption, the I. W. W. agitators, headed by Tom Campbell and Joe Shannon at last succeeded in completely paralyzing the industry. Realizing that their cause in Butte was about to collapse, they directed all their energies to Anaconda where they succeeded in splitting the smelters' union. As a result only 110 men out of a total of 2500 reported for work at the Washoe works for the 11 o'clock shift on Aug. 24, and it was then seen that a complete shut-down was inevitable. This was effected at 3 o'clock in the afternoon, no further efforts in the direction of negotiations being made on either side. Since then only a few men needed to protect the property have been employed at the smeltery. The closing of the smeltery made the closing of the Butte mines a natural necessity and all men excepting those required to keep the mines unwatered and otherwise protected, were dismissed. Eleven thousand men in Butte and Anaconda are affected by the shut-down, and about 2000 will be retired at the Great Falls smeltery; other men in other branches of the industry in different parts of the state will bring a total of 15,000 men who will be idle, all because of the activities of a handful of radicals who have succeeded in bringing about this shutdown. The Butte & Superior company, the Elm Orlu, the East Butte and a few other concerns who are not affected by the closing of the Anaconda company's smelteries, are still carrying on operations. Butte is quiet and no disturbances that can be attributed to the shut-down have been reported. No one is able or willing to predict how long the mines will remain closed and under what conditions they will be re-

opened. Rumors that the Federal Government will take a hand in bringing about resumption of operations cannot be confirmed and while the Government may ultimately furnish protection to those who are willing to work, the operation of the mines by anyone but the companies themselves seems a very remote possibility. At all events it does not seem clear how Government officials, inexperienced in the game could cope with the labor problem with greater success than the local companies and their trained staff of engineers and legal talent who have for years studied the problem from all angles. While Butte hopes that a satisfactory solution of the problem will ultimately be found, it has settled down resignedly to await a brighter day.

### DENVER—Sept. 1

**New Wage Scale, in Telluride** district became effective Aug. 15, as follows: While monthly average New York quotation for silver is 70c. or over, machinemen in drifts, \$4.75; machinemen in stopes, \$4.50; timbermen, \$4.50; timber helpers, \$4; shovelers, trammers, trackmen and miscellaneous mine labor, \$4. Men not working full month will be paid 50c. less per shift unless absent on account of sickness, accident or upon request. Occupations not listed have special rates at the different mines. The companies announcing this schedule are: Tomboy, Smuggler-Union, Liberty Bell, Black Bear, Primos Chemical Co., Alta., Humboldt and Tomboy Tramway and Tunnel Company.

**Colorado School of Mines'** presidential turmoil calls for abundant consideration. Daily papers carry editorials as well as news items. In general, the comment is decidedly adverse to the appointment of Victor C. Alderson. He accepted his position upon the authority of three of the trustees acting individually and not officially. This appointment has been passed upon by the state's attorney-general and declared void. Two of the three trustees who invited him to return to Golden will remain firm for his election, while the third, A. E. Carlton, of Cripple Creek, states that he will alter his position in the matter if he can be convinced of Alderson's lack of fitness. Last night (Aug. 31), a meeting of declared "anti's" was held in Denver and specific charges were formulated for presentation today to Governor Gunter, who will hold a council with the trustees. Owing to the brevity of time available, some charges were omitted. Witnesses or sworn documents to substantiate the charges are to be offered today. Among the accusations are the following: Disloyalty to the school; disloyalty to the faculty; lowered standards of scholarship by compelling faculty members to give fewer conditions, by compelling them to raise marks of poor students, and by compelling professors to pass students in order to render such students eligible for intercollegiate athletic contests; loss of numerous professors of ability; and, finally, exercising presidential authority before official election.

### SALT LAKE CITY—Aug. 31

**Coal-Mine Insurance**—under the workmen's compensation act—is to be offered by 10 large companies from outside the state representing a large aggregate capitalization and working under the name of the Associated Companies. This organization will compete with the state insurance fund, offering insurance at the same rate—\$7.81 per \$100 of payroll.

**Large Government Reservoir** may be built in Carbon County, just below Scofield in Pleasant Valley, possibly taking the place of the mammoth reservoir of the Price River Irrigation Co., the breaking of which about six weeks ago flooded the Rio Grande tracks between Kyune and Helper tying up coal transportation for a period, causing large monetary loss to the railroad, and forcing the coal mines to hold down their output for a time. Following the request for immediate investigation by the Utah delegation in Congress, L. M. Winsor of the United States Department of Agriculture has been in Carbon County looking into the question. The proposed site just below Scofield in Pleasant Valley appears advantageous. The water backed up into this valley before passing down the narrow canyon, when the dam broke.

**Mines Information Bureau** will be established by the Utah Chapter of the American Mining Congress according to plans now under consideration. The bureau will serve as a guide to prospective investors in mining properties and others in this state. It is proposed to collect and file information—obtained from public records and from owners and promoters—the object being to give support to worthy undertakings and to discourage fraudulent promotions, and to make reliable information readily accessible, free of charge. Companies and promoters will be asked to fill out question blanks as to stock issues, debts, obligations, physical value, acreage, development, equipment, transportation, working forces employed, water, etc.

#### TONOPAH, NEV.—Aug. 30

Price of silver being around 90c. per ounce has a great effect upon low-cost producers such as Jim Butler, which cost is about 25c., but whereas the effect on high-cost producers such as West End is equally important. West End's cost of production last year was 45c., with price of silver at slightly more than 62c., and at present price of 90c. the profits will show an increase of almost 100% or nearly double.

#### HOUGHTON, MICH.—Sept. 2

Montana Copper Labor has started to flow into the Lake Superior district, because of the shut-down in Butte. Men commenced to arrive on Aug. 25, and each train brings in more. Most of these men are men of families who formerly resided in the Michigan district but were lured to the Montana copper fields by the high wages paid. They all claim that the Michigan district has advantages for the home-loving, peaceable miner that cannot be found in any other copper-mining camp in the world. Many Detroit machinists are coming to the copper country now. These are men who went to Detroit to work in automobile factories. They too are returning, convinced they say, that there are few places in the world where labor is treated as squarely as in northern Michigan.

Calumet & Hecla's Flotation Tests proved successful, having been tried out on a sufficiently large scale to give positive results at the White Pine plant of 50 tons capacity. A license has been granted by the Minerals Separation company to the Calumet & Hecla

Mining Co., to use the process at its own mill, Lake Linden, and at the White Pine, the construction to be done by the Calumet & Hecla, for which plans are now being made. Negotiations were concluded on Aug. 27, during the recent visit of Chairman John Ballot, of the Minerals Separation, Ltd. It is likely that this license is only the precursor of others that will be granted in the near future. The success of the process on this ore warrants its use elsewhere in the district.

Mining Costs have risen so much within the last two years that the present cost of production of the smaller producers—Hancock, Winona, La Salle, Old Osceola, and possibly the Franklin and Mass—averages at least 20c. a lb. and they feel that they possibly will have to close down if 20c. or less is declared as the price by the Government, and are, therefore, protesting, especially when they learn that wheat, for which 80c. to a dollar have been hitherto considered good prices is to have a Chicago base price of \$2.40. The tonnage for August will be little better or about the same as for July, though there were two more working days, the daily tonnage having averaged somewhat less.

Cost Of Production of copper at the mines of the Lake Superior district will be higher in 1917 than it was in 1916 by at least 10% on the average and higher by 20% in many specific instances. The thing that now is bothering most of the copper producers here is the price to be fixed by the Government on copper output. If that figure is 25c. a pound there can reasonably be expected a continuance of copper mining prosperity in this Michigan district. If it is under 20c. a number of smaller mines will be forced to close down. In fact orders to that effect already have been received at some of the properties. Costs last year were higher than they have been in quite a period, but this year everything that enters into the production of a pound of copper has gone up still higher. Labor is not efficient, although there is little doubt that the Michigan copper district has less to complain about on that score than any other district in the copper-production business. The cold truth of the matter is that the mining corporations here would add still further bonuses to the pay of employees if they believed it would bring about greater efficiency or increase the

number of men on the payrolls, but the fact is that the men now are making so much money and making it so easily that they want an average of two day's vacation a week now to enjoy the ideal autumnal climatic conditions for automobile journeys. And they take what they want.

#### JOPLIN, MO.—Aug. 31

Highest Grade Ore produced in the Joplin district has long been a disputed point. Recently it was noted that A. C. Ihlseng, local manager for the Metal Ore Corporation, in 1898, bought and shipped to Antwerp, Belgium, 100 tons of zinc concentrates that assayed 65.70% Zn. This is better than any shipment in recent years of as much as a carload of zinc concentrates, and beats the recent record of over 64% made by the Admiralty Zinc Co., from Century, Okla.

#### JOHANNESBURG—July 25

Geology of Reitfontein Reefs has been elucidated by the publication of the "Geological Map of the Witwatersrand Goldfield" and the accompanying explanatory pamphlet by the government geological survey. Ever since the discovery of the Rand, the true age of the Reitfontein Reefs has been a geological puzzle and many thousands of pounds have been fruitlessly spent in attempting to trace their continuation east and west. Draper considered that they were inverted Elsburg reefs, others that they constituted a separate series of reefs, and still another geologist held the view that they belonged to the Main Reef series. Dr. Mellor, however, shows that the Reitfontein series is contained in a faulted outlier of the Upper Witwatersrand beds, containing both the Kimberley and Main Reef, as well as other series. Being cut off south, east and west by faults, this remnant of the Upper Witwatersrand formation is essentially local in occurrence and this will explain why its extension has been impossible to trace. The Reitfontein gold mine, situated on this faulted outlier, recently closed down on account of mining operations becoming unprofitable after considerable sums for many years had been expended in prospecting operations. This affords another instance of how much useless expenditure of capital, and dependence on quack geologists, might have been avoided had a geological survey of the Rand been earlier undertaken by the government.

## The Mining News

### ARKANSAS

#### Boone County

DEEP DRILLING will be done in Zinc camp by Sidney Aumick and associates of Tulsa, Okla. Work will start as soon as sufficient acreage has been acquired.

BROOME COUNTY MINING CO. (Zinc)—Mrs. S. H. Everett of Indianola, Miss., purchased this zinc mine, which is equipped with mill. A. R. Van Mater, of Springfield, Mo., superintendent.

MCCURRY MINING AND MILLING CO. (Zinc)—W. S. McQuain and H. H. Banta, of Rupert, Idaho, joined W. A. McCurry in forming new company. Properties controlled are the Coker Hollow, Zinc camp; Rhodes-Manchester, Zinc camp; Haulk, Dodd City camp; Keys Gap, Newton County camp; and a custom mill at Zinc. Marion County

CONTINENTAL (Yellville)—W. O. Krueger, who lately leased the Bear Hill mine in Dodd City, and the Beulah mine in Rush, incorporated the two properties under name of Continental Mining Company of Oklahoma. Both are blende mines and in operation.

### ARIZONA

#### Mohave County

PAYROLL (Chloride)—Leased to L. F. Martin; is shipping between 25 and 35 tons of lead-zinc ore daily to the Needles, Calif., mill. A. W. Henning, superintendent.

RATTLESNAKE (Chloride)—Has carload of silver-gold-lead ore in the bins. Will probably ship to Selby smeltery. F. E. Braly, superintendent.

SCHENECTADY (Chloride)—Owned and operated by the Chloride & Telluride Mining, Milling and Leasing Co., taking out

ore from north and south drifts on 175-ft. level. Shows much wire silver. Will soon have carload for shipment to smeltery. H. L. Heath, superintendent.

MARY BELL (Chloride)—Under lease and bond to J. P. Ryan, Chloride, is opening up into shipper. More than 2 ft. good ore struck in tunnel in 260 ft. Half carload each of zinc ore and of silver-lead-gold ore piled on dump. Road building in progress preparing for steady shipments. J. P. Ryan, superintendent.

COPPER AGE (Chloride)—Owned and operated by Arizona Ore Reduction Co., has found ore in new working tunnel, also opening up reserves of good ore in upper workings. New mill started up Aug. 23, ran few hours when clutch broke, necessitating shutdown of several days. Lead concentrates will be shipped; other concentrates treated in furnace department now building. E. E. Northrup, superintendent.

MCCRACKEN SILVER-LEAD MINES CO. (Yucca)—Situated in Owens district, consists of nine claims, 29 miles east of Havaland, a station on Santa Fe railroad. Wagon road permits hauling at cost of \$6.50 per ton. Lead ore exposed on opencuts on Galena claim, carrying silver, and tunnel driven to cut vein at 150-ft. depth. Ore also found on Swastika No. 1 claim on surface and in opencuts and tunnels. Discovery shafts being sunk on Atlanta Extension claim, which is only one now being developed. W. B. Van Horne, of Indiana Harbor, Ind., president.

#### Pinal County

RAY CONSOLIDATED (Ray)—Output for July was 7,808,766 lb. copper, comparing with 7,614,114 in June and 6,834,492 in July, 1916.

### Yavapai County

UNITED VERDE EXTENSION (Jerome)—Stated that future policy will be to produce 4,000,000 lb. of copper monthly until new smeltery is in operation.

CALUMET & JEROME (Jerome)—It is announced that crosscut is in 50 ft. Ore will be handpicked to average over 10%. Drifting started. John Rauber, superintendent.

JEROME VERDE (Jerome)—Alleged drill-hole strike reported last April now announced to have been a "frame-up," drillers having been bribed by some local interests.

### Yuma County

GLORY HOLE BONANZA MINES CO. (Salome)—Owens Glory Hole group of seven claims and Cobrita Pay Streak group of five claims. Expect to start development campaign in autumn.

### CALIFORNIA

#### Amador County

OLD EUREKA (Sutter Creek)—Enlarging shaft below 1600-ft. level and shaft repairs still in progress. New change house constructed. New Electric hoist and other equipment recently installed operating satisfactorily.

CENTRAL EUREKA (Sutter Creek)—Full capacity, 40 stamps, dropping, the last 10 starting for the first time since shaft was deepened to 3350 feet. The development necessary to deepening shaft reduced the per ton value of ore in May and June to average of ore milled \$2.78. This value is below normal but believed the mining and treatment of the ore as extracted in future will reach a payable value.

PLYMOUTH CONSOLIDATED (Plymouth)—Just completed sinking main



shaft to 2600 ft. and will start Sept. 1 to deepen to 2900 ft. before opening another level. Physical and other conditions satisfactory. Two new Hardinge mills being installed in mill with purpose of finer grinding of tailings and thus increasing extraction which at present is not equal to possibilities afforded by development. Fine grinding mills now are overloaded and not capable of taking care of all the ore that can be mined. C. F. Parks, superintendent.

**KEYSTONE (Sutter Creek)**—Report for first half of 1917 shows 39,896 tons of ore milled, yielding an average of about \$2.03 per ton on the plates; concentrates about 1505 tons. Bullion valued at \$14,281; concentrates, \$84,893; total production, \$99,174, less \$18,061 freight and smelting charges, leaving net value of ore treated, \$81,113. The 40-stamp mill was idle only 296 hr. in the 6 mo. Greater portion of ore hoisted came from 1200- and 1400-ft. levels; 900-, 1000- and 1800-ft. levels also yielded good production. Station at 1800-ft. level completed and crosscut driven 550 ft. east, cutting vein at 500-ft. point, where drifts on vein were driven north and south, the latter a distance of 100 ft. and the north drift now well started.

#### Butte County

**HUNTER DREDGE (Oroville)**—Taken out of commission after operating for about 10 years. In 120 mo. operation, 11,600,000 cu. yd. of gravel was dug, yielding approximately \$1,500,000. Boat owned by American Gold Dredging Co., successor to Oro Electric Power and Water Co. Recently employed in reclamation work for Federal Government, on Feather River.

**GOLDEN FEATHER MINES CO. (San Francisco)**—Property known as Robinson Mine, in Granite Basin, developed by the United States Exploration Co., taken over by the operating company. Reported that drift from 320-ft. point disclosed vein 10 in. wide, carrying good ore. Ore also at 80-ft. point in shaft.

#### Calaveras County

**CALAVERAS (Murphys)**—Reported about to be unwatered and if development warrants will be equipped with electric hoist and other machinery. Is an old mine with record of \$500,000 production. Los Angeles men are in charge.

**DUNTLEY-COTTON MINES CO. (Railroad Flat)**—Known formerly as old Keystone mine. W. O. Duntley, president, and W. J. Cotton, vice-president and general manager. Mr. Cotton reports that stamp mill has been completely overhauled, boiler and engines installed, also Chicago Pneumatic Tool compressor. Main shaft is 270 ft. deep with working levels at 100, 200 and 250 ft., both north and south. On latter level good shoots of ore have been uncovered. W. H. Armstrong, assistant manager and mill superintendent. Report that R. L. Gunn is mine engineer and superintendent denied.

#### Colusa County

**CERISE (Williams)**—Pipe line being installed to carry water from Bear Valley to new mill. Installation of other machinery and equipment in progress. Property situated near Wilbur Springs.

#### Eldorado County

**HUGHES RANCH (Folsom)**—William P. Steincamp and L. C. Metto installing pump to unwater shaft. Had disclosed high-grade ore when driven out by water. In addition to gold also found chrome on another part of ranch. On adjoining ranch, J. Fleischman, of Mormon Island, is mining and shipping good chrome ore.

**RIISING HOPE (Placerville)**—Gold-bearing gravel reported tapped by 14-ft. raise from face of 2000-ft. tunnel under construction last several months. Gravel is about 12 ft. thick, cemented and hard and will require a stamp mill to crush it. Revolving-barrel gravel mill now in operation reducing loose "bench gravel."

#### Nevada County

**FRANKLIN AND FORD (Grass Valley)**—Reported that order placed for electric pump of 75 hp. and 10-drill compressor. Mine will be unwatered and extensive development undertaken. Mine was a producer in early days. Salt Lake men have optioned the property.

**OAK TREE (Grass Valley)**—Situated within city limits, being reopened by M. J. Brock. Shaft being cleaned out and timbered, 40 ft. of the 200-ft. depth having been made ready for further repair. Mine worked in early days, but pumping plant not equal to demands and operators quit when poor zone was reached. Development will follow if money is obtained.

**GOLDEN CENTER (Grass Valley)**—Permit to sell remaining 14,785 shares of capital stock at 25c. per share to prior

investors who paid more than \$1 per share, to dispose of the present capital stock, then increase and consolidate the capital stock and use the money resulting from the sales for further development and installation of new hoisting and pumping equipment. The mine is situated in the approximate center of the town and in the early days was a producer. The old hoist is a monument to the memory of the old timers who made money as long as the pay ore lasted and who quit when it required large expenditure to develop new orebodies. Recent development discontinued until sufficient money can be obtained to explore new ground and develop the ground already opened up.

#### Shasta County

**MAMMOTH COPPER MINING (Kennett)**—Estimated production of smeltery copper for July is 1,750,000 lb.

**KEYSTONE (Kennett)**—Under development by Mammoth Copper Mining Co. Diamond drill equipment being installed. Situated near Stowell mine owned by the Mammoth.

#### COLORADO

##### Boulder County

**ILLINI MINES CO. (Boulder)**—Recently organized by Boulder and Denver men, will operate Wood Mountain mine, at Wall Street.

##### Clear Creek County

**ONONDAGA (Georgetown)**—Ventilation greatly improved, and larger crew now employed.

**CONSOLIDATED MINES CO. (Alice)**—Stated 100-ton mill will be built. Company operating Alice and Yukon groups.

##### Custer County

**BROWNING (Westcliffe)**—Shoot of good-grade copper ore opened at Boneyard Park.

##### Gilpin County

**BEZANT (Central City)**—New electric motor will be installed to operate pump and mine unwatered to 160-ft. level where shoot of ore containing gold and pitchblende opened. Electric drill will be used in driving west toward Wood mine. Mine in pitchblende producing area on Quartz Hill.

**STAR OF THE WEST (Central City)**—Ore increasing in value as drift on 300-ft. level extended west. Oreshoot opened for length of 150 ft. in drift, and to depth of 25 ft. in winze, shows 6-ft. width of milling-grade ore and small shoot smelting-grade ore. Gibson shaft of company, to west, is 385 ft. deep with levels at 125, 225 and 385 ft., all in ore.

##### San Miguel County

**OPHIR GOLD MINING AND REDUCTION CO. (Ophir)**—Will install flotation plant.

**CARRIBEAU (Ophir)**—Boiler purchased from dismantled Junta mill being installed to operate additional machinery. Flotation plant completed and expected other equipment will be installed in time to commence operations early in September.

##### Summit County

**NEW GOLD STRIKE** made in Montezuma district on Independence Mountain on ground adjoining Ida Belle mine.

**JESSIE (Breckenridge)**—Mill completely overhauled and will be in operation soon. Mine-development work continues to open good-grade ore.

**MOLLY B (Breckenridge)**—Good-grade gold-silver-copper ore being shipped. High-grade gold-bismuth ore being sacked by lessees.

**MOZART (Montezuma)**—Adjoining Bullion group, taken over recently by A. E. Carlton, of Cripple Creek. Stated Carlton's holdings now include 30 patented claims.

**TONOPAH PLACERS CO. (Breckenridge)**—Railroad tracks of Colorado & Southern railroad laid around No. 1 dredge temporarily while dredge cuts through right-of-way. When dredge passes, tracks will be returned to old place, using tailings as road bed.

##### Teller County

**COPELAND SAMPLER (Cripple Creek)**—Improvements being made.

**GOLD PINNACLE (Cripple Creek)**—Vein 3 ft. wide, of good-grade, opened in surface trenching on Flying Cloud claim.

**BIG TOAD (Cripple Creek)**—Overhauling Reed mill of Dante Gold Mining Co. Will treat dump and low-grade mine ore under lease.

**LAST DOLLAR (Cripple Creek)**—Masonry work on new shaft house completed; foundations laid for change house and blacksmith shop.

**C. O. D. (Cripple Creek)**—Surface discovery on this Poverty Gulch mine, made by lessee just south of El Paso end line; 20-ft. shaft down in ore.

#### IDAHO

##### Shoshone County

**HILL MINING CO. (Kellogg)**—Situated near Wardner. Josiah Hill, president, states company is drifting to strike vein which has been traced from Yankee Boy, on Big Creek. Tunnel driven over 900 ft. in last year. Outcropping shows three distinct veins of white quartz with galena.

**LOMBARDY (Kellogg)**—Consists of 15 claims now being surveyed for patent. Outcrop is chiefly oxidized iron. Being developed by tunnel just high enough above creek to allow for dump. Diabase dike struck by tunnel short distance from portal and vein of iron ore cut at 480 ft.

**YUKON GOLD (Murray)**—Dredge being installed on Prichard Creek near Murray is nearly completed as frame work is now in position and also much of the machinery. I. W. W. laborers caused delay in the work by unreasonable demands after they had obtained employment. Dredge will be completed before power line is finished.

#### ILLINOIS

**ALUNITE CHEMICAL CO. (East St. Louis)**—Will be incorporated in Missouri and manufacture a fertilizer with good percentage of potash. F. H. Thwing, president, also of Evans Thwing Refining Co., of Kansas City, states that alunite ore will be shipped from southern Utah.

#### MICHIGAN

##### Copper

**MASS (Mass)**—Owing to labor shortage only shipping 700-800 tons.

**NEW ARCADIAN (Houghton)**—Shaft down 160 ft.; excellent speed being made, 5 ft. being the daily average.

**NEW BALTIC (Houghton)**—Eastern drift recently passed through narrow unidentified lode, carrying copper.

**WINONA (Winona)**—Likely to adopt flotation process; only working King Philip shaft No. 1 night shift, and getting splendid ground at its lowest levels.

**VICTORIA (Rockland)**—In August, will probably for first time in months, fall below 100 tons of mineral; great shortage of labor; mill improvements completed in another month.

**BEAR LAKE "POOL" (Calumet)**—Owing to delay of laying 4000 ft. of water pipe did not get started in diamond drilling first hole at angle of 55° until Aug. 23; deepening of pit disclosing excellent copper.

**CHEROKEE (Houghton)**—Usual good grades in western drift on 320-ft. level until discontinuing work there, Aug. 27; not much change in ground opened by sinking, copper showing constantly.

**CALUMET & HECLA (Calumet)**—Daily tonnage for week ending Aug. 25 was 9200; for that ending Sept. 1, 9600; increase due more to favorable circumstances than to increase of labor. Production of all mines for July was 11,933,433 lb. of copper.

#### MINNESOTA

##### Cuyuna Range

**KENNEDY (Cuyuna)**—Drifted through 1500 ft. of rock to open a new ore lens.

**PENNINGTON (Ironton)**—Removing 130,000 yd. additional overburden. Will forward 125,000 tons of ore this season.

**NORTH THOMPSON (Crosby)**—State lease, has removal of overburden well advanced and made first shipment to docks. Operated by Inland Steel Co.

**KENNEDY (Cuyuna)**—Fire in sub level. Shaft sealed three days to smother fire. Michigan state mine-rescue car squad with oxygen helmets entered mine after third day of fire and sealed all drifts leading to sub level. Idle on account of smoke and gas from burning timbers. Operated and owned by Rogers-Brown Ore Co.

##### Mesabi Range

**SARGENT LAND CO. (Hibbing)**—Has three drills at work prospecting its properties west of the St. Paul mine at Keewatin.

**PETTIT (Gilbert)**—Republic Iron and Steel Co. is sinking new hoisting shaft to take place of one sunk in center of orebody several years ago.

**NORTH EDDY (Hibbing)**—This mine, operated by the Dean Iron Co., sinking second hoisting shaft to 300 ft. Will be electrically equipped, power to be obtained from Great Northern Power Co.

**MESABI MOUNTAIN (Virginia)**—This Oliver Iron Mining Co. property plans to install an electric pump at Virginia Lake to furnish 100 gal. of water per minute for the steam shovels and locomotives in this pit. Permission asked of the city council for installation; lake shore is within city limits.

**PICKANDS MATHER (Gilbert)**—Belgrade and Corsica mines, which have been closed down for the last two weeks on account of sympathetic strike, caused by Finns walking out in sympathy with the I. W. W. of the Gogebic Range, have reopened. Strikers returned voluntarily.

#### MONTANA

##### Mineral County

**ST. LAWRENCE (Saltese)**—Eight cars copper-gold ore shipped up to present to Washoe smelter at Butte. Hauling five miles to Saltese. Producing 10 tons per day.

##### Silver Bow County

**OPHIR MILL (Butte)**—E. H. Giberson, on Aug. 9, started suit asking for injunction to prevent further operation of mill. Claims it is a nuisance to tenants renting his houses adjoining and that vibrations impair foundations of his houses, wherefore he asks for \$3000 in addition to injunction. Order to show cause why injunction should not be issued against Davis-Daly and Butte-Detroit companies will be heard Sept. 11.

**NORTH BUTTE (Butte)**—Foundation Co. of New York, under direction of W. I. Johnson, started concreting Granite Mountain shaft, beginning at the 3000-ft. level and working upward to 2400-ft. level. Balance of work will be carried on from various levels. Expect concreting between surface and 3000 level will be completed within four months. Lining of structural steel and concrete, and is absolutely fireproof. First shaft of its kind in Butte camp and experiment being watched with unusual interests by all companies in district. Another damage suit for \$10,000 filed against company by Martin Gerrity, survivor of recent fire. Claims having been injured by exposures in the mine during 48 hours before being rescued.

#### NEVADA

##### Clark County

**BIG CASINO MINING CO. (Searchlight)**—Drifting east and west on 550-ft. level, struck orebody about 200 ft. long.

##### Lyon County

**MASON VALLEY MINES CO. (Mason)**—Ileport of W. H. Aldridge, president, for period of 4½ months, beginning Feb. 13, shows only one blast furnace in continuous operation, because of coke shortage; gross operating profit, \$342,214, with net of \$244,601, charging off six months' depreciation and deferred charges. Ore smelted was, Mason Valley 50,645 tons and other ores 80,666 tons. Blister copper produced was 5,877,682 lb., yielding 5,822,130 lb. copper, 436 oz. gold and 21,345 oz. silver.

##### Mineral County

**NEVADA RAND (Rand)**—Owns about 3000 ft. along vein, two miles northwest of Golden Pen mine, on same fissure, and adjoining property now operated by Queen Regent Co. Worked by vertical double compartment shaft, 450 ft. deep, with cross-cuts and drifts at 150-, 250- and 450-ft. levels. Intermediate level run from winze, 30 ft. below 150-ft. level. Enriched zones on hanging- and foot-wall sides vary from 1½ to 13 ft. wide and ore shoot shown by present development is 240 ft. long. Expect to erect 40- to 50-ton mill, operating at cost of \$4 to \$5 per ton, using cyanidation and amalgamation. Charles Huber, Tonopah, president.

##### Nye County

**TONOPAH ORE PRODUCTION** for week ended Aug. 25 was 9407 tons, valued at \$164,622, comparing with 8999 tons the previous week. Producers were: Tonopah Mining, 2600 tons; Tonopah Extension, 2380 tons; Jim Butler, 900 tons; West End, 943 tons; Rescue, 126 tons; Montana, 78 tons; and Cash Boy, 55 tons.

##### White Pine County

**NEVADA CONSOLIDATED (McGill)**—Production for July amounted to 7,253,337 lb., as compared with 6,850,186 in June and 8,537,231 in July, 1916.

#### NEW MEXICO

##### Grant County

**CHINO COPPER CO. (Santa Rita)**—July output was 7,343,757 lb. copper, against 7,193,262 lb. in June and 6,883,403 in July, 1916.

#### OREGON

##### Josephine County

**FLEMING (Gold Hill)**—O. M. Raseau, of Seattle, has crew of men at work on this manganese property. Could ship at once, but extent of ore will be first determined.

**QUEEN OF BRONZE (Takilma)**—In July, 1600 tons of copper ore shipped. Ore hauled by teams and trucks to Waters Creek railroad terminus; then to Tacoma via. Grants Pass. R. C. Crowell, manager.

**GREENBACK (Grants Pass)**—Modern machinery being installed at this gold mine; entire plant electrified. Will be in operation by autumn. F. F. Childers, manager.

**MEAD (Grants Pass)**—Collins McDougall, of this place, leased this gold property on Jones Creek, five miles east. Ore is free milling. Vein is 12 ft. wide and opened for 1200 ft. Lessee is negotiating for 5-stamp mill to be operated by gasoline engine. Expects to crush 15 tons daily.

**MANGANESE (Wilderville)**—Michael G. Womack, of Medford, Ore., and M. A. Clark, of Ashland, Ore., are developing manganese, 2½ miles west of their recent manganese strike, 10 miles west of the Josephine Caves, on Buck Peak. Is 22 miles away from Wilderville, on the Grants Pass-Crescent City R.R.

#### PENNSYLVANIA

##### Lehigh County

**BIRKENBINE ENGINEERING CO. (Phila.)**—Has leased several farms at Zionsville, Penn.; Giles Drilling Co., New York, is exploring for iron ore. The land leased covers some old mines operated many years ago, but long abandoned.

#### UTAH

##### Juab County

**VICTORIA GOLD (Eureka)**—Option reported taken on this ground in north Tintic by large company. Bunches of lead ore on surface.

**SIOUX CONSOLIDATED (Eureka)**—Stringer of copper ore cut on 800-ft. level, where drifting east for continuation of Iron Blossom copper ore.

**CHIEF CONSOLIDATED (Eureka)**—Three new belt-driven, triplex pumps delivered; to be installed on 1800, 1200 and 600-ft. levels. Capacity, 300 gal. per min., each pump having own 75-hp. motor.

##### Salt Lake County

**UTAH COPPER (Garfield)**—Production for July was 18,127,154 lb. copper, comparing with 19,909,097 in June and 20,302,228 in July, 1916.

**BINGHAM AMALGAMATED (Bingham)**—Shaft on east side free of water below 300-ft. level, and ore being mined on that level. Two cars shipped from here in June.

**ALTA-UTAH MINES (Alta)**—Company to have capitalization of 1,000,000 shares, par value 10c., 600,000 shares in treasury, owns 150 acres of ground, adjoining South Hecla on west, Seils on north and Peruvian on south. George Watson, of South Hecla, president. Ground to be opened starting from western and eastern ends of property. Dwyer tunnel of the South Hecla will be extended easterly into the Alta-Utah ground; 100 ft. of work being necessary to reach the latter and work will be started at the same time in the tunnel on the Native Copper property—a part of the Alta-Utah—at the eastern end, driving toward the west. Work from the South Hecla side will give a depth of 900 ft. vertically from surface.

##### Summit County

**ONTARIO SILVER (Park City)**—Ore opened on the 1600-ft. level and drifting being done on levels above and below for upward and downward extension of the ore.

**CALIFORNIA-COMSTOCK (Park City)**—Ore in raise from stop above Walker drift opening up satisfactorily, and 50 ft. further along another raise being driven for same orebody. Since beginning work July 20, thirteen cars of ore shipped. Hampered somewhat by lack of men and railroad cars.

##### Tooele County

**POLE STAR COPPER (Gold Hill)**—New equipment working satisfactorily. Bismuth ore opened in floor of tunnel followed downward for 35 ft.; up to 3 to 4 ft. wide; ore carries silver, gold, lead and copper as well as bismuth.

**WESTERN MINES DEVELOPMENT (Gold Hill)**—Big Chief mine, in Ferber district, owned by this company being developed. Ore, lead-silver. Shipments, held back by lack of teams, being made by auto-truck to railroad station at Erickson's ranch.

#### VERMONT

##### Rutland County

**KINNEY KOBBLE MANGANESE (South Wallingford)**—This property, reopened in June by William C. Bull, of Danby and Bennington, Vt., has produced about 1200 tons of manganese ore. Recent analysis showed manganese, 41.33%; iron, 12.07%; phosphorus, 0.09%, and silica 4.46%. Feldspar and kaolin deposits also being opened on this property, which is about one-half mile from railroad. From former

workings, about 20,000 tons of manganese ore was produced. Over 200 ft. of new work has been done.

#### WISCONSIN

##### Zinc-Lead District

**FRONTIER (Galena)**—New Hird No. 3 mill is completed at Benton.

**C. S. H. (Platteville)**—Two-jig mill has been constructed at G. O. P. mine, at Cuba City, with equipment moved from the Roosevelt.

**OLD MEXICO (Platteville)**—Bell mine equipment being installed on James Tracey lease, 6 miles west of Platteville. Chicago men financing the work.

**LAURENCE MINES CO. (Dubuque, Ia.)**—New run of zinc ore developed at Indian Mound property, on Murphy land, at New Diggings, since company took it over six months ago.

#### CANADA

##### Alberta

**NICKEL DEPOSITS** of considerable extent, said to have been found in Fond du Lac district by H. V. Dardier, mining engineer for Vickers-Maxim interests, and party, sent into the Athabasca country. Supplies and equipment were freighted and floated 2800 miles north of Edmonton, and three shafts sunk, according to current report.

##### British Columbia

**CANADA COPPER CORPORATION (Greenwood)**—Production of copper for June amounted to 178,976 lb. Plant closed down on June 26, owing to coke shortage, and operations resumed on Aug. 15.

##### Manitoba

**TASH-ORN (Tashota)**—Closed down pending reorganization.

**PITTSBURGH LORRAIN (South Lorrain)**—Force of 30 men employed and considerable quantity of high-grade ore being bagged for shipment.

##### Ontario

**ORE SHIPMENTS** over the Temiskaming & Northern Ontario Ry. for July were 1724 tons from properties in the Cobalt district, 1746 tons from Miller-Lake-O'Brien, in Elk Lake district, and 489 tons of nickel ore from Alexo mine, at Porquis Junction.

**IMPERIAL (Porcupine)**—Crosscut driven 136 ft. at the 200-ft. level is stated to be in ore of commercial grade for the last 58 feet.

**NORTHERN PYRITES CO. (Northpine, via. Graham)**—Shipping from 16 to 20 cars of ore per day. Expected that the total shipments for this season will amount to 100,000 tons.

**MURRAY MOGRIDGE (Wolf Lake)**—Shaft is down to near the 200-ft. level, where station will be cut and sinking continued to 300 ft. Drifting progressing on 50-ft. level.

**PETERSON LAKE (Cobalt)**—Quarterly statement for term ended July 31 shows cash on hand \$43,122. Operations on Susquehanna section lead to belief that looked-for orebody will be found but if not search will be continued in other directions.

**TEMISKAMING (Cobalt)**—In reply to criticism, President F. L. Culver issued statement, showing that at time control was assumed in March, 1914, assets were placed at \$116,304, the mine being considered as about exhausted. Since then several thousand dollars have been spent in betterments, \$25,000 paid in dividends, and on Aug. 1, cash on hand was \$246,560, and ore valued at \$287,788. Deducting balance as of Mar. 31, 1914, shows net profit of \$943,044.

**SCHUMACHER (Schumacher)**—Report to shareholders on occasion of reopening property states that mill has been overhauled and with additional tank capacity is expected to handle 150 tons per day, to be increased to 180 tons as soon as new tanks are completed. With new compressor installed, giving 25-drill capacity, one Hardinge mill and one tube mill will be installed to give 300-ton daily capacity. Additions allow lower-grade ore to be profitably mined. Decided to sink main shaft from present 600-ft. level to 1000 ft., and put down No. 4 shaft to 400 feet.

#### MEXICO

**MINING TAXES**, according to dispatch dated Sept. 4, will be the same that were assessed by decree by President Carranza as First Chief, prior to the constitutional period. The Chamber of Deputies have passed a bill to this effect. These taxes are progressive, taxing large holdings more than small ones.

#### CHILE

**BRADEN (Sewell)**—Production for July amounted to 6,015,000 lb. of copper.



# The Market Report

## Metal Markets

### SILVER AND STERLING EXCHANGE

Aug. Sept.	Sterling Ex-change	Silver		Sept.	Sterling Ex-change	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
30	4.7556	90½	46	3	.....	.....	47
31	4.7556	90½	46	4	4.7550	93½	47½
1	4.7556	90½	46	5	4.7550	95½	48½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

### DAILY PRICES OF METALS IN NEW YORK

Aug. Sept.	Copper		Tin		Lead		Zinc
	Electro-lytic	Spot.	N. Y.	St. L.	N. Y.	St. L.	St. L.
30	24½	61½	10½	10.20	10.40	10.00	7.70
31	24½	61½	10½	10.20	10.40	10.00	7.70
1	24½	61½	10½	10.20	10.40	10.00	7.70
3	24½	61	10	10.20	10.40	10.00	7.70
4	24½	61	10	10.20	10.40	10.00	7.70
5	24½	61	10	10.20	10.40	10.00	7.70

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r. t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

### LONDON

Aug. Sept.	Copper		Tin		Lead		Zinc
	Standard	Electro-lytic	Spot	3 Mos.	Spot	3 Mos.	Spot
30	120	119½	137	244	242½	30½	54
31	120	119½	137	244½	243½	30½	54
1	120	119½	137	244	243	30½	54
4	120	119½	137	242	241	30½	54
5	120	119½	137	241	240	30½	54

\* No cables received on this date.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80: £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21c.

### NEW YORK—Sept. 5

The same conditions continued to prevail in the metal markets, the uncertainty respecting action by the Government being the dominating factor. The only ameliorating condition was the general idea that things are coming to a head and that the trade will not be much longer delayed in knowing where it stands.

### Copper, Tin, Lead and Zinc

**Copper**—As to business with domestic manufacturers, there was probably none, for barring an occasional inquiry nobody is disposed to enter into buying contracts so

long as the present uncertainty continues. Rather has it been the policy of manufacturers to use the last pound of copper in their yards, down to the limit of safety, for keeping their works going. There is some reason to believe that not a few have carried the thing too far, and notices that have been issued this week by certain important refiners of inability to make deliveries owing to strikes are likely to be something of a shock.

In view of the small amount of business transacted the quotation of the market is largely nominal. There are reports of offers of fourth-quarter copper at as low as 23½c. net, cash, and of September copper at 24@25½c. Yet the largest single transaction reported for the week was at 26c. cash, New York, for October. It is certain, however, that producers are willing to enter into large contracts at 25c., which may be considered the market.

All of the copper mines and metallurgical works of the Anaconda company in Montana, including the electrolytic-zinc plant, are now closed. The Tooele plant, in Utah, is operating at full capacity. The Raritan refinery is running about 50% rate. There is prospect that smelting will soon be resumed at Miami. As to the prospects in Montana, nobody is willing to prophesy. Our own belief is that the price-fixing controversy in Washington is at the root of all the trouble, and that if Washington is willing to pay the market price for copper the labor troubles in Montana and elsewhere will quickly clear up.

**Copper Sheets** are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

**Tin**—This market was very dull and a shade weaker. At the close Straits tin was quoted at 61c. and Banca tin at 59c.

**Lead**—The volume of business was very small. The American Smelting and Refining Co. reduced its price to 10½c. on Aug. 30, and was immediately undercut by other smelters. On Sept. 4, the price was further reduced to 10c., and some business was taken. The second cut was not generally known until Sept. 5. Hearing of it then, other producers and dealers offered at further concessions, but even those did not serve to attract buyers. The situation of lead, respecting September delivery, has now become fairly easy, while as to future deliveries sellers are bearish, October being reported offered at 9½c. and November at 9¼c.

The labor difficulties in southeastern Missouri are clearing up, but now a strike of miners in the Cœur d'Alene, on the subject of recognition of the union, is threatened.

**Zinc**—Business was very small at unchanged prices up to Sept. 5, when sales were reported as low as 7½c. The best opinion in this market is that the bottom is not far away, if not already reached, and important interests have withdrawn, awaiting events. Although the unsold stocks of spelter are large, the curtailment of production is also large, the present rate being estimated at about 55,000 tons per month, or 10,000 tons less than the maximum.

**Zinc Sheets**—Price of zinc sheets has not been changed. Market is still at \$19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

### Gold, Silver and Platinum

Gold exports noted for the week were \$1,000,000 to Peru and \$1,000,000 to Japan.

**Silver**—This market has been an excited and advancing one during the past week, owing to the urgent demand and short supplies both here and in London. China banks are bidding a premium over the yield of a London shipment on account of the lower cost of shipment by the Pacific route. Supplies of producers have been well sold ahead and demand continues in excess of offerings. Market closes firm.

Mexican dollars at New York: Aug. 29, 71c.; 30, 71c.; 31, 71c.; Sept. 1, 71c.; 4, 73c. Recent shipments to China from San Francisco have been 4,670,000 oz. silver. China has also been a considerable buyer in London and in Australia.

**Platinum**—Steady at \$105.

**Palladium**—In good demand at \$120@125.

### Other Metals

**Aluminum**—This market continues inactive with quotations nominal at 46@48c. for No. 1 ingots at New York. Price would probably be shaded for actual business.

**Antimony**—This market was stagnant, with a nominal quotation of 14½c. for spot, and 13½@13¾c. c.i.f. in bond for futures. It is reported that the antimony supply is contracting, Chinese production and shipments both falling off.

**Bismuth**—Unchanged at \$3.50 per pound.

**Cadmium**—Unchanged at \$1.40@1.60 per pound.

**Nickel**—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

**Quicksilver**—Unchanged at \$115. San Francisco reports, by telegraph, \$114. firm.

### Zinc and Lead Ore Markets

**Joplin, Mo., Sept. 1**—Blende, per ton, high, \$78.75; basis 60% Zn, premium, \$75; medium to low, \$70@65; calamine, per ton, basis 40% Zn, \$40@38; average selling price, all grades of zinc, \$66.40 per ton.

Lead, high, \$98.90; basis 80% Pb, \$100@90; average selling price, all grades of lead, \$96.21 per ton.

Shipments the week: Blende, 8023 tons, calamine, 500 tons, lead, 1091 tons. Value, all ores the week, \$670,810.

Several zinc-ore buyers reduced their purchases one-half and one buyer reduced his 75%, causing a drop in shipment of 5975 tons of zinc ore less than last week. Premium and low prices remain unchanged, but intermediate grades suffered a cut of \$1 to \$2.50 per ton. Lead was cut another \$10 per ton, a drop of about \$40 in three months.

**Platteville, Wis., Sept. 1**—Blende, basis 60% Zn, unchanged at \$70 for premium ore down to \$65 base for second grade. Lead ore, basis 80% Pb, reduced to \$100 per ton. Shipments reported for the week are 2959 tons of zinc ore, 377 tons of lead ore, and 432 tons of sulphur ore. Shipments during the week to separating plants amount to 3307 tons of zinc ore. For the year to date the figures are: 95,560 tons of zinc ore, 4715 tons of lead ore, and 19,130 tons of sulphur ore.

### Other Ores

**Manganese Ore**—Unchanged at \$1 for high-grade metallurgical ore.

**Molybdenum Ore**—Molybdenite unchanged at \$2.10@2.20.

**Pyrites**—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 32s. 6d. for northern ports, and 40s. for southern ports.

**Tungsten Ore**—High-grade wolframite was quoted at \$23@24, while low grade was reported around \$18.50. Scheelite was quoted at \$26 for ore of 60% grade, with a premium of 30c. per unit above 60%.

**Iron Ore**—Season prices for Lake Superior iron ore remain on the basis of \$5.05 for Mesabi non-bessemer, on Lake Erie dock, but advances over the season Lake rate of \$1 are added, Bethlehem's recent purchase being at 50c. above the schedule, based on a Lake rate of \$1.50. Predictions are made of a Lake rate of \$2 before the close of navigation.

### Iron Trade Review

The magnitude of the Government's task in fixing steel prices is shown in repeated postponement of action, says "Iron Age." In the past week prominent producers have been called upon for additional data, and there is still no appointment for the expected meeting of the War Industries Board and the general committee of steel manufacturers.

The markets for pig iron, semi-finished steel and rolled products continue to drift. Indications of coming readjustments are

chiefly those given by resale transactions which are but meager basis for conclusions. The August pig-iron statistics emphasize again the little success of blast furnace operators in the face of coke scarcity. The output was 3,247,947 tons, or 104,772 tons a day, against 3,342,438 tons in July, or 107,820 tons a day. New modern blast furnaces were started last month at five steel plants—Midvale, Bethlehem, Donner, Republic and Whitaker-Giesner—yet with all this reinforcement production declines. Many furnaces were banked for days at a time for lack of coke.

On Sept. 1, 357 furnaces were in blast, with daily capacity of 110,165 tons, while 351 furnaces with daily capacity of 109,248 tons were active on Aug. 1. The situation is well indicated by the fact that 25,660,000 tons of pig iron was produced in the first eight months of the year, or 175,000 tons less than in the first eight months of 1916, and yet 38 more furnaces were in blast at the opening of this month than on Sept. 1, 1916.

PITTSBURGH—Sept. 4

It is claimed there are specific advices from Washington that the prices the Government is to pay for steel products will be finally fixed within a week, but there is no hint as to what the schedule will be. In some quarters the declines in Wall Street the last few days are attributed to expectations that the prices will be lower than anticipated, but in other quarters the declines are attributed chiefly to the great excess profits taxes being considered in the Senate.

The fixing of bituminous-coal prices a fortnight ago at a general average of about \$2 created an impression that the steel prices would be low, but private advices received today from Washington are to the effect that the coal limits are likely to be raised within a week.

The finished-steel market continues extremely quiet and almost devoid of transactions. Export demand is keen in some directions, but much of the business is held up by uncertainty as to the freedom with which export licenses will be granted.

The plate market has undergone a definite decline. While until recently tank plates were strong at 9@10c., there have been sales lately at 8c. and even at a trifle less, and 8c. is the maximum of the market, though hardly the minimum. New capacity to the extent of 125,000 tons a month is expected to be brought in during the next six months, approximately doubling the capacity for making plates suitable for shipbuilding and large tanks. In other finished-steel products prices are not quotably changed, but an easier tone is in evidence in spots. Mills are sold up, as to the full output, for from two to four months, rarely for a longer period, and the general readjustment in finished-steel prices, which has been a certainty for some time past, cannot be delayed long. Perhaps the fixing of the Government's prices will be a signal for the readjustment in the general market to begin.

Pig Iron—Average prices realized on sales of Valley iron in August are reported by W. P. Snyder & Co. at \$53.221 for bessemer, a decrease of \$3.279 from the July average, and \$49.422 for basic, a decline of \$3.426, making the August averages not far from those of June. The basic sales entering the average were made chiefly late in the month, and there was one of 5000 tons at \$48, now the quotable market, although a firm bid at \$47 might bring out iron. Bessemer remains quotable at \$52, while foundry and malleable are quotable at \$53 instead of \$53@55 as formerly. Prices delivered Pittsburgh are 95c. higher.

Steel—A middle interest has been offering billets at \$75, the lowest mill quotation apparently being \$75. There is practically no demand, and the general trend of the market in billets, forging billets, sheet bars and rods, is downward.

Ferroalloys

Ferromanganese—Usual quotations remain at \$375@400 for prompt and balance of year and \$350 for first quarter or first half of next year, but these quotations are sometimes shaded. Sale of a round lot for near-by delivery is reported at \$350. Prices are with freight allowed.

Coke

Connellsville—There is no news as to the Government fixing prices on coke, but the expectation remains that the action will be taken, under the provision in the Food Control law, which covered coal and coke. The market is about 50c. easier in the week, at \$13@13.50 for spot furnace and \$13.50@14.50 for spot foundry, per net ton at ovens.

STOCK QUOTATIONS

Table with columns: N. Y. EXCH.†, Sept. 4, BOSTON EXCH.\*Sept. 4. Lists various stocks like Alaska Gold, Am. Sm. & Ref., etc.

Table with columns: N. Y. CURB†, Sept. 4, BOSTON CURB\* Sept. 4. Lists various commodities like Big Ledge, Butte & N. Y., etc.

Table with columns: SAN FRAN.\*, Sept. 4, SALT LAKE\* Sept. 4, TORONTO\* Sept. 4. Lists various regional stocks.

STOCK QUOTATIONS—Continued

Table with columns: COLO. SPRINGS Sept. 4, LONDON Aug. 20. Lists stocks like Cresson Con., Doctor Jack Pot., etc.

\* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Table showing monthly average prices for Silver and Copper in New York and London from 1915 to 1917.

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

Table showing monthly average prices for Tin in New York and London from 1915 to 1917.

Table showing monthly average prices for Lead in New York, St. Louis, and London from 1915 to 1917.

Table showing monthly average prices for Spelter in New York, St. Louis, and London from 1915 to 1917.

Table showing monthly average prices for Pig Iron in Bessemer, Basic, and No. 2 Foundry from 1915 to 1917.

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

Table showing monthly average prices for Pig Iron in Bessemer, Basic, and No. 2 Foundry from 1915 to 1917.

† As reported by W. P. Snyder & Co.



# Current Prices—Materials and Supplies

## IRON AND STEEL

**SHEETS**—Price in cents per pound:

Blue Annealed	Large Lots.				San Francisco	New York	
	Pittsburgh	St. Louis	Chicago	Sept. 1, 1917		One Yr. Ago	
No. 10	8.00 to 9.00	10.05	10.00	11.00	10.00	4.25	
No. 12	8.05 to 9.05	10.10	10.05	11.05	10.05	4.30	
No. 14	8.10 to 9.10	10.15	10.10	11.10	10.10	4.35	
<b>Black</b>							
Nos. 18 and 20	7.80 to 8.80	10.15	9.80	11.07	10.30	3.45	
Nos. 22 and 24	7.85 to 8.85	10.20	9.85	11.12	10.35	3.50	
No. 28	8.00 to 9.00	10.35	10.00	11.37	10.50	3.65	
No. 26	7.90 to 8.90	10.25	9.90	11.12	10.40	3.55	
<b>Galvanized</b>							
No. 10	9.00 to 10.00	10.95	10.70	12.15	11.40	4.10	
No. 12	9.10 to 10.10	10.95	10.70	12.15	11.40	4.10	
No. 14	9.10 to 10.10	10.95	10.70	12.15	11.40	4.10	
No. 16	9.10 to 10.10	10.95	10.70	12.15	11.40	4.10	
Nos. 18 and 20	9.40 to 10.40	11.15	11.00	12.45	11.40	4.40	
Nos. 22 and 24	9.55 to 10.55	11.30	11.15	12.59	11.55	4.55	
No. 26	9.70 to 10.70	11.45	11.20	12.74	11.70	4.70	
No. 28	10.00 to 11.00	11.75	11.50	13.03	12.00	5.00	

**STEEL RAILS**—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Sept. 1, 1917	One Year Ago	Sept. 1, 1917	One Year Ago
Standard bessemer rails.	\$38.00	\$33.00	\$38.00	\$33.00
Standard openhearth rails.	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	83.00 to 84.00	50.00	95.00 to 100.00	43.00
Light rails, 12 to 14 lb.	82.00 to 83.00	49.00	95.00 to 100.00	42.00
Light rails, 25 to 45 lb.	75.00 to 80.00	47.00	95.00 to 100.00	40.00

\*Activity in rails principally governmental.

**TRACK SUPPLIES**—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco
	Sept. 1, 1917	One Year Ago			
Standard railroad spikes.					
¾ in. and larger.	\$7.00	\$2.65	\$5.00	\$5.75	\$5.75
Track bolts.	7.00	3.25	6.25	Premium	7.30
Standard section angle bars	3.65	2.00	4.50	Premium	4.65

**STRUCTURAL MATERIAL**—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	New York		St. Louis	Chi-ago	San Fran-cisco	Dallas
	Pitts-Sept. 1, 1917	1 Yr. Ago				
Beams, 3 to 15 in.	\$4.50	\$5.25	\$3.25	\$5.05	\$5.00	\$7.75
Channels, 3 to 15 in.	4.60	5.25	3.25	5.05	5.00	7.75
Angles, 3 to 6 in., ¾ in. thick	4.50	5.25	3.30	5.05	5.00	7.75
Tees, 3 in. and larger	4.50	5.30	3.30	5.05	5.05	7.75
Plates	10.00	10.00	4.00	10.05	10.00	9.00

**RIVETS**—The following quotations are per 100 lb.:

	STRUCTURAL					
	Mill Pittsburgh	New York	Chicago	St. Louis	San Fran-cisco	Dallas
¾ in. and larger	\$5.25	\$7.00	\$5.50	\$5.55	\$7.15	\$8.40
<b>CONE HEAD BOILER</b>						
¾ in. and larger	5.35	7.10	5.60	5.65	7.25	8.50
¾ and 1 in.	5.50	7.25	5.75	5.80	7.40	8.65
1 in. and larger	5.85	7.60	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

**HORSE AND MULE SHOES**—Warehouse prices per 100 lb. in cities named:

	Mill					
	Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	\$4.75	\$6.75	\$7.00	\$7.00	\$7.75	\$6.75
Assorted	4.90	7.25	7.00 to 7.50	7.15	8.00	7.25

**WIRE ROPE**—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10-2 ½ %	10-2 ½ %	10-2 ½ %	15 %
Bright	20-2 ½ %	20-2 ½ %	20-2 ½ %	10 %

**SWEDISH (NORWAY) IRON**—This material per 100 lb. sells as follows:

	Sept. 1, 1917	One Year Ago
New York	\$14.00	\$6.00
Cleveland	13.30	6.30
Chicago	13.00	5.50

In coils an advance of 50c. usually is charged:  
Note—Stock scarce generally.

**PIPE**—The following discounts are for carload lots f.o.b. Pittsburgh, as per basing card of July 2, 1917:

Inches	Steel		Iron	
	Black	Galvanized	Black	Galvanized
¾ to 3	49%	35 ½ %	¾ to 1 ½	33% 17%
<b>BUTT WELD</b>				
<b>LAP WELD</b>				
2	42%	29 ½ %	2	26% 12%
2 ½ to 6	45%	32 ½ %	2 ½ to 4	28% 15%
7 to 12	42%	28 ½ %	4 ½ to 6	28% 15%
13 and 14	32 ½ %		7 to 12	25% 12%
15	30%			
<b>BUTT WELD. EXTRA STRONG PLAIN ENDS</b>				
¾ to 1 ½	47%	34 ½ %	¾ to 1 ½	33% 18%
2 to 3	48%	35 ½ %		
<b>LAP WELD. EXTRA STRONG PLAIN ENDS</b>				
2	40%	28 ½ %	2	27% 14%
2 ½ to 4	43%	31 ½ %	2 ½ to 4	29% 17%
4 ½ to 6	42%	30 ½ %	4 ½ to 6	28% 16%
7 to 8	38%	24 ½ %	7 to 8	20% 8%
9 to 12	35%	19 ½ %	9 to 12	15% 3%

From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	38%	42.8%	42.8%
¾ to 6 in. lap welded	18%	38.8%	38.8%
7 to 12 in. lap welded	10%	35.8%	
<b>Galvanized</b>			
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	22%	27.8%	27.8%
¾ to 6 in. lap welded	List	24.8%	24.8%
7 to 12 in. lap welded	List	20.8%	

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron, standard sizes, 34 and 5%.

## MISCELLANEOUS

**FLOTATION OILS**—Prices of oils for flotation, in cents per gallon, in barrels:

	New York		Denver	
	Nek York	Chicago	In Bbl.	In Car-Lots load Lots
Pure steam-distilled pine oil	\$0.50 ½	\$0.45	\$0.30	\$0.27
Pure destructively distilled pine oil	.40	.43	.30	.27
Pine tar oil	.26	.30	.22 ½	.19
Crude turpentine	.37	.47	.44	.38
Hardwood creosote	.19 ½ *		.34 ½	.31

\*F.o.b. Cadillac, Mich.

**SODIUM CYANIDE**—New York price is 30c. per lb.; Denver, 46c. to 48c.; in Chicago, 65c.

**SODIUM SULPHIDE**—In New York the price per pound is 3 ¼ c. for concentrated, 2c. for crystals. The Denver price for concentrated is quoted at 3 ½ c. The Chicago price is 3 ½ c. Concentrated comes in 500-lb. drums, the crystals in 400-lb. barrels.

**ZINC DUST**—New York price is 18c. per lb. in 1600-lb. barrel; Denver, 14c.; Chicago, 18c.

**CALCIUM CARBIDE**—Price f.o.b. cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is \$90 for Cameo, \$95 for Union. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add \$5; west of Rockies, add \$10 to \$15.

## HOSE

	Fire		
	50-Ft. Lengths	70c. per ft.	
Underwriters' 2 ½-in.		40-10%	
Common, 2 ½-in.		40-10%	
<b>Air</b>			
	First Grade	Second Grade	Third Grade
¾-in. per ft.	\$0.55	\$0.30	\$0.25
<b>Steam—Discounts from list</b>			
First grade	30%	Second grade	30-5%
Third grade	40-10%		

**RUBBER BELTING**—The following discounts from list apply to transmission rubber and duck belting:  
Competition 50-10% Best grade 25%  
Standard 40%

**LEATHER BELTING**—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	40%	40%
Chicago	40-5%	35-10%
Birmingham	35%	35%
Denver	40%	45%

**RAWHIDE LACING**—40%.

**MANILA ROPE**—For rope smaller than ½-in. the price is ¼ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ¾-in., 6 ft.; 1-in., 4 ½ ft.; 1 ¼-in., 2 ft. 10 in.; 1 ½-in., 2 ft. 4 in. Following is price per pound for ½-in. and larger, in 1200-ft. coils:

Boston	\$0.34	Kansas City	\$0.31 ½
New York	33 ½ %	New Orleans	.31
Chicago	31 ½ %	Los Angeles	.30
Denver	.34		

**PACKING**—Below are prices each per pound in cities named:

Asbestos		St. Louis	New York	Denver	Birmingham
Valve	Twisted plain, 25-lb. cartons	\$1.25	\$0.65 @ 0.70	...	\$1.50
Due	Twisted graphite, 25-lb. cartons	1.25	...	...	1.50
Stuffing	Braided plain, 25-lb. cartons	1.50	...	...	1.50
Box	Braided graphite, 25-lb. cartons	1.50	1.00	.60	1.50

Asbestos wick in balls, ¼, ½, 1-, 25- and 50-lb. cartons, \$0.65 @ 0.70. New York; \$1. Chicago.  
Rubber asbestos, compressed sheet, medium grade about \$0.80, New York; 45c., St. Louis; \$1. Chicago.

**STEAM**

Following in 25- and 50-lb. cartons:

	New York	Denver	Birmingham	St. Louis
First grade	\$0.83	\$0.80	\$1.00	\$0.80
Second grade	.55	.60	.90	....

**RUBBER AND DUCK**

High grade	\$0.50	....	....	\$0.60
Cold water	.30	....	....	.40

**PISTON**

Asbestos, duck and rubber	\$1.75	\$0.80	\$0.00	\$1.50
Flax, first grade	.94	.60	.32	.75
Rubber and duck	.90	.60	.60	.60

**RAILWAY TIES**—For fair-size orders, the following prices per tie hold:

	Material	6 in. x 8 in. by 8 Ft.	7 in. x 9 in. by 8 Ft. 6 In.
New York	Yellow Pine	\$1.06 to 1.11	\$1.25
St. Louis	No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
San Francisco	Green	.77	1.01
San Francisco	Creosoted	1.20	1.62

**GREASES**—Prices are as follows in the following cities in cent sper pound for barrel lots:

	New York	Denver	Chicago	Birmingham	St. Louis
Cup	5 to 7	8	7½	5½	5.6
Fiber or sponge	5 to 7	15	7¾	12½	5.9
Transmission	5 to 7	9	6¾	12½	5.9
Axle	3 to 7	5	5¾	4½	3.3
Gear	4 to 5	5	6½	10½	6
Car journal	5½ to 7½	4½	6	9	3.75

**WIPING CLOTHS**—In Cleveland the jobbers' price per 1000 is as follows:

13¼ x 13¼	\$35.00	13¼ x 20¼	\$45.00
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In Chicago they sell at \$30 to \$33 per 1000.

**COTTON WASTE**—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Sept. 1, 1917	One Year Ago		
White	11.00 to 12.00	12.50	16.00	14.00 to 15.00
Colored mixed	8.50 to 12.00	9.00	14.00	10.00 to 12.00

**LINSEED OIL**—These prices are per gallon:

	New York		Cleveland		Chicago	
	Sept. 1, 1917	One Year Ago	Sept. 1, 1917	One Year Ago	Sept. 1, 1917	One Year Ago
Raw in barrels	\$1.26	\$0.75	\$1.30	\$0.75	\$1.27	\$0.75
5-gal. cans	1.35	.85	1.40	.85	1.37	.85

**WHITE AND RED LEAD** in 500-lb. lots sell as follows in cents per pound:

	Red		White	
	Sept. 1, 1917	1 Year Ago	Sept. 1, 1917	1 Yr. Ago
100-lb. keg	Dry 13.25	In Oil 13.50	Dry 10.50	In Oil 11.00
25- and 50-lb. kegs	13.50	13.50	10.75	11.25
12½-lb. keg	13.75	14.00	11.00	11.50
1- to 5-lb. cans	15.25	15.50	12.50	12.50

**NUTS**—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Sept. 1, 1917	One Year Ago	Sept. 1, 1917	One Year Ago	Sept. 1, 1917	One Year Ago
Hot pressed square	List \$1.50	\$1.65	List \$2.75	\$3.00	List \$3.25	\$3.25
Hot pressed hexagon	List 1.50	1.50	List 2.75	3.00	List 3.25	3.25
Cold punched square	List 1.00	1.25	List 2.50	1.60	List 3.00	3.00
Cold punched hexagon	List 1.50	1.25	List 3.00	2.00	List 3.50	3.50

Semifinished nuts sell at the following discounts from list price:

	Sept. 1, 1917	One Year Ago
New York	50%	50-10%
Cleveland	45%	60%
Chicago	50%	65%

**MACHINE BOLTS**—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	30%	35-5%	40-10%
Larger and longer up to 1 in. by 30 in.	15%	20-5%	35-5%

**WROUGHT WASHERS**—From warehouses at the places named the following amount is deducted from list price:

New York	\$5.00	Cleveland	\$4.50	Chicago	\$4.00
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For cast-iron washers the base price per 100 lb. is as follows:

New York	\$2.25	Cleveland	\$4.50	Chicago	\$3.50
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**EXPLOSIVES**—Price per pound in small lots a cities named:

	Low Freezing	40%	Gelatin	80%
	20%		60%	
New York	...	\$0.26½	\$0.33½	...
Boston	...	...	...	\$0.40¾
Kansas City	\$0.19	.25¼	.39¼	.42¼
New Orleans	...	.24¼	.32¼	...
Chicago	.18¾	.22¾	.32	...
St. Louis	.15¼	.19¼	.28½	.38½
Los Angeles	.19	.25	.32¼	...
Denver	.18	.24¼	.31¼	.41¼
Dallas	.24	.28	.38	.48
San Francisco	.17½	.23½	.30½	.40½

**FUEL OIL**—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quote:

	Chicago	St. Louis
Domestic light, 22-26 Baume	7¼ c.	8.5c.

Note—There is practically no fuel oil in Chicago at present time.

**OILS**—Price per 50-gal. bbl. is as follows:

City	Fuel	Black	Red Engine	Steam Cylinder	Gasoline
New Orleans	\$5.00	\$7.75	\$9.50	\$16.30	\$11.25
Seattle	4.40	6.25	11.00	21.00	10.25
Denver	2.87	8.25	15.50	23.00	12.00
Los Angeles	1.45	6.50	12.00	26.00	10.00
Denver	2.87	8.25	15.50	23.00	12.00
St. Paul	3.00	5.50	11.00	17.50	10.05
Cincinnati	5.00	5.50	10.50	17.00	12.00
Boston	5.25	8.00	12.50	18.75	12.50
Kansas City	6.95	4.35	10.25	17.35	10.15

Note—Standard prices of oil are necessarily difficult to give Those above are for average grades.

**CONSTRUCTION MATERIALS**

**ROOFING MATERIALS**—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	\$61.00	\$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

**PREPARED ROOFINGS**—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	\$1.25	\$1.40	\$1.45	\$1.60	\$1.75	\$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs \$5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs \$1.85 per roll in carload lots and \$2.10 for smaller quantities.

Shingles, red and green slate finish, cost \$4.75 per square in carloads, \$5 in smaller quantities, in Philadelphia.

**HOLLOW TILE**—

	4x12x12	8x12x12	12x12x12
Boston	\$0.0957	\$0.171	\$0.2266
Kansas City*	.0595	.1125	.1575
Denver	.09	.17	.25
New Orleans	.0892	.1417	.1863
Los Angeles*	.05	.10	.165
Chicago	.07	.135	...

\*In quantities of 1000.

**LUMBER**—Price per M in carload lots:

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Kansas City	\$44.00	\$44.50	\$43.00	\$52.00	...
Seattle	18.50	18.50	18.50	18.50	\$18.50
New Orleans	38.00	...	...	36.00	...
St. Paul	...	51.00	33.50	59.00	37.50
San Francisco	...	22.00	22.00	...	22.00

	8 x 8-in. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y.P.	Fir	Hemlock	Spruce	Y.P.	Fir
Kansas City	\$39.00	\$35.00	\$35.00	...	\$45.00	\$35.00
Seattle	18.50	18.50	18.50	18.50	\$18.50	18.50
New Orleans	38.00	...	...	...	38.00	...
St. Paul	...	40.00	31.50	32.00	...	45.00
San Francisco	...	22.00	22.00	...	22.00	22.00

**PORTLAND CEMENT**—These prices are for barrels in carload lots, including bags:

	Sept. 1, 1917	One Month Ago	One Year Ago
New York	\$2.22	\$2.22	\$1.72
Jersey City	2.16	2.16	1.66
Boston	2.77	2.77	1.92
Chicago	2.31	2.31	1.86
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Denver	2.39	2.39	...
Los Angeles	2.40	2.40	...

**LIME**—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	\$16.50	\$13.25	\$2.10	\$1.90
Chicago	15.00	12.00	1.90	...
St. Louis	12.00	10.75	...	...
Dallas	20.00	15.00	...	...
San Francisco—	...	...	...	...
Washington hand	17.00	...	...	1.65
California hand	13.50	...	...	...