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## Tungsten in Boulder County, Colorado

BY LEROY A. PALMER\*

*SYNOPSIS*—Boulder County, Colo., furnishes 60% of United States tungsten. Veins are associated with pegmatite in granite. The economic mineral is ferberite. Mines are small and shallow. Stopping is simple. Conger mine largest producer. Most of the ore is concentrated. Different concentrating systems employed in Primos and Wolf Tongue mills.

During 1912 the tungsten production of the United States was equivalent to 1290 tons of concentrate carrying 60% of tungsten trioxide. Of this amount, 1200 tons

entered the field, the combined output being 46 tons, averaging a little better than 60% of trioxide.

The district lies in the southwestern part of Boulder County, the mines now producing extending about eight miles in a general northeast and southwest direction, although discoveries have been made over an area of eight miles east and west and 16 miles north and south.

### MINERAL OCCURS AS FERBERITE

As stated, the metal occurs as ferberite, a black or brownish-black mineral, crystallizing in the monoclinic

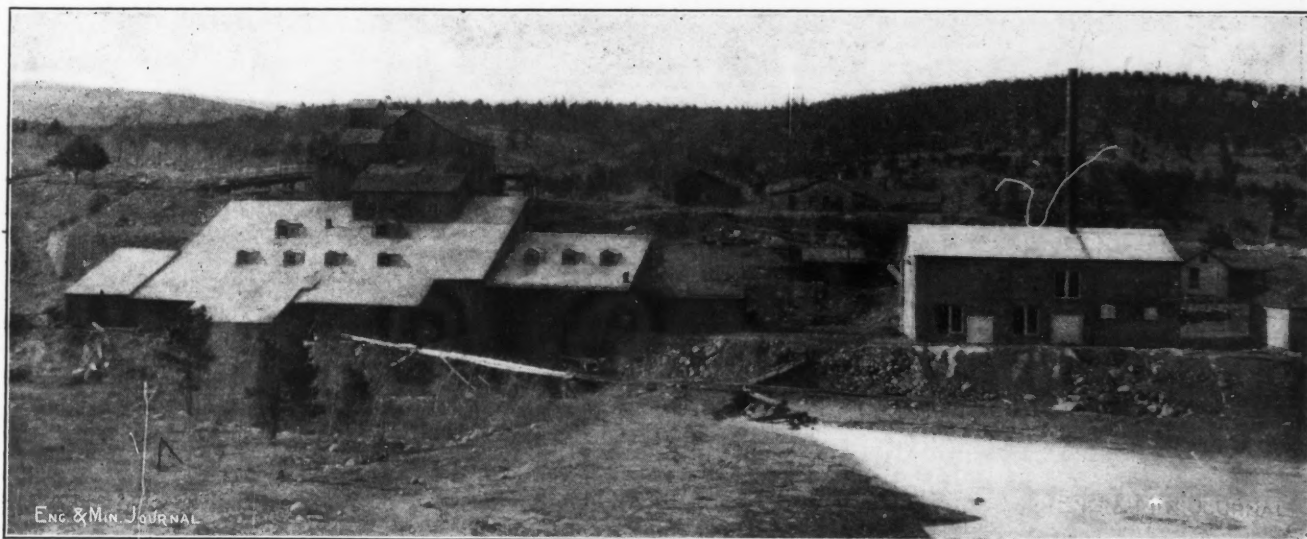


FIG. 1. WOLF TONGUE MILL AND POWER PLANT, NEDERLAND, COLORADO

equal to 775 tons of the 60% product or 60% of the total, came from Boulder County, Colo., the only district in the country where this rare metal is found in commercial quantities in the form of ferberite.

In 1900, Sam P. Conger, an old prospector of this district and locator of the Caribon mine, learned from a former partner, just returned from Arizona, where he had seen tungsten mined, the true nature of the "black iron" which was found abundantly as float and as numerous croppings to the detriment of much good agricultural land on the near-by ranches. Mr. Conger got a lease on a portion of the Boulder County ranch and in the same year the Great Western Exploration & Reduction Co.

system with perfect cleavage; hardness, 4 to  $4\frac{1}{2}$ ; sp.gr., 7.1 to 7.5 (according to Dana 6.8); friable and distinguished from similar minerals by its fusibility (5), specific gravity and cleavage. Seven analyses from the Nederland-Beaver Creek (southwestern) portion of the field show it as an almost pure ferrons tungstate carrying  $WO_3$  from 72.36 to 75.35% and MnO from 0.10 to 0.86% and a slight excess of FeO, while analyses from the northeastern portion of the field show MnO as high as 4.16%. The Boulder County deposits are remarkable for the absence of the minerals usually associated with such deposits, pyrite and galena being rarely found and no occurrence of native copper has so far been reported.

The district extends from the uptilted sedimentary

\*Mining engineer, 46 Federal Bldg., Helena, Mont.

rocks, rising from the plains, westward to the Front Range, thus presenting an easterly sloping belt in which many cañons and steep gulches have been eroded. The tungsten area lies in the Front Range in pre-Cambrian strata, three miles west of the nearest sedimentary rocks.

#### DISTRICT IS LARGELY GRANITE, GNEISS AND SCHIST

The most important rocks of the district are a more or less gneissoid granite and a granitic gneiss, which grades into quartz-mica schist and mica schist.<sup>1</sup> As a rule, each rock occurs in a well defined area but sometimes bodies of one are found within the other, showing no distinct contact but a gradual transition from one to the other. Granite, in the form of irregular intrusive bodies, cuts the granite and the gneiss and in the western and northwestern parts of the field are many other dikes varying in composition from acidie porphyry to basalt. The granite and gneiss are themselves complex, being made

and fracture lines. The most common occurrence of the latter form is in connection with orebodies. The ore is usually found as a breccia which includes a chaledonic quartz or "hornstone," dike granite and pegmatite, country rock and ferberite.

#### BEST OREBODIES IN GRANITE

The best orebodies are found in the granite, gneissoid granite and the more granitic parts of the gneiss. There are only a few instances where mines are situated at any distance within the gneiss, most of them being in the granite or near the granite-gneiss contact. It is extremely rare to find a valuable orebody in the more pronounced gneiss or schistose portions of the district. When the vein reaches these formations it pinches and is usually barren. In view of the almost identical compositions of the gneiss and the granite this fact, at first, appears puzzling and the explanation is physical rather than



FIG. 2. SURFACE WORKINGS AND DIKE, STAR MINE



FIG. 3. OUTCROP AT THE CONGER MINE

up of a primary rock mass and many intrusions, the latter comprising a large portion of the whole. The intrusions occurred in different periods and there is a corresponding variance in the degree of metamorphism shown, but, with the exception of the dike rocks, there is little that has not been subjected to this action, and the older intrusives have been so metamorphosed that they are only with difficulty distinguished from the inclosing rocks.

The granite and the gneissoid granite were intrusive and the structure varies from massive to one in which directional structure is marked and segregation of mica particularly noticeable. The granite is the ordinary biotite variety with hornblende crystals. Orthoclase is the principal constituent of the granite proper but as the rock grades into gneiss the quartz becomes predominant. The gneiss, which has the general chemical composition of the biotite granite, and in many places resembles it in structure, is much older than the latter rock and lies in the western and northwestern part of the field. The evidence is that this is of sedimentary origin. Neither rock shows any regularity of dip or strike.

#### PEGMATITE IS OF FREQUENT OCCURRENCE

Pegmatite occurs in two different forms, coarse-grained, which is found as dikes frequently holding large masses of country rock, and a finer-grained, which grades into the surrounding country rock and was formed by the solution and recrystallization of the latter along seams

chemical. It appears that the schists acted as plastic masses and the forces which caused fracturing and consequent opening of channels in the pegmatite and gneissoid granite resulted in folding, crumpling and shearing in the schist so that any openings were small and in many cases were closed again, thus allowing only a limited circulation of the mineral-bearing solutions or cutting them off entirely. A similar condition obtains in Gilpin County, which adjoins Boulder on the south.<sup>2</sup> In the Nederland-Beaver Creek portion of the field, fissuring seems to have been subsequent to the intrusion of the pegmatite dikes and to have followed the general line of the latter as that of least resistance.

There does not seem to be any regular vein system, although the strike of the veins is principally through the northeast and southwest quadrants varying from due north to N80°E. The dip is usually steep, rarely less than 45°. According to Prof. R. D. George, the ore deposition took place in the following stages: (1) The first opening of the fissures accompanied by much crushing and the formation of masses of angular fragments. (2) The silicification of the rock fragments and their partial cementation into an open breccia and a slight local deposition of tungsten mineral. (3) The second movement and brecciation. (4) The first important deposition of tungsten mineral. (5) The third movement, crushing the breccia ore, and mingling it with much rock matter and in places forming a new breccia by pressure. (6) The second deposition (local) of chal-

<sup>1</sup>Geologic data largely obtained from report of Prof. R. D. George, Colorado Geological Survey.

<sup>2</sup>Collins' "Application of Genetic Theories to the Search for Local Enrichments in Veins," Proc. Colo. Sci. Soc., Vol. X.



cedony-like silica. (7) The second important tungsten deposition, partly cementing the breccia. It is possible that this was a secondary enrichment, but no clear evidence has been found to support this theory. (8) The contemporaneous deposition of silica and tungsten. (9) Local solution of the tungsten and deposition of silica. (10) In parts of the field, slickensiding and recent brecciation, showing that movement has occurred later than recognizable deposition of ferberite and silica. This is particularly well illustrated at the Clyde mine.

#### PROMINENT OUTCROPS LED TO SURFACE WORKING

As noted, many of the veins follow the general course of the pegmatite dikes, sometimes on one wall, sometimes on the other and occasionally splitting a dike. In Fig. 2 the dike at the Star mine of the Wolf Tongue Mining Co. is shown in the background through the trees and Fig. 3 shows the prominent dike north of the Conger shaft of the Primos Mining Co. The veins themselves crop prominently, which fact, with the soft nature of the ferberite, rendered them particularly susceptible to erosion, resulting in an abundant float which thoroughly

after the value of the "black iron" was discovered the company bought the ranches outright to secure the mineral land thereon. The headquarters of the company are at Lakewood on North Boulder Creek at a point about central to its holdings.

This company operates three mines, the Quaker & Oregon, four miles from Lakewood, which has a 325-ft. shaft and works eight to 10 men, the Lone Tree, ½ mile from Lakewood, 325 ft. deep with 10 men, and the Conger, two miles from Lakewood, with a 450-ft. shaft and 45 men. The output of the Quaker & Oregon and the Lone Tree is small and is hauled to the mill by wagon. The latter is of interest from the fact that in the schist here a high-grade orebody, measuring 100 ft. long, 70 ft. high and with a width up to 20 ft., was stoped out.

#### CONGER MINE A LARGE PRODUCER

The Conger, the largest producer of the district and probably of the world, was originally opened by an incline on the vein and later by a vertical shaft 580 ft. distant and at 60 ft. lower elevation. This shaft has been sunk 450 ft. and gives 600 ft. of backs. A 5x8-ft.



FIG. 4. OPEN STOPE IN THE CLYDE MINE

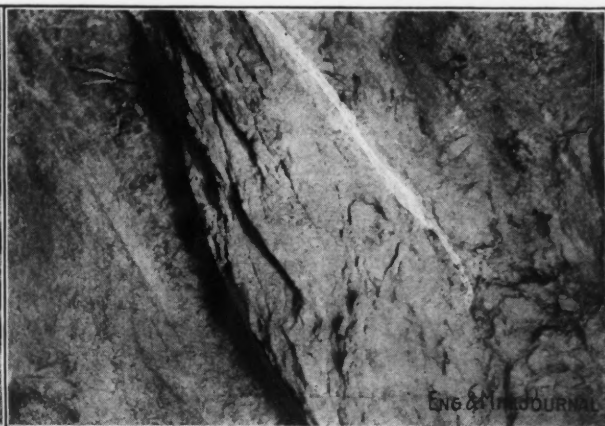


FIG. 5. STRINGER OF RICH ORE, COLD SPRING MINE

impregnated the soil in the vicinity and rendered location easy. These conditions naturally led to surface mining and the country is gophered with opencuts, trenches and shallow shafts, as shown in Figs. 2 and 4. The latter is a stope at the Clyde mine, which was opened on the surface and then, after the Clyde shaft was sunk, stoped by the overhand method from the 80-ft. level. The stulls shown are typical of the timbering found in the district. A great many tons of high-grade ore have been shipped by simply picking up float, which was found abundantly in pieces as large as one's fist, and, after this was pretty well worked over, by shoveling up the surface soil near the outcrops and hand-jigging it.

The largest mining companies in the district are the Primos Mining Co., at Lakewood, and the Wolf Tongue Mining Co. and Colorado Tungsten Corporation, at Boulder. The last has not been in operation recently and production comes from the other two and several leases on scattering groups of claims.

The Primos Mining Co., a subsidiary corporation of the Primos Chemical Co., owns 1680 acres scattered over an area of five miles in the northern portion of the field. Title to about three-fourths of this acreage was originally obtained from the Government by agricultural patent and

tunnel, 350 ft. long, meets the vertical shaft on the 150-ft. level and is continued to the incline shaft where a 15-hp. electric hoist has been installed so that the incline may be used for hoisting while the next 100-ft. lift of the vertical shaft is being sunk this summer. Fig. 6 shows the vertical shaft house at the left and the incline shaft house and dump in the middle background.

The mine has been opened by seven levels. The shaft is 5x10 ft. with hoistway and ladderway. Equipment consists of a 10x12-in. Hendrie & Bolthoff, duplex, second-motion hoist having a rope speed of 400 ft. per min with full load; a 6¾x12x12-in. air and 10x12-in. steam Norwalk two-stage, straight-line compressor with a capacity of 200 cu.ft. of free air per min. working at 90 lb.; a 100-hp. return-tubular boiler; and a 5x6-in. Deming triplex pump geared to a 10-hp. Fort Wayne motor on the 450-ft. level. The water question is not serious, although the flow has increased recently on account of the fact that one of the drifts has been carried under a nearby creek; the small pump handles all of the water, working about half of the time.

Three veins, the Conger, Middle and East have been developed. The dip is such that they are expected to unite at depth and the Conger and Middle veins have

united on their strike at the 450-ft. level where a large orebody was formed on the intersection. Most of the orebodies are ideal for convenient mining. They occur more or less lens-shaped, pinching down to a narrow seam, then opening out to from 4 to 8 ft. over frequently a considerable length, as exemplified by the fact that above the 200-ft. level they have been stoped in a continuous body for 800 ft. The width mentioned is sufficient to give good working room without involving any serious problems of timbering.

#### STOPING BY SHRINKAGE SYSTEM—NO FILLING

The usual procedure is to crosscut from the shaft until a vein is reached and then to follow it until it opens out. It is then stoped up about 8 ft. and 14- or 16-in. round stulls are put in with round lagging laid on top. Usually the regular system of shrinkage stoping is followed. Chutes are put through holes left in the lagging and uppers are drilled in the ore, which is broken down on the lagging and drawn off only in sufficient amount

south of Nederland, and 518 acres in the Ranch group, about three miles northeast; 160 acres of the latter was homesteaded and patent secured in 1881 as agricultural land and 80 acres is placer. No attempt has yet been made to work the placer, but it is quite possible that work will be undertaken this season by hydraulic methods.

#### WOLF TONGUE MINES OPERATED BY LESSEES

Since 1907, when the financial depression seriously affected tungsten mining through the steel industry, the Wolf Tongue has extracted all of its ore by leasing, a policy which, judging from the appearance of the mines, will be of doubtful benefit to the company in the long run. A rather unusual agreement has recently been made with the lessees by which the latter are paid \$7 per ft. for all shaft-sinking in barren ground. Most of the workings on Wolf Tongue ground are comparatively shallow and the ore is extracted from a number of small shafts. In the past most of these have been equipped with whims or small steam hoists, but since the Central Colorado Power Co. has brought electricity into the dis-



FIG. 6. CONGER SHAFT HOUSES

to allow working room for the miners. As the ore is broken down it receives a rough hand-sorting in the stopes and if a high-grade streak is encountered it is carefully broken out by single-hand drilling instead of by stopers in order to avoid mixing it with the lower grade. When a stope is worked out to the level above, the ore is drawn off and the stope abandoned. At first when a stope was emptied, waste was run in and the walls were shot down, but this was found to be unnecessary as the hard and, in most cases, nearly perpendicular walls stand without support. On the 200-ft. level the "big stope" has been emptied and only partially filled with waste and stands, a huge cavern, 250 ft. long, 90 ft. high and about 8 ft. wide.

The ore is hoisted to the tunnel level and trammed to a bin at the mouth, Fig. 7. Here it is dumped over grizzlies, hand-sorted and loaded to cars of  $1\frac{1}{4}$  tons' capacity, which are hauled to the mill in trains of five by a  $3\frac{1}{2}$ -ton, 10-hp., storage-battery, General Electric locomotive. The tramway is a little over two miles long, with an average grade of 2%, 24-in. gage and 30-lb. steel.

The Wolf Tongue Mining Co. owns 593 acres of land, 75 acres of which is in the Beaver group, about a mile

strict this equipment is being supplanted with small electric hoists of from 10 to 22 hp. Four leases are operating on the Beaver group in shafts from 50 to 150 ft. deep and 19 on the Ranch group at depths up to 300 feet.

The principal producers are the Clyde and the Cold Spring, both on the Ranch group. Both of these mines show a high-grade ferberite. Fig. 5, taken on the 150-ft. level of the Cold Spring, shows a 6-ft. face of ore with an 18-in. streak diagonally across that carries 56.9%  $WO_3$ . The Clyde was opened by a 4x8-ft. incline on the vein, which has a dip of about 80°. The shaft is 305 ft. deep and at the 230-ft. level a 5x8-ft. tunnel has been run 560 ft. to the shaft, where it cuts the vein, and 94 ft. beyond on the vein. At the tunnel level a rather unusual pumping equipment has been installed, consisting of a Fairbanks-Morse, American deep-well pump. This is simply an ordinary lift pump, of the same principle as the ordinary hand pump used in deep wells, with the rods driven by a crank geared to a 5-hp. Fort Wayne motor. The piston is 3 in. in diameter and attached to 67 ft. of wooden rods. The pump makes a 2-ft. stroke, 37 per min., and delivers about 20 gal. to the tunnel level. In the drift beyond the shaft an underground compressor



has been installed. This is a 10x10-in. Blaisdell with a capacity of 130 cu.ft. per min., sufficient to run two Waugh stopers.

The Cold Spring is opened to the 150-ft. level with three levels at 50-ft. intervals. It is equipped with a 10-hp. hoist and a 10x8-in. Chicago Pneumatic Tool Co. compressor with a capacity of 120 cu.ft. per min. belted to a 20-hp. motor. Pumping is done by a Deming triplex pump geared to a 3-hp. motor and discharging 16 gal. per minute.

The general ore occurrence in the Wolf Tongue mines is similar to that at the Conger; although, as a rule, the orebodies are smaller, more high-grade ore is found. The usual practice is to break the ore down by overhand stopping, usually by hand, and tram it out as broken. Stulls are put across the stopes, and lagging laid on them as a



FIG. 7. CONGER ORE BIN AND ELECTRIC STORAGE-BATTERY LOCOMOTIVE

platform for the men to work on. All ore is hauled by wagons to the mill at Nederland.

PRIMOS MILL IS CONVENIENT AND ROOMY

The Primos mill, Fig. 8, is situated at Lakewood, near North Boulder Creek. It is a frame building and, as shown by the illustration, is abundantly supplied with windows and skylights and is, in general, built with a view toward convenience, being roomy, with motors on elevated platforms, broad runways to the line shafts, etc. The tramway from the Conger enters the south side and makes a loop for the return. Wagons from the Quaker & Oregon and Lone Tree are driven in on the floor below. Below the tram track are the bins, six of 15-ton capacity for high-grade or custom ore and one of 100 tons for mill ore. The former is wheeled by buggies to a 6x12-in. Blake crusher set to 1 in. and driven by a 10-hp. motor and from the bin beneath wheeled to pockets similar to those above while awaiting settlement or shipment.

The mill ore is fed through two lever gates over 1½-in. grizzlies and the oversize shoveled to a 10x16-in. Blake crusher set to 1 in. and making 250 r.p.m., driven by a 15-hp. motor. The crusher discharges to the 125-ton battery bin beneath the grizzlies. On the crusher floor is the sample-grinding equipment, consisting of two jaw crushers, a gyratory and a pulverizer driven by a 5-hp. motor. Below the battery bin are two 5-stamp batteries driven by a 35-hp. motor and fed by Challenge feeders actuated by the middle tappet of each battery. The

stamps weigh 1000 lb. each and make 88 drops from 6½ to 8 in. per min. with a 1½-in. discharge. The order of drop is 1-5-2-4-3. Each stamp delivers from 3½ to 4 tons per 24 hr., crushing from 1 in. through a 20-mesh Ton-cap screen.

Each battery discharges to a No. 6 Wilfley table, which treats the feed without any classification. The Wilfleys make 7/8-in. strokes, 240 per min., sending the concentrate to tubs and the tailing to a 3-in. Frenier pump, which raises it 16 ft. to a tub from which it flows to a four-compartment V-shaped settling tank above six 4-ft. Frue vanners which make 210 strokes per min. with a belt speed of 44 in. The first compartment of the settler feeds two of the vanners, which have corrugated belts. The second and third compartments, each feed one plain-belt vanner, and the fourth compartment, two plain-belt. The vanner tailing is delivered by 3-in. Frenier pumps in two lifts of 9 and 12 ft. to a large V-shaped settling tank 60 ft. long, 10 ft. wide and 10 ft. deep, provided with six gooseneck discharges. The discharge from the first gooseneck goes to a Dorr classifier, the sand from which goes to a 66x84-in., silix-lined Prosser tube mill, which makes 21 r.p.m. The slime from the classifier is piped around the tube mill and with the discharge of the latter is lifted by a Frenier pump against a 19-ft. head to the third compartment of the large settler. Each of the spigots from the settler, except the first, feeds a Frue vanner, the first three with 6-ft. belts and the last two with 4-ft. These vanners are plain-belt and make 180 strokes per min. with a belt speed of 40 in. per minute.

SEVERAL SERIES OF CANVAS TABLES

All tailing from these vanners is conveyed by a launder to 12 plain canvas 6x40-ft. tables on the next lower floor, Fig. 9, the tailing from which goes to the next floor to 14 "rags," 6x30 ft., and then to 16 tables, 6x20 ft., so that the tails from the five vanners are treated on 7320 sq.ft. of canvas. All of these tables have a slope of 9°. They are cleaned, as necessary, by diverting the feed and sluicing off the surface with a hose. Little attention is required and the management states that the saving is satisfactory.

Below the last row of canvas tables are four rows of settling tubs, two of which may be seen in the illustration. In order to effect a thorough settling of all particles held in suspension, all water from the slime concentrate must pass through the entire series, which extends the full width of the mill, before being discharged. All concentrate is shoveled into buggies and wheeled to a steam drier, those from the Wilfley tables and vanners being lowered down a 20° incline with a slope carriage and small hoist, as the drier is on a level with the lowest floor of the mill.

ELECTRIC POWER IS PURCHASED

Power is bought from the Central Colorado Power Co. and transformed at the mill from 13,000 to 440 volts. The following General Electric three-phase induction motors are in use:

Machines	Number of motors	Hp.
1 crusher .....	1	15
10 stamps .....	1	35
2 Wilfley tables and 1 Frenier pump.....	1	5
1 tube mill.....	1	35
11 vanners, 3 Frenier pumps and 1 Dorr classifier .....	1	10
<b>Total horsepower.....</b>		<b>100</b>

The mill uses about 200 gal. of water per min. A ditch 6500 ft. long connects it with North Boulder Creek and for about seven months of the year supplies all necessary water, but during the winter an additional supply is furnished by a triplex pump operating against a total head of 125 ft. The regular day shift consists of one man for crusher, one for batteries, tables and vanners, two ragmen, drierman and foreman. Crusherman and drierman do not work at night. Wages are \$3.50 and \$4.50 for a 12-hr. shift.

#### WOLF TONGUE MILL HANDLES LESSEES' ORE

The Wolf Tongue mill and power plant, Fig. 1, are adjacent to each other on South Boulder Creek, at Nederland. The ore is hauled from the various mines by wagons and dumped in four 15-ton ore pockets. Ore running better than 50%  $WO_3$  is shoveled to a 5x8-in. Sampson crusher set to 1 in., which dumps to a chain-and-sprocket elevator with 4x4x6-in. cnps and a 19-ft. lift. This elevator running at a speed of 88 ft. per min. dumps to a Vezin sampler which makes a  $\frac{1}{10}$  cut, the sample re-

#### JIGS ARE USED

After settlement is made the ore is delivered to the elevator and chuted to a 20-ton bin from which a plunger feeds it to the screen line consisting of two 3x7-ft. trommels with 6 and 12 meshes per in. Each trommel sends its oversize to a two-compartment harz jig. These jigs work through side and hutch, making concentrates in both compartments, that from the first compartment assaying 53 to 55% and that from the second 25%. They are sacked and shipped as separate products. A 15-hp. motor drives the jigs and trommels.

The jig tailing goes to a 50-ton battery bin from which it is fed by Challenge feeders to three of four 5-stamp batteries. The stamps weigh 900 lb. each and drop 5 in. with even discharge, each stamp crushing two tons per 24 hr. from  $\frac{1}{4}$ -in. through 18-mesh Ton-cap screens. The fourth battery is used for regrinding, as many stamps as may be necessary being dropped for this purpose. The even discharge is used to minimize the amount of slime produced. A 35-hp. motor drives the batteries and two

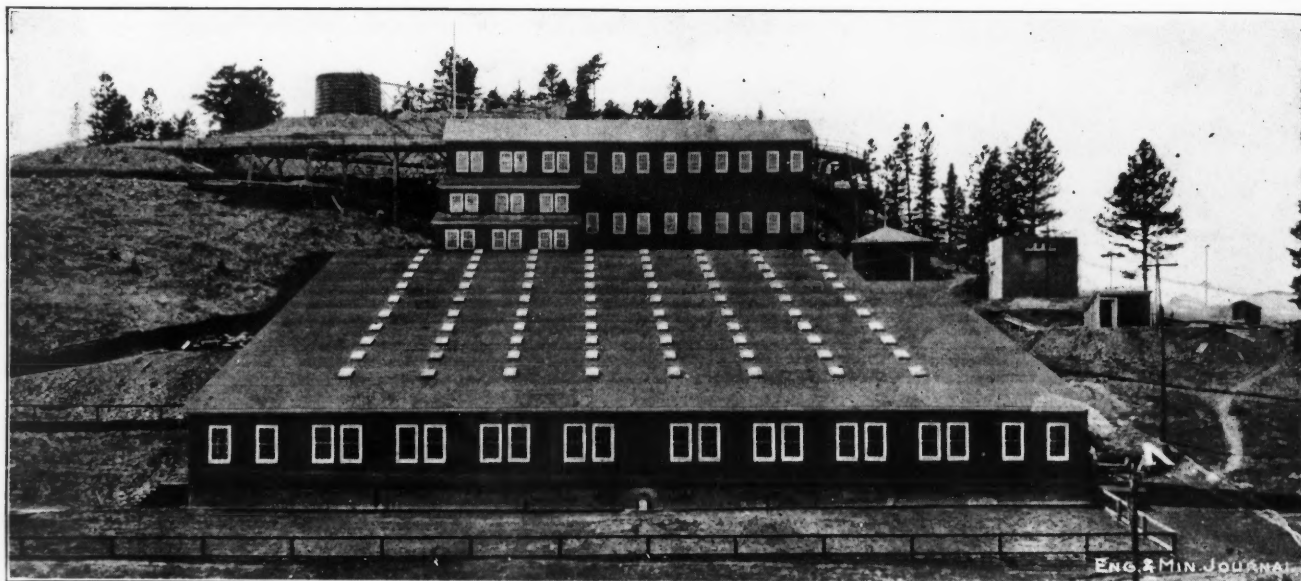


FIG. 8. THE PRIMOS MILL AT LAKEWOOD

ject going to a 4-ton bin from which it is sacked and shipped.

The lower grade is shoveled to an 8x10-in. Colorado Iron Works Blake crusher set to 1 in. and making 203 r.p.m. From the crusher it goes to a set of 14x32-in. MacFarlane cornish rolls set to  $\frac{1}{4}$  in. and driven at a speed of 110 r.p.m. by a 48-in. wooden "bull-wheel" and friction. The rolls discharge to an elevator similar to the one described; this raises the ore 20 ft. to a Vezin sampler which makes a  $\frac{1}{10}$  cut, the reject going to an elevator which raises it 30 ft. and chutes it to one of three 30-ton bins in which it is held until settlement is made with the lessee. These bins are provided, in the mill, with gates from which the ore may be chuted to the elevator which raised it to the bin and delivered through another chute to the jig bin and, on the outside, with gates through which it may be unloaded and hauled away if, for any reason, the lessee decides not to have it treated. All of the above machinery is driven by a 50-hp. motor.

Frenier pumps mentioned later. The battery discharge goes to an 8x44-in. Frenier pump which lifts the pulp 15 ft. and discharges it to a tank to which the undersize of the second trommel of the screen line flows by gravity.

#### SPECIAL SIZER USED

On the table floor below the batteries are one Wilfley and five Card tables with speed and stroke as follows: 240 r.p.m.,  $\frac{3}{4}$ -in.; 260 r.p.m.,  $\frac{1}{2}$ -in.; 270 r.p.m.,  $\frac{1}{4}$ -in.; 270 r.p.m.,  $\frac{1}{4}$ -in.; 285 r.p.m.,  $\frac{1}{4}$ -in.; 258 r.p.m.,  $\frac{1}{4}$ -in. The last table is a Wilfley and is used for treating the recrushed product. Classification is by means of three, small, shaking screens designed by William Loach, manager of the Wolf Tongue, and peculiar to this plant. The screen consists of an eccentrically operated, galvanized-iron hopper with a screen inside, so that the oversize is discharged to the table and the undersize passes out of the bottom of the hopper and on to the next screen. The first three tables are provided with these sizers as follows: 20-mesh, 240  $\frac{1}{2}$ -in. strokes; 40-mesh, 260  $\frac{3}{4}$ -in. strokes;



90-mesh, 280 3/4-in. strokes. They are found to give satisfaction.

The first five tables, the Cards, make two grades of concentrate, a first grade running from 62 to 65%, and a second grade running from 25 to 30%. All tailing from the first table is reground, but the second and third make a rejection. The fourth and fifth treat the undersize of the last shaking screen and send all tailing to the slimers. All middling from the first three and last tables goes to an 8x44-in. Frier pump which elevates it 21 ft. to the regrind battery, where it is passed through a 60-mesh screen and sent to the Wilfley table, which makes only second-grade concentrate and middling. A 20-hp. motor drives the tables and sizers.

MONELL SLIMERS IN USE

Slime is treated on three Monell slimers. This is a comparatively unknown machine, but has given good results on this ore. It consists of a rubber-edged canvas belt with an exposed surface of 5x18 ft. and a transverse slope of 2 in. Feed is discharged lengthwise for a length of 12 ft. along the upper edge of the belt from a perforated

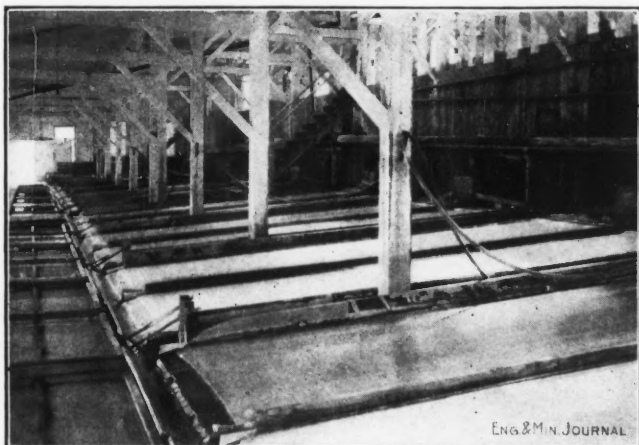


FIG. 9. CANVAS TABLES, PRIMOS MILL

pipe and wash water is fed on at the concentrate end. It has a belt speed of 1 ft. per min. and receives 260 1/2-in. strokes longitudinally from an eccentric without differential motion. The slimer feed consists of the middling of the fourth and fifth Card tables and the overflow of the table-feed tank, one slimer to each of the above products. The slimers make second-grade concentrate and the tailing is sent to a double-compartment concrete sump, 18x18 x4 ft. While this tank is filling, quicklime in the proportion 20 lb. per 100 tons of tailings is added to settle the colloids which, otherwise, would remain in suspension almost indefinitely. As many of these fine particles consist of valuable mineral too fine to be recovered by any process yet devised, it is sometimes found advisable to ship the slimer tailing as second-grade concentrate. All tailing of ore running over 20% WO<sub>3</sub> is treated in these tanks and either shipped or pumped back by an 8x44-in. Frier pump and re-treated. A 15-hp. motor drives the slimers, Frier pump, 2-in. centrifugal pump for delivering slime concentrate to the drier and a small compressor for cleaning the motors.

CONCENTRATES SHIPPED TO MCKEESPORT

The concentrates are dried and shipped to the Firth-Sterling Steel Co., McKeesport, Penn., where their prin-

cipal use is in the manufacture of ferrotungsten. First grade is settled for at the market quotation and second grade at about 5% better than the same grade in ore.

All motors are General Electric, three-phase, induction, 440-volt and are distributed as follows:

Machines	Number of motors	Hp.
1 crusher, 1 set rolls, 2 elevators, 1 sampler....	1	50
2 trommels, 2 jigs.....	1	15
2 pumps, 20 stamps.....	1	35
6 tables, 3 sizers.....	1	20
3 slimers, 2 pumps, 1 compressor.....	1	15
Total horsepower.....		135

Tailing is settled consecutively in three ponds before the overflow is discharged to the creek. The mill operates 12 hr. per day with superintendent, foreman, sampler, jigman, tableman, weigher and a mechanic who makes repairs in the mill and attends to the power house. The extraction is claimed as from 88 to 90%. This is possible when the slime tailing is shipped and the only rejection made is from three of the Card tables.

The power plant occupies half of a 40x60-ft. concrete building. The company has 42 sec.-ft. of water appropriated and uses about 20. This is brought through 1500 ft. of 48-in. and 280 ft. of 30-in. wood stave pipe and discharged with 91-ft. head to a 150-hp. vertical Lefell turbine with two 17 1/2-ft. 15-in. draft tubes. The turbine is direct connected to a 480-volt, 100-kw. General Electric alternating-current generator with a 5-kw. exciter. Connection is also had with the lines of the Central Colorado Power Co., and an auxiliary steam plant is provided.

CONGER MINE BETTER OPERATED—WOLF TONGUE MILL FOLLOWS BETTER PRACTICE

A study of the methods of the two companies shows many interesting contrasts. The Conger mine follows up-to-date methods and is a pleasure to examine. The exclusive leasing system practiced by the Wolf Tongue has brought about the almost inevitable gophering and its advantages would appear questionable.

The mills show an even greater variance in practice. The Wolf Tongue follows coarse crushing as closely as possible, considering that it is obliged to adapt an old stamp mill to present usage, while the Primos uses practically an all-sliming process, crushing to 20-mesh at the outset and sliming in a tube mill. As the ore is extremely friable and the "hornstone" that accompanies it is tough and as the Wolf Tongue states 55 to 60% of its output comes from the jigs, the argument would seem to be in favor of that system. One cannot but be impressed with the power used in operating both mills, especially the Wolf Tongue. The Primos is run practically without classification, the only attempt at this process being the tanks which classify for the vanners, while the Wolf Tongue makes a classification for every concentrating machine. While the Wolf Tongue is working under adverse conditions in being obliged to adapt to its use an old mill built for the treatment of gold ores and doubtless would do away with stamps entirely if it were designing a new mill, it is probable that a millman examining both systems would conclude that the principles it is following conform more closely with successful practice elsewhere.

The writer wishes to acknowledge the courtesy of officials and employees of both companies and especially that of William Todd, of the Wolf Tongue, and George W. Teal, of the Primos.

# Sale of Power on the Rand

**SYNOPSIS**—Central generation of electric power and compressed air on the Rand has proved successful. Additional installation planned. Air sold by units specially devised. Venturi recording air meter designed.

The Victoria Falls & Transvaal Power Co., Ltd., was formed at the end of 1906 with the object of supplying power in South Africa and Rhodesia, and of acquiring the concessional rights to develop the Victoria Falls. The proposed development of the falls has been delayed for various reasons, and the Witwatersrand has been supplied from steam plants using local fuel.

When it was appreciated that a cheap power supply was available, the mining groups entered into contracts with the company and the demands for power increased

down transformers and switches are provided by the power company, while the consumer supplies the substation building and pays the power company a sum equal to 2% of the power bill to cover the losses in the step-down transformers.

The agreed standard price in mining contracts, of 1.06c. per unit, has reduced the cost of power to the mines by 40%, and has reduced the cost of production of gold by an amount varying from 12c. to 25c. per ton of ore milled. It has further resulted in a saving of capital expenditure on plant, which in the case of a new mine may amount to \$500,000.

The area which a power supply has to cover lies within a strip about two miles broad, stretching 50 miles from east to west. The total power used by the mines at

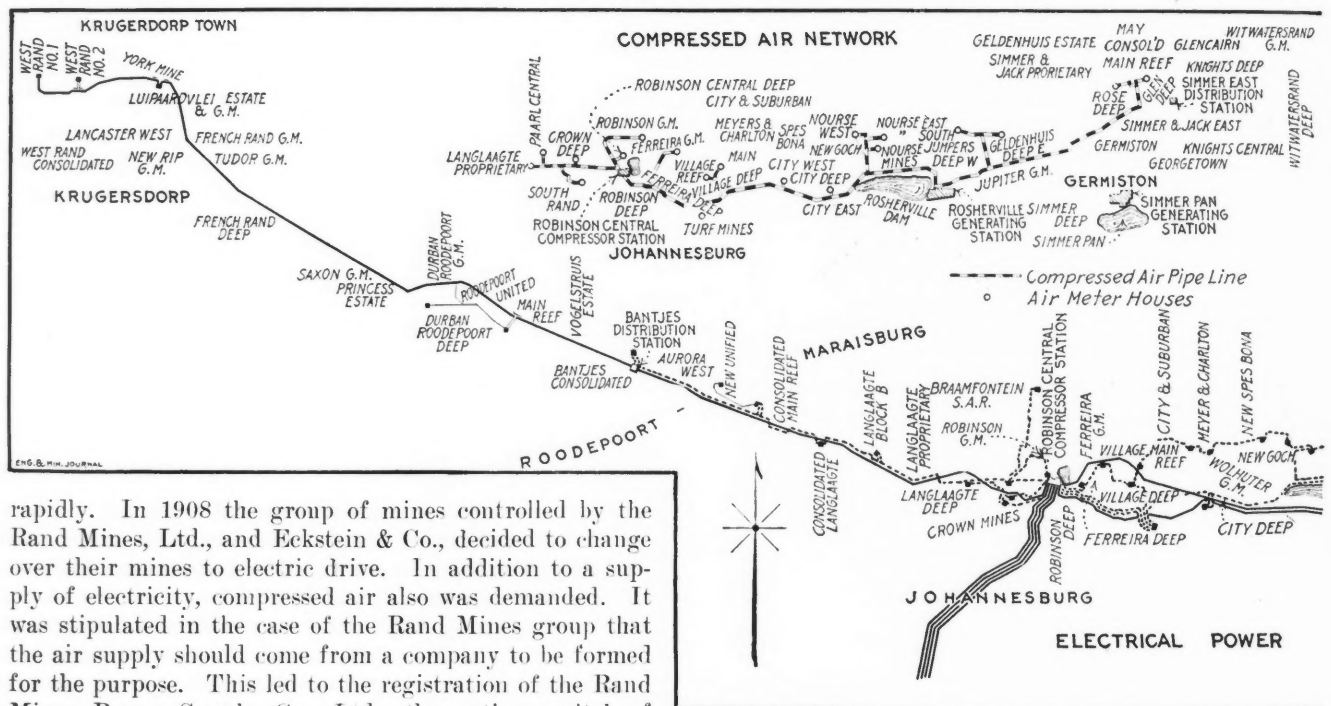


FIG. 1. MAP OF POWER DISTRIBUTION

rapidly. In 1908 the group of mines controlled by the Rand Mines, Ltd., and Eckstein & Co., decided to change over their mines to electric drive. In addition to a supply of electricity, compressed air also was demanded. It was stipulated in the case of the Rand Mines group that the air supply should come from a company to be formed for the purpose. This led to the registration of the Rand Mines Power Supply Co., Ltd., the entire capital of which was provided by the Victoria Falls Power Co. The two companies are working under separate licenses, but from an engineering point of view they are one undertaking.

### SCALE OF OPERATIONS IS LARGE

The peak load of the combined undertaking has reached 88,000 kw., and the sales average 1,350,000 units per day. These figures include the sales of compressed air by the Rand Mines Power Supply Co. to 10 mines. The air units represent practically the same amount of energy as if these mines had converted their compressors to electric drive and purchased electricity. When the further demands for power are met by the plant now ordered, the sales will reach 2,000,000 units daily. The monthly load factor, based on the hour of maximum output, varies from 70 to 74 per cent.

The power supply is furnished to all mining consumers at 2100 volts and 525 volts. The necessary step-

the present time is estimated at about 400,000 hp. The town of Johannesburg, which has its own electric plant, is situated about the middle of this strip, while the township of Germiston, about nine miles to the east, is supplied by the company. These relations are exhibited in Fig. 1. Power plants aggregating nearly 180,000 kw. have been installed or are in process.

### VARIOUS TRANSMISSION PRESSURES EMPLOYED

At all stations steam-turbine electric generating sets are employed and produce a 50-cycle, three-phase current. Step-up transformers raise the pressure to 40,000, 20,000 or 10,000 volts. The main system of transmission involves 40,000-volt overhead lines stretching practically the whole length of the reef. At the present time, however, the western extremity is working as a 20,000-volt distribution line. Where the load is most dense the transmission system consists of two rows of towers, each of these being arranged to carry two circuits.

The 40,000-volt transmission system is fed at four

Note—Excerpts from a paper by A. E. Hadley presented before the Institution of Electrical Engineers, London, Mar. 13, 1913.



points, namely, Brakpan, Simmer Pan, Rosherville and Robinson Central. In addition to these distribution stations the transmission lines pass through two other distributing centers, Hercules to the east and Bantjes to the west. From these six points, distribution networks, laid out as ring mains, supply the various substations on the mines. The three eastern distribution stations supply the system through 10,000-volt overhead lines; the central portion of the area is served by an underground 20,000-volt cable system, and the western distribution network as mentioned is working at 20,000 volts with overhead lines. The Vereeniging station is connected to the Rand by an 80,000-volt line approximately 35 miles long, terminating at the Robinson Central distributing station, where the pressure is transformed to either 40,000 or 20,000 volts.

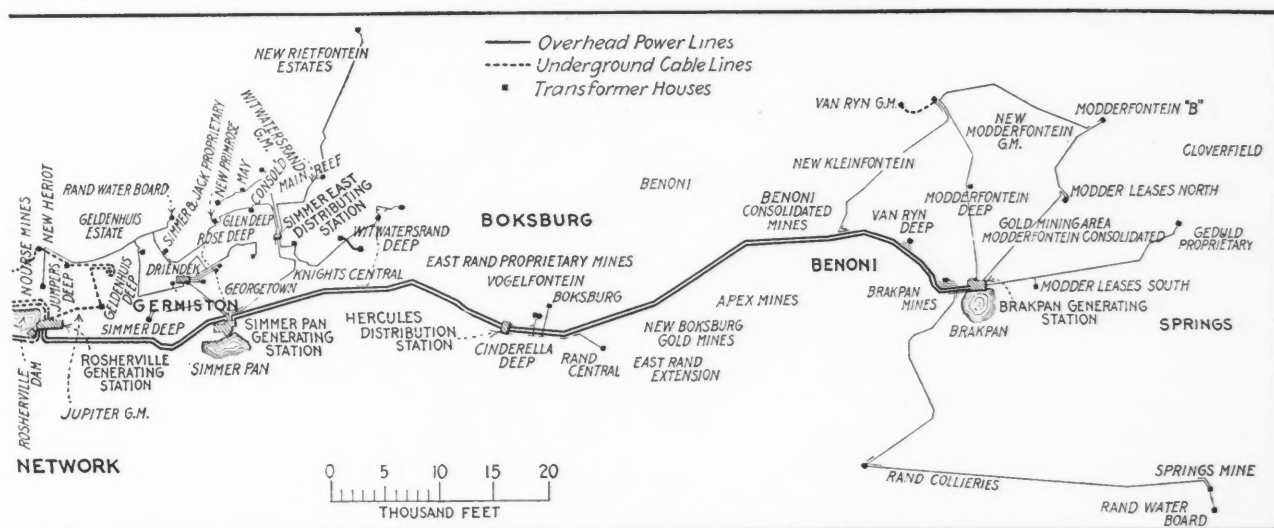
**TWO COMPRESSING STATIONS INSTALLED**

The Rand Mines Power Supply Co. installed two central compressing plants. By the use of two stations the advantages of centralization are obtained, and a considerable saving in the cost of mains is effected. The distance between the two extreme mines served by the air-pipe system is approximately 14 miles; the total length

pressors in use. Six sample machines were selected and tested and it was found that the average overall efficiency was 64.1%. Therefore, a commercial air unit was fixed upon equivalent to 0.641 of the quantity of air which would be compressed isothermally by the expenditure of 1 kw.-hr. of electrical energy. The measurement of the compressed air was a problem, and it was important that it be accurately done in view of the large amount of power to be sold over a long period of years. A master three-crank displacement meter of large size was specially designed with clearances, leakages, etc., reduced to a minimum. It was sufficiently sensitive and accurate to give good results for a flow of air through an orifice 0.1 in. in diameter. Using this master meter as a standard, a series of orifices were calibrated and the coefficients of flow through these were thus determined. The flow through these orifices was used in testing the sample compressors.

**A NEW DESIGN OF AIR METER**

The development of a satisfactory meter to measure the air used by the various consumers was a matter of difficulty and importance. A meter working on the Venturi-tube principle was finally adopted. It records



SYSTEMS ON THE RAND

of pipe is about 20 miles, varying from 9-in. to 24-in. At Rosherville Dam were installed six steam-driven rotary compressors and at Robinson Central Deep six miles to the west, six similar compressors, electrically driven. These rotary compressors, rated at about 3500-kw. each, were made by three German firms. They are said to be the largest compressors yet constructed. Three additional steam machines each rated at 7000-kw., are under construction.

**SPECIAL MEASUREMENTS TO DETERMINE FAIR UNIT OF AIR POWER**

It was arranged to sell the compressed air to the consumers at the rate which it would have cost them to produce it from their local steam-driven plants, supposing these plants to be driven by power costing the same as the electrical power brought from the distributing company at the price charged by it. To obtain this figure it became necessary to measure the efficiency of the com-

pressors in use. Six sample machines were selected and tested, and allows for the efficiencies of the various types of compressors originally used. It is necessary in such a meter to measure the quantity of air passing and the pressure under which it is contained. The Venturi tube measures the quantity of air and has the advantage of containing no moving parts such as those present in fans or displacement meters. The coefficient for the tube was determined by exhaustive tests. The arrangement is sensitive to a "Venturi head" of less than 0.0001 lb. per sq. in., and will measure a Venturi head up to 0.85 lb. The pressure is measured by steel diaphragms and the combined measurement of pressure and quantity is made to show a displacement on the dials proportionate to the actual air units delivered. The dials are driven by clockwork, which is itself driven by a small, constant-speed air turbine. The meter is guaranteed accurate to 1.5% at full load, 1.75% at half load, and 2.25% at one-tenth load.

### TESTS IN PRACTICE CONFIRMED ESTIMATES FOR SYSTEM

The compressors on the line work in parallel and no difficulty has been encountered from hunting of the electrically-driven machines. A series of careful monthly tests have been conducted for some time past by taking throughout the working day 10-min. readings of the output from the compressors and of the meter readings and pressures at the mines. It has been found that of the air units sent out, 95% were recorded on the consumers' meters; 3% were lost in transmission and 2% were unaccounted for. The monthly air-load factor is at present 50%. The delivery pressure has to be about 100 lb.; the average pressure drop from the generating plant to the consumer is not more than 6 lb. The pressure drop for each consumer was calculated before the distributing pipe was installed, and it has been found that the observed delivery pressure does not vary more than 2% from the calculated figure. The condition of the pipes is carefully watched. There are 4000 joints designed to allow for contraction and expansion, and only those within a radius of half a mile from the station, where the temperature variations are greatest, have required atten-

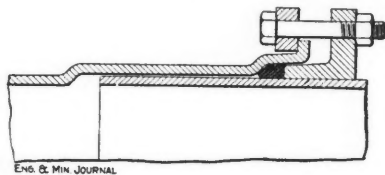


FIG. 2. SECTION SHOWING JOINT FOR COMPRESSED-AIR MAINS

tion. The accompanying drawing, Fig. 2, shows the joints on the pipe line. It is of the bell-and-spigot type, and the jointing material consists of an india-rubber ring brought down tight by means of a gland, held from bolts to a flange on the socket end of the length.

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### Progress of Minerals Separation Process

The Minerals Separation American Syndicate, Ltd., has achieved pronounced success in the application of its flotation process to the porphyry copper ores of the United States, according to a published report of the meeting held in London on June 16, 1913. John Ballot, chairman of the syndicate, reported that the process had engaged the serious attention of the owners of great copper mines in America, and that experiments of an especially interesting nature had been carried out at the property of the Inspiration Consolidated company, of Arizona, where a 50- to 75-ton test plant has yielded recoveries of more than 90% of the contained copper.

All of the minerals containing copper in the Inspiration mine have been successfully treated by the process, except the oxidized capping, and even this material has been handled more successfully than by any other process up to the present time. That problem has been given particular study and it is believed that within the near future it will be treated with a percentage extraction as high as that secured on other classes of ore.

The Minerals Separation process is to have a more thorough trial in a 600-ton unit of a new mill, which is

now in course of erection at the Inspiration. If this final test proves satisfactory, the whole 8000-ton mill will be equipped for the use of the process.

Successful use of the process has taken place at the Britannia mines, in British Columbia, where recoveries of more than 94% are being obtained. At the Cuba Copper Mines the output is also treated by the flotation process. It is also stated that the W. A. Clark mines, Elm Orlu and Colusa-Parrot have obtained license to use the Minerals Separation flotation system.

It is freely announced that additional copper saving, amounting to from 20 to 30%, may be obtained from copper ores now concentrated by other processes. An instance of a test is mentioned, omitting the name of the property, in which a production of 2,852,515 tons of 1.69% copper ore, produced 65,881,116 lb. of copper, or 68.25%, by ordinary processes, whereas by the Minerals Separation system, the same ore yielded 85%, which, on the quantity treated, would have increased production by \$933,639 net, with copper at 14c. per lb. In general, the opinion is that the Minerals Separation process is thoroughly successful and has been so carefully tested that practical working results will be favorable to the company.

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### Nevada-Douglas Copper Co.

The report of the Nevada-Douglas Copper Co., for the year ended Dec. 31, 1912, has been submitted. The company owns 33 lode-mining claims, a smeltery site and water privileges, all located in the Mason mining district, Lyon County, Nev., also one-half of the capital stock of the Nevada Copper Belt Railroad Co. Production during the year amounted to 120,908 wet tons, an average of 331.3 tons per day. In dry weight there were 106,483 tons which produced 2,020,640 lb. of copper, or an average of 84.71 lb. of copper per dry ton of ore. During the same period leasers shipped 551 wet tons. There was employed, in the extraction of this ore, a monthly average of 243 men whose daily wage averaged \$3.41. The tonnage mined and shipped during the past year has been produced from all sections of the Ludwig and Douglas Hill mine.

The development accomplished by the company during the year amounted to 2087 ft. of sinking, 6128 ft. of crosscutting, 4503 ft. of raising, and 8623 ft. of drifting, a total of 21,362 ft. of development.

The gross operating revenue of the company was \$824,891, while operating expenses were \$390,077, leaving a gross operating profit of \$434,814. Deducting from this the expenses for mine depreciation and for fixed charges, amounting to \$164,657, there remains a net profit of \$270,157 for the year.

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### Microscopy in Economic Geology

In the communication from Prof. Wadsworth under the above title in the JOURNAL of July 5, 1913, p. 31, the microscopic sections numbered 8000 instead of 800 as printed. We take this opportunity of correcting the typographical error.

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The Tata Iron & Steel Co., of Bombay, India, which has for three years past been developing an iron deposit and building furnaces near Bombay, has begun to sell iron in Japan. Some trial sales were made last year, and now the Mitsui Co. has contracted to take 30,000 tons of Tata pig.



## Johannesburg Correspondence

Some anxiety has been caused by the action of the government in prohibiting the further importation of natives from north of lat. 23°, Portuguese East Africa. There are about 25,000 working on the mines at present and the stoppage of this supply will affect 8½% of the present annual supply. The reason for the action was the high death rate, which in January and February was 44.6 and 64.1 per 1000, and in March, 71.8 per 1000 on the mines; but it became known that in addition to these figures, of 4597 of these natives who passed through the central compound (where they remain about 22 days to become acclimated before starting work) some 88 died (mostly from pneumonia) or 19 per 1000 per month. There is some hope that the investigations of Sir Almroth Wright may lead to the discovery of an anti-pneumonia serum, which would cut down the mortality and allow the resumption of recruiting.

The season has been a dry one and the mine reservoirs along the reef are only about 40% full. This may cause a water shortage before spring. The Springs Mines, which lie three miles southeast of Geduld mine, on the East Rand, and are the most easterly "deep" mine, recently struck the reef, as reported, in No. 1 shaft. A bore hole from the bottom of No. 2 shaft has now struck the reef at a depth of 3696 ft., assaying 11.5 dwt. over 38½ in.

Prospects have improved at the Witwatersrand Deep mine. The water which hindered development in the lower levels, has been reduced from 2½ million to 1¼ million gallons per day, and rich ore has been disclosed on the lower levels. The ore reserves amount to 1,492,257 tons, valued at 6.83 dwt. over 52 in. The Witwatersrand mine, Knights, is one of the oldest mines on the field and the first to erect a 100-stamp mill. Owing to its holding 200 deep-level claims, it still has a life of 15 to 20 years, and is now making large profits and erecting five tube mills.

The management of the Premier Deep is making a gallant fight to render the mine a payable one. The ore reserves are 1,436,693 tons of a recovery value of \$4.27; its working cost last year on a monthly tonnage of 52,000 tons was only \$3.98, which for a mine working at between 3000 and 5000 ft. in depth is remarkable. In February, 1913, 60,150 tons were treated at a cost of \$3.49. It is hoped to procure sufficient layout to allow the plant to be increased to a capacity of 75,000 tons per month, to reduce costs still further. The ore reserves of the Jupiter, the neighboring mine, are 1,270,000 tons of a value of 4.4 dwt. Unfortunately, development in depth of both these mines shows no sign of entering a richer zone. The total exports of the Union of South Africa in 1912 were valued at £61,000,000, and of this, £47,500,000 were the product of gold and diamond mines.

Metallurgical results continue to improve and costs to decrease for the last four months of 1912. Reduction costs on the Village Deep were 84.3c. per ton, with 96% recovery, residues assaying 0.276 dwt. per ton. The mill on the City Deep is now working well and reduction costs are 89.8c. per ton. The New Modderfontein and City Deep, both high-grade mines, recovered 97½ and 96.7%, respectively, of the value of the ore crushed.

A diamond of 460 carats of good value was discovered in the 200-ft. level of the Premier mine. Another dia-

mond trust, with £1,000,000 capital, has been formed by Lewis & Marks, to work several smaller diamond mines in Orange Free State.

The City Deep Gold Mining Co. has agreed to sell 15 claims, lying on their northwestern boundary, to the City & Suburban for £100,000. This will add some two years' life to the older mine, and the money will be spent in sinking a 18-ft. diameter circular shaft on the north boundary of the City Deep to a depth of 2000 ft. to improve the ventilation and working conditions. This is the first acknowledgment of errors made in laying out such a mine with two vertical shafts, which struck the reef dipping 40° several thousand feet from the western boundary, leaving some seven million tons in a block on the rise to the boundary. It was proposed to back stope this ore. It has been found impossible to ventilate or work this area economically, hence the property is to be robbed of 15 claims (or some 600,000 tons of ore), to remedy mistakes of the past. These account for the high working cost of \$5.84 per ton prevailing in the past, and the inability to keep the mill supplied with ore. The Crown Mines has also decided to sink a similar shaft to ventilate its western areas. It seems needless to mention that to supply air currents to make use fully and efficiently of shafts of this size, no less than five drives or winzes, 5x10 ft. in section, must communicate with them at the bottom and this takes no account of greater resistance along drives. There is nothing like thoroughly correcting a mistake!

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## Inspiration Consolidated Copper Co.

The Inspiration Consolidated Copper Co., Miami, Ariz., states that, during the year 1912, the underground work consisted of 25,355 ft. of drifting, 4676 ft. of raising, 2348 ft. of shaft sinking and 454 ft. of miscellaneous work. No drilling was done during the year, except for 1795 ft. on the boundaries of the Live Oak property, which did not add to the ore reserves. The record of the drilling to date shows for the Inspiration orebody an average thickness of capping of 354 ft. and an average thickness of ore of 142 ft., and for the Live Oak orebody 435 ft. of capping, and 114 ft. of ore. The ore estimate remains the same as at the time of the consolidation, namely, 45,000,000 tons, running 2%. In one block of ore, the regular mine samples of the underground work were checked against the estimate for the block calculated by Mr. Krumb from the results of the churn drilling and a second careful independent sampling of the same block was also performed underground, the three results being almost identical in respect to tonnage and to grade.

It is hoped that by some leaching process, auxiliary to the regular sulphide concentration, the 8,000,000 tons of oxidized and semioxidized ore above the sulphide orebodies, which averages 1.4% copper, may be made to yield net returns above the reduction costs. No mining method, except one relatively expensive, can give a clean ore and it is believed that greater net returns will follow the use of a cheaper method, although the admixture of waste and low-grade capping will reduce the grade of the mill ore below that previously estimated.

The ore from the mine will be hoisted in two main shafts, 104 ft. apart, located on the Gift claim in Webster Gulch, outside the known orebody. The shafts have

reached a depth of 585 ft., this giving a suitable distance below the second and lowest level of the Inspiration mine. Surface construction has included the erection of steel headframes at the two Live Oak shafts; the enlargement of the temporary power plant and shops at the mouth of the Inspiration tunnel; the erection of a supply house at that point and another at the junction of the Inspiration R.R. with the Arizona Eastern R.R.; the building of a dam and excavation for a pumping plant at Wheatfields on lower Pinal Creek, to provide milling water; the joint construction with the Miami company of an emergency hospital; the construction of housing quarters; road building; grading for the mill site; and work on the 4½-mile Inspiration Railroad.

Work on the concentrator building is held up, pending possible changes in methods. A 10-year contract has been made with the U. S. Reclamation Service for hydro-electric power from the Salt River project. A mill site has been acquired a mile and a half below the main shaft, where ample storage room for tailing exists. Plans for a 750-ton concentrator have been drawn by H. K. Burch, comprising a coarse-crushing plant at the shaft, which will reduce the ore to one inch, rail transportation to the fine crushing plant at the mill, and ore bins with a total capacity of 40,000 tons. The 1½-mile railroad from the

inder in small grains, without lumps. The granulated slag is then elevated to the bins, whence it is taken as required to the cement furnaces. At the end of the drum is a flue to carry off the smoke and gases. For cement making the slag thus reduced is better than that granulated by water. In the water-granulated slag the adherent moisture has to be eliminated before it can be employed in the manufacture of cement, while the slag granulated by air is very dry and also much more dense. It can also be employed as sand.

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### Splicing Transmission Rope

Hemp or manila rope is often used for transmitting power, but its application does not seem to be as wide as its advantages merit. Several objections are made to the use of this rope as a transmitter of power, but it is probable that at least 90% of the trouble complained of in rope drives are directly caused by bad splicing, notwithstanding that to make a proper transmission splice is a very simple operation, the idea having once been grasped. The essential points in such a splice are: First, that its diameter be absolutely the same as that of the original rope; second, that it be smooth and free from lumps; third, that the original lay of the strand and yarns

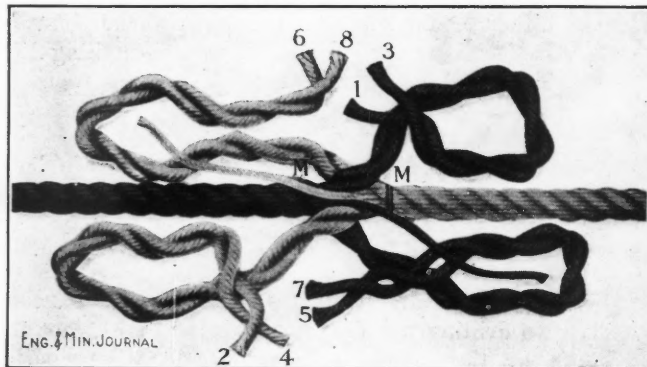


FIG. 1

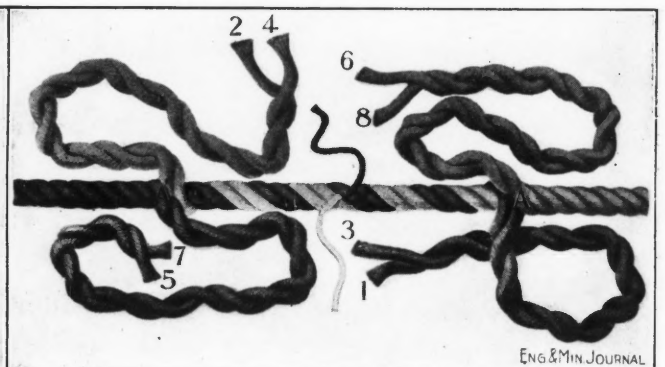


FIG. 2

mines to the mill will have a grade in favor of the load of 0.3%. While good results for water concentration were promised by the experiments conducted under the direction of Mr. Callow, further experiments are now under way with the flotation process of the Minerals Separation Company.

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### Granulation of Slag by Compressed Air

In a paper read before the German Metallurgical Association, G. Juntzen describes a method of granulating slag by means of a jet of air. It has been employed for more than a year at the Buderus works, which produce 100 tons daily. The slag run from the furnace is passed through a conduit to a rotating drum 45 ft. long and 6 ft. in diameter. On entering this drum it is met by a jet of compressed air, which hurls it against the sides, which are kept cool by an exterior circulation of water, the slag always encountering cooled surfaces. Scrapers conveniently disposed within the drum prevent the adhesion of the slag, which finally comes out at the bottom end of the cyl-

be disturbed as little as possible; and, fourth, that where several strands are rejoined, each fastening or tuck should be made in such manner as to prevent its wearing away and the rope unstranding.

There are many different splices now in use, but after a careful consideration of each the conclusion is reached that all of the best features are combined only in what is called the English transmission splice, and experience has proved it the best now known. In describing this, a four-strand rope 1¾ in. in diameter, spliced on the sheaves, is taken for example. The rope is first placed around the sheaves, and, with a tackle, stretched and hauled taut; the ends should pass each other from 6 to 7 ft., the passing point being marked with twine on each rope. The rope is then slipped from the sheave and allowed to rest on the shafts, to give sufficient slack for making the splice.

Unlay the strands in pairs as far back as the twine, *M, M'*, Fig. 1. Crotch the four pairs of strands thus opened, the cores having been drawn out together on the upper side. Then having removed the marking twine *M*, unlay the two strands 6 and 8, still in pairs, back a distance of 2 ft., to *A*; the strands 1 and 3, also in pairs,



being laid in their place. Next unlay the strands 5 and 7 in pairs, to A', replacing them as before with 2 and 4. The rope is now as shown in Fig. 2.

The pair of strands 6 and 8 are now separated, and 8 unlayed 4 ft. back to B, a distance of 6 ft. from the center, strand 6 being left at A. The pair of strands 1 and 3 having been separated, 3 is left at A, as companion for 6, strand 1 being carefully laid in place of strand 8 until they meet at point B. The two pairs of strands 2, 4 and 5, 7 are now separated and laid in the same manner, every care being taken, while thus putting the rope together, that the original twist and lay of the strand is maintained. The protruding cores are now cut off so that the ends when pushed back in the rope, butt together. The rope now appears as shown in Fig. 3, and after the eight strands have been cut to convenient working length, about 2 ft. long, the companion strands are ready to be fastened together and tucked. This operation is described for strands 2 and 7, the method being identical for the other three pairs.

forming again the lock. The strand ends at both locks are now cut off, leaving about 2 in., so that the yarns may draw slightly without unlocking.

This completes the joining of one pair of strands, as

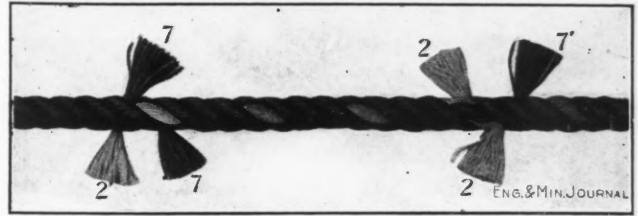


FIG. 7

shown at Fig. 7. The three remaining pairs of strands are joined in the same manner. After the rope has been in service a few days, the projecting ends at the locks wear away, and if the tucks have been made carefully, and the original twist of the yarns preserved, the diameter of the

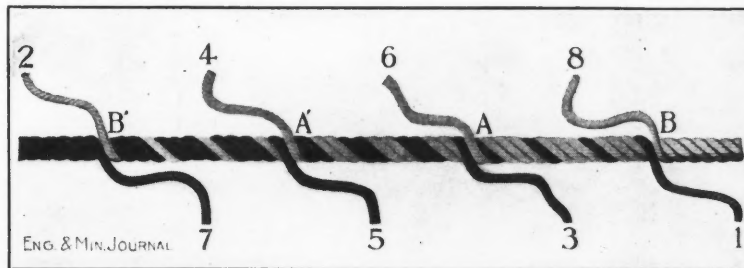


FIG. 3

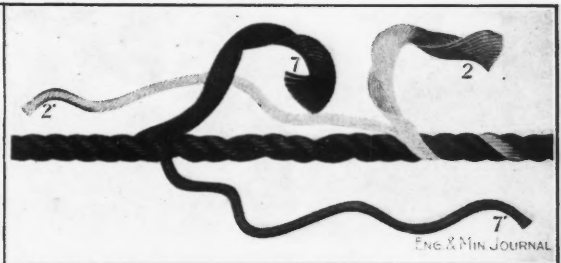


FIG. 4

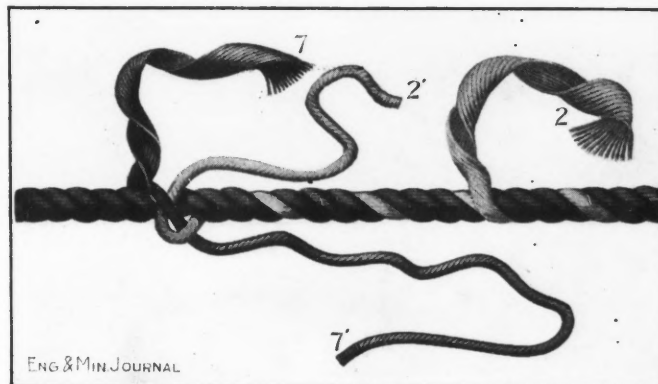


FIG. 5

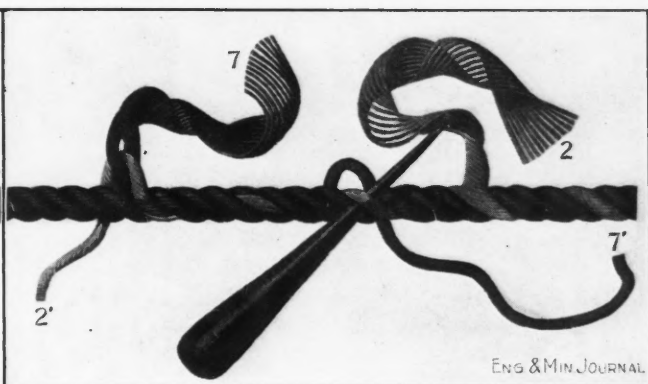


FIG. 6

Unlay 2 and 7 for about 12 to 14 in., divide each strand in half by removing its cover yarns, as shown in Fig. 4, whip with twine the ends of the interior yarns 2' and 7'; then, leaving cover 2, re-lay 2' until near 7 and 7', here join with a simple knot 2' and 7', as shown in Fig. 5. Divide the cover yarns 7, and pass 2' through them, continuing on through the rope under the two adjacent strands, avoiding the core, thus locking 2', as shown in Fig. 6. In no event pass 2' over these or any other strands.

The half strand 7' must now be taken care of; at the right of the knot made with 2' and 7', 2' is slightly raised with a marlin spike, and 7' passed or tucked around it two or three times, these two half strands forming in this way a whole strand. Half strand 7' is tucked until cover 2 is reached, whose yarns are divided and 7' passed through them and drawn under the two adjacent strands,

rope will not be increased, nor can the splice be located when the rope is in motion.

This method of splicing transmission rope has been developed and perfected by the American Manufacturing Co., of 63-65 Wall St., New York, and is published in its catalog.

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### Largest Fluorspar Production

All records for fluorspar production in the United States were broken in 1912 when 99,285 short tons of domestic gravel spar, valued at \$578,294, were marketed. The total quantity of domestic fluorspar reported to the U. S. Geological Survey as marketed in 1912 was 116,545 short tons, valued at \$769,163.

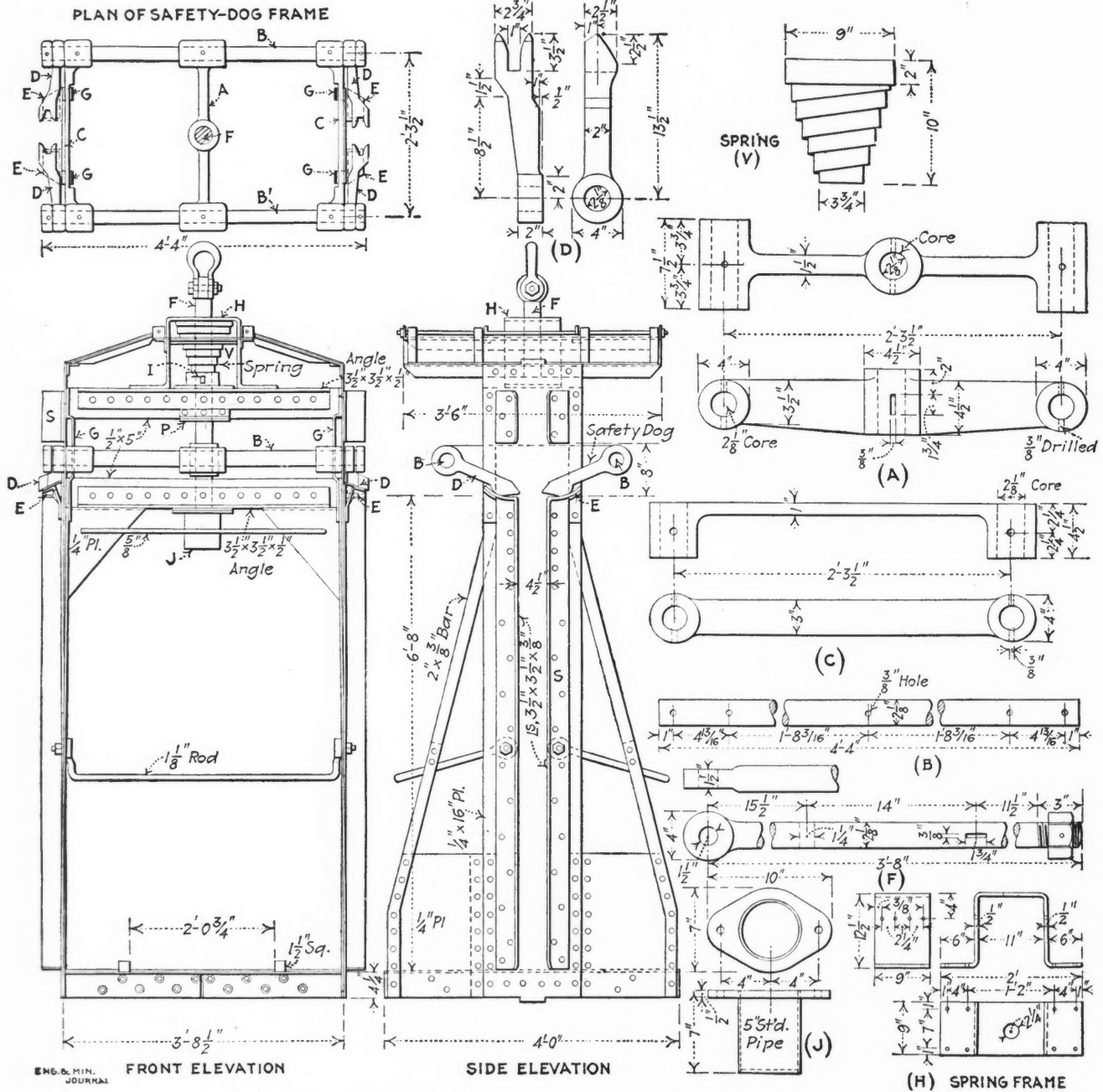
Fluorspar was produced in five states: Illinois, Ken-

tucky, Colorado, New Hampshire and New Mexico, in the order named. A considerable decrease of imports was noted, notwithstanding higher cost of the domestic spar, which was \$5.82 against \$5.74, duty paid, for the foreign product. The freight on the domestic spar is considerably higher than that on the foreign from dock to works. Its consumption is probably due to the Illinois producers offering a higher and more uniform grade of spar than that imported.

Fluorspar is used in the manufacture of glass, and of enameled and sanitary ware, the electrolytic refining of antimony and lead, the production of aluminum, the

### Cage with Munzner Safety Catches

Cages fitted with the Munzner type of safety catch have been in use for 15 years in the shafts of the Doe Run Lead Co., of southeastern Missouri. This safety catch was designed by F. A. Munzner, in Germany, about 1893, and is largely used in Saxony. Its action consists of thrusting pointed knife edges into the guides by a toggle action. The shape of the dogs used in the Doe Run mines was worked out by Karl Kley, in Saxony, and was adopted, as being the most satisfactory, by O. M. Bilharz, general manager of the Doe Run company. The



THE MUNZNER SAFETY DEVICE AS APPLIED TO DOE RUN CAGES

manufacture of hydrofluoric acid, and as a flux in blast furnaces, and in basic openhearth steel furnaces. About 80% of the American production, the gravel spar, is used in openhearth steel making.

dogs offer the advantage as against the ordinary type of toothed-cam safety-dog, of stopping the cage with a slower, braking action instead of with a sudden grip and they more perfectly fulfill the requirements of a good



safety catch, namely, that it be positive and reliable, quick to come into action, but slow to complete its action, and capable of acting on guides of varying thickness. It is urged against the cam dog that it acts so quickly as to tend to injure the men riding on the cage and to tear out the guides. It also is likely to fill with wood and possibly thus become inoperative. The use of the double knife edge minimizes the danger of splitting the guides and while it cuts and damages them somewhat more than a single blade, this is a point of minor importance.

On one occasion at the Johannes shaft in Freiberg, the Munzner attachment stopped a cage so gradually after the cable broke, that the men riding did not realize but that it had been stopped by the engineer. In demonstrating the reliability of the device to the Doe Run miners, when it was first proposed to install it, Mr. Bilharz and his master mechanic mounted the cage 40 ft. from the ground in an experimental tower, cut themselves loose and were stopped immediately. In the 15 years' use of the Munzner catch in the Doe Run mines, the only instance in which it failed to work was on one occasion when the rope broke with the cage 20 ft. from the shaft bottom and the catches were unable to take care of the extra weight of cable and stop the cage in that distance. Usually the cage stops in three or four feet. In a German test, a cage weighing 3440 lb. was allowed to fall about 1.5 ft., when the safety dogs came into action and sank  $1\frac{1}{4}$  in. into the guides, stopping the cage after a groove about a foot long had been cut.

On the Doe Run cages, the spring is placed above the actuating frame instead of below, an improvement on the original design. The details of the device are shown in the accompanying drawing. The dogs *D* are carried loose on the ends of the shafts *B*. The shafts are pinned to the crosshead *A* and crossbraces *C*, making a rigid frame, which moves with the drawbar *F* to which *A* is keyed. The dogs are held on the shafts by collars and rest on and move over the plates *E*. The spring *V* is held under the strap *H*.

When the pull comes on the drawbar, it moves up, and the collar *I*, keyed to it, compresses the spring *V* until *A* strikes the plate *P* fastened to the cage frame and thus gives a positive stop to upward motion of the drawbar and the frame. This motion tends to pull the points of the knives *D* away from the guides. If the rope breaks or the tension is otherwise released, the frame is thrust down, relative to the cage, by the spring *V* and the dogs revolving on *B* and lying on *E* are forced with a toggle motion to engage the guides. It is necessary to keep the knives always sharp.

The bottom of the drawbar is protected by a cylindrical hood *J* to prevent pinching the hands of the men riding. The motion of the frame and the dogs is controlled by the vertical guides *G*. The original design had stops to limit the inward motion of the dogs. These are here omitted. The guides in this case are 4x6 in. The spring is a volute,  $9 \times 9\frac{1}{2} \times 2 \times \frac{3}{8}$  in., made by the A. French Spring Co., of Pittsburgh, and has proved satisfactory. The spring should not take the whole load of the cage before the frame catches *P*, or the device will be too sensitive. A sharp fluctuation in speed might tend to make the dogs catch and the jumping of the cage after stopping would bring them into action. Probably the adjustment should be such that the spring will

take about 80% of the weight of the empty cage before the positive pull comes on the frame. The best springs will deteriorate and should be frequently tested to determine their strength quantitatively.

The weight of the cage illustrated is 2400 lb. and its cost, as shown, about \$425, erected in the company's shops. One difficulty with the design is the obstruction of the top of the cage, which interferes with loading timbers, pipe and rails. The knife-edge principle, however, should be applicable to a cam dog with satisfactory results; possibly in such case, the edges should be toothed slightly at the points where they begin to grip.

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## Gasoline Locomotives for Mine Use

For a considerable time, German and Austrian companies have been engaged in the work of applying the internal-combustion motor to the work of mine haulage, and there are now a large number of these engines working in various parts of the globe. They offer advantages over other means of transport, especially in localities where both coal and water are scarce. *Mining Engineering*, June, 1911, makes this comment on the use of the internal-combustion motor for underground haulage and continues by stating that when compared with steam locomotives, these machines show advantages in that they are always ready for use, consume no fuel during stoppages, require only one man for attendance, possess no boiler to require inspection or renewal, and are of considerably less dead weight than a steam locomotive with its tender laden with coal and water.

There are further special circumstances in which it is practically impossible to employ a steam locomotive, as, for example, in dry forest or grassy country, timber yards, paper mills, and the like, where there is a constant danger of fire, this being also the case in mines where naked lights are prohibited on account of the presence of explosive gases. Compared with electric locomotives, working with an overhead trolley wire, these engines have the advantage of requiring no central power station, and are independent of any breakdown in the same, and afford considerable economy in first cost over electrical installation, and in addition the haulage system and output are capable of instant extension by simply employing more locomotives as the output requires.

The correct location of shafts has a very important bearing upon the satisfactory and systematic installation of underground mechanical haulage, says the *Journal of the Transvaal Institute of Mechanical Engineers*, August, 1910. It is hardly possible to install at once mechanical haulage systems underground where the mines have not been opened with that idea in view. Drifts are likely to be small, both narrow and low, and the track installed is likely to be too poorly constructed, having light rails carelessly laid and insecurely joined which will not do at all to support the heavy burden and fast movement of heavy locomotives and the large heavy trucks required to transport large quantities of ore economically.

Straight or gently curved trackways fitted with heavy rails, frogs and crossings laid on good ties with a well packed roadbed ballasted in the best possible manner in the mine, would permit the use of heavier trucks and allow the discarding of hand labor in tramping.

Hand labor requires one man for every truck, is slow,

requires the use of light trucks, to be within the limit of operation of one man, and permits and condones careless and unsatisfactory track installations which are to be found at present in most mines not using the mechanical haulage method. Locomotives and mechanical haulage systems are used underground at the present time, almost entirely in the coal-mining industry, there being few installations in metal mines. However, the use of these locomotives is becoming more frequent, and some progressive companies are beginning to take them up. There are quite a number of them in use for surface haulage and their advantages in this use have led to the extension of the practice to underground work. Perhaps, the greatest objection to the use of underground locomotives is, as has been heretofore stated, the necessity of the mine being opened with the express idea of using systems of the kind. If this has been done, great economies will result.

A study of the underground use of internal-combustion motors has been made by M. Barjot in *Annales des Mines de Belgique*, Vol. 18. This problem is studied in detail and the advantages and disadvantages of its use shown. It is stated that one of the most important objections to the use of internal-combustion motors underground is the odor which they give forth, which is not only disagreeable, but is positively noxious. Where ventilation is well accomplished, this objection can be reduced to a minimum, but where ventilation is insufficient, it seems reasonable to believe that the product of gas combustion would be decidedly objectionable. In coal mines, unless great care were taken to prevent the exhaustion of burning gases, there would be great danger in those mines which produce gas. This is also true in respect to the electrical connections which are used for producing a spark in the motor. These must be most carefully made in order to avoid presenting a naked spark or flame to the air in the mine.

In metal mines, of course, this objection does not usually exist, and the objections would be principally the discomfort caused by the formation of gas in the mine, coming from the locomotives, and the bad effect it might have on the workmen.

In spite, however, of these objections, there are a large number of gasoline motors being used underground, and it is quite likely that this number will increase until large hauling questions have been solved. There is no doubt of the economy of moving material underground on a large scale, just as there is no doubt that it is more economical in surface transportation to move in large units with small high-powered machines. The gasoline locomotive is somewhat expensive, but not more so than the total installation required for either steam or electrical transportation, and is probably considerably less than in the latter case.

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### U. S. Sulphur Production

The production of sulphur in the United States in 1912 was 303,472 long tons, compared with 265,664 long tons in 1911, according to W. C. Phalen, of the U. S. Geological Survey. The sulphur came from Louisiana, Nevada and Wyoming, the production of Louisiana being the dominant factor in the domestic sulphur industry.

During the last 12 years the growth of the sulphur industry in the United States has been phenomenal, and

the last seven years has seen the dethronement of Sicily from the dominating position so long held in the world's sulphur market.

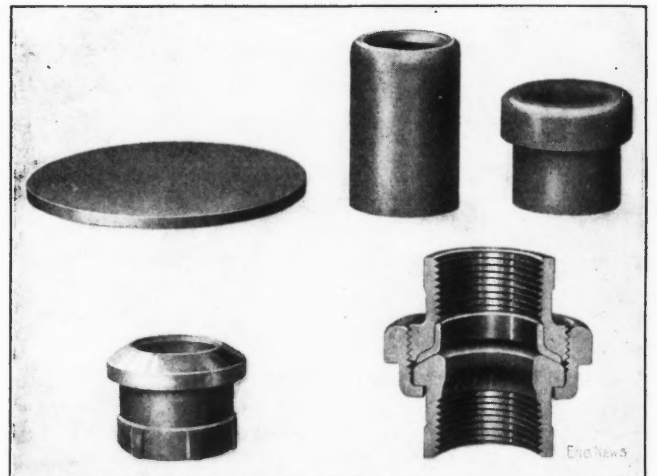
In 1900 the sulphur production of the United States amounted to 3147 tons; the imports during that year were 167,696 tons, of which 166,825 tons were classified as crude sulphur, chiefly from Sicily. Thus the domestic production in 1900 amounted to not quite 2% of the sulphur consumed. During 1912 the domestic production constituted more than 91% of the consumption and the imports amounted to less than 9%. Moreover, the imports of sulphur from Italy were only 8.7% of the total importation, and Japan was the leading exporter of sulphur into the United States, 91% of the foreign sulphur admitted having come from that country.

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### Pressed-Steel Screw Union

A screw union recently put on the market is unique in being pressed from sheet steel. It is composed of the usual three parts with an additional soft-brass ring to serve as a seat or gasket.

In the process of manufacture, sheet-steel strips are cut into blanks which are then pressed into cups and the bottoms punched out. The end of the cylinder thus formed is rolled back on itself and upset as shown. The



STAGES IN PRESSING SCREW UNIONS FROM STEEL SHEETS

piece is then pressed into its final shape and threaded, the threading follows Briggs' standard and so is tapered, unlike standard fittings. The steel pieces are sherardized.

It is claimed for the fitting that, being made of the same material as pipe, it expands equally with the pipe and so diminishes the tendency to leak. Furthermore, the processes of manufacture eliminate the possibility of defects being carried through into the finished piece. The piece bearing against the brass seat has received a high polish and finish by the pressure, and has been hardened so that a tight joint is possible. The union is made by the Mark Manufacturing Co., of Chicago, Illinois.

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**The Largest Ingot in the World** weighing 150 tons, was recently cast at the Grimsthorpe Works of Cammell, Laird & Co., Ltd., Sheffield, England. It is 24 ft. long, 7 ft. 1 in. mean diameter over flats and 7 ft. 6 in. mean diameter over corners. It is acid openhearth steel and destined for admiralty purposes.



# DETAILS OF PRACTICAL MINING

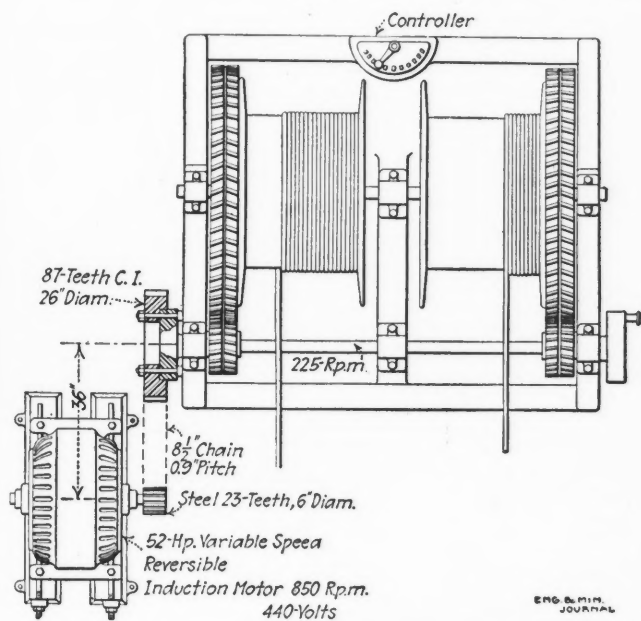
## Chain-Driven Convertible Hoist

BY E. E. CARTER\*

A steam-driven, double-drum, geared hoist at the Gold Hill mine, at Quartzburg, Idaho, was changed into an electric hoist by disconnecting the driving and valve rods and substituting a gear on the crank disk. With this combination the hoisting speed was 450 ft. per min. The motor ran at 850 r.p.m., and both motor and hoist were operated considerably below rated capacity. Steel and rawhide pinions were tried and found unsatisfactory. Both gear and pinion gave constant trouble from excessive wear, the teeth in the case of the steel gears becoming

has shown that the wear on these chains is confined almost entirely to the pins. As the chain lengthens because of wear and the pitch becomes greater, the chain will ride higher on the gears and thus give warning a long time before it is necessary to put in new pins. The cost of new pins is nominal and they may be put in easily. We expect the chain to last between three and four years before repairing with new pins.

The 52-hp., variable-speed, 440-volt, alternating-current motor is set on a concrete foundation with a sub-base and suitable slide to allow adjustment of the chain. The chain is run comparatively loose. A hoisting speed of more than 600 ft. per min. is now the rule instead of 450 ft. as formerly. The chain is removed at intervals and cleaned thoroughly with gasoline. It is allowed to dry, and is lubricated with Albany, Keystone or a suitable cup grease, which has previously been warmed so that it will work in around the pins. Any excess is wiped off. It is lubricated at intervals as required with the same lubricant. Mica axle-grease or graphite should not be used. As it is possible to disconnect the gear from the crank disk and replace the driving rods, etc., it allows a change from electric to steam or air power within a short time, which is desirable when power troubles are frequent.



STEAM HOIST ARRANGED FOR ELECTRIC DRIVE

crystallized and falling out. Furthermore, the vibration was carried to the motor and thus resulted in the motor connections shaking loose, making it necessary to keep an extra one on hand for frequent changes.

This arrangement was a constant source of expense, as well as a loss of time, so, therefore, the following arrangement was tried with success: An 8½-in. silent-chain drive was substituted for the gears, set at 36-in. centers, and arranged as shown in the accompanying sketch. This drive has been in operation sufficient time to prove its efficiency. No sign of wear is apparent and no time has been lost because of mishap to the hoist since its installation. The hoist picks up its load much easier than it did with the gears or even better than it did with steam. There is no trouble with the "flop" of the chain, when reversing, as was anticipated.

The cost of the chain installation was practically the same as for the original gear drive. Experience elsewhere

## Safety Rules—Hoisting Engineers\*

(1) It shall be the duty of every master mechanic of every mine having a hoisting engine to appoint and designate as hoisting engineers one or more men who shall be able to speak and read the English language readily. Where men are hoisted or lowered, such hoisting engineers shall not be less than 21 years of age, and otherwise they shall not be less than 18 years of age. They shall be familiar with the details and workings of a hoisting engine. No one, other than such duly appointed hoisting engineers, shall be permitted to run such engine or hoisting machinery, except that with the consent of the master mechanic, specified apprentices may be taught its operation at such times and under such restrictions as the master mechanic may determine to be free of risk to life and limb.

(2) The hoisting engineer shall familiarize himself with and use the signal code for hoisting and lowering, and a copy of the signal code shall be posted in the engine house and at the collar of the shaft and at all stations in the mine.

(3) He shall not run his engine unless it is properly provided with brakes, indicators and distance marks on hoisting ropes or cables or drums.

(4) He shall exclude every person from the engine room, except those whose duties require their presence therein and visitors authorized by the superintendent of the mine.

(5) He shall hold no conversation with anyone while

\*Manager, Gold Hill & Iowa Mines Co., Quartzburg, Idaho.

\*From Inland Steel Co.'s book of rules.





### Tests on Structural Paints

Priming paints on structural steel are usually red lead. Red lead sets so rapidly that it cannot be used ready-mixed unless "suspenders," such as china clay, silica, chalk or asbestine are added. The effect of these suspenders on the quality of the paint has been a subject of dispute. To determine this point, experiments were undertaken by Westinghouse, Church, Kerr & Co., and the results are given by Cloyd M. Chapman (*Eng. News*, May 8, 1913). Ready-mixed red-lead paints, 42 in number, from various manufacturers, were tested, together with five paints mixed from red-lead pigment alone and six mixed from red-lead pigment with asbestine or china clay added. Litharge paints were also mixed and tested,

although no advantage lay with those containing suspenders.

Examination of the effects on the protective paints showed that the tar paint was far superior. However, the general run of hydrocarbon (tar and asphalt) paints offers poor protection as a steel covering and the experiments should be taken as indicating only that a superior paint can be prepared from such materials.

### Derrick for Sinking 557 Feet

Shaft No. 6 of the St. Louis Smelting & Refining Co. in southeastern Missouri was sunk to a depth of 557 ft. with a boom derrick. The derrick is rather generally used in Missouri and Michigan for starting sinking opera-

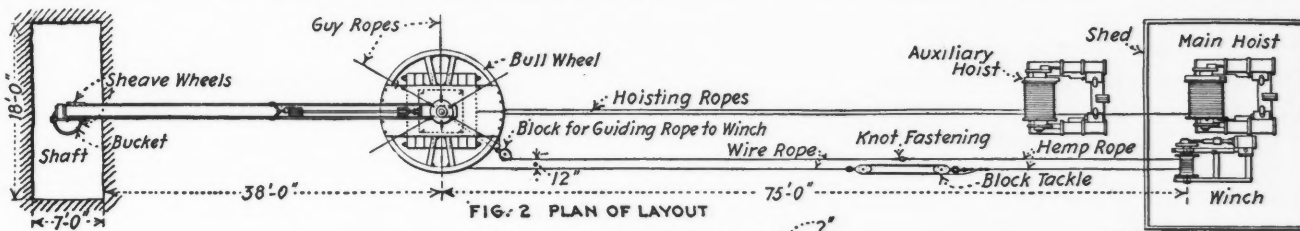


FIG. 2 PLAN OF LAYOUT

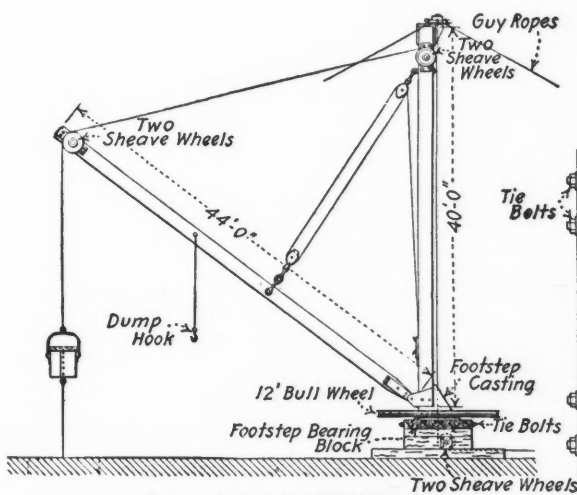


FIG. 1 SIDE VIEW OF DERRICK

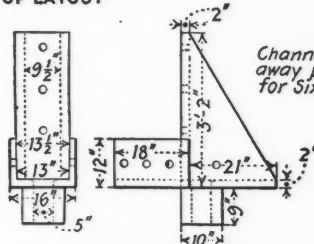


FIG. 3 FOOTSTEP BEARING

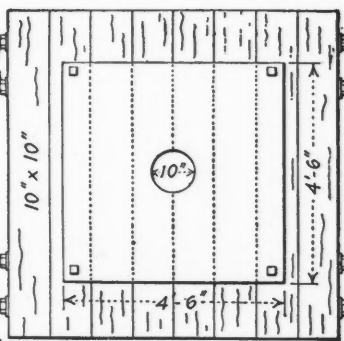


FIG. 4 FOOTSTEP BEARING BLOCK

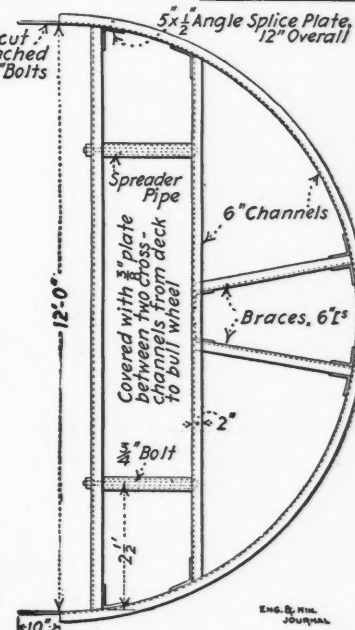


FIG. 5 PLAN OF HALF BULL WHEEL

#### LAYOUT AND DETAILS OF SINKING DERRICK

two of straight litharge and six with asbestine or china-clay suspenders. With each paint, six plates were painted, one with one coat, one with two coats and the remaining four in turn with one coat of the priming paint and a second coat of iron oxide, artificial graphite, carbon or tar-product paint. The 318 plates were exposed to the weather on the top of a New York building for 21 months. Tests were also made on the oxide, graphite, carbon and tar coverings by themselves without primers. The results are instructive. They show that after one year, the ready-mixed red-lead paints made the poorest showing, while those locally mixed with suspenders, made the best. After 21 months, the locally mixed pure red-lead paints showed the most deterioration and those mixed with suspenders were still better, relatively. The best showing of all, however, was made by the litharge paints,

tions, but 100 ft. has usually been the limit of depth to which it is applied. Considerations of cost and convenience led to its adoption in this instance.

The derrick was set opposite the center of the long side of the shaft and 38 ft. back from the center line. It was steadied by six guy lines. The mast was 40 ft. in height and the boom 44 ft. An elevation of the derrick is shown in Fig. 1, and a plan of the whole layout in Fig. 2. The bottom of the mast was carried by the footstep casting, shown in Fig. 3, to which it was bolted. This footstep rotated in a bearing block made of 10x10-in. timbers bolted together as illustrated in Fig. 4, with a hole in the center fitted to the footstep shaft. The top of the block carried a 4 1/2-ft. square plate around the center bearing hole. The block was bolted to the frame structure supporting the derrick. Rotation of the derrick was ob-

tained through the 12-ft. bullwheel, the construction of which is shown in Fig. 5. It was built of 6-in. channels, one forming the circumference and the others acting as braces. The wheel was attached to the cast footstep. The circumferential channel was turned with the ribs out to form a trough for the actuating rope.

Two hoists and a winch were employed in conjunction with the derrick. The winch was used for rotating the bullwheel. A small wire rope was wrapped several times around the bullwheel and one end brought back as a tangent to a point near the winch. The other end was brought around to a point near the first end and turned in the same direction by a block and also brought near the winch. On the 12-in. winch drum a hemp rope was used to avoid bending the wire rope to so small a radius. This rope had its ends attached to the ends of the wire rope, one attachment being brought through a block and tackle for taking up slack.

The main hoisting cable passed over a sheave on the end of the boom and another on top of the mast, down through a 5-in. hole in the footstep casting, over another sheave attached to the supporting framework and thus to the hoist. By this arrangement the swinging of the derrick did not interfere with the operation of the rope. The rope to the auxiliary hoist followed through a similar series of sheaves placed on the opposite side of the boom and mast. The slope of the boom was changed by hand when necessary, using a block and tackle from the top of the mast to a point near the center of the boom. But the bucket usually operated in the shaft center and for that reason the slope of the boom was seldom changed.

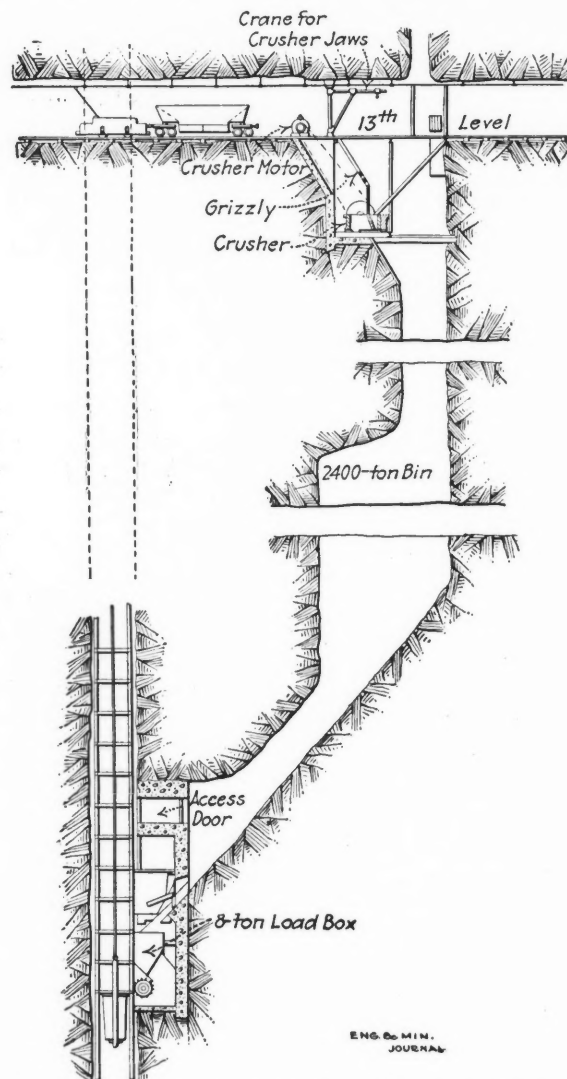
The arrangement of the hoists is shown in the plan, Fig. 2. The winch was near the main hoist so that the engineer had easy control over both; each hoisting operation of course necessitated a turning of the derrick. Usually it was not necessary to operate both the auxiliary and main hoists at the same time, but when it was, a topman could manipulate the auxiliary, as it was used only for material. The main hoist had a 4-ft. drum and 15x18-in. cylinders. The auxiliary had a 30-in. drum and 8x10-in. cylinders. The winch had a 4x4-in. engine.

The bucket was unguided in the shaft, but no difficulty was experienced from spinning. It was dumped in the usual manner by the rope and hook shown in Fig. 1. An unusual piece of equipment was a platform on which the men worked while timbering, placing pipe or barring down the sides. This so-called "butterfly" was handled by the main hoist, being attached by four  $\frac{7}{8}$ -in. ropes from the main timbers of the framework. It was a great convenience, giving opportunity for spreading out the tools while working and being capable of swinging to any desired corner of the shaft.

Advantages attendant on using a derrick are: (1) All surface work is done away with near the collar of the shaft and the danger of objects falling on the men at the bottom is reduced. The men themselves were unloaded at least 35 ft. from the collar. (2) There is no structure near the shaft collar to be injured by flying rock while blasting the upper sections of the shaft. (3) The derrick is cheap to erect and on the completion of any one job is available for another. (4) By the use of two hoists, one for men and one for material, the work of pipe and timber erection is greatly facilitated. (5) By rotating, a great deal of lifting is avoided both in the shaft and around the collar on the surface.

## Underground Crushing and Loading Station

The 13 level is the main haulage level for the No. 5 shaft of the Crown Mines, Ltd., and a large ore bin and a crushing plant are necessary in connection with the shaft on this level. The accompanying drawing, from an article by R. C. Warriner in the "Journal of the South African Institute of Engineers," April, 1913, illustrates diagrammatically the arrangement used. The capacity of the bin is 2400 tons. The front is built of ferro-concrete lined on the inside with 60-lb. rails. Loading boxes holding a skip load are provided.



BINS AND CRUSHER AT 13 LEVEL OF CROWN MINES

The underground crushing was installed to save the labor involved in breaking the large rocks by hand at the grizzly and to prevent the bin chutes from choking. Two  $21\frac{1}{2} \times 39\frac{1}{2}$ -in. jaw crushers were installed under the main track on the 13 level, and above the main ore-bin. The grizzlies above these crushers are set to 8-in. spaces at  $45^\circ$ . The crushers are driven each by a 60-hp. motor set on the 13 level out of the dust and dirt. The arrangement has proved cheap, the power cost being about 0.026c. per ton. Two light cranes over the crusher pit are used to facilitate repair work on the crushers.



## DETAILS OF METALLURGICAL PRACTICE

### Adjustable Draw-Off for Jig Middlings

The devices commonly used to draw off the middlings from a jig bed have the height of the opening fixed. A draw-off patented by C. E. Knowles and used in some of the Joplin mills permits the opening through which the middlings pass, to be raised or lowered. It consists of a fixed casting set across the lower end of the jig compartment with three slots *A* cut at 45° in the upright face and of another casting set inside the fixed casting and capable of movement across it, with three similar slots *B* inclined in the opposite direction. The faces carrying the slots are in contact and where the slots cross, a diamond-shaped opening *C* is formed, through which the concentrates pass. As the movable casting slides back and forth, the opening is raised and lowered.

The fixed casting is in the form of a box, a cover plate forming the vertical side which does not carry the slots.

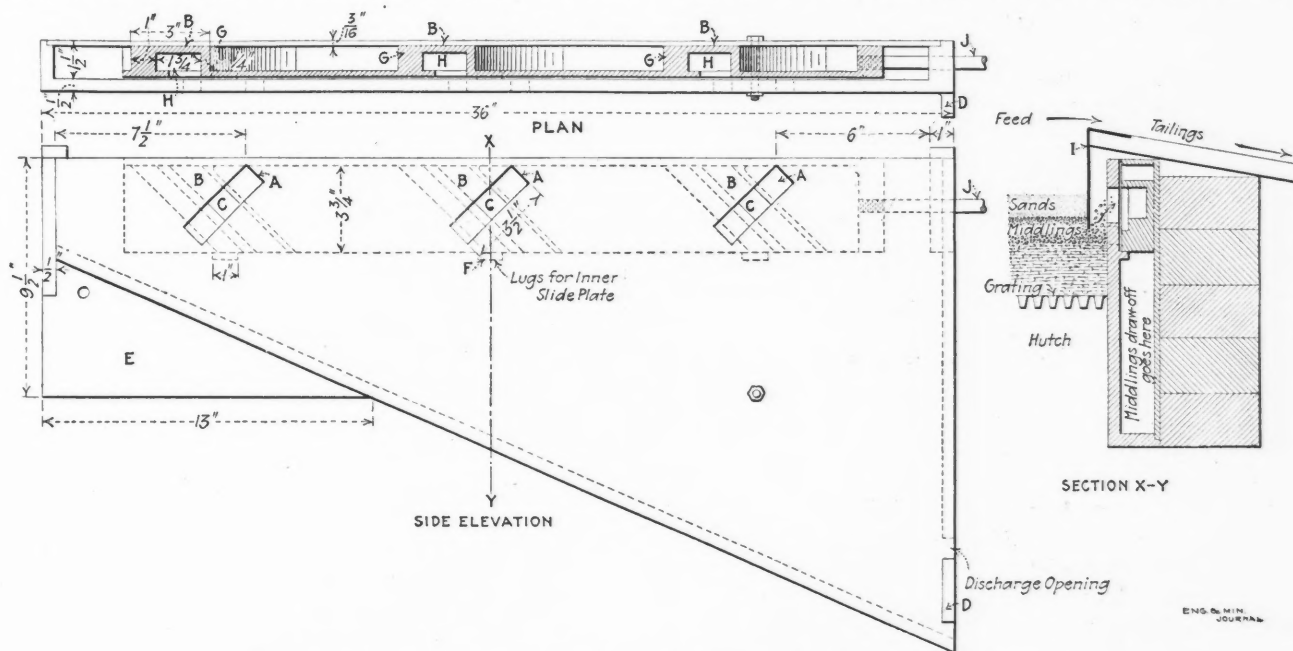
small chutes and fall to the sloping bottom of the fixed casting. The top of the sliding piece is a plate to fit the inside of the fixed casting. The movement of the piece is controlled by the rod *J*, which is screwed into its end and projects through the side of the jig.

In setting this discharge device in the jig compartment, a hood *I* is brought down from the tail-board discharge between the discharge device and the jig bed to such a point that the middlings only can pass under it and be drawn off. This is illustrated in the cross-section of a compartment end.



### Treatment of Zinc Muffle Residues

These residues often contain, apart from unconsumed cinders, considerable quantities of metals, such as Zn, Pb, Fe, Ag and metal sulphides, though the Pb contents are usually less than 1%, and the Ag contents no more than 40 or 50 grams per ton (*Min. Journ.*, June 14,



MIDDLING DRAW-OFF FOR JIG WITH ADJUSTABLE HEIGHT OF OPENING

The dimensions and shape are as shown. The middlings fall to the sloping bottom and are discharged at the lower end. A lug *D* and a bolting bracket *E* are provided for holding the box in the jig compartment. Lugs *F* are cast on the face carrying the slots in order to support the sliding casting.

The sliding casting is made with inclined lugs *G* on the back which follow down so as to correspond to the slots in the face and bear against the cover plate of the fixed casting. They are hollow, connected with the slots and are of a size, so that the chutes *H* which they form are somewhat larger than the slots. The middlings passing through the diamond-shaped holes slide down these

1913). The recovery of these metals, which presents great difficulties, has been the object of exhaustive experiments by Mr. Lindt, who adopted, as a preliminary to wet reduction, the electro-magnetic method. The residues experimented upon contained 3.8% Zn, 0.56% Pb, 18.9% Fe, 4.73% S, and 39 grams Ag per ton. Of the total mass, Mr. Lindt separated electro-magnetically 26%, containing 3.8% Zn, 0.16% Pb, 59.6% Fe, 3.65% S, 116 grams Ag per ton. The nonmagnetic portion (74% of the total) carried 3.8% Zn, 0.71% Pb, 4.6% Fe, 5.12% S and 16 grams Ag per ton. In the nonmagnetic portion the Zn is present as sulphide, and the sulphur contents are just sufficient to bind the other metals as sulphides

and concentrate them to regulus. Of the original silver contents by far the greater part segregates in the magnetic portion, and can easily be reduced by the wet process, while the small quantity remaining in the non-magnetic portion combines with the lead. Mr. Lindt also describes how the process can be applied to the recovery of the unconsumed cinders.

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### Safety Rules—Instructions to Foremen

(1) You will be held responsible for accidents to your men, whether they are working directly under you or your subforeman.

(2) When a man is being placed to work on a new job where there are special dangers (such as oiling, operating a machine, handling hot metal, etc.), instruct him thoroughly and let him be broken in by a man familiar with the work.

(3) Do not put men to work on any job until you have inspected everything and satisfied yourself that the place is safe. Warn the men of any danger that may come up in the course of doing this work. If you see a man violating your instructions or taking chances that place him liable to injury, deal with him so as to make it certain he will not again disobey orders. When you finish a job replace the safeguards and remove all loose material.

(4) Use judgment at all times in placing men on jobs; heavy, slow men should not be placed on jobs where light, quick men are required. Slow-thinking, unintelligent men should not be placed around machinery or in places where presence of mind is required.

(5) Employ the best men you can get and try to keep them. Never have a man in your employ to whom no one in the gang can talk.

(6) If possible, engage only English-speaking men for operation of machines.

(7) Drill your men to notify you immediately when injured, no matter how slight the injury may be, and send them to the doctor at once.

(8) Do not allow injured men to go to the doctor unassisted, where the injury is other than of a minor nature.

(9) Report and discuss with the foreman on the other turn accidents you have had, with a view to preventing their repetition.

(10) When one of your men is injured, immediately notify the safety department, and leave the conditions unchanged until photographs have been taken or an O. K. received from the department. Preserve and mark any material, tools or pieces of machinery involved in the accident.

(11) Investigate every accident thoroughly and try to prevent its repetition.

(12) Fill out a foreman's accident report for every accident in accordance with instructions and mail immediately. Give the names of all witnesses.

(13) Watch out for men who are hurt frequently, and put them where they will not get hurt.

(14) When it is necessary for men to work above or below other men, both parties shall be notified, and covering provided to protect men below.

(15) Do not allow machinery to be started before the safeguards have been replaced. If it is necessary to start machinery for testing be sure that every one is out of danger.

\*From Inland Steel Co.'s book of rules.

(16) Carefully inspect all appliances, and if machinery, tools or other appliances are dangerous, do not continue to use them, but call your superintendent.

(17) Have a thorough understanding of all the rules in this book. Until you know them all, and are living up to them, you are not doing your full duty.

(18) Exercise care for the safety of "loaned" men. See that they are not exposed to any unknown danger and are not taking any unnecessary chances.

(19) Do not allow material to be piled under crane ladders or so as to interfere with trimming of lights.

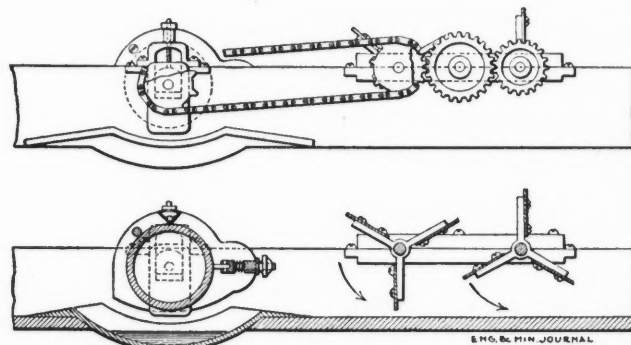
(20) Do not allow men to use switch boxes for lockers or for any other purpose than that for which they are intended.

(21) If lights do not burn when it is necessary to use them, report to the electrical department at once.

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### Float-Gold Collector

An apparatus for collecting float gold in placer mining has been invented by Lawrence C. Gray, of Boston, and patented under U. S. pat. No. 1,056,652. The device consists of a roller placed in the sluice, through which the pulp is passing, this roller being placed above a slight depression in the bottom of the sluice, which depression contains a small quantity of mercury. The roller is of



COLLECTOR FOR FLOATING PLACER GOLD

amalgamable material and upon it mercury is fed from a small reservoir located above it.

A scraper is arranged so that the amalgamated gold and silver, which sticks to the roller, is scraped off and dropped into the mercury well below the roller, which prevents it from being carried away by the stream of pulp in the sluice. Movement may be imparted to this roller by a pair of impulse waterwheels in miniature. The accompanying drawing explains in full the action of the machine.

Another apparatus designed by the same inventor and patented under 1,056,633, is for the same purpose and accomplishes the object by placing in the sluice a mercury well of such peculiar shape that it gives a whirling motion to the pulp, and causes the heavier solids to be precipitated against the surface of the mercury, thereby producing conditions favorable to the amalgamation of any precious metals present.

❖

Screen Tests Are an Essential part of the preliminary experiments on an ore, but no standard method has been agreed upon for making the tests. They can be made dry or wet, the dry method taking more time and a great deal more care to carry it out correctly. By the wet method the material may be rapidly passed through the series of screens, but care has to be taken to avoid loss in splashing and leaking.



# THE COST OF DOING THINGS

## El Oro Costs

During the year ended June 30, 1912, the El Oro Mining & Railway Co., El Oro, Mexico, treated 302,698 tons of ore and 84,459 tons of tailings in its mill and cyanide plant. The mill averaged 8.88 tons of ore per stamp per 24 hr. The average assay value of ore treated was \$6.36 gold and \$1.30 silver and tailings re-treated averaged \$2.68 gold and 88c. silver, a combined average of \$5.581 gold and \$1.212 silver per ton. Theoretical ex-

## Alaska Treadwell

The Alaska Treadwell costs are always interesting as they represent the result of high efficiency, excellent management and modern practice. The annual report for year ended Dec. 31, 1912, shows that 861,973 tons of ore were stoped, 892,192 tons crushed by the two mills and 12,578 ft. of development work performed. The average grade of the ore mined, as indicated by the mine assays, was \$3.22 per ton. The average of the ore milled, obtained by

COST OF MINING, ALASKA TREADWELL

	Development 12,578 Ft. Cost per Ft. Developed	Stoping 861,973 Tons Cost per Ton Stoped	Tramming 892,192 Tons Cost per Ton of Ore Trammed	Hoisting 892,192 Tons Cost per Ton of Ore Hoisted	Pumping Cost per Ton Milled	Total Cost per Ton Milled
<b>Direct Labor—</b>						
Machine drillers.....	\$3.188	\$0.143	.....	\$0.000	\$0.000	\$0.183
Hand miners.....	.....	0.003	.....	.....	.....	0.004
Laborers.....	1.551	0.114	0.026	0.000	0.000	0.158
Powdermen.....	0.072	0.010	.....	.....	.....	0.011
Tool carriers.....	0.018	0.001	.....	.....	.....	0.001
Engineers, skipmen, oilers.....	.....	0.003	0.003	0.020	0.000	0.023
Cagemen.....	.....	0.000	.....	0.004	.....	0.004
Chutemen.....	.....	.....	0.015	.....	.....	0.014
Trainmen and trammers.....	.....	.....	0.029	.....	.....	0.030
Track and stablemen.....	0.069	.....	0.003	.....	.....	0.004
Pumpmen.....	.....	.....	.....	.....	0.003	0.003
Foremen, shift bosses.....	0.177	0.009	0.002	0.000	0.000	0.014
Blacksmiths, tool sharpeners.....	0.153	0.006	0.001	0.000	.....	0.008
Machinists, pipemen.....	0.056	0.002	0.000	0.000	0.000	0.003
Carpenters, timbermen.....	0.244	0.003	0.001	0.001	.....	0.007
Watchmen.....	0.022	0.000	0.000	0.000	0.000	0.001
Contractors.....	1.241	.....	0.003	.....	.....	0.020
Timekeeper.....	0.025	0.001	0.000	.....	.....	0.001
<b>Total direct labor.....</b>	<b>\$6.816</b>	<b>\$0.292</b>	<b>\$0.083</b>	<b>\$0.025</b>	<b>\$0.003</b>	<b>\$0.489</b>
<b>Direct Supplies—</b>						
Powder.....	\$1.239	\$0.146	.....	.....	.....	\$0.157
Fuse and caps.....	0.120	0.016	.....	.....	.....	0.017
Candles.....	0.078	0.006	.....	.....	.....	0.007
Machine drill supplies.....	0.131	0.006	.....	.....	.....	0.008
Iron and steel.....	0.122	0.003	0.001	0.000	0.000	0.006
Steel rope.....	.....	.....	0.001	0.008	.....	0.009
Lumber and timber.....	0.095	0.003	0.000	0.001	.....	0.006
Lubricants.....	0.007	0.000	0.001	0.001	0.000	0.002
Blacksmith coal.....	0.001	0.000	.....	.....	.....	0.000
Stable.....	.....	.....	0.003	.....	.....	0.003
Fuel oil.....	0.031	0.001	0.000	0.000	0.000	0.001
Miscellaneous.....	0.192	0.002	0.003	0.001	0.001	0.009
<b>Total direct supplies.....</b>	<b>\$2.016</b>	<b>\$0.183</b>	<b>\$0.009</b>	<b>\$0.011</b>	<b>\$0.001</b>	<b>\$0.225</b>
<b>Subsidiary Accounts of Mixed Labor and Supplies—</b>						
Building repairs.....	\$0.022	\$0.001	\$0.000	\$0.000	.....	\$0.002
Electrical repairs.....	0.049	0.000	0.000	0.000	0.001	0.002
Mechanical repairs.....	0.169	0.002	0.002	0.008	0.000	0.015
Power.....	0.236	0.007	0.001	0.040	0.003	0.054
Train service.....	0.041	0.002	0.000	0.000	0.000	0.003
Assaying.....	0.013	0.001	.....	.....	.....	0.001
Surveying.....	0.052	0.001	.....	.....	.....	0.002
Douglas Island general expense.....	0.675	0.031	0.008	0.004	0.001	0.051
Compressed air.....	0.494	0.018	0.001	0.000	0.001	0.027
Electric lights.....	.....	.....	0.000	.....	.....	0.000
Steam heat.....	0.019	0.001	0.000	0.000	0.000	0.001
Blacksmith shop.....	0.137	0.005	0.001	0.001	0.000	0.008
<b>Total mixed labor and supplies.....</b>	<b>\$1.907</b>	<b>\$0.069</b>	<b>\$0.013</b>	<b>\$0.053</b>	<b>\$0.006</b>	<b>\$0.166</b>
<b>Less credits.....</b>	<b>1.803</b>	<b>.....</b>	<b>0.000</b>	<b>0.001</b>	<b>0.002</b>	<b>0.028</b>
<b>Total cost.....</b>	<b>\$8.936</b>	<b>\$0.544</b>	<b>\$0.105</b>	<b>\$0.088</b>	<b>\$0.008</b>	<b>\$0.852</b>

traction of contents of ore and tailings treated was: 87.98% of the gold and 69.58% of the silver, or a total of 84.68%. The actual extraction by bullion was 87.51% of the gold, 74.23% of the silver and 85.14% of both, based on the assay value of the heads. The costs were made up as follows: Mining, \$1.89 per ton mined, development, 83c.; milling, 18c. per ton milled; cyaniding, 93c. per ton treated; water supply, 1c.; general expenses, 22c., and taxes, 23c.; other expenses, 10c., making a total of \$4.39 per ton.

adding the tailing value to mill returns was \$2.67 per ton.

The total net returns from the mill amounted to \$2.4724 per ton, indicating a saving of 92.5%, figured by tailing plus product. The operating expenses and construction charged amounted to \$1.2208 per ton milled, leaving a profit of \$1.2506 from the ore. Miscellaneous profits of \$0.0605 credited made a total of \$1.3111 per ton from operations. Depreciation written off profit and loss amounted to about 69.5c. per ton milled.

The tables given herewith show the details of mining and milling costs:

#### COST OF MILLING—240 STAMP MILL

	371,308 Tons Ore Crushed.		6,838.63 Tons Sulphurets Saved		
	Crushing Cost Per Ton	Tramming Cost Per Ton	Stamping Cost Per Ton	Concentrating Cost Per Ton	Total Cost Per Ton
<b>Direct Labor—</b>					
Feeders.....			\$0.025		\$0.025
Amalgamators.....			0.015		0.015
Vannermen.....				0.016	0.016
Sampler.....			0.000	0.001	0.001
Foremen.....			0.003	0.002	0.005
Oilers.....			0.003	0.003	0.006
Stationary engineers.....			0.006		0.006
<b>Total direct labor.....</b>			<b>\$0.052</b>	<b>\$0.022</b>	<b>\$0.074</b>
<b>Direct Supplies—</b>					
Shoes.....			\$0.012		\$0.012
Dies.....			0.004		0.004
Cams and camshafts.....			0.000		0.000
Tappets and keys.....			0.001		0.001
Mortars.....			0.001		0.001
Mortar extras.....			0.004		0.004
Screens.....			0.002		0.002
Quicksilver.....			0.002		0.002
Lubricants.....			0.001	0.000	0.001
Vanner belts.....				0.003	0.003
Belting.....			0.001	0.000	0.001
Vanner rollers.....				0.001	0.001
Miscellaneous.....			0.002	0.002	0.004
<b>Total direct supplies.....</b>			<b>\$0.030</b>	<b>\$0.006</b>	<b>\$0.036</b>

#### Subsidiary Accounts of Mixed Labor and Supplies—

240 tailing.....			\$0.001	\$0.001	\$0.002
Ore crushing.....	\$0.025				\$0.025
Tramming to mills.....		\$0.016			0.016
Pumping salt water.....			0.001	0.001	0.002
Building repairs.....			0.011	0.001	0.012
Electrical repairs.....			0.000	0.000	0.000
Mechanical repairs.....			0.009	0.002	0.011
Power.....			0.019	0.009	0.028
Train service.....			0.002		0.002
Assaying.....			0.001	0.001	0.002
D.I. general expense.....	0.001	0.901	0.006	0.002	0.010
Steam heating.....			0.002	0.002	0.004
Compressed air.....				0.001	0.001
Electric lights.....			0.000	0.000	0.000
Miscellaneous.....			0.001	0.002	0.003
<b>Total mixed labor and supplies.....</b>	<b>\$0.026</b>	<b>\$0.017</b>	<b>\$0.053</b>	<b>\$0.022</b>	<b>\$0.118</b>
<b>Total cost.....</b>	<b>\$0.026</b>	<b>\$0.017</b>	<b>\$0.135</b>	<b>\$0.050</b>	<b>\$0.228</b>

Chrome-steel consumption in shoes used was one pound per 2.78 and 2.58 tons of ore respectively in the 240- and 300-stamp mill, compared with 5.12 and 4.24 tons of ore per pound of iron in dies. About one assay was made for the mines for every 200 tons of ore mined and one for the mill for every 147 tons milled or a total of one assay for every 78.5 tons milled. The average number of men employed was 745 and the average wage, \$3.47

#### COST OF MILLING—300 STAMP MILL

	520,884 Tons Ore Crushed.		10,558.54 Tons Sulphurets Saved.		
	Crushing Cost Per Ton	Tramming Cost Per Ton	Stamping Cost Per Ton	Concentrating Cost Per Ton	Total Cost Per Ton
<b>Direct Labor—</b>					
Laborers.....			\$0.002	\$0.001	\$0.003
Feeders.....			0.017		0.017
Amalgamators.....			0.010		0.010
Vannermen.....				0.011	0.011
Samplers.....			0.000	0.000	0.000
Foremen.....			0.002	0.002	0.004
Oilers.....			0.002	0.002	0.004
Carpenters.....			0.002	0.001	0.003
Watchmen.....			0.001	0.000	0.001
<b>Total direct labor.....</b>			<b>\$0.036</b>	<b>\$0.017</b>	<b>\$0.053</b>
<b>Direct Supplies—</b>					
Shoes.....			\$0.012		\$0.012
Dies.....			0.005		0.005
Cams and camshafts.....			0.003		0.003
Tappets and keys.....			0.002		0.002
Mortar.....			0.004		0.004
Screens.....			0.002		0.002
Quicksilver.....			0.003		0.003
Lubricants.....			0.000	0.000	0.000
Vanner belts.....				0.002	0.002
Belting.....			0.001	0.000	0.001
Vanner rollers.....				0.000	0.000
Miscellaneous.....			0.005	0.003	0.008
<b>Total direct supplies.....</b>			<b>\$0.037</b>	<b>\$0.005</b>	<b>\$0.042</b>

#### Subsidiary Accounts of Mixed Labor and Supplies—

300 tailing.....			\$0.002	\$0.003	\$0.005
Installation pump.....			0.000	0.000	0.000
Ore crushing.....	\$0.024				0.024
Tramming to mill.....		0.015			0.015
Pumping salt water.....			0.000	0.001	0.001
Building repairs.....			0.003	0.000	0.003
Electrical repairs.....			0.001	0.000	0.001
Mechanical repairs.....			0.006	0.001	0.007
Power.....			0.012	0.005	0.017
Train service.....			0.001		0.001
Assaying.....			0.001	0.000	0.001
D.I. general expense, proportion of.....	0.001	0.001	0.004	0.002	0.008
Steam heating.....			0.001	0.003	0.004
Electric lights.....			0.000	0.001	0.001
Compressed air.....				0.000	0.000
Miscellaneous.....			0.001	0.002	0.003
<b>Total mixed labor and supplies.....</b>	<b>\$0.025</b>	<b>\$0.016</b>	<b>\$0.032</b>	<b>\$0.018</b>	<b>\$0.091</b>
<b>Total cost.....</b>	<b>\$0.025</b>	<b>\$0.016</b>	<b>\$0.105</b>	<b>\$0.040</b>	<b>\$0.186</b>

per day. This indicated about 1195 tons per year per man.

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## Cost of Mixing and Placing Concrete

The costs in the accompanying table do not include excavation, forms, steel, or miscellaneous items, the costs of materials including only cement and aggregates. The figures were obtained from actual jobs and are given in Taylor and Thompson's "Concrete Costs." Wages range from 15 to 25c. per hr. The costs include an allowance for superintendence, overhead charges and general expenses, but do not include home-office expenses or profit. These costs are approximate only and are suitable for nothing but preliminary estimates. They are given in dollars per cubic yard.

#### APPROXIMATE LABOR AND TOTAL COSTS FOR MIXING AND PLACING CONCRETE

	Labor only		Labor and Material	
	Range	Average	Range	Average
Mass-dams, foundations, etc.....	\$0.75 to \$2.50	\$1.25	\$3.00 to \$9.00	\$5.50
Tunnels and conduits.....	1.00 to 3.00	2.00	4.50 to 8.00	6.25
Reservoirs and standpipes.....	0.75 to 3.00	1.50	3.50 to 13.00	7.00
Buildings.....	0.75 to 4.00	1.50	4.50 to 9.00	6.50
Bridges.....	0.50 to 2.50	1.50	4.00 to 8.00	6.00
Sewers.....	0.75 to 1.75	1.50	3.50 to 8.00	6.00

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## Esperanza Costs

The Esperanza Mining Co., El Oro, Mexico, as shown by its report for 1912, mined 135,003 tons of ore for \$3.34 per ton, consisting of: \$1.08 for development; \$1.70 for ore breaking; 49c. for hoisting and placing in mine bins; and 7c. for moving ore from mine to mill bins. The cost of milling was \$1.61 per ton milled; shipping and selling, 23c.; general expenses, 56c., and renewals, 26c. Total cost for mining and milling was \$6 and profits amounted to \$1.30 per ton. Construction not charged to expenses was equal to 3.9c. per ton mined.

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## Dredging Costs

According to the annual report of the Colorado Gold Dredging Co., Breckenridge, Colo., during the dredging season of 1912, 1,270,476 cu.yd. were dredged, giving a total yield of \$208,248, or an average of 16.391c. per cu.yd. The average cost was 5.296c. per cu.yd. and administration and general expenses 0.263c. per cu.yd., a total of 5.559c. per cu.yd., leaving a profit of 10.832c. per cubic yard.

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**Lining Costs** at one of the modern basic-lined converter installations are understood to have been brought down to 8½c. per ton of blister produced.



## NEW PUBLICATIONS

- EXPORTERS' ENCYCLOPEDIA, 1913. 5½x8¼, pp. 1023; \$7.50. Exporters' Encyclopedia Co., New York.
- NORTH CAROLINA—BIENNIAL REPORT OF THE STATE GEOLOGIST, 1911-12. Pp. 118. Joseph Hyde Pratt, State Geologist, Chapel Hill, N. C.
- AN EXPENSIVE EXPERIMENT. The Hydro-electric Power Commission of Ontario. By Reginald Pelham Bolton. 5¼x8¼, pp. 281, illus. The Baker & Taylor Co., New York.
- RECURRENT TROPIDOLEPTUS ZONES OF THE UPPER DEVONIAN IN NEW YORK. By Henry S. Williams. Pp. 101, illus. Professional Paper 79, U. S. Geological Survey, Washington.
- ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1911. By John McLeish. Pp. 316. Canada Dept. of Mines, Mines Branch, Ottawa.
- THE MAGNETIC IRON SANDS OF NATASHKWAN, COUNTY OF SAGUENAY, PROVINCE OF QUEBEC. By George C. Mackenzie. Pp. 57, illus. Canada Dept. of Mines, Mines Branch, Ottawa.
- SURFACE WATER SUPPLY OF THE UNITED STATE, 1910. Part XII, North Pacific Coast. By F. F. Henshaw, E. C. La Rue and G. C. Stevens. Pp. 685, illus. Water-Supply Paper 292, U. S. Geological Survey, Washington.
- DIE ANWENDUNG HOHER DRUCKE BEI CHEMISCHEN VORGAENGEN UND EINE NACHBILDUNG DES ENTSTEHUNGSPROZESSES DER STEINKOEHLE. By Friedrich Bergius. 9¼x6½, pp. 56, paper; 2.80 marks. Wilhelm Knapp, Halle a. S., Germany.
- JAHRBUCH DER ELEKTROCHEMIE UND ANGEWANDTEN PHYSIKALISCHEN CHEMIE, XIII. JAHRGANG. Berichte über die Fortschritte des Jahres 1906. By Heinrich Danneel and Julius Meyer. 6¼x10, pp. 868, illus.; 23 marks. Wilhelm Knapp, Halle a. S., Germany.
- THE PETROLOGY OF THE SEDIMENTARY ROCKS. Vol. II of "Textbook of Petrology." By F. H. Hatch and R. H. Rastall. With an appendix on the Systematic Examination of Loose Detrital Sediments, by T. Crook. 5x7½, pp. 425, illus.; 7s. 6d.; George Allen & Co., Ltd., London, Eng.
- ELECTRIC FURNACES IN THE IRON AND STEEL INDUSTRY. By W. Rodenhauser and I. Schoenau. From advance sheets of the second German edition; authorized translation and additions by C. H. vom Baur. 6x9¼, pp. 419, illus. John Wiley & Sons, New York.

While this work treats especially of electric furnaces for steel-making and iron-ore smelting, it goes into principles in general and is as satisfactory a treatise on the subject as any whereof we know. To metallurgists interested in the electric furnace for iron and steel it may especially be commended.

THE BASIC OPENHEARTH STEEL PROCESS. By Carl Diehm; translated and edited by Alleyne Reynolds. 5½x8½, pp. 334, illus.; \$3.50. D. Van Nostrand Co., New York.

This is a book upon the theory of the openhearth steel process and, therefore, fills a want which has existed for a long time. More particularly does it fill this want because, although theoretical, it is written by an experienced man in a practical way with a view to the problems likely to be met with in actual operation. The author's own description of the situation is given in the following words:

During more than 20 years' practical experience in openhearth furnace management, I have frequently been faced with problems to which I was unable to find satisfactory solutions. A pause in such practical activity has enabled me to investigate these questions as a whole, and in this connection I have taken advantage of all available literature on the subject which was at my disposal. The gaps remaining I have endeavored to fill in to the best of my ability.

This was the origin of my book, and in now giving it to the public I do so on the plea that the literature relating to the openhearth process is very meager, in spite of the daily increasing importance of the process, and because I hope to enlist further workers in clearing up the abstruse problems involved.

There is little but praise to be said of the German text from which this book was translated; such a discussion was needed; the author had at his command, from practical experience and study, means of filling the need and he applied his abilities with skill and judgment to the making of an excellent book.

The English translation unfortunately follows too literally the German text even to the extent of bodily translating German idioms into English, with the result that the language of the English text is so crude and at times even ridiculous that the mind is occasionally tempted away from the author's thought to a consideration of the language in which it is clothed. A single example will serve to make this condition evident (pp. 154, 155):

Therefore, the entrance of iron protoxide into the iron must be profited by, which can only be achieved by adding to the latter substances, which do not permit protoxide of iron in their presence, but convert it into metallic iron. For fulfillment of this proviso, only reducing agents are suitable, of which some are always present in all classes of iron technically employed.

They are dissolved in the melted metal and have a disposition to an equalization of their division in the entire mass of iron, and, therefore, also present at the place from which the permeation by the protoxide of iron takes place, namely, the contact surface of metal and slag.

The first 16 chapters (embodying about 136 pages) are taken up with the study of openhearth fuels from the theoretical and practical standpoint, but chiefly the former. Part 2 (embodying chapters 17 to 24, inclusive, and covering 166 pages of the text), is devoted to the chemistry of the basic-openhearth process. Commencing with an elementary chapter on reduction and oxidation processes the author then discusses the chemical action of flame, including the formation of slag, the elimination of impurities from the metal and a study of the relative volume of oxidation by means of flame and slag. This chapter has the unusual quality of being elementary and of becoming more and more valuable in proportion to the experience of the reader. This same favorable characteristic applies to all the theoretical discussions in part two. Chapter 19, the work done by heat in openhearth furnaces (11 pages), contains much valuable material, clearly and simply expressed. Chapter 20 (22 pages), the enhancement of the oxidizing action of the flame, is a useful elaboration and extension of this subject, which has been discussed several times before. Chapter 21, the occurrences in openhearth furnaces and their judgment (16 pages), is full of information of much practical value, and the same is equally true of Chapter 22, the principal methods of working in the basic-openhearth process, which contains 68 pages. Indeed, students and those entering upon their experience with the openhearth process will probably find it most desirable to read the last two chapters of the book first, but should not neglect to re-read them later in the light of the theory given in the discussions appearing earlier in the volume.

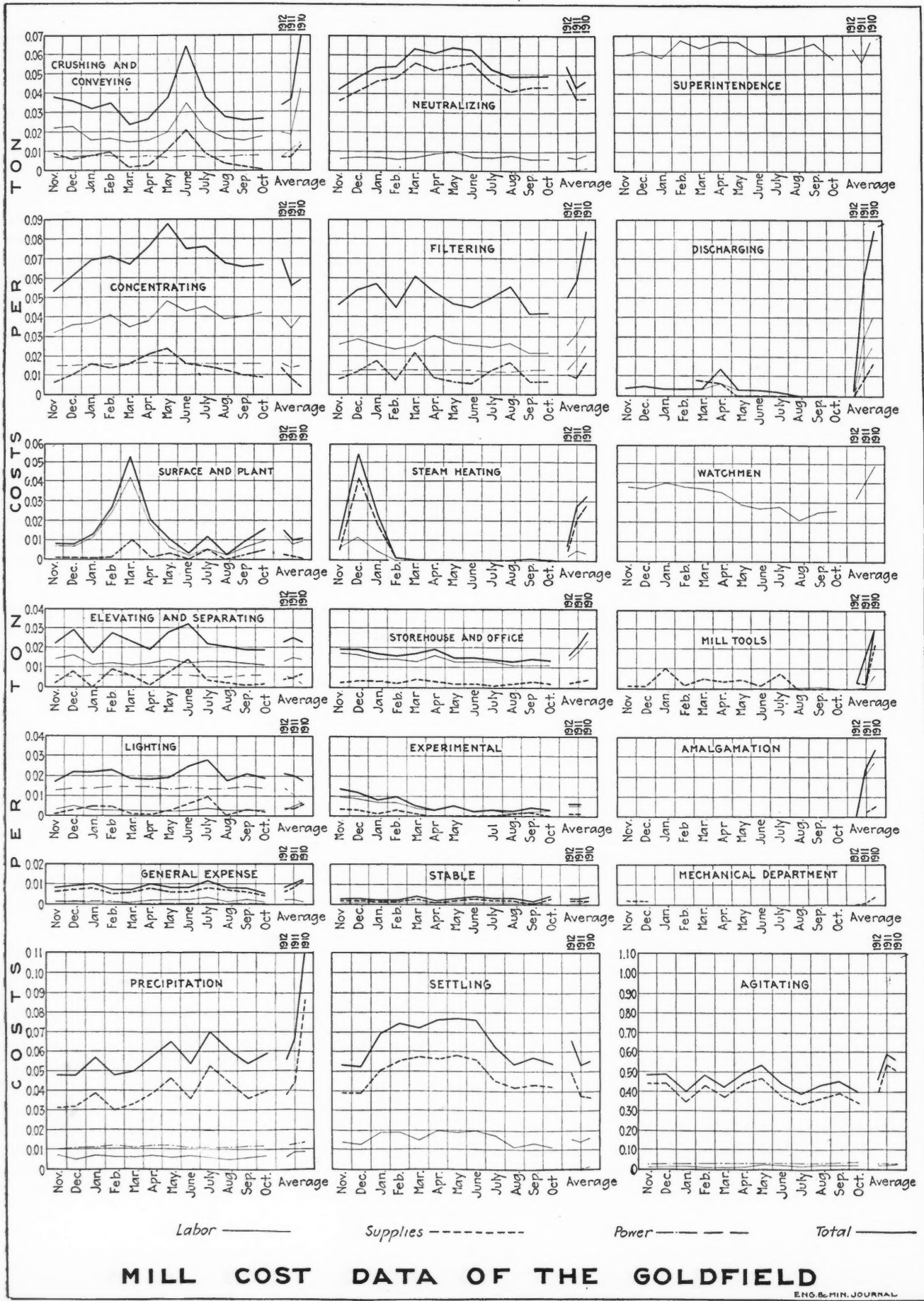
Taken altogether, this is one of the most useful and interesting discussions of the most important steel process of the industry, and it is only to be regretted that the translator and the publishers permitted it to appear in such crude and unattractive English. The tables are numerous; the illustrations are excellent and comprehensive, and the general make-up and typography of the volume are good.

BRADLEY STOUGHTON.

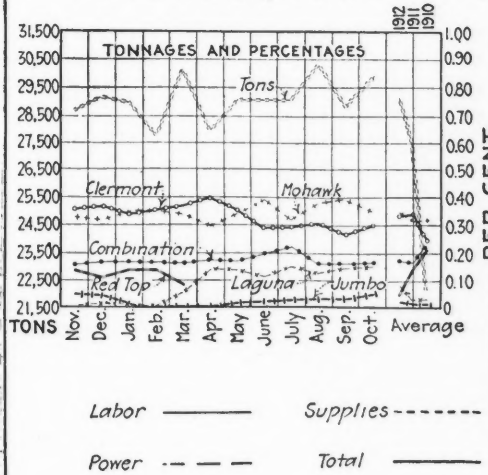
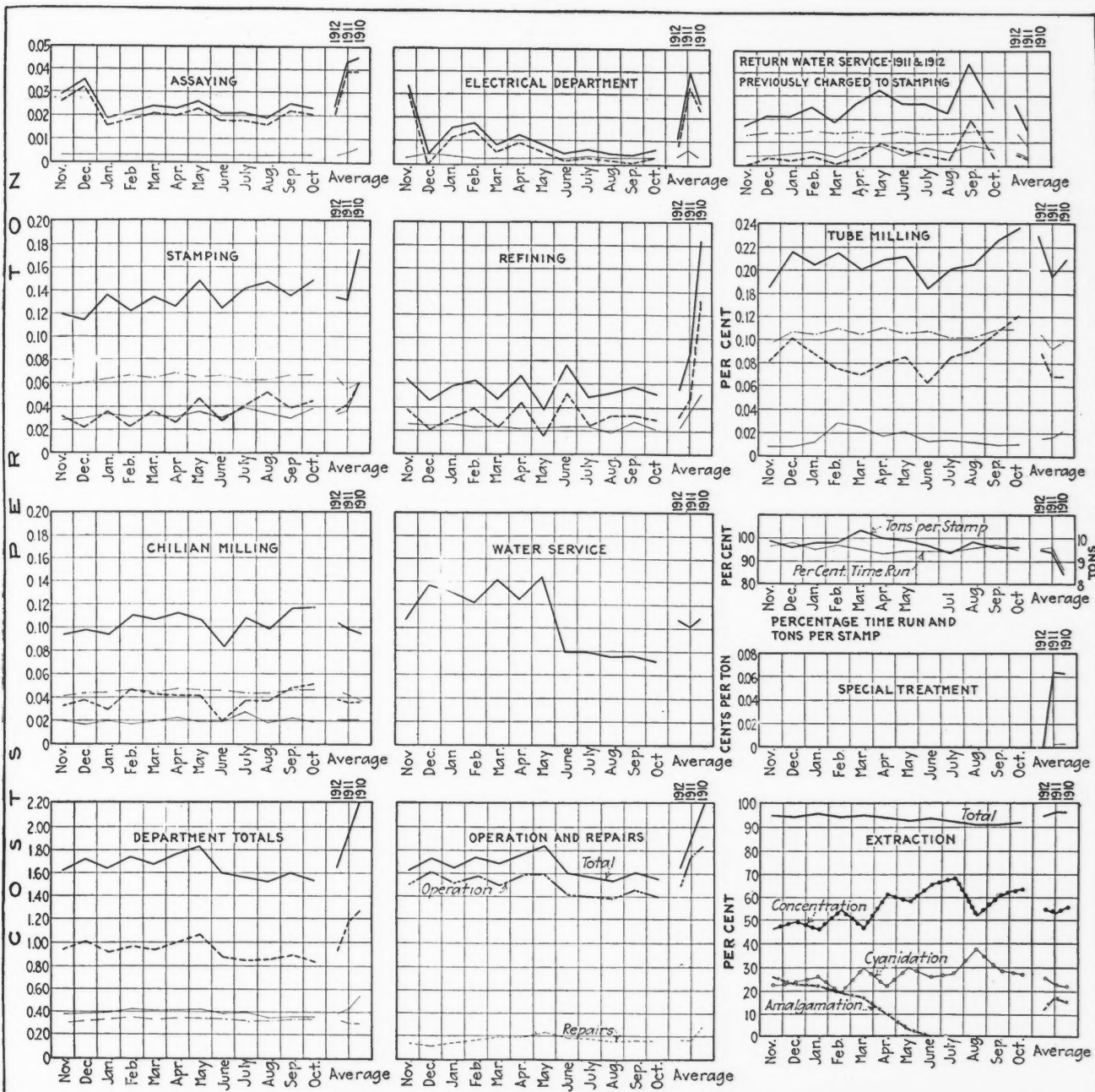
PETROLEUM IN SOUTHERN CALIFORNIA. Compiled by Paul W. Prutzman. 9½x6, pp. 430, illus. Issued by the California State Mining Bureau, San Francisco, California.

In this bulletin a great deal of data have been brought together. The different areas are described as well as their topographical and geological characteristics. The methods of oil analysis followed are given, together with drawings of some of the different forms of apparatus used. The different fields are taken up showing, in many cases, drawings of the geological structures, maps, photographs and analyses of petroleum from many of the wells. However, a careful examination of the analyses presented would seem to indicate in some cases that the interpretations of the distillations into yields of commercial products were not even approximately accurate. The results obtained by treating the lubricating oils from the distillations with sulphuric acid have no doubt in some cases been taken too literally; for in the manipulation of the acid treatment of such products, slight variations in the process give widely different results. On page 69, analysis 5462 of the South Well of the Union Oil Co., Tar Flat, the indications are, from the results given, that this oil contains from 2 to 3% of paraffin wax. The statement is made in speaking of the lubricating stock obtained from this distillate—"The latter is pasty with paraffin at 60° temperature, and the reduced stock sets solid at 70° F., making it useless for the manufacture of engine oil, as the paraffin from these oils does not crystallize." In several cases the statement is made that the lubricating stock contains too much paraffin to be of much value for lubricants. Probably if such products were redistilled once, using steam, the paraffin would be rendered crystalline, and could be easily separated by refrigeration and filter-pressing, or the lubricating stock may have to be cut out at a higher gravity and then redistilled. In many cases the probable yield of D grade asphalt has been calculated from the yield of coke obtained by distillation. This method can, at best, be only roughly approximate, and may in some cases be the cause of condemning a good oil. It is unfortunate that steam reductions to certain fixed residues were not made in some cases, as there is evidence in some of the analyses that by proper refining methods good cylinder oils, similar to those obtained from Pennsylvania crude, could be manufactured. In general, the book is well arranged, simple and direct in style, and contains a good deal of data of value to those interested in petroleum and its products.

T. T. GRAY.





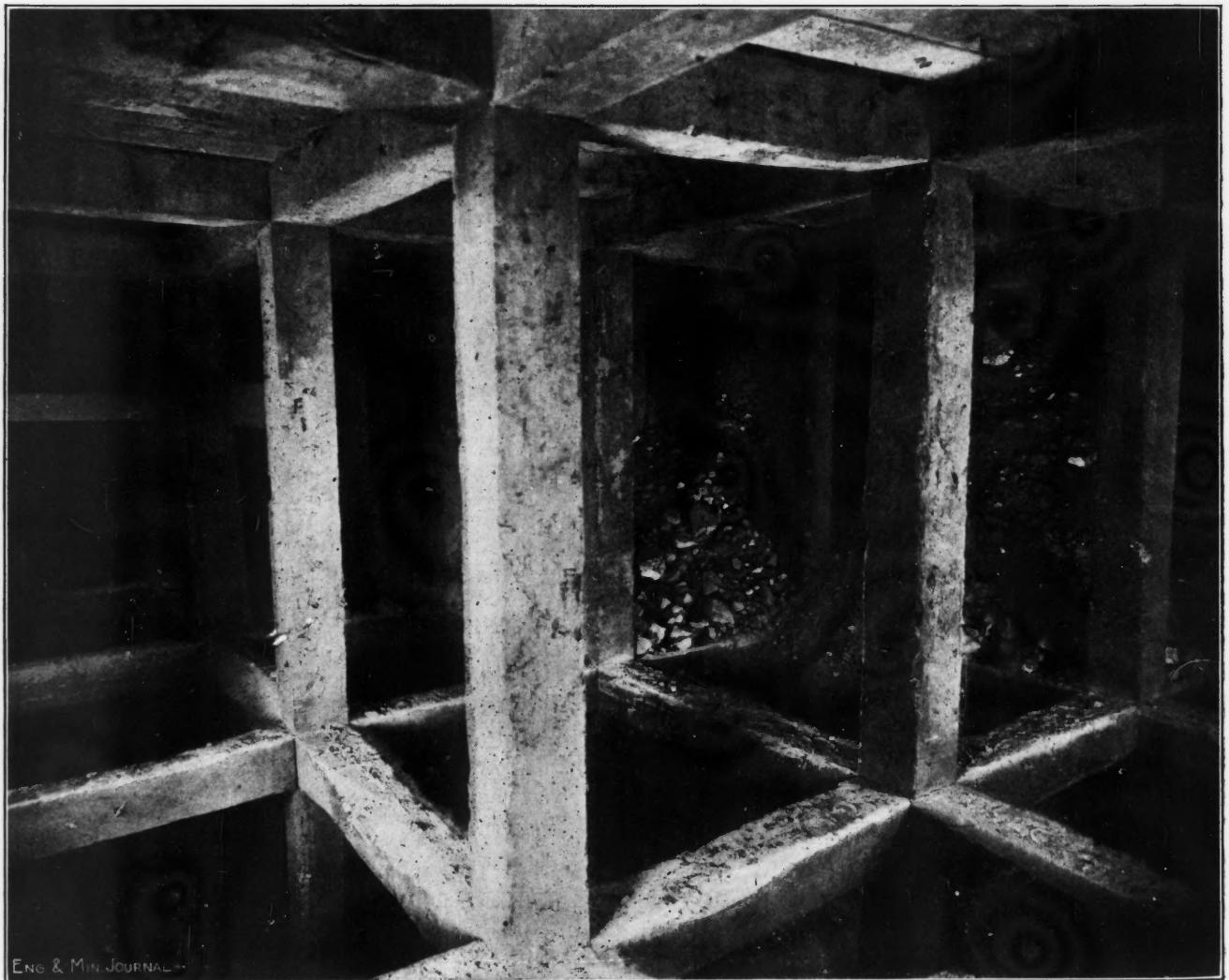
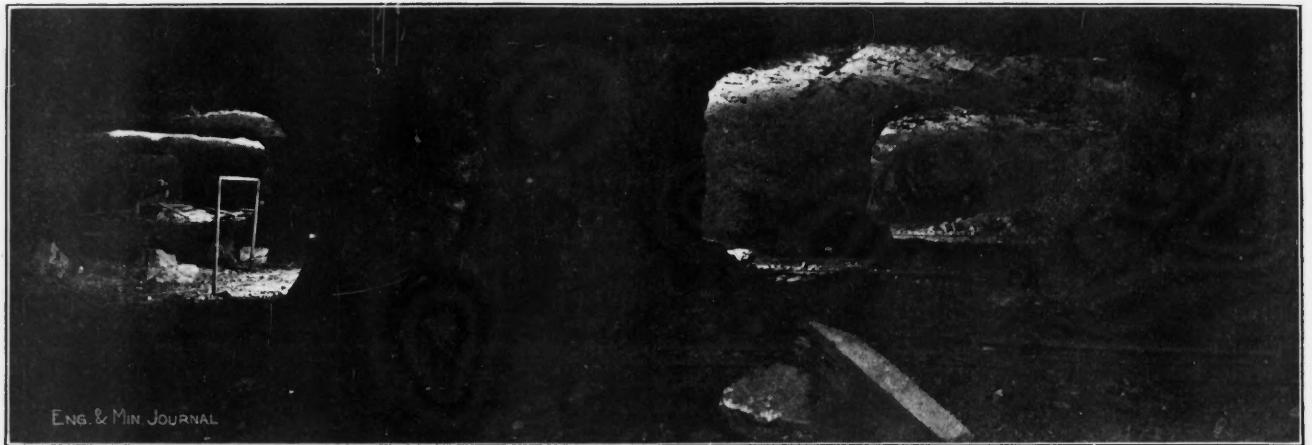


SUPPLIES	1912										Aver.		
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.		Sep.	Oct.
Cyanide	0.390	0.393	0.312	0.388	0.319	0.348	0.383	0.305	0.260	0.290	0.280	0.273	0.328
Zinc	0.029	0.028	0.051	0.030	0.027	0.034	0.038	0.034	0.045	0.042	0.036	0.034	0.034
Lime	0.071	0.077	0.086	0.093	0.111	0.098	0.105	0.108	0.088	0.082	0.083	0.085	0.091
Lead Acetate	0.041	0.048	0.034	0.040	0.048	0.080	0.069	0.064	0.072	0.072	0.064	0.064	0.058
Water	0.107	0.136	0.131	0.122	0.141	0.124	0.145	0.080	0.080	0.077	0.078	0.073	0.108
Belting	0.004	0.010	0.016	0.018	0.008	0.009	0.011	0.017	0.003	0.007	0.012	0.004	0.013
Lubrication	0.010	0.003	0.002	0.008	0.007	0.009	0.009	0.008	0.008	0.011	0.003	0.006	0.007
Borax	0.003	0.000	0.005	0.004	0.007	0.013	0.003	0.013	0.006	0.007	0.006	0.005	0.006
Litharge	0.013	0.000	0.005	0.011	0.000	0.019	0.000	0.019	0.005	0.014	0.016	0.011	0.009
Pig Lead	0.004	0.007	0.007	0.007	0.003	0.002	0.004	0.005	0.002	0.005	0.003	0.003	0.004
Shoes and Dies	0.025	0.019	0.029	0.014	0.026	0.022	0.027	0.020	0.023	0.029	0.023	0.024	0.023
Pebbles	0.053	0.087	0.072	0.060	0.049	0.048	0.053	0.055	0.050	0.056	0.069	0.071	0.060
Tube Mill Lining	0.023	0.015	0.013	0.007	0.013	0.029	0.000	0.000	0.027	0.030	0.031	0.037	0.019
Chilian Steel	0.017	0.026	0.021	0.027	0.020	0.031	0.020	0.000	0.021	0.021	0.032	0.031	0.022
Screens	0.007	0.008	0.007	0.011	0.007	0.005	0.010	0.005	0.006	0.002	0.005	0.003	0.006
Filter Cloth	0.003	0.005	0.003	0.000	0.007	0.000	0.008	0.000	0.006	0.000	0.000	0.005	0.003
Assaying	0.025	0.032	0.016	0.018	0.021	0.020	0.023	0.018	0.016	0.017	0.022	0.020	0.021
General Stores	0.117	0.119	0.131	0.114	0.123	0.111	0.164	0.124	0.133	0.101	0.138	0.102	0.121
Total Supplies	0.942	1.013	0.921	0.972	0.937	1.002	1.072	0.875	0.863	0.900	0.849	0.849	0.933
Labor	0.378	0.393	0.393	0.415	0.413	0.410	0.417	0.389	0.391	0.345	0.360	0.352	0.388
Power	0.304	0.318	0.330	0.345	0.330	0.350	0.336	0.339	0.320	0.320	0.342	0.341	0.331
Total Costs	1.624	1.724	1.644	1.732	1.680	1.762	1.825	1.603	1.571	1.528	1.602	1.542	1.652

CONSOLIDATED MILLING & TRANSPORTATION CO.

ENG. & MIN. JOURNAL

## PHOTOGRAPHS FROM THE FIELD



### MOUNT MORGAN MINE, QUEENSLAND, AUSTRALIA

An open drift on the 850-ft. level is shown in the upper illustration; a square-set stope in the lower. It will be noticed that the ore tends to break fine.

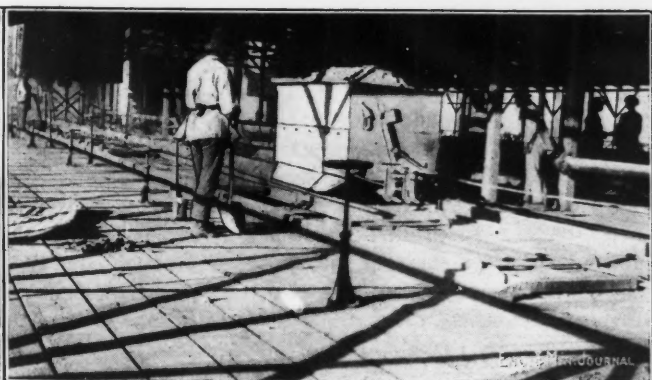




GENERAL VIEW OF NITRATE WORKINGS

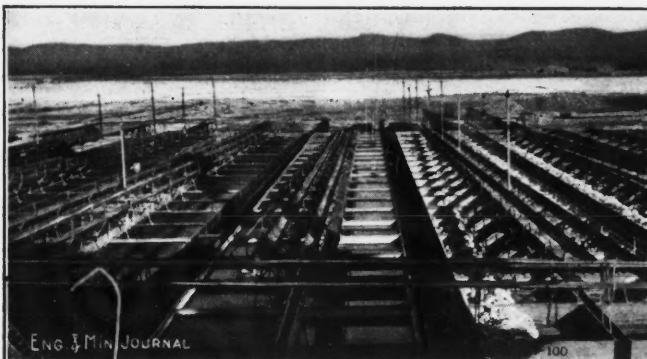
Home-made powder shown on sack in foreground.

"Caliche" ready to be taken to nitrate plant.



GENERAL VIEW OF NITRATE PLANT, CRUSHERS IN FOREGROUND.

A CAR OF "CALICHE" READY TO BE DUMPED INTO THE "CACHUCHOS."



"BATEAS" IN WHICH THE NITRATE CRYSTALLIZES  
Crystallized nitrate shown at right.

NITRATE READY FOR BAGGING AND SHIPMENT  
Nitrate is brought from bateas in steel cars.



THE HARBOR AND CITY OF TALTAL, A TYPICAL NITRATE PORT  
CHILEAN NITRATE INDUSTRY

Photographs furnished by Walter S. Tower, University of Chicago, and published by courtesy of Pan-American Union.

## Operations of Murex Magnetic Co., Ltd.

At the third general meeting of the Murex Magnetic Co., Ltd., held in London, June 19, the chairman, Lionel Holland, gave a résumé of the operations of the company.

First in explaining the necessity for a reorganization of the company, the chairman (*Min. Journ.*, June 21, 1913) enumerates the non-revenue-producing units created. The option over Murex rights at Broken Hill has not been exercised. Further, due to a report by Professor Carlyle that there is no ore suitable for concentration at the Mazapil mines in Mexico, the plant installed there is being dismantled and transferred to fulfill another contract. A plant in the Pyrenees is also idle due to a dispute with mine owners.

Returns from other operations, in the opinion of the chairman, establish and prove the worth of the Murex process in treating sulphides in any gangue.

At the Malines mines, France, two units are successfully handling about 1000 tons per month of blende in a barytes gangue and producing a concentrate assaying 45 to 50% zinc, with an extraction over 90%. A silver-lead ore in a barytes gangue is being treated equally successfully at the Grund mine in the Harz mountains. During 12 months, under the direction of the Minister of Mines of the Prussian Government, an extraction of 80% in form of concentrate assaying 65% lead and 95 oz. silver per ton, has been made treating slimes.

### TREATS OXIDIZED ORES.

Tests at the Whim Well mines in Australia are stated to prove the value of the process for a copper carbonate ore containing no sulphide. An ore composed of copper glance and copper carbonate will be treated at the Avino mines in Mexico. The ore handled at Cordova, Spain, is a chalcopyrite and oxidized copper. Six Murex units are operated at these mines.

Contracts covering Murex rights for Chile and Peru have been consummated and tests are being made by the Bogoslawski company, a Russian company holding extensive deposits. These facts seem to warrant favorable opinions of the future of the company and a reorganization is being effected with a view of raising the necessary working capital.

## Arizona Mineral Production

Figures compiled by V. C. Heikes, of the U. S. Geological Survey, show a notable increase in production of both precious and common metals, especially of copper, in Arizona in 1912.

The production of gold was \$3,762,310, an increase of \$331,807, and the output of silver increased from 3,276,571 fine oz. to 3,490,387 oz. The greater part of the gold production was derived from siliceous ores treated at gold mills, and a large part of the remainder came from copper ores. Mohave County alone supplied \$1,899,131 of the gold production, against \$1,547,663 in 1911. Of the silver output 2,378,593 fine oz. came from copper ores treated at smelters. Cochise County alone produced 1,962,644 oz. in 1912, against 1,946,319 oz. in 1911.

The copper production increased from 306,141,538 lb., in 1911, to 365,638,649 lb. in 1912, and maintained Ari-

zona as the leading copper state of the country. Cochise County, including the great Warren or Bisbee district, produced 147,654,661 lb. in 1912, against 132,290,007 lb. in 1911. Greenlee County, embracing the Copper Mountain and Greenlee districts of the Clifton-Morenei region, produced 76,848,299 lb. in 1912, against 70,926,330 lb. in 1911. Yavapai County, including the Verde district, produced 34,043,005 lb., and Gila County, including the Globe district, yielded 63,969,423 lb. in 1912. In Pinal and Gila counties the low-grade so called "porphyry" ores (which include deposits in schists) produced 76,848,299 lb. in 1912, against 30,666,515 lb. in 1911.

The output of lead, produced mainly in Cochise and Mohave counties, decreased from 10,274,552 lb. in 1911, to 6,806,443 lb. in 1912, but the output of zinc (figured as spelter), mainly from Mohave County, increased from 4,562,984 lb., in 1911, to 8,758,243 lb. in 1912.

There were 444 mines producing gold, silver, copper, lead and zinc in Arizona in 1912, against 397 in 1911; and the total quantity of crude ore sold and treated in 1912 was 6,840,082 short tons, an increase of 2,272,943 tons over the output of 1911.

## June Oil Dividends

Although only one quarterly dividend was paid in June, says the *San Francisco Chronicle*, July 6, 1913, that of the Standard Oil Co. of California, for \$1,125,000, that one was greater by nearly \$315,000 than the total dividend disbursements of the previous month, which included the California Oil Fields, Ltd.'s payment of over \$361,000 made in England. If this last item were excluded from the May list, the Standard's big dividend would equal more than two and a half times the total May dividends. Following is the table of June payments in detail:

	Par Value	Rate	Dividends
Amalgamated.....	\$100.00	1.25	\$62,500
Am. Petroleum pfd.....	100.00	0.50	8,225
Am. Petroleum common.....	100.00	0.334	17,100
Maricopa Queen.....	1.00	0.005	4,960
Claremont.....	1.00	0.01	4,500
Dome-Pinal.....	1.00	0.01	4,000
Home (Coalinga).....	1.00	0.01	10,000
Mount Diablo.....	1.00	0.0075	7,500
Record.....	2.00	0.05	10,000
Rice Ranch.....	1.00	0.05	3,000
S. F. & McKittrick.....	10.00	0.10	5,000
Sauer Dough.....	0.50	0.015	2,993
Section 25.....	1.00	0.50	20,000
Standard Oil of Cal.....	100.00	1.25	1,125,000
State Consol.....	1.00	0.01	5,000
Union.....	100.00	0.60	184,754
Union Prov.....	100.00	0.60	91,403
United Petroleum.....	100.00	0.60	48,451
West Coast pfd.....	100.00	1.50	15,000
Western Union.....	100.00	0.50	5,000
W. K.....	1.00	0.02	10,000
Total California companies.....			\$1,644,416

These are, however, only the dividends of listed companies.

**Mississippi Is Soon to Have Its First Iron Mine** and its first blast furnace. The Memphis Mining & Manufacturing Co., Potts Camp, Miss., is now assembling the materials necessary for the construction of a cold-blast charcoal furnace at Winborn, 2½ miles southeast of the place named, and on the main line of the St. Louis & San Francisco R.R. The furnace is to have a daily capacity of 10 tons. The construction work and the subsequent management of the furnace will be in the hands of J. W. Flannery, of Wisconsin, who has had long experience in the manufacture of cold-blast charcoal iron. The company owns over 16,000 acres of ore and timber land, its ores analyzing 60% in metallic iron, 1.40% manganese and 0.6% phosphorus. An abundance of hardwood timber is on the property and more can be had within a radius of 50 miles, giving a supply of charcoal for many years. The intention of the company is to make a high-grade iron, to be sold exclusively on analysis. A. C. Jones is president of the company; W. S. Allen, vice-president, and Marlon Allen, secretary and treasurer.



## CORRESPONDENCE AND DISCUSSION

### Relationship of the Geological Survey to the Mining Geologist

The following correspondence, between F. L. Ransome, geologist in charge, Section of Metalliferous Deposits, U. S. Geological Survey, and George E. Collins, has been forwarded with the following letter:

Can you give space in the *JOURNAL* to the attached correspondence? As you will note it is an entirely friendly discussion of certain relations between federal geologists and mining men. As an explanation of statements made by Mr. Collins in an address published in part in the *JOURNAL* of May 10, and as the expression of a desire on the part of the Geological Survey to cooperate generously and cordially with all who are interested in the study of ore deposits it should, I think, be presented to the *JOURNAL* readers.

F. L. RANSOME,

Washington, D. C., July 8, 1913.  
Mr. George E. Collins,  
Denver, Colo.

In your paper on "Ore Shoots in Veins" (*ENG. AND MIN. JOURN.*, May 19, 1913, p. 942), the paragraph<sup>1</sup> in which the members of the U. S. Geological Survey are taken to task for ignoring the work of others, naturally attracted my attention. There is certainly no convention "which forbids its members to refer to the observations or acknowledge the assistance of any but their own colleagues" and I am sure that both as an organization and

<sup>1</sup>The paragraph referred to and its preceding paragraph, are as follows: "In an examination of any such deposit, we can merely see what happens to be exposed in drifts, raises, and so forth, at that particular moment. Even of these, only a small proportion, in most mines, is open for examination at any one time; and the openings themselves form only part of the total area. The visiting geologist or engineer therefore sees only a small fraction of the entire deposit, and it is natural enough that in many cases the really significant piece of evidence escapes him. The man who has the best opportunity to study the deposit is he who is familiar with it throughout the entire period when it is being worked; who sees the freshly broken face of each drift, and the developments from day to day in every working place. A relatively less degree of ability so applied may be expected to yield greater results than an occasional brief visit from an eminent scientific authority. The greatest progress in the study of ore deposits may be looked for when these men become conversant with the fundamentals of economic geology; when the mine superintendent and the mine surveyor have been trained in the methods of the field geologist, to observe accurately and to record their observations.

"Even now I do not believe for one moment that the men who do the actual work of underground mining are as unobservant or as incapable as one might suppose, judging from the comparative absence of mention of their observations in the modern literature of ore deposits, and especially in the publications of the United States Geological Survey. I prefer to conjecture that their work has somehow failed to become adequately recognized in the publications; and that many of the luminous observations recorded are really due to the careful study of some unnamed foreman or mine superintendent who conducted the distinguished visitor through the mine. It would almost seem as if there is some convention in the U. S. Geological Survey which forbids its members to refer to the observations or acknowledge the assistance of any but their own colleagues, past or present."

individually the Survey has no intention of slighting any contributor to our knowledge of ore deposits. As the Survey's work in Western mining regions has been placed under my supervision I am naturally much concerned in this matter and earnestly desire that, if the complaint is well founded, all basis for similar protest in the future shall be removed.

Of course, as would be expected in a general address, you do not particularize your charges. The average reader, however, is uncritical in that respect and is all too likely to accept without investigation the statement that the members of a large organization ignore individual workers. I cannot, therefore, believe that you would make charges reflecting so injuriously on the Geological Survey unless you know of some definite instances of failure on the part of its members to give due credit to others. If you will furnish me with specific memoranda, of all the actual cases of such failures as have come to your attention and which you had in mind when writing your paragraph, this information will be sincerely appreciated. As they stand, your charges injure without being helpful. This I am certain is not your intention.

There are some aspects of the relation between superintendents or mine foremen and geologists which I should like to discuss with you but this perhaps had better be deferred until you shall have given me the concrete instances requested.

F. L. RANSOME,

Geologist in charge, Section of Metalliferous Deposits.  
Washington, D. C., May 24, 1913.

Mr. F. L. Ransome,  
Washington, D. C.

I think you misread the extracts given in the *JOURNAL* from my presidential address, if you took them as constituting charges against the Survey.

I have heard many individual complaints and much unfavorable comment on the part of engineers who considered that their published or unpublished studies had met with insufficient acknowledgment; but I fear that those who made them would by no means thank me for giving particulars of such cases. The rôle of "unrecognized genius" is a thankless one, and most men will hesitate before making a formal complaint which would seem to place them in that light.

Nor would I care, myself, to state—or argue the merits of—any individual case. The scientific value of any man's observations, or their novelty, is only a matter of opinion after all. Most of us recognize the superior "weight of metal" carried by many of the Survey men, past and present, and in any individual case are ready to concede the probability that, if credit is denied to an outside observer, it is because less credit is due than was supposed. What makes the case serious, and in my opinion justifies the conclusion which I expressed, is the cumulative value of such complaints. I am ready to concede that in any individual instance they may be unfounded, but the cases are too numerous for all to be

brushed aside. A perusal of the Survey reports gives the impression that three-fourths of the results accruing from investigation into American mining geology are to be credited to the Survey; but it is incredible to me that such a condition should fairly represent the facts of the case.

My statement should, therefore, not be considered as a charge, but as a matured expression of opinion, which will carry more or less weight, according to the degree of confidence with which my readers regard my judgment.

Certainly, to injure the Survey, among which I count several warm friends, is as far from my mind as anything can be. The actual sentence which you quote was "wrote sarkastic," somewhat in the vein of Mr. Dooley's reference to Colonel Roosevelt's "Alone in Cuba"—yet I think that if the Survey men can take it in the spirit in which it was intended, and adopt a more generous attitude toward the men of inferior training who are most closely in touch with ore deposits, the result will be beneficial to both sides.

Perhaps you would be sufficiently interested to read the entire address?

GEORGE E. COLLINS.

Denver, Colo., May 31, 1913.

Mr. George E. Collins,

Denver, Colo.

I am, of course, gratified to learn that you had not intended to bring charges against the Geological Survey and that you were merely contributing your quota to the cumulative value of such complaints as our correspondence relates to. Is not the present instance, therefore, an apt illustration of how slight that value really is, and how rapidly adverse criticism of an organization may grow from the vague impressions it feeds on? Inasmuch as parts of your address have been given wide publicity it might be well, if it meets with your approval, to publish our correspondence in one of the mining journals. It would, I believe, be conducive to a better understanding between geologists of the Survey and mining engineers, and would emphasize what I know to be the earnest desire of the director, of my colleagues, and of myself, to give all due recognition to other workers in economic geology.

Every Survey geologist who studies a mining district is, of course, greatly helped by the intimate knowledge of resident mining men who bring to his attention facts that he would have to spend much time in finding out for himself, although he would undoubtedly discover most of them ultimately. Such guidance is usually acknowledged and is deeply appreciated. The information given, however, must always be critically examined and verified by the geologist himself before it is admitted into his select body of ascertained facts and naturally the local man sometimes feels that his own observations have not been accorded that importance which they seem to him to deserve. Even with the most scrupulous care on the part of the geologist to give credit where it is due, some dissatisfaction now and then is unavoidable in certain quarters where there is only a partial conception of the actual study that a trained geologist devotes to a district under investigation, of the thought that goes into the preparation of a good monographic report, or of the difficulties involved in arranging and drawing conclusions

from a voluminous mass of observations. While there may be cases in which Survey men have not adequately recognized previous workers, I believe that such instances are not numerous and I hope that they will be extremely rare in the future.

F. L. RANSOME,

Washington, D. C., June 6, 1913.

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## Extinguishing Fires with Sawdust

Referring to the article "Extinguishing Fires with Sawdust," in the JOURNAL of June 7, I believe a note of caution should be sounded. In the use of sawdust for the purpose mentioned, of extinguishing fires in lacquer, wood alcohol, benzine or gasoline, the statement is made that "sawdust itself is not very easily ignited, and when it does become ignited, burns without flame. . . . The character of the sawdust, whether from soft wood or hard wood, appears of little or no importance. The amount of moisture contained in the sawdust is apparently not a factor. The dry sawdust . . . was evidently as efficient as the untreated sawdust."

A few years ago a manufacturer who was using wood of various kinds, became suspicious as to the inflammability of the fine dust which gathered about the shop. He submitted samples of this dust to the Bureau of Mines for tests of its inflammability or explosibility. These tests were made, and it was found that this fine, dry wood dust not only gave higher pressures per unit than the standard Pittsburgh coal dust, but that the inflammation accompanied by pressures, started at a much lower temperature of the igniting coil. Three kinds of dust were tested, pine, oak and mahogany; these are mentioned in the order of their inflammability or explosibility, the mahogany dust giving the highest pressures. While in many cases, and undoubtedly in the tests cited in the article herein mentioned, the sawdust was coarse, there may be times when fine wood dust collects, and if this were thrown on a flame when dry, it is entirely conceivable that a rapid inflammation, or low order of explosion might result. In general, it would seem far safer to treat the sawdust with sodium bicarbonate, as suggested, which, as the author states, would further decrease danger of fire from the sawdust itself.

GEORGE S. RICE.

Chief Mining Engineer, Bureau of Mines.

Pittsburgh, Penn., June 19, 1913.

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## Principles and Methods of Ore Testing

Important as the subject of ore testing is, it is too much to expect exhaustive treatment in a short article. I would, however, call attention to one point which, as presented by Mr. Laucks, in the JOURNAL of July 12, 1913, might be misleading. While it is undoubtedly correct to determine the point of finest grinding at which leaching is practicable, it should be remembered that economy is promoted by determining the coarsest grinding compatible with satisfactory extraction. That point should be determined.

HENRY A. MARVIN.

Yonkers, N. Y., July 14, 1913.



## EDITORIALS

### Copper Statistics, Prices, Etc.

The refiners' statistics for June did not throw any great new light upon the situation. The immediately available stock of copper in Europe and America has dwindled to what is, relatively speaking, a small figure indeed, but buyers have continued to be conspicuous by their absence. In this respect the copper market is at present much like the stock market, but there is the difference that nobody has to buy stocks unless he wants to, while manufacturers must buy copper if they are going to continue in business. Their abstention from the market for so long indicates that at the time of the last buying movement they contracted for more than was commonly supposed. In view of the present situation in finance and commerce they are obviously now going to put off buying until the last possible moment, considering that every day of delay works in their favor. So far this theory has been good, copper being purchasable today at materially less than a week ago.

Of course the recent weeks of dullness have not been devoid of business. On the contrary there has been a lot of hand-to-mouth buying all the time by consumers who have supplied themselves from what are contemptuously called "second hands." In fact these "second hands" comprise agencies, producers, dealers, and brokers. The accurate definition of "second hands" is "everybody except the Amalgamated, Guggenheims, and Calumet & Hecla." It is thought that some of them, even, do not hesitate to put copper into the hands of dealers upon occasions.

The public through the newspapers, Wall Street tickers, etc., is treated habitually to a lot of misinformation about the copper market. Thus, the papers reported last week a cut in copper prices and gravely commented that the stock market manifested indifference. Such indifference was but natural, inasmuch as the conditions whereof the reporters had just learned had in fact transpired at least a week previous.

The actual situation was that the Amalgamated and Guggenheims had been for some weeks maintaining an asked price of 15c., i. e., they would have liked to sell at that price and would therefor have delivered the copper in Europe or Connecticut and would have allowed certain times, discounts, etc. There were no buyers at that price and what the askers would have accepted if anybody had come forward with overtures to trade can't of course be told, that being something that did not happen. In the meanwhile prices were crumbling from day to day on the transactions of "second hands," whom we have previously defined. After awhile the two big agencies began to invite business, abandoning their "asked" price and intimating that they would consider trading. In other words they came down to the market price previously established by those who were willing to trade. There was no cut in price, inasmuch as the market had been slowly crumbling for many weeks previous,

and there was no change in the policy of the two agencies at the time reported inasmuch as they had been seeking business, one of them at least, as early as July 2.

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### The Sense of Proportion

The world has been experiencing a great financial strain, there's no doubt about that, but the pessimists who can't see anything but halting business for years to come lose sight of the world's wonderful power of recuperation. War is waste, but probably the cost of all the gunpowder, etc., that has been spent in the Balkans and the cost of feeding and clothing the people while they are getting ready to work again is not very much more than that of a Grand Central railway station. Senator McCumber has just been telling his fellow statesmen, especially the Democrats, that if the American people would cut in half their liquor bill, their tobacco bill, their candy bill and some other frivolous, though popular expenditures, they would save a couple of billions or so per year and there would be no need to try to reduce the cost of living by reducing the tariff, incidentally reducing and ruining the North Dakota farmers.

Besides the economies which Senator McCumber has so ingenuously pointed out to us, we know from the conservationists about the billions that the nation could save by cutting down the fire loss, the rat loss, the health loss and many others. But in spite of all the frivolities, extravagances, wastes, etc., here comes the Commissioner of Internal Revenue telling us that the corporations of the United States earned \$3,304,000,000 above expenses in 1912, surpassing all previous records by \$400,000,000, and he knows because he has collected the taxes upon it. There were about 310,000 corporations in 1912, which was an increase of about 7% over 1911 and they made their increased earnings in spite of the increased wage scales, which by the way have been one of the grounds of the recent pessimism. The financial skies are not clear, we'll admit, but there ought to be some attention to the proofs coming repeatedly from the statisticians that the world and the United States are still doing business.

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### Exploration Company Experiences

The exploration department of the United States Smelting, Refining & Mining Co., under Sidney J. Jennings, is an active organization. Its record during the last three years has been as follows:

Year	A	B	C	D
1910	684	124	46	2
1911	921	144	28	1
1912	694	121	36	4

Column A gives the number of mines offered to it, B the number deemed worthy of a preliminary examination and C the number of which detailed examination, i. e., measurement and sampling of the orebodies, was made. Column D gives the number of purchases. These figures show: (1) That there are many mines in North America

that are for sale; and (2) that there are not many good ones. However, the ratio of good mines is not precisely determined by the formula  $D:A$ , or even  $C:A$ . Many of the mines in column  $C$  were, no doubt, good mines, but the seller and buyer could not come to terms. The Canadian Mining & Exploration Co. in 1912 had 428 offers and made no purchases, but that company being new in the business was, no doubt, tendered all the mines on the market that previously had been rejected by everybody else.

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### New Construction in Chile

There has been a good deal of talk about the contracts for the plant of the Chile Copper Co. going to German manufacturers rather than to American. The stories are only partly true, inasmuch as the German contracts cover only the electrical and power plants, which is, however, a big item, amounting to about \$3,000,000. The Siemens people, who have had special experience in South American construction, were able to underbid everybody else. The remainder of the contracts, which will comprise wire, tracks, railway material, steam shovels, crushing machinery and hundreds of odds and ends, will probably be placed in the United States. Construction work is going right ahead. The company has about completed its railway connection and is about ready to fetch in its mining and milling material.

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### Goldfield Consolidated Cost Curves

Accurate records of cost are kept by many large companies but they are not usually available for publication. When they are, their extreme value makes their publication an event of importance. We are indebted to J. W. Hutchinson, superintendent, for the interesting cost curves of the Goldfield Consolidated mill which appear in this issue. Beside being accurate, they are in convenient form for ready reference and will be doubly appreciated for their extreme clarity. No explanation of them is necessary. Operating engineers are fortunate in being able to get this important information. A similar set of curves referring to the cost of treating concentrate at the same mill will be published in our issue of July 26, 1913.

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### The Shale Oil Industry

The Scotch shale oil industry is an example of a small business which has managed to survive in the face of what appears to be overwhelming competition. The business of distilling oil from the Scotch shale was hardly started when discoveries of petroleum in the United States and elsewhere brought into the market supplies of cheap oil of apparently unlimited extent. The Scotchmen stuck to their business, however, and have kept it going to this day with varying fortunes but generally with success, mainly because of their close attention to details and careful saving of byproducts. After two lean years, 1912-13 has proved a fortunate one, and the four companies into which the smaller producers were gradually consolidated, paid dividends ranging from 15 to 35%. The gain was due to the

better prices of oil, and an increased demand for tar and sulphate of ammonia.

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When the coinage of silver rupees in India was stopped and arrangements for a gold standard completed, no one supposed that in the precious metals absorbed by that country gold would displace silver to so great an extent as has proved to be the case. Statistics recently published in London show that in the 10 fiscal years 1885-1895 the net imports of gold into India were \$54,220,500; in the next 10-year period, 1895-1905, the amount had increased to \$189,504,500; while in the five-year term the net imports were \$195,722,500, or more than in the ten years previous. That the demand for gold is still increasing is shown by the fact that the net imports for 1911-1912 were \$79,919,000. Thus India took over one-sixth of the world's total production of gold; and as, with gold as with silver, the metal thus taken is not returned but absorbed, the practical disappearance of 15 or 20% of the world's gold production is rather a serious question.

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The zinc smelters have so reduced their operations, putting furnaces out of commission because they were unprofitable or to take advantage of the unfavorable situation to make needed repairs, that the present production of spelter must be at a much less rate than a few months ago. Consequently when the largest consumer recently manifested a willingness to buy some spelter there was a prompt rally in the price. It does not seem likely, however, that there can be any strong appreciation in the market so long as it is likely that the duty will be reduced to 10 to 15% *ad valorem* in the course of a few months and so long as there is a large accumulation of unsold spelter in Europe. This accumulation seems to be growing rather than diminishing, and until its absorption is well under way it will be a menace to the markets, both European and American.

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The *Evening Post* points out that financial conditions in Europe are improving and says:

The "midsummer settlements," for which all kinds of complications were predicted, have passed off so uneventfully that Lombard Street and the Continent hardly knew they were in progress. With this achieved, comes a whiff of reviving confidence; Berlin stops its urgent bid for gold, and other countries begin to remit to London. The importance of all this lies in the inference which people will draw regarding predictions of severe money stringency in the autumn. It cannot be too often pointed out that it was in Europe where the present troubles began; that Europe was hit hardest by them, and that it is Europe, therefore, where the first distinct rift in the clouds overhanging the whole world's financial horizon should be seen.

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A distinguished mining engineer, who is now engaged on some professional work in a famous old camp west of the Rocky Mountains, said in a recent letter, "I am having a lot of interesting work this summer. There are remarkable developments in this camp. I should like to see a lot of these Western camps and study the developments. As I get older, I am surprised to see how much bigger the really strong mineralizations are than anybody supposed them to be 10 years ago. 'Ore in sight' seems like a trifling measure to take of a big mining property."



BY THE WAY

The United States Mints in the fiscal year ended June 30, 1913, turned out 186,626,871 coins, a pretty good year's work. The face value of these coins was \$37,496,530, but this amount was rather unevenly distributed, \$30,058,228 being in gold coins, \$3,448,200 in silver and \$3,940,102 in copper and nickel. In number, however, the copper coins had even more preponderance than the gold coins had in value, since there were 170,068,761 of them, against only 4,221,400 of the gold pieces.



The greatest difficulty encountered in attempting to decrease accidents in mining is the inborn carelessness of the miner himself. We note a case in point from the Spokane Spokesman Review, which reports an accident occurring May 23 to J. R. Jones, a miner at the Morning mine in the Cœur d'Alenes, who had his skull crushed apparently by a rush of waste from a bin in his charge. He was alone at the time, so that the exact nature of the accident is indeterminable. The habit of miners, however, of poking their heads and shoulders inside of chute mouths to see what makes the ore hang up is so general as to make it a safe guess that such was the cause of Jones' death. To eliminate carelessness like this is a long and difficult process, and can be accomplished only by the creation of an entirely different viewpoint among the body of miners. Legislation can stimulate the creation of this new point of view, and employers' liability laws in particular will encourage companies to educate their men along safety lines.



A dispatch from Oroville states that the honor of producing the earliest ripe peaches in California has been accorded to James H. Leggett, who on May 27 consigned a box of perfectly ripened fruit to the East. The peaches were grown on leveled dredge tailings and were reported to be large and luscious examples of this fruit. Last year the earliest Tokay grapes in California were produced by Mr. Leggett. His orchards on dredged land have attracted widespread attention among horticulturists because there is apparently no soil in the cobbles now superimposed on the fine gravel. When the trees are planted, a shallow place is excavated in the rock tailing and filled with good soil; the young trees are then planted with the usual ball of earth around the roots. Frequent irrigation is required until the roots penetrate the moist zone of gravel and sand underlying the cobbles. Grapevines, orange, fig, peach, almonds and eucalyptus trees have been transplanted and grown by Mr. Leggett on the old tailings left by the gold dredges. The early ripening of the fruit is ascribed by him to the fact that the rocks retain the sun's heat longer than does the usual soil.



The Civil Service Commission announces an examination for editorial clerk, men only, Aug. 6 and 7, 1913, to fill a vacancy in the Geological Survey, Washington, D. C., at a salary ranging from \$1500 to \$1800 per year. The appointee to this position should have such a knowledge of English, printing, and bookmaking, elementary geology, and geologic nomenclature as will fit

him to criticize and correct the manuscripts of the Survey's report; to prepare them for printing; to carry along the proofreading, and to prepare satisfactory indexes to the reports. The subjects will have the weights indicated: (1) English (correction of expression), 40; (2) French and German footnotes (translation into English), 10; (3) Proofreading and indexing, 30; (4) Elementary geology and geologic nomenclature, 20. Applicants must have reached their twentieth but not their fortieth birthday on the date of the examination. Persons who desire this examination should at once apply to the United States Civil Service Commission, Washington, D. C., for application Form 304 for editorial clerk, No. 752.



The Furukawa Mining Co., operating the famous Ashio copper mines in Japan, of which M. Otagawa, who is well known among metallurgists of the United States,

THE MINERS' FRIEND.

銅 足 山 尾 鑛 夫 之 友

第一號 大正二年五月十五日

● 發刊の辭

本誌は毎月一回、鑛夫之友と題して發行する。此の發行は、鑛夫の福利を謀るに當り、鑛夫の生活の改善を期すに在り。鑛夫の生活は、極めて苦勞に充ち、且つ健康を損なふものなるを以て、鑛夫の福利を謀るに當り、鑛夫の生活の改善を期すに在り。鑛夫の生活は、極めて苦勞に充ち、且つ健康を損なふものなるを以て、鑛夫の福利を謀るに當り、鑛夫の生活の改善を期すに在り。

● 鑛夫の福利

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● 鑛夫の生活

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where he resided for several years, is general manager, has just inaugurated the publication of a monthly paper, The Miners' Friend, with a view of promoting the interests of the Ashio miners. We give herewith an illustration (half-size) of the first page of the first number. The edition is to be 6000 to 7000, in order that the paper may be freely given to the miners of the company. The first number contains these departments: Miners' Ethics; Rules and Regulations of the Ashio Mines; Maxims and Mottoes; Biographies of Self-Made Men; Current News of the Mines; Lest We Forget; Hygienic and Sanitary Topics; Literary Column. Mr. Otagawa has asked us if there be any such publication among our American mines. We do not know of any such and consider our Japanese friends to be more enterprising in this respect than we are. If we are mistaken, we hope our readers will inform us.

## PERSONALS

F. D. Burt has left San Francisco for Seward, Alaska.  
 F. C. Alsdorf is visiting the Cobalt district in Ontario.  
 J. Parke Channing is expected home about the end of July.  
 C. T. Brown has returned to Socorro, N. M., from an extended trip in the field.  
 Homer L. Carr is in the Dominican Republic on an examination of alluvial gold deposits.  
 J. R. Finlay is in Utah on professional business. He expects to return to New York about the end of July.  
 Prof. Fayette A. Jones, of Albuquerque, N. M., was, on July 15, elected president of the New Mexico State School of Mines.  
 Wilber Judson has returned from the Southwestern States and from the west coast of Mexico, and is in Lansing, Michigan.

Robert Linton has been in New York for a few days. His business address in New York henceforth will be 25 Broad Street.

H. Foster Bain left San Francisco last week for Denver and the East. He will attend the International Geological Congress in August.

J. B. Tyrrell, of Toronto, Ont., is making a short visit to the Hurriganaw district in Northern Quebec to investigate some recent gold discoveries.

Thos. A. Varden, of Butte, and Wm. Orem, state mining inspector, of Helena, visited the Corbin Copper Co.'s property at Rochester, Mont., recently.

J. A. Holmes, director of the Bureau of Mines, sailed from Seattle last week with a party of engineers, on his way to examine the Matanuska coalfields in Alaska.

W. N. Sawyer and G. H. Hulett, president and vice-president of the Wellman-Seaver-Morgan Co., Cleveland, Ohio, have gone to Panama on a short business trip.

Professor S. B. Christy has been visiting the mines of Porcupine, Cobalt and Sudbury. He will spend the remainder of his vacation in visiting other mining districts.

H. V. Winchell has gone to Utah and Nevada on professional business, which he expects to complete in time to attend the Geological Congress in Canada in August.

John O. O'Keefe, superintendent for some years of the Sharon works of the American Steel & Wire Co., has retired on a pension, and has been succeeded by August Mann, formerly of the Anderson works.

Peter Eyermann, engineer of construction of the Witkowitz Steel Works, Witkowitz, Austria, which is extending its works, is in the United States for a four weeks' trip, including various steel work centers.

W. Weston, of Denver, Colo., who for seven years was mining engineer at the head of the industrial department of the Moffat road has been retained as consulting engineer by a Belgian party visiting the coalfields of northwestern Colorado with the object of purchase and development.

President James A. Farrell, of the United States Steel Corporation, is making a tour of the Mesabi range mines of the corporation, visiting also the new steel plant at Duluth. In the party are President James A. Hatfield, of the American Bridge Co., of New York, and J. Robertson Dunn, Liverpool, England.

Recently officials of the Jones & Laughlin Steel Co., Pittsburgh, inspected its ore properties on the Mesabi range. The party included B. F. Jones, president; Henry M. Laughlin, vice-president; W. L. Jones, general manager, and D. M. Philbin and E. F. Bradt, the latter two having charge of the properties.

John Howard Evans, who has been with the Peirce-Smith Converter Co. since its inception, returned recently from Norway, and after visiting the principal copper-smelting works of this county will sail from San Francisco on July 29 for Australia, where he has accepted an engagement with Great Cobar, Ltd., for two years.

Ralph R. Sweetser, who has been superintendent of the Columbus Iron & Steel Co., Columbus, Ohio, since 1907, was elected president and general manager of the Thomas Iron Co., Hokendauqua, Penn., July 3, succeeding B. F. Fackenthal, Jr., resigned. Mr. Sweetser was graduated from the Massachusetts Institute of Technology in 1892, and has had wide experience in blast-furnace work, starting at Everett furnace in 1897 as assistant superintendent.

## OBITUARY

Henry C. Mount, an oil operator from Mexico, was fatally hurt in New York, July 11, by some unknown companions with whom he had quarreled.

Frederick W. Gordon died at his residence, Fort Washington, Penn., July 11. He was a mining engineer and metallurgist of standing in Philadelphia.

Arthur B. Canfield, who was largely interested in oil operations in California, was killed July 2 in a collision between his automobile and an electric car.

Robert Mannesmann, a large iron operator in Germany and an inventor of several well known machines, died July 10 in Morocco, while on a visit to mines owned by him in that country.

Henry Burton, of Montclair, N. J., a young engineer, who was employed in building a dam in the Conchas River in Mexico, was killed July 10 at Santa Rosalia, in an encounter with rebel soldiers.

Gen. E. Burd Grubb, who died at Newark, N. J., July 7, aged 62 years, had been actively identified with the control and development of the Cornwall ore banks in Lancaster County, Penn., which at one time were owned exclusively by his family. His great grandfather, Col. Peter Grubb, owned the Cornwall ore banks, the title to which was received direct from William Penn. Gen. Grubb's father, Edward Burd Grubb, who was a native of Lancaster, Penn., succeeded to these iron properties and became an extensive miner of iron ores and a manufacturer of pig iron. He died in 1867, at Burlington, N. J., where he had resided many years. Upon the death of his father, Gen. Grubb assumed the management of the family iron interests in Dauphin, Lancaster and Lebanon counties. He lost his fortune in 1885, but two years later a brother died and left him considerable property, with which he resumed his activities in the iron business. Later the iron firm of Kauffman & Co., of which he was a member, failed. Gen. Grubb, personally, assumed the obligations of the firm and pledged his property to that purpose. After several years of trying struggle, he was successful and, to a considerable extent he rehabilitated his personal fortune. At one time, he was president of and operated the blast furnace of the Lebanon Valley Furnace Co., at Lebanon. Title to most of the Cornwall ore banks is now held by the Pennsylvania Steel Co. and by several other iron and steel manufacturers. Gen. Grubb served in the Civil war and was brevetted brigadier-general for his record before Petersburg. He was an unsuccessful candidate for governor of New Jersey in 1889. He served as minister to Spain in President Harrison's administration.

## INDUSTRIAL NEWS

The H. W. Johns-Manville Co., of New York, has recently opened a branch office at Charlotte, N. C. The new office, which is located in the Commercial Bank Building, is in charge of E. U. Heslop, who is assisted in covering the western section of North Carolina by P. J. McCusker and Paul W. Whitlock.

The Inspiration Copper Co. has purchased two double-drum hoists from the Nordberg Mfg. Co., of Milwaukee, Wis. Each hoist is designed to lift the following load: Ore, 24,000 lb.; skip, 12,000 lb.; rope, 1½ in. This load is to be lifted in balance from the present working depth of 650 ft., at a hoisting speed of 750 ft. per min. Each hoist will have two drums, 10 ft. in diameter by 65-in. face, grooved for 1000 ft. of 1½-in. rope. One drum will be keyed to the shaft, the other equipped with the Nordberg axial clutch. Both drums will be equipped with Nordberg post brakes with parallel-motion supports. Clutch and brakes will be actuated by Nordberg air-operated thrust cylinders with oil-cataract cylinders and the Nordberg floating-lever mechanism, for flexibility of control and positive locking of brakes for any position of the operating lever. The normal hoisting rate will be 30 trips per hr. or 5000 tons of ore in 14 hr. for one hoist. The hoists will be driven through Wuest herringbone gears by G. E. direct-current motors operated by an Ilgner motor-generator set.



## EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—July 9

**Dredging Land in Yuba River Basin** is being contested in the Superior Court of Yuba County, in the title suit of the Yuba Investment Co. against the Yuba Consolidated Goldfields. The land is situated near the town of Hammonton. It was conveyed to the United States Government by James O'Brien Sr., of Smartsville, in 1901, for the sole purpose of constructing thereon a settling basin for the debris of Yuba River. The plans of the Government were not successfully carried out. It was found that the proposed settling basin would prove a menace instead of a benefit to the farms along the river. The Government in 1911 surrendered its right to use the land for the purpose set forth in the agreement. Mr. O'Brien then made claim that the land reverted to him, but the Secretary of War decided adversely and the land was sold at auction to the Yuba Consolidated. In April, 1912, O'Brien made a conveyance of title to the land to the Yuba Investment Co., a corporation organized to carry on the suit now being tried. After the Government had sold the land to the Yuba Consolidated, that company and the Marysville Gold Dredging Co. entered into a contract with the Government to build retaining walls for straightening the channel and preventing the flood waters from overflowing adjacent farms and other lands. These retaining walls were constructed of tailing from dredges operated by these two companies. Some of the land in the present contest is valuable for dredging; a portion of it may be reclaimed for agricultural purposes. The case is set for hearing Sept. 30.

**Two Dredges Are Out of Commission** in the Natomas Consolidated field. No. 5 was sunk, June 8, in about 50 ft. of water, when a hole was punched in the starboard side of the hull between the center and the stern. The boat turned over, starboard side down and was practically under water within 10 min. from the time it began listing. The water has been taken out of the pond and it is expected that the boat can be righted and repaired so that it can be used to finish dredging its present territory. This boat was built for the Folsom Development Co. and began operation in December, 1905. It is equipped with 9-cu.ft. Bucyrus type buckets and Bucyrus machinery. It was built to dig 44 ft. below the water line, but the general depth of digging has been from 50 to 60 ft. No. 6 dredge is on the drydock for repairs to the hull and for general overhauling. The boat will be ready for flotation some time in July. The hull is practically being rebuilt. This was the last dredge put in operation by the Folsom Development Co. and went into commission in March, 1908. This dredge and others built for the same company were taken over by the Natomas Consolidated of California when that corporation was organized. This is also a 9-cu.ft. Bucyrus-type dredge rated to dig about 40 ft. below the water line and has been digging a maximum of about 60 ft. The driving machinery and operating parts are in good repair and with a new hull and the necessary overhauling now in progress it is likely that No. 6 dredge will be in operation for another five or six years. The necessity for reconstruction and repairs on these two dredges will strengthen the demand for steel hulls; but in these two instances the requirements of the dredges in the territory they are now working would not warrant the expense.

### DENVER—July 12

**From the Platoro District** another important strike is reported on the Alamosa river about two miles above Stunner. It was made by Lewis and Zangmeister who are said to have discovered a quartz vein 30 ft. in width.

**The New Taxation Law** divides mining property into two classes, producing and non-producing. A producing claim is defined as one which has a gross production of \$5000 or more for the calendar year. A non-producing claim is one that produces less than \$5000 yearly. The assessed value of a producing claim for the year is fixed at 50% of the gross output, plus all the net output. The gross output is defined as the total mill or smelting return, not allowing any deduction for costs of treatment, transportation or operation. A non-producing claim cannot be assessed at more than the least producing claim in the same neighborhood.

**In the La Plata District** the two richest mines, the May-

day and Idaho, are maintaining normal production and the latter is credited with producing daily ore worth \$1000. The orebody is 8 ft. wide and is of smelting grade; the shoot has been developed for a length of 80 ft. The Eagle Pass mine, on Lewis Mountain, is to install complete mining equipment. The Bonnie Nell is to resume operations, as a fine shoot of ore said to assay \$50 per ton has been opened. The Columbus crosscut is being driven ahead; a new compressor and Waugh drill being used. It is expected that the old workings will be reached at a depth of 400 to 500 ft. by autumn. It is claimed that in these workings, which have been under water for years, 60,000 tons of ore is blocked out.

**In the San Juan Region** the construction of the big mill of the Junta Consolidated company, near Telluride, is well under way and part of the machinery purchased in Denver is on the way in. When completed the mill will have a capacity of 300 tons per day. It is thought that by Nov. 1 crushing will be begun. In the Morning Star group at Mount Wilson, an air line is being put in so that machine drills may be used in development work. The Bagley tunnel at Animas Forks, near Silverton, which is operated by the Frisco Tunnel company has continued shipping at the rate of one carload per day since June 1. The tunnel is nearly one mile long and cuts several veins at depths of 900 to 1500 ft. below the surface. The ore is being mined in the Morgan vein, the Red Cloud, and the Dakota. It is lead-zinc sulphide carrying silver and gold to the value of \$10 per ton; the ore concentrates four into one. Four carloads of a trial ore shipment have been made from the Allerton mine, at Silverton, and the president and other officers of the company are in Silverton inspecting the recent strike of ore in the lower workings.

### BUTTE—July 12

**A Rival to the Yogo Sapphire Mines** may be developed in the Dry Cottonwood Gulch district in Deer Lodge County, between Warm Springs and Philipsburg. Several years ago two gold dredges were operated in the gulch, but they proved unprofitable and were abandoned. Later D. A. Jacobi and Charles B. Bennett, of Philipsburg, discovered that the ground contained sapphires. They repaired the dredges some months ago and are operating them in recovering the gems from the gravel.

**A Gold Nugget Was Discovered** recently while drilling a well on the premises of Frederick Feilke, on the outskirts of Twin Bridges. A good-sized nugget and several smaller particles of gold were found at a depth of 60 ft. Several layers of gravel had been passed through and the one in which the gold was found is believed to lie close to bedrock. Having occasion to pull the drill from a depth of 60 ft., the driller found the gold lodged in the valve. The find caused considerable local excitement and it is probable that further tests will be made to determine the extent of the deposit. It is looked upon as not improbable that gold may be found in paying quantities, as it is believed that the entire lowland, from the Big Hole River to the rim of the east bench, is an ancient river bed.

### SALT LAKE CITY—July 12

**Measures for Improving Sanitary Conditions in Bingham Cañon** were considered by the county commissioners July 9. The cañon and town, as is well known, are woefully lacking in this respect, and a sewage system to cover the territory from Highland Boy to a point below the town is being considered. Arrangements were recently made for garbage wagons to handle the garbage and keep the streets clean, which has improved things to some extent. Dr. T. B. Beatty, of the state board of health, has taken up the matter with the Salt Lake county commissioners, and a visit of inspection will be made.

**Park City Ore Shipments for the First Six Months of the Year** amounted to 41,095 tons of crude ore and concentrates. This is approximately normal, the usual output of the camp

varying from 80,000 to 110,000 tons a year. During the second half of the year, road and hauling conditions are much better, and the tonnage sent to market will undoubtedly be increased. The Silver King Coalition, Daly West, Daly-Judge, Ontario Co. and lessees, American Flag, Silver King Consolidated, Thompson-Quincy, and small zinc plants, treating tailings below the town, are the principal shippers. The monthly production ranges between 6000 and 8000 tons.

#### HOUGHTON, MICH.—July 9

**A Referendum Vote of the Western Federation of Miners** in the Lake Superior district, indicates a large majority in favor of demands which embody shorter hours and a minimum wage of \$3 per day. Union officials will undertake to arrange a conference with representatives of mining companies some time next week.

**Reduction in Ahmeek Dividend Rate** is not surprising. Ahmeek has ahead considerable construction work, mostly at the stamp mill where plans now are being put into execution for additional stamps, and this work is expensive. At the same time there is a general belief that the reduction likewise reflects Calumet & Hecla opinion that the metal price for the future output is not likely to be as close to 17c. per pound as to 15c. At the mine, preparations for additional production are working out satisfactorily. The two additional shafts at the North Ahmeek are being sunk rapidly and the surface equipment for handling this heavy addition to the rock tonnage is getting into shape. In fact the mine will be ready to supply the larger rock tonnage before the mill is ready to handle it, to judge from the situation at present. The two North Ahmeek shafts continue to open good-looking average Kearsarge lode rock, by no means as rich as the general run of the Ahmeek shafts, Nos. 1 and 2, but quite the equal of the general run of this lode as opened at various properties on the Calumet range. Sinking and drifting continue in average rock. To date the Ahmeek has been a marvellous dividend producer, considering its size and the capitalization. In the two shafts from which the main rock tonnage comes there is undoubtedly the richest streak on the Kearsarge lode, even better than the rich zone which the Wolverine opened, and the management has made the most of an excellent opportunity for demonstrating practical results and low costs. It must be remembered, however, that while the North Ahmeek shafts will be in shape, in another year, to double the output of the Ahmeek company as a whole, the shareholders must not anticipate a doubled copper production; for the general run of the North Ahmeek rock is more like that of the Mohawk than the Wolverine and certainly not up to the grade of the rock produced at the main Ahmeek shafts. The Ahmeek record is unprecedented in the history of copper mining. For years the property remained idle. Even after the Stantons went down into that then discredited section and opened the Mohawk shafts on some of the old Fulton territory from which Ernst Bollman had cut off the timber, it was impossible to interest the Hyams-Bigelow syndicate in the possibilities of this Ahmeek tract. It is true they maintained a corporate organization and kept things shipshape, but their little preliminary exploration work done some years before had been unsatisfactory and they had no idea of spending any more money on question marks. This preliminary exploration consisted of sinking two shafts on the Kearsarge conglomerate. Commercial copper was not found. In 1902, operations were resumed on the ground that "there is no reason why the Ahmeek should not bear the same relation to the Mohawk as the Tamarack does to the Calumet & Hecla." That possible relationship hoped for 10 years ago has been found to exist, excepting that the order is reversed and now the hope and expectation of the Mohawk is that the shafts to the south will open the same rich ground that the North Ahmeek shafts have. In 1902 the shaft was sunk to cut the Kearsarge amygdaloid. From the first the work was successful. Practically from the grass roots, or the bed of the swamp, to be correct in reference to the commencement of this work, this shaft opened commercial copper. When the first trial shipment was sent to the Tamarack mill it was so rich in copper that they doubted the correctness of the figures. From that time on the Ahmeek has paid its own way, without increasing its capital, without borrowing funds, without selling bonds, without calling further assessments, and to date it has paid nearly \$2,000,000 in dividends in two years. The best opinion is that the Ahmeek's future is bright. Of course there are few who expect to see the general average of refined copper remain at 25 lb. per ton. That would be out of all reason, for the history of the Lake Superior district would indicate that the main shafts will show a falling off in the copper returned as depth is reached. It would be unreasonable to expect the new shafts to maintain anything like that figure.

#### MARQUETTE—July 2

**The Jones Step Process** was the invention of John T. Jones, a metallurgist of Iron Mountain, who for several years has been experimenting with a process of treating low-grade iron ores; he has transferred his activities to the Cuyuna range. It is reported that the inventor and his associates have become interested in several properties and that the step-process furnace erected at Republic, on the Marquette range, will be removed to the new Minnesota field and given an exhaustive test there. Mr. Jones is quoted as declaring that the treatment of Cuyuna ore is a simple proposition.

#### PHOENIX—July 12

**The State Tax Commission** has completed a tabulation of the returns made by the various producing mining companies of the state for taxation purposes for the year 1913. The total valuation for the state is \$113,713,154, which does not include the nonproductive, patented mines, improvements on mining claims, smelting or reduction works. Although the exact figures have not been secured as yet, it has been estimated that the total valuations, including the exceptions noted, will amount to \$140,000,000. The Copper Queen Consolidated Mining Co., of Cochise County, makes the largest return. In its group "A" mines the valuation is \$28,505,865. To this figure should be added the value of the group "B" Copper Queen property which was returned at \$23,508, making a total of \$28,529,373 for the Copper Queen properties. By counties the total mining wealth of the producing mines of the state is as follows: Cochise, \$51,275,224; Gila, \$14,734,073; Greenlee, \$21,192,723; Maricopa, \$22,467; Mohave, \$4,067,930; Pima, \$224,104; Pinal, \$8,478,010; Santa Cruz, \$194,079; Yavapai, \$13,524,544.

#### SPOKANE—July 12

**Construction and Development at Granby Bay Is Progressing Rapidly**, and on July 1 there were 1125 men on the payrolls. Equipment for the machine shops is being placed. The brick plant is ready for the machinery, which is arriving, and the ground has been stripped and the railway sidings laid, so that it will be ready to begin making brick soon. The steel for the furnaces and converter rooms is on the ground, except the roof trusses, which were too long to be handled by the boats plying between Vancouver and Granby bay, necessitating the purchase of a vessel to deliver them. This is being loaded now and will be towed to the site in a few days. Delay in delivery of this material has retarded operations a little, but it is planned to have everything ready to operate by Jan. 1, 1914. The hotel, a 40-room structure, modern in every respect, is completed and will be occupied July 15, and the hospital, which is up to date in every particular, is under construction. The infirmary will have six private wards and one large ward, together with operating and dressing rooms, culinary and storage departments, and will provide every facility for caring for the sick and injured. The recreation hall, to be erected and maintained by the company for its employees has in the basement, bowling alleys, a gymnasium and plunge and shower baths, on the second floor billiard and card rooms and a library, on the third floor quarters for attendants and hotel employees. A modern town is being built at Granby Bay; the streets have been graded, sidewalks laid, electric lights and a telephone system installed, and a sewage system, for the greater part of the town, is nearly completed. There are 100 dwellings built for use of married employees at a nominal rent, containing two to six rooms each, with bath, lavatory, hot and cold water and electric lights. The company store, housed in a three-story building, is operating and doing an average daily business of \$1000. It is equipped with a cold-storage system, supplied with ice from a local plant, and all meats and other perishable food are shipped in refrigerator vessels, and transferred immediately to this department. A drug store is run in connection with it. The Canadian government has established a post office, and also has appointed a police magistrate and stationed a detachment of the government constabulary there.

#### TORONTO—July 12

**The Hole River and Rice Lake Gold Camp** just east of Lake Winnipeg and within 100 miles of the city of Winnipeg, has attracted the attention of a large number of prospectors and mining men this season. Gold was discovered about a year ago, and three companies had a total of 52 men at work all winter. The Independence company, one of these, has just engaged an additional force of 20 experienced miners and is putting down a 200-ft. shaft. H. A. MacDonald, formerly of Cripple Creek, Cobalt, and Porcupine, is in charge. The Independence, Gabriel and Big Four Section mines have on their dumps altogether 500 tons of ore running from \$15 to \$50 per ton awaiting the erection of stamp mills.



# THE MINING NEWS

## ALASKA

**GOLDSTREAM (Fairbanks)** and its tributaries show the greatest activity in a placer way of any of the creeks of the camps. On Pedro and upper Goldstream there are many outfits working by the open-cut method, principally scraping. Gius, Atwood, Deruchia, Gilmore & McPike, Mallinson and Bleeker are sluicing, using scrapers. Henry Wagner has two outfits stripping the overburden from the pay gravel and expects to begin sluicing soon. On lower Goldstream the depth to bedrock is greater, and the pay dirt is extracted by drift mining. Our claim No. 11, A. G. Johnson and E. P. Short are working. On the old Aubert-Voegtlin ground on 12 and 13, Casalegno Brothers & Bosco have a fair-sized crew at work. The large dump taken out during the winter on the Biglow bench is rapidly disappearing into the sluice boxes. Peterson, Craig and Johnson are working 80 men in good pay on claim No. 17.

**RUBY DISTRICT**—The early cleanups returned a total of \$120,000, on which basis the probable output for the entire season is estimated at \$700,000. Many small outfits are sluicing and much prospecting is being done.

**CARIBOU CREEK**—A stampede has begun to the new diggings, where gold assaying about \$18.40 per ounce has been found. It is round, shotty and fairly coarse. The locality is in the Valdez Creek country. The trail runs from Knik up the Matanuska, and then over the hills to Caribou. About 100 prospectors are on the scene.

**HIRST MINE (Sitka)**—This property at Mine Cove, Chichagof Island, is employing a small force of men. A tunnel and crosscut have been run and drifting on the vein is in progress. It is hoped soon to reach the oreshoot discovered in the upper tunnel, 165 ft. above the present workings. Bernard Hirst, merchant, of Sitka, owns the property.

**MIZPAH (Fairbanks)**—Work has been resumed on the Mizpah claim, on the left limit of Fairbanks Creek. A boiler and hoist will be installed and two stopes will be opened on the 80-ft. level. The ore mined will be crushed at the Willis or at the Fursteneau mill at the head of Fairbanks Creek.

**NEWSBOY (Fairbanks)**—The mill was started June 9 after an idleness of several months. There are 100 tons of ore broken and it is hoped that the stopes will supply sufficient to keep the mill running all summer. Underground, work is progressing steadily on the 150- and 215-ft. levels. The oreshoot has shown no sign of diminishing in size or in value. Work will soon be resumed on the 315-ft. level, and if the orebody developed in the upper levels is found there, a crew will be put to work to deepen the shaft to the 500-ft. level.

**CRITES & FELDMAN (Fairbanks)**—The adit on the Helen S. claim has been driven 300 ft. At a distance of 250 ft. from the portal of the adit, a raise was run to the surface, a distance of about 80 ft. It is the intention of the operators to continue the tunnel and at the same time to work two stopes from the raise. All ore taken out is separated into first and second grade. The first grade will be crushed at the Willis mill on Chatham Creek and the second grade will be stored on the dump to await the installation of a mill.

**RELiance MINING CO. (Fairbanks)**—Two recent cleanups from the Spalding-Ronan lease netted more than \$4000, an average of about \$100 per ton. The ore was taken from the 50- and 100-ft. levels on the Wild Rose vein. As the lessees are limited to a depth of 100 ft., no attempt has yet been made to sink deeper. The working shaft on the MacGillivray-Tremblé lease on the Wild Rose claim has reached a depth of 20 ft. The vein is small, but panning tests show it to be rich. It is the intention of the lessees to sink to a depth of 50 ft., and if the ore proves satisfactory so far, to install a hoist and continue the shaft to the 100-ft. level.

## ARIZONA

### Cochise County

**COMMONWEALTH EXTENSION (Pearce)**—A modern 350-ton cyanide plant is in process of building and will be ready for business Sept. 1. Edgar A. Collins is general manager.

**HEFFERN MINING CO. (Douglas)**—This company has just completed its reorganization and A. Heffern, the general manager, is preparing to put several men to work cleaning out the old workings and start development.

**LEADVILLE MINING CO. (Courtland)**—This property was recently bonded to A. Fuller and O. L. Neer, but owing to a misunderstanding has reverted back to the company. Mr. Neer has another deal on the property pending.

**TEXAS GROUP (Douglas)**—This group, owned by August Baron, has been purchased by Tennessee people represented by B. Frank Murphy through whom the deal was made. The property contains eight claims carrying silver, copper, lead and zinc; the price paid is said to be \$100,000.

### Gila County

**McMILLEN (Globe)**—Preparations for the resumption of work are almost concluded and arrival of diamond-drilling equipment is being awaited.

**APACHE (Globe)**—Shipments have been resumed by Pfeister Brothers, of Globe, to the Old Dominion plant. The ore comes from a contact of limestone and quartzite and is said to carry 25% copper.

**INSPIRATION EXTENSION (Miami)**—At the Inspiration Extension, work is finished on the erection of a 40-ft. head-frame and of a hoist building and on the installation of a 25-hp. gasoline engine. The roadway between the hoist and the Inspiration ranch, whence the new shaft will secure its water supply, has been thoroughly repaired, and work on the shaft will begin within a few days.

**INSPIRATION (Miami)**—Beyond the grading for the mill site, which will be completed about the middle of August, there is little surface work in progress at the Inspiration, and underground work has slackened considerably since institution of the Keystone's suit to restrain the Inspiration from driving its main transportation drift through the former company's ground. On the fourth level the laterals, or "turnouts," are being started westward through the Colorado orebody and considerable drifting toward the main east and west shafts is in progress. Last month's underground development totaled 2600 ft. In the inclined shaft, 212 ft. were cut in June. It is now 90 ft. below the fourth level, three compartments being carried from the tunnel level downward. It will be sunk to a depth of 90 ft. below the sixth level, the extra 90 ft. to be used as a 180-ton pocket. West of the concentrator site, the rock crusher to be used in supplying material for the concrete construction work is finished. Although some preliminary concrete work may be begun early next month there will be no material construction started until all grading is finished.

**MIAMI COPPER CO. (Miami)**—At the Miami mine satisfactory progress is being made in the work of reopening the caved ground in the northwest section of the orebody. Superintendent Lawton thinks he will have it restored to normal condition by August. Since there are 2,000,000 tons of ore in that block, the discovery that the pillars were not materially damaged pleased the management. Although some of the drifts and stopes were wholly closed and many of them partly filled, most of the previous development work was found intact. The greatest obstacle to steady progress in the work of rehabilitation is the condition of many of the raises, which are found filled with loose ground. In such cases, rather than risk starting the drift is carried around the former course until firm ground is again encountered. Despite the fact that all this work in the caved ground is charged to mining expense, development work during July reached 7235 ft. The mine is furnishing more than 3300 tons of ore to the mill daily. The Captain shaft is again the scene of considerable work. A raise was lifted from the 420-ft. level to connect with the bottom of the shaft 220 ft. below the surface. Now the shaft is being timbered and the narrow raise from the 220-ft. point is being enlarged as the timbering is carried downward. At the bottom, the Captain shaft will be well below the Captain orebody, which contains about 4,000,000 tons, thus insuring permanency of the tramping level as it will be when completed at that point. The shaft will be used to lift the waste rock taken from that section of the mine in working the Captain orebody, and will also serve as a needed air-channel and an extra outlet for men in emergencies.

### Maricopa County

**SUNFLOWER CINNABAR MINING CO. (Phoenix)**—A contract for the reduction of the quicksilver ore will be installed at an early date. Col. Fred Bowler is superintendent.

### Mohave County

**ARKANSAS & ARIZONA (Jerome)**—Three boilers weighing 20,000 lb. each are being installed on the property of this company. The boilers are part of the hoisting equipment.

**OAK SPRING**—Work has been begun on the new concentrating plant to treat the tungsten ores. The mine is well developed, insuring a large and steady production. Preliminary tests show that the concentrate will carry 70% tungstic acid.

**BROOKLYN-ARIZONA (Dewey)**—The United States supreme court has decided that the silica deposit near Dewey belongs to C. C. Miller and not to the Brooklyn-Arizona company. It is expected that operations will now be resumed on the property.

**ARIZONA SOUTHWESTERN (Yucca)**—The mill is being tried out preparatory to being put into commission. The new plant is one of the most up-to-date in the Southwest. The building is steel and concrete and all units are driven by separate motors. A new electric hoist and large compressor are being installed at the shaft.

### Pinal County

**CALUMET & ARIZONA (Superior)**—The shaft is now nearing the 500-ft. mark and the pump station at the 400 level is completed. Drifting eastward into the mountain will be begun from the shaft soon. The shaft and the main tunnel have been connected at the 180-ft. level.

**REYMERT**—At this property, recently bonded by the Gunn-Thompson mining interests, Superintendent Thomas Tighe is getting ready for an active campaign of development. A 40-hp. gasoline hoist is being installed and a crew of shaft men has gone to the property. Road building and other preliminary work has been finished and the water supply has been developed sufficiently to serve all present needs.

### Pima County

**CHESTERFIELD**—Payment on the company bonds being in default, the property has been closed down and the business placed in the hands of the courts.

**OCEANIC (Arivaca)**—Work has been suspended temporarily pending the settlement of financial difficulties. Albert Stienfeld & Co., of Tucson, having filed a suit for the recovery of \$8000.

**CORNELIA**—Claims constituting the Cornelia group in the Ajo district have been formally deeded to the Calumet & Arizona. The nominal consideration was \$1. It is reported that the purchase price was \$800,000.

#### Santa Cruz County

**FOUR METALS (Patagonia)**—Considerable activity is being shown at this mine, 16 miles from Patagonia. More than 150 men are employed. Construction work is being rushed and everything about the camp indicates prosperity. The concentrator is now assured and several other new buildings are contemplated.

#### Yavapai County

**WAKOTA DEVELOPMENT CO (Congress)**—This is a reorganization of the Coronado Gold Mining Co. A 5-stamp mill is being built on the new Grasshopper property. Little development work has been done, but about \$60,000 worth of free-milling gold ore assaying about \$100 per ton is, according to the manager, already blocked out. This work has been done in addition to the continuation of work on the old Coronado property. A diversion ditch from Sand Creek to the reservoir has just been completed, and will supply water to both properties and a ranch owned by the company. L. G. Ochsenreiter, of South Dakota, is president and W. T. Sawyer, formerly of Cripple Creek, Colo., is manager.

**HARQUA HALA (Prescott)**—The Yuma Warrior Mining Co. is preparing to develop this property extensively along modern lines. The plant erected by the company will be in operation within 60 days.

### CALIFORNIA

#### Calaveras County

**CALAVERAS COPPER CO. (Copperopolis)**—It is reported that the repair work is completed and that the plant is in operation.

**LIGHTNER (Angels Camp)**—Repairs on the stamp mill are in progress while waiting for new transformers. Extraction of ore will begin in levels above the 700-ft. point.

**UTICA (Angels Camp)**—Work has been resumed in the Cross shaft and the Stickle mill is again in operation. The recent shutdown was due to the need of repairing seven miles of flume that carries water for milling, and for domestic use in the town. The work on the flume was begun in April.

**HOMESTEAD (Georgetown)**—The tunnel has intersected the pay shoot at a distance of 150 ft. at the point where it was disclosed by the shaft. A winze is being sunk. A 2-stamp mill has been installed for development purposes; water power is used. The property is situated on Carson Creek above the Georgia Slide mine.

**REINER (Angels Camp)**—Divers have been employed to assist in the lifting of two skips from the shaft. The skips were caught on the clutches at a depth of 200 ft., and it was necessary for the divers to work under about 10 ft. of water to release them. No damage was done either to the skips or the shaft by the lodging of the skips.

#### Lassen County

**CALIFORNIA-UTAH MINING CO. (Doyle)**—The mine is shipping about 100 sacks daily of selected ore of high grade. The ore goes to the Murray, Utah, smelting plant. The company is controlled by Salt Lake and Chicago men.

#### Modoc County

**HESS (Alturas)**—The new hoist is completed and will be in operation upon the receipt and installation of a 25-hp. gasoline engine for driving the stamp mill. The cyanide tanks are being put in place and will soon be ready for operation. Work will begin on the 300-ft. level.

**SPEARMINT (New Pine Creek, Ore.)**—The shaft is 75 ft. deep, and drifting has been started. The surface water from melting snow has somewhat retarded underground work. The snow is rapidly disappearing at High Grade camp, and the road to New Pine Creek is now opened to wagon traffic.

#### Nevada County

**NORTH STAR (Grass Valley)**—The first quarterly dividend for 1913 amounting to \$75,000, or at the rate of 30c. per share has been paid. The company has disbursed a total of \$3,861,989 in dividends.

**LE DUC MINING CO. (Grass Valley)**—The entire plant, including blacksmith shop, dry house, engines and blowers was destroyed or damaged by fire June 20. The plant was at the entrance to the Osborne Hill tunnel.

#### Placer County

**JARVIS (Forest Hill)**—The tunnel is in 2250 ft. and under the red gravel, with good indications of pay gravel. Washing only will be required, as the gravel is not cemented.

**BEAVER (Loomis)**—The dredge has been remodeled and the tailing is now run through sluices, and the tailing pile is leveled, leaving the land practically in the same condition as before being dredged.

**REUBLIN (Last Chance)**—The tunnel has been advanced to the 760-ft. point. It is expected to cut the vein at 600 ft. from the surface. A new stamp mill with crusher and rolls equipment is contemplated.

**ASSOCIATED MINERS (Loomis)**—A new method of hydraulic mining has been adopted by which it is expected that the water may be used continuously, enabling the operators to use the same water over again until exhausted by waste or evaporation.

#### Plumas County

**BELLEVEUE (La Porte)**—The cleanup from this channel mine, amounting to \$2000, was recently stolen. Two men, believed to have stolen the gold, were trailed to Onion Valley, but there the trail was lost. Several efforts had previously been made to rob the mine.

**INDEPENDENT (Quincy)**—This property has been sold to Charles L. Spangler and Joseph M. Anderson, of Sacramento. It is understood that development will be immediately undertaken.

#### Shasta County

**BLACK HAWK (Whiskeytown)**—A 10-stamp mill is being built at this mine. It is expected to begin dropping stamps in July. A good strike of ore which developed extensively is reported to have warranted the installation.

**PITTSBURGH & MOUNT SHASTA (Keswick)**—This company, owning the Little Nellie mine situated between Keswick and Iron Mountain, has given a trust deed to the Real Estate & Trust Co., Allegheny, Penn., to secure payment of promissory notes aggregating \$125,000.

**HEROULT (Heroult)**—The Redding Iron works has received 60,000 lb. of iron from this electric smeltery, which was made in the new furnaces recently installed.

### COLORADO

#### Lake County

**EUREKA**—The Eureka and Saturday Night group of claims in Lackawanna Gulch, is reported by J. McAlpine, the manager, to have a strike of rich gold ore. The group is owned by a New York company.

#### Montrose County

**FIVE CARLOADS OF VANADIUM ORE** were shipped last week from the Placerville station of the Rio Grande Southern Ry., one being from the Standard Chemical Co., one from Curran & Hudson and three from the Primos Chemical Co., of Newmire.

#### San Miguel County

**TOMBOY (Smuggler)**—The mill ran 28 days in June and crushed 11,500 tons of ore, yielding bullion to the extent of \$22,600 and concentrate worth \$50,500. Profits from mining operations were \$35,100.

#### Summit County

**THE SECOND CLEAN-UP FOR JUNE**, as reported from Breckenridge, gave returns of \$30,975, shipped by the Colorado Gold Dredging, French Gulch Dredging and the Reliance Gold Dredging companies.

#### Teller County

**DEEP DRAINAGE TUNNEL**—The flow of water from the portal is now about 7000 gal. per min. and the recession in the deep shafts, for June, was 6½ ft.

**VINDICATOR (Independence)**—It is proposed by the company to erect a small testing plant of about 10 tons daily capacity for the treatment of its low-grade ore and dump material.

**ELKTON (Elkton)**—The output is about 3000 tons per month. The August dividend will be passed, the rumored cause being that the company contemplates a large expenditure in building a mill. The condition of the treasury is as good as ever.

**EL PASO**—So far as can be learned no date has been set by the directors of the El Paso Consolidated Gold Co. for taking action on the dividend. The disbursement was due on June 30, but payment was deferred on account of the heavy and not anticipated expenditures incurred in connecting the Nichols shaft with the main shaft. It is said, however, that it is the intention of the management to pay the full 10% on the stock by the expiration of the company's fiscal year, which ends Dec. 31, next.

### IDAHO

#### Idaho County

**MOUNT MARSHALL MINES LTD. (Resort)**—This was formerly the Rapid River Reducing Co. An 800-ft. tunnel which cut two veins will be continued to cut other veins. The important contents of the ores are gold and silver. Total development includes 1734 ft. of work. The reduction plant is a six-stamp, 30-ton Merralls mill, with two Wilfleys and two Frue vanners. George A. Wales is president; W. Waugh, secretary; H. M. Brugger, treasurer and Edward Luzador, general manager.

#### Coeur d'Alene District

**GETTYSBURG-INDEPENDENCE (Mullan)**—It is believed that F. Augustus Heinze will soon begin development on this property. It adjoins the Morning mine on Chloride Hill.

**INTERSTATE-CALLAHAN (Wallace)**—The new 300-ton concentrator has been in operation since June 1. The survey for a Northern Pacific extension to the plant has been made. An aerial tram connects the mine with the mill.

### MICHIGAN

#### Copper

**LA SALLE (Calumet)**—The railroad connections into this property have been completed and the rock shipments to the Calumet and Hecla mills have been started. At the present time, about 100 tons daily is being handled, but this will be materially increased.

**NEW ARCADIAN (Houghton)**—The shaft is down to the 750-ft. level and the station will soon be cut preparatory to starting crosscuts east and west to two other parallel formations. Payments of the assessment called July 1 are being made, which provide funds for the continuations of the exploratory work.

**NEW BALTIC (Houghton)**—Work of extending the crosscut at the 500-ft. level has been discontinued at a point about 2000 ft. from the shaft and a diamond drill will be placed in commission to put in a horizontal hole to test the formation



further on. In driving the crosscut, two favorable formations were opened and about 100 ft. of drifting has been done on one of these with encouraging results.

**SOUTH LAKE (Lake Mine)**—The shaft is bottomed at this property at a depth of 500 ft. where a station is being cut. At the 300-ft. level, the crosscut should soon reach the lode that was found at a depth of 40 ft. in the shaft and that showed good copper content.

**CONTACT COPPER CO.**—A special meeting of the company will be held Aug. 1 to authorize the sale of its timber holdings in order to provide funds to carry on work of exploring the company's lands. President Fay says: "Many of the government sub-divisions of our 2400 acres are heavily timbered and it is believed that a large part, if not all, of this timber can be sold at an advantageous price without detriment to the company's interests. If such a sale is made it will obviate the necessity of calling an assessment, and should provide the company with funds to carry on its diamond drilling investigations for a considerable time. The results thus far obtained from our diamond drilling, while not disclosing any lode of marked value, convince us that the work should be continued and the lands of the company thoroughly explored by this method."

#### Iron

**STRUTHERS FURNACE CO. (Crystal Falls)**—This Cleveland company which recently took over the Hilltop and Victoria properties at Crystal Falls has encountered difficulty on account of questions regarding the title to the Victoria property. A small body of ore is known to exist in the two properties which adjoin.

**CASCADE MINING CO. (Negaunee)**—The Isabella shaft has been sunk to a depth of about 200 ft. and sinking will be continued for 600 ft. more before drifting will be started to open the orebody. It is thought that this mine will commence shipping next year and the Chicago & Northwestern Ry. is now laying a track to the property.

#### MINNESOTA

**WEYERHAUSER INTERESTS** are again resuming exploratory work on the Cuyuna Range. They control a considerable acreage of prospective mineral land, in addition to several iron ore deposits, and resumption of activities on their part means much to the district in general.

**CUYUNA-DULUTH IRON CO. (Ironton)**—The company has drifted 85 ft. on the 200 level. New skips and increased boiler capacity have been installed, and shipping will begin soon.

**JONES & LAUGHLIN**—Vice-president, William Larimer Jones, and party, made an inspection trip over the Cuyuna range recently. It is understood that at least one option was taken, and that drilling operations would start soon. Capt. Thomas Walters, of Ishpening, Mich., accompanied the party. This marks the probable entrance of one more large consuming interest into the Cuyuna range district.

#### MISSOURI

##### Joplin District

**DELTA (Spring City)**—New drifts have been cut in the mine and the mill now is being operated regularly. Some new orebodies have been developed, it is said.

**BEAR CAT (Sarcoixie)**—Operations at this property, near Sarcoixie, have been suspended pending development work. Some time ago there was considerable drilling done on the lease, and the company will prove up the strikes, made at a depth of 250 and 280 feet.

**HARDY (Webb City)**—A company composed of Joplin, Carthage and Webb City operators has been organized to prospect the Hardy tract, situated south of Webb City. It is virgin territory. The drill now has reached 125 ft. Several holes will be put down.

**ISHERWOOD**—This mine last week produced ore running 25% in zinc sulphide, the rich ore making it one of the best in the Carl Junction camp. The company has a lease on 80 acres and has been operating the mine but a few weeks since striking the ore. J. I. McClaren of Galena and A. M. Gaines of Joplin are the operators.

**QUAKER**—This mine has been leased by a new company and is in operation after several years' idleness. It is situated in the Chitwood camp, where much of the one-time producing territory has been worked out. The shaft is being sunk deeper and a drift at a deep level will be cut to a point where the operators believe there is a good orebody.

**HARTFORD (Galena)**—The Empire Zinc Co. has begun sinking the shaft and will go to a depth of 300 ft., an unusual depth for Joplin district mines. Drilling is said to have shown a 50-ft. face of zinc ore, ten holes having been put down. The mill, of 300-ton capacity, has been shut down temporarily for repairs.

**ILLINOIS LEAD & ZINC CO.**—Thomas Coyne of Webb City has taken a lease on this tract, which several years ago was one of the best producers in the Galena district. Ten drill holes have been sunk, five of which showed ore, Mr. Coyne says. The lease contains several old shafts, some of which are to be sunk deeper. A contract has been awarded for a 200-ton concentrating plant, to be completed in October.

**LU LU V (Joplin)**—A 200-ton mill is being erected at this mine. Henry L. Timmonds of Kansas City and Harry Peiffer of Spring City own the lease. The ore formation is found at the 185-ft. level, with a 20-ft. face of both lead and zinc. The lease was worked by another company, which was forced to abandon it, before the ore was reached, on account of insufficient funds.

**MEXICO-JOPLIN**—Drill prospecting on this land has been followed by the sinking of two shafts. Both lead and zinc ore were found in several holes. The drilling was done on leases formerly held by the Katy Mining Co. and the Richinore company. On the Katy lease, ore was found at a depth of 130 ft. and continued to 165 ft. A good run of lead was encountered at the 127-ft. level in one hole on the Richinore lease, while zinc was found in the other holes.

#### MONTANA

##### Beaverhead County

**PENOBSCOTT MINING CO. (Melrose)**—Good progress is being made on the construction of the new 20-stamp mill at the Hecla mine, 15 miles west of Melrose. From 60 to 75 men are engaged in the work and they expect to complete the mill in 60 days. The plant will be operated by electricity obtained by a transmission line from the Big Hole dam.

##### Jefferson County

**CENTER REEF (Elkhorn)**—The Ballard brothers are preparing to resume work at this mine. The ore is rich but the mine is situated on the top of Old Crow Mountain where the season is short, allowing work to be done during only a few months each year.

**SOUR DOUGH (Elkhorn)**—John Rothfus, the owner of this mine, one of the Golden Curry group of claims, has announced his intention of working the mine again. The Elkhorn Mining Co. was formed last winter to operate the property under a lease and bond, but on account of bad roads little has been done, and Mr. Rothfus is dissatisfied with the progress made up to date.

##### Madison County

**BEDFORD (Sheridan)**—The mill at this gold property near Mill Creek is being operated steadily, about 40 men being employed in mine and mill.

**BONANZA (Sheridan)**—At this group of claims near the head of Mill Creek, ore assaying from \$30 to \$50 per ton, principally in gold, is being mined and placed on a stockpile; it will later be shipped to the Washoe smelting works. A tunnel is being driven on the vein.

**MONTROSE (Rochester)**—James Miller, Isaac Hansen and John Mahoney, owners of this mine, are doing considerable development and opening a good body of ore. A tunnel has been driven 160 ft. on the vein, the ore assaying well in gold and silver. A shaft being sunk on the vein has reached a depth of 60 ft. and will be continued some distance further before drifting is started.

#### NEVADA

##### Comstock Lode

**SAVAGE (Virginia City)**—Work has been resumed on the surface-tunnel level through both the upper and lower tunnels, and sampling indicates that much ore of milling grade is in prospect.

**SIERRA NEVADA (Virginia City)**—A north drift has been started across the fault plane from the top of the raise from the intermediate level, for the purpose of intercepting the vein. High-grade ore existed on the intermediate.

**C. & C. SHAFT (Virginia City)**—The Comstock Pumping Association has made rapid headway in reopening the old drifts from the 2500 shaft station, and 700 ft. of old workings has been recovered, which will be used as a drainage adit from the Ophir-Mexican winze. Changes have also been made in the shaft, looking to more economy in operating.

##### Humboldt County

**BORLAND PROPERTY (Rochester)**—A car of good-grade ore is ready for shipment.

**QUEEN (Gold Circle)**—A gasoline hoist has been installed and sinking is now being done.

**LINCOLN HILL (Rochester)**—This property has recently made a shipment to the Thompson smelting plant.

**ROCHESTER HILLS (Rochester)**—The two-compartment shaft is now down 200 ft., or about 75 ft. below the tunnel level.

**BADGER (Rochester)**—It is reported that a discovery of rich ore has been made on this property in the Indian Creek section.

**NEVADA-PACKARD (Rochester)**—This property is now shipping regularly to the Hazen sampler. The last car of ore mined by the lessees assayed \$60 a ton.

**PEERLESS CLAIM (Rochester)**—Free gold has been struck in the bottom of the 16-ft. shaft. The Forvilly Rochester Mining Co. is half owner in this claim which is now being worked by lessees.

**CODD LEASE (Rochester)**—The compressor has been installed and the air drills are in operation; 35 men are employed. An average of one car of ore per day is being shipped. The production will be greatly increased as soon as the Silver Belt railroad is in operation. H. C. Zulch is superintendent.

##### Nye County

**TONOPAH MERGER (Tonopah)**—The west drift on the 1070-ft. level, which is now out nearly 600 ft. from the shaft, is assaying from \$19 to \$30 per ton, and is apparently entering a new oreshoot. In the North Star mine the east drift on the MacDonald vein on the tenth level is now out over 120 ft., the vein having ranged for this distance from 5 to 8 ft. in width; the ore is of high-grade shipping class. The drift on the parallel vein is out 165 ft. on 2½ ft. of very good shipping ore, and another drift being run on a cross vein shows from 12 to 18 in. of ore assaying from \$200 to \$400 per ton.

#### NEW MEXICO

##### Socorro County

**TRI-BULLION (Kelly)**—Operations of the company have been indefinitely suspended.

**GERMANY (Kelly)**—This mining and development company has resumed drifting south from its Sleeper tunnel to a conjectured orebody.

**GRAPHIC (Kelly)**—The Ozark company, subsidiary of Sherwin-Williams, is operating the new mill. Reports state that the plant is making 30 tons of concentrate per day from 100 tons of ore.

**OREGON****Baker County**

**GOOD LUCK (Sparta)**—Some fine ore has been encountered at this mine, assaying as high as \$90 per ton. Charles Eisner is in charge.

**CANYON MOUNTAIN**—Equipment for a 10-stamp mill has been delivered at this property. The plant will be in operation at an early date.

**Josephine County**

**MAMMOTH (Sumpter)**—Work has again been resumed at this property, and some fine ore has been uncovered.

**CHAMPLAIN DREDGE**—It is stated that this dredge on Footh Creek, the only dredge in the county at present, will be put into commission again on the bars in the river. This dredge has been idle for several years, although the ground is good. The dredge and property are owned by the Champlains, of Chicago.

**Jackson County**

**BEAVER CEMENT CO. (Gold Hill)**—About 200 men will be employed during the summer building the large plant on the Rogue River. The plant will be in operation next year, and will be one of the largest of its kind on the coast.

**UTAH****Juab County**

**GRAND CENTRAL (Robinson)**—Water has been encountered at about the 2400 level, and work has been discontinued for the time being. A pumping plant may be installed.

**NORTH SCRANTON (Eureka)**—A cave containing ore similar to that found in the Scranton mine in North Tintic has recently been encountered here. The North Scranton is controlled by Lehi men.

**YANKEE CONSOLIDATED (Eureka)**—Drifting south of the shaft on the 2000-ft. level has opened a 4-ft. vein, carrying bunches of silver and copper ore. The fissure is strong and well defined. Eight cars of zinc ore were marketed in May from upper workings, and brought approximately \$500 per car.

**WASHINGTON****Ferry County**

**BUTTE-CHEWELAH (Chewelah)**—A hoist and compressor are to be installed at this mine. A winze will be sunk on the ore to a depth of about 400 ft.

**SAN POIL (Republic)**—Operations of the mill are in full swing again at double capacity. The 250-hp. Corliss engine, installed recently, went into commission last week and the entire mill began operating satisfactorily. Having about 25% reserve power, it is estimated the engine will cut the milling costs 50% by reason of the increased tonnage and the increased economy of the engine. During the period of suspension in the mill a considerable volume of better ore is said to have been blocked out in the mine.

**UNITED COPPER (Chewelah)**—Electric energy for the mine and new mill will be available by the latter part of July. With the electrification of the mine and concentrator, the operating force, now numbering 100 men, will be increased and the output largely augmented. A long tunnel is being driven from the base of the mountain on the west side of the mine to tap the main vein a mile in and at a vertical depth of 1000 feet; it is expected to reach the orebody by the first of next year. The shaft is now down 600 ft., several stringers of high-grade ore having been encountered at unexpected places. A drift 500 ft. long has been driven on the vein at the 500-ft. level, exposing the highest grade ore ever encountered in the property. Shipments at present average 26 tons of crude ore and five to six tons of concentrate daily.

**CANADA****British Columbia**

**HEDLEY**—Production figures for five months to June 1 are: Ore crushed, 29,180 tons; value of gold recovered, \$377,483, an average of \$12.95 per ton.

**CONSOLIDATED**—During the first half of 1913 there was smelted in this company's works at Trail, 162,000 tons; with a gross value of metal content of \$4,232,000.

**SALT DEPOSIT**—Further particulars are now available regarding the newly discovered salt bed in Kwintisa, Mile 46, on the Grand Trunk Pacific main line, east of Prince Rupert. The property, consisting of 1000 acres, is situated within 200 ft. of the railway and within 400 ft. of the Skeena River. An up-to-date drilling plant has been installed as well as a small testing plant consisting of three evaporating pans. So far, five holes have been drilled at considerable distances apart, some more than a mile from the others, and all have struck salt at depths varying from 50 to 350 ft. In all, 8 tons of salt have been secured from deposits. The owners and discoverers expect to have a plant in operation with a capacity of 50 tons per day within the course of a few months.

**Ontario**

**PEARL LAKE (Schumacker)**—An explosion of powder at this mine July 3, caused by bush fires, did considerable damage to the property, but no one was injured.

**COBALT-FRONTENAC (Cobalt)**—This company has let a contract to William H. Pritchard, of Hamilton, for sinking a shaft to the depth of 200 ft. on its property at Elk Lake.

**CHAMBERS-FERLAND (Cobalt)**—The financial statement for the year ended Apr. 30 shows total receipts of \$75,741, and a balance carried forward of \$196,743. The cash in hand amounted to \$177,474.

**COCHRANE (Cobalt)**—Drifting is being done in both directions on the 200-ft. level on a calcite vein showing native silver, this level having been reached by a winze from the 100 level, where the vein was barren.

**HUGHES (Porcupine)**—The shaft has been sunk to the 300-ft. level, on which a quartz vein about 10 ft. wide show-

ing free gold has been encountered. Tentative plans for a 150-ton mill are being prepared, but the treatment of the ore has not yet been finally determined.

**SWASTIKA (Swastika)**—In pursuance of the action recently taken by the shareholders, the directors are offering 500,000 shares of stock at 6c. per share to present stockholders pro rata. In case any portion is not taken up the directors are authorized to sell on such terms as they consider advisable.

**JUPITER (Schumacker)**—The annual report for the year ended Mar. 31, shows that \$175,482 has been expended on development work. The cash remaining in the treasury amounted to \$40,841. A raise from the 300- to the 200-ft. level has been finished in which some of the best ore so far opened up was encountered. A winze is being put down from the 300-ft. level.

**SILVER CLIFF (Cobalt)**—On account of the poor recovery made by the mill it is proposed to put in a new Chilean mill and six slime tables at a cost of \$8000. There are 3000 tons of milling ore in the stopes and a vein of high-grade ore has been encountered in the crosscut from the bottom of the shaft.

**MEXICO****Chihuahua**

**THE CHIHUAHUA SMELTING WORKS** was looted by rebels June 29. In fear of another attack American women and children moved into the city. The plant is closed.

**Durango**

**PENOLES (Mapimi)**—The report in the JOURNAL of May 3 to the effect that the Peñoles smelting plant was closed was a mistake. It was in operation at that time and on June 9. A letter of the latter date has just been received.

**Sonora**

**NACAZARI CONSOLIDATED COPPER CO. (Douglas, Ariz.)**—A 10-in. streak of high-grade silver-lead-copper ore has just been struck in the breast of the long tunnel and a 12-in. streak of low-grade ore alongside. The company contemplates building a mill. The property is located about nine miles east of Nacozari and about two miles from Pílares.

**CON VIRGINIA (Moctezuma)**—A California company has just secured an option on this property from the owner C. C. Soto of Douglas, Ariz.; the terms call for no payment down but specify that 1000 ft. of development must be done inside of nine months. This property is considered a good low-grade deposit; it lies about 50 miles east of Moctezuma, Sonora.

**CINCO DE MAYO (Esqueda)**—This property recently confiscated by the Constitutionalists is being worked by them. At the time it was taken there was said to be \$1,000,000 worth of ore blocked out for shipment. It has now been worked for about two months and two cars of high-grade ore shipped to Douglas, the better grade being smelted in adobe furnaces and the bullion sent to California. At present the smelters will not handle the ore, fearing trouble with Col. Garcia, the owner of the mine, who is now the Governor of Sonora for the Huerta government.

**SOUTH AMERICA****Colombia**

**EL ZANCUDO**—April production was \$32,000, and May, \$29,000.

**LA CLARA (Amalfi)**—The mine produced in May, \$9000, paying a dividend of \$200 per share.

**LA CONSTANCIA (Anori)**—The May production was \$7000, a dividend of \$150 per share being paid.

**LA BRETANA (Sonson)**—The mine produced about \$10,000 in May, without counting returns from the cyanide plant.

**LA UNION (Manizales)**—A first-class cyanide plant is to be put in. Recent reports give exceptionally fine results from new development work.

**THE ANDES DISTRICT** is again coming into note as an important quartz region, the most important mine there being known as the Chaquiro.

**VIBORITA MINING CO.**—This company, near Amalfi, has completed its long tunnel for dumping into the Porce River, and is opening up the mine.

**BREITUNG MINES CORPORATION**—The report of the existence of a suit against this corporation involving the title to its properties is wholly unfounded and incorrect.

**LA CASCADA (Manizales)**—The production in May was \$18,000; a dividend of \$400 per share was distributed. One share sold recently for the sum of \$13,200, 28 being the whole number issued.

**PATO**—Flattering reports are heard regarding the operations at the mines near Zaragosa, where dredging has proved successful. It is said that the company is drilling new ground in the same vicinity.

**PORCE RIVER**—About everything on the river has been closed down on account of high water. A new enterprise representing Colorado capital has begun the construction of a hydraulic elevator plant on the Rio Grande, a branch river.

**AFRICA****Transvaal**

**GOLD PRODUCTION IN JUNE** shows a falling off. The total was 747,077 oz., which is 47,229 oz. less than in May, and 6859 oz. less than in June, 1912. For the six months ended June 30 the total output of gold was 4,543,127 oz. in 1912, and 4,640,421 oz.—or \$95,917,502—in 1913; an increase of 97,294 oz. this year. The July production will show the full effect of the strike, which barely touched the June working.

**AUSTRALIA****Western Australia**

The Chamber of Mines reports the gold production of Western Australia in June as follows: Exported, 5112 oz.; delivered to mint, 108,373; total, 113,485 oz. For the six months ended June 30, the total output was 627,849 oz. in 1912, and 628,631 oz.—or \$12,993,800—in 1913; an increase of 782 oz. this year.



# THE MARKET REPORT

## METAL MARKETS

NEW YORK—July 16

The metal markets have remained generally rather quiet, and changes in price have been for the most part declines, though only moderate in amount.

### MONTHLY INDEX NUMBERS

Month	1912	1913	Month	1912	1913	Month	1912	1913
Jan.....	111	126	May.....	118	126	Sept.....	127	...
Feb.....	109	125	June.....	117	117	Oct.....	133	...
March.....	111	125	July.....	114	...	Nov.....	129	...
April.....	115	124	Aug.....	120	...	Dec.....	129	...

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115  
Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

### Copper, Tin, Lead and Zinc

**Copper**—The market during the last week was rather curious. The two big agencies had apparently been looking forward to favorable statistics and the manufacturers promptly coming to them. The statistics were as favorable as was expected, but insofar as inspiring a buying movement was concerned, they fell completely flat. As soon as this was recognized something like demoralization overtook the market, all sellers joining in the movement of soliciting bids. However, as rapidly as the leading agencies reduced their intimations of what would be accepted, competing agencies and other sellers promptly undercut. At about 14c., delivered in Europe, corresponding to about 13.80c. cash, f.o.b. New York, sales amounting to some millions of pounds were made to Europe, and offerings of more at that price, both for European and domestic delivery were freely made.

The Lake market is much less competitive than the electrolytic, and at present none of the producers of this kind experience any urgency to sell. Consequently, buyers who insist on Lake copper have to pay what is asked. Some appeared during the last week who paid from about 14.70c. for a special brand down to about 14.40c. for ordinary brands, the bulk of the business reported to us being at the latter price. The willingness of some buyers to pay these prices while the sellers of electrolytic were inviting business at large concessions was one of the remarkable features of the week.

At no time during the week did domestic buyers figure to any important extent, although perhaps there was a little more inquiry from them. It is thought that their stocks are now nearly depleted and that they must soon of necessity buy copper, but undoubtedly they will postpone their buying until the last possible moment and then limit it to the minimum quantity. It is equally probable that many of them will overstay this bear market.

At the close we quote Lake copper at 14¼@14½c. and electrolytic at 13.75@13.80c. for cakes, ingots and wirebars. Casting copper is quoted nominally at 13½@13¾c. as an average for the week.

The London market, which on July 10, was £63 for spot and £63 3s. 9d. for three months, declined 5s. on July 11, and was down to £62 2s. 6d. for spot and £62 7s. 6d. for three months on July 14. On July 16, the market was stronger, and closes at £63 for spot and £63 5s. for three months.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 15¼c. per lb., for carload lots at mill.

Exports of copper from New York for the week were 6249 long tons. Our special correspondent gives the exports from Baltimore at 2551 tons for the week.

**Tin**—The reluctance on the part of eastern interests to meet the low prices established in the London market and fair orders which were placed on this side gave a strong tone to the London market the latter part of last week. Quotations advanced about £11 from the low point, only to drop again to the extent of about £8 10s. on Monday of this week. A bear attack is given as the reason for this abrupt decline. Since then the market steadied, but closes dull at £181 15s. for spot and £182 5s. for three months, and about 39¾c. per lb. for July tin here.

Messrs. Robertson & Bense report arrivals of tin ore and concentrates at Hamburg, Germany, in June, at 3134 tons; of which 29.5 tons were from South Africa and 3104.5 tons from Bolivia.

**Lead**—The market is quiet and lead at St. Louis is quoted 4.17½@4.22½; New York, 4.32½@4.35 cents.

The foreign market is firmer, Spanish lead being quoted £20 and English lead £1 higher. The supplies abroad continue scant, due to the falling off in shipments from Mexico.

**Spelter**—The market is dull. The demand is being freely met at slightly lower prices. At the close, we quote St. Louis 5.05@5.10c., and New York 5.20@5.25 cents.

In London good ordinaries are quoted £20 10s and specials £21 per ton.

The price of zinc sheets is now \$7 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

**Cadmium**—The latest quotation from Germany is 725@750 marks per 100 kg. f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

### DAILY PRICES OF METALS

#### NEW YORK

July	Sterling Exchange	Silver	Copper		Tin Cts. per lb.	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
10	4.8680	58½	@14.30 @14.50	13.90 @14.00	39½	4.30 @4.35	4.17½ @4.20	5.20 @5.25	5.05 @5.10
11	4.8680	58½	@14.30 @14.50	13.75 @13.85	40½	4.30 @3.35	4.17½ @4.20	5.20 @5.25	5.05 @5.10
12	4.8675	58½	@14.30 @14.50	13.75 @13.85	40½	4.30 @4.35	4.17½ @4.20	5.20 @5.25	5.05 @5.10
14	4.8670	58½	@14.25 @14.50	13.75 @13.80	39½	4.32½ @4.35	4.17½ @4.22½	5.20 @5.25	5.05 @5.10
15	4.8675	58½	@14.25 @14.50	13.75 @13.80	39½	4.32½ @4.35	4.17½ @4.22½	5.20 @5.25	5.05 @5.10
16	4.8660	58½	@14.25 @14.50	13.75 @13.80	39½	4.32½ @4.35	4.17½ @4.22½	5.20 @5.25	5.05 @5.10

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

#### LONDON

July	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
10	26½	63	63½	68½	179	179½	19½	20½
11	26½	62½	62½	68½	185	185½	19½	20½
12	27½	...	...	...	...	...	...	...
14	26½	62½	62½	67½	179½	180½	19½	20½
15	26½	62½	62½	67½	182	182½	20	20½
16	27	63	63½	67½	181½	182½	20	20½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21½c.

## Other Metals

**Aluminum**—Business is still somewhat unsettled. Current quotations are a little lower, 23@23½c. per lb. being quoted for No. 1 ingots, New York. Foreign metal is still quoted at 19@19½c. in bond.

The Senate amendments to the tariff bill propose to make the duty 2c. per lb. on ingots and 3½c. per lb. on sheets and wire.

**Antimony**—Business has been small and prices are a shade easier. Quotations are 8.50@8.60c. per lb. for Cookson's; 8@8.15c. for Hallett's; 7.50@7.75c. for Chinese, Hungarian and other outside brands.

**Quicksilver**—The market has been quiet and prices are unchanged here at \$40 per flask of 75 lb., with 60c. per lb. for small orders. San Francisco, \$39.50 for domestic orders and \$37 for export. London £ 10s. per flask, with £7 2s. 6d. asked from second hands.

**Bismuth**—The syndicate which controls the European production quotes 7s. 6d.—equal to \$1.80—per lb. in London. In New York a quotation of \$1.72 per lb. is made for metal produced from American ores.

**Magnesium**—The price of pure metal is \$1.50 per lb. for 100-lb. lots f.o.b. New York.

**Nickel**—Shot, block and plaquettes are quoted at 40@45c. per lb., according to quality and size of order. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—Producers of this metal quote large lots at \$2.75@3.50 per lb., according to size of order; while as high as \$4.50@5.50 is paid for retail lots.

Included in exports from Baltimore for the week were 880 lb. selenium to Hamburg.

## Gold, Silver and Platinum

**Gold**—There was no change on the open market in London, prices remaining at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was some demand for Paris and Berlin. In New York \$3,000,000 more gold has been taken for export to Paris.

Imports of gold at New York week ended July 12 were \$831,118, from Mexico, Central and South America; exports were \$5,057,572, nearly all to Paris.

**Iridium**—There has been no improvement in supplies and dealers are still quoting about \$85 per oz., New York.

**Platinum**—The market is rather quiet but remains very steady. Dealers continue to ask \$45@46 per oz. for refined platinum, and \$49@52 for hard metals.

Our Russian correspondent writes under date of July 3 that the market is quiet; no sales have been made. The position can be warned as an expectant one, the business having been confined to negotiations. Sellers have avoided selling, not consenting to reduce prices. Buyers expect lower prices, owing to the increase of the offer by the starateli of new metal. The quotations are: at Ekaterinberg, 9.75 rubles per zolotnik; in St. Petersburg, 37,700 rubles per pood. These prices are nominal and subject to negotiations. They are for crude metal, 83% platinum, and are equal to \$36.66 and \$36.95 per oz., respectively.

**Silver**—The market has continued quiet and steady, with slight fluctuations. Reports of the Monsoon situation in India are favorable, while on the other hand, currency returns indicate that the Indian government will not be a buyer of silver for the present.

Exports of silver from London to the East, Jan. 1 to July 3, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India.....	£3,549,700	£4,012,000	I. £462,300
China.....	933,500	417,000	D. 516,500
Total.....	£4,483,200	£4,429,000	D. £ 54,200

Exports of silver from New York week ended July 12, were £980,601, mainly to London; imports were \$163,147, chiefly from Mexico.

## Zinc and Lead Ore Markets

## PLATTEVILLE, WIS.—July 12

The base price paid this week for 60% zinc ore was \$43@44 per ton. The base price paid for 80% lead ore was \$52@53 per ton.

## SHIPMENTS WEEK ENDED JULY 12

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week .....	2,497,800	117,700	1,241,700
Year to date.....	78,214,630	3,811,780	33,455,440

Shipped during week to separating plants, 1,535,000 lb. zinc ore.

## JOPLIN, MO.—July 12

The high price of zinc blende is \$47, the base per ton of 60% zinc ranging from \$43 to \$45 an advance of \$1 to \$2. Calamine was advanced \$2 to a base or \$22@24 per ton of 40% zinc. The average of all grades is \$42.26 per ton. With no diminution of the demand for lead and an output restricted by two days' holiday last week prices continue firm at \$52.50 per ton of 80% metal contents and an average of all grades \$52.42 per ton.

## SHIPMENTS WEEK ENDED JULY 12

	Blende	Calamine	Lead ore	Value
Totals this week	9,582,840	468,710	1,521,560	\$252,320
Totals 28 weeks.	303,663,200	21,204,020	50,553,300	\$8,426,637
Blende value, this week,	\$206,918; 28 weeks,			\$6,825,038.
Calamine value, the week,	\$5507; 28 weeks,			\$274,287.
Lead value, the week,	\$39,895; 28 weeks,			\$1,327,312.

## IRON TRADE REVIEW

## NEW YORK—July 16

No material change can be reported in the finished steel markets. Mills are generally busy and shipments are good, but new orders come in slowly. Steel makers, for the most part, do not seem disturbed. They do not expect much this month or in August, but there is a general belief that a good buying movement will come with September, before present contracts are worked out. It is significant that early July holidays have been cut short almost everywhere, and only the absolutely necessary repairs are being made.

July shows only a slight curtailment in pig iron production, much less than had been expected. Prices seem to have reached the bottom point, but it can hardly be said that they have commenced to go up. The larger demand is for basic pig, but there are inquiries for foundry pig for early requirements. On the whole there is more disposition to place contracts for pig iron than has been shown for some time.

**Pig Iron Production**—The monthly reports of the blast furnaces, as collected and published by the "Iron Age" show that on July 1 there were 282 coke and anthracite furnaces in blast, having a total daily capacity of 88,000 tons; a decrease of 2200 tons from June 1. Making allowance for the charcoal furnaces the total production of pig iron in June is estimated at 2,663,600 tons; for the six months ended June 30 it was 16,558,000 tons. Of this total 11,469,300 tons, or 69.3%, were made by furnaces owned or operated by steel companies.

**The United States Steel Corporation** reports the total unfilled orders on its books June 30 at 5,807,317 tons of material. This is a decrease of 517,005 tons from the report of May 31, but a difference of only 29 tons from the report of a year ago.

## PITTSBURGH—July 15

The finished-steel trade has now been stagnant for at least three weeks, with new contracts very light and specifications on old contracts being filed at a rate very small compared with outgoing shipments, which shipments are maintained at practically full capacity. Thus the trade is running down rapidly and without a striking change in buying it will not be many weeks until production is restricted.

Production and shipments by the steel mills in the general Pittsburgh district have slightly increased in the past few days, owing to better weather conditions, the latter part of June and early part of July having seen very hot weather, which always cuts into tonnages. There is a wide diversity in the amount of business actually specified on the books of the different mills. Some mills are well fixed, and are experiencing no cancellations worthy of note, while some other mills have very little tonnage in actual specifications.

Finished-steel prices continue to be very well held, there being no question at all as to the majority of regular steel products, while in sheets and wire products, which showed irregularities some time ago, there has been no further weakness in the past few days.

**Pig Iron**—The heavier buying which has featured the past three or four weeks continues, but is not of sufficient volume to stiffen the market, which is at a practically unchanged level. Buyers of pig iron are covering, but are taking smaller tonnages than usual. The Standard Sanitary Manufacturing Co., which has bought various lots lately, is now inquiring for 4000 tons of No. 2 and 500 tons each No. 3 and forge, for August and September delivery, with the privilege of deferring some deliveries to October. The Pittsburgh Steel Co. has bought part of its July basic iron requirements. There have been few small purchases of bessemer, some of them appar-



entirely at slight cuts. We continue to quote: Bessemer, \$16; basic, \$14.50; malleable, \$14.25; No. 2 foundry, \$14; forge, \$13.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Interest in the pig-iron market is increased by the contest the Connellsville coke operators are waging for \$2.50 coke. The purchases a fortnight ago for July at this figure have not been followed by purchases to cover the balance of the uncovered requirements, and some furnaces have banked rather than pay the price, others now threatening to bank or blow out. A \$2.50 market for coke firmly established would probably advance pig iron in some districts, while restriction of production ought also to have such an effect, but a break in the coke market is regarded as far from impossible, particularly because the financial strength of some coke interests is questioned since the failure of the First-Second National Bank of Pittsburgh.

**Ferromanganese**—The continued softness in the market has been recognized by a definite cut of \$2.50, and we now quote prompt and contract at \$58.50, f.o.b. Baltimore, freight to Pittsburgh being \$2.16. The market remains quiet.

**Steel**—The market remains firm although quiet, with billets at \$26.50 and sheet bars at \$27.50, maker's mills, Pittsburgh or Youngstown.

**Sheets**—There is no change in the situation, operations being at 85 or 90% of capacity, and prices fairly well maintained. We quote: Blue annealed, 1.75c.; black, 2.25@3.35c.; galvanized, 3.30@3.50c.; painted corrugated, 2.45@2.55c.; galvanized corrugated, 3.35@3.55c. per pound.

**IRON ORE**

Shipments of iron ore from the Lake Superior region in June were recognized by 7,974,444 tons, being 406,889 tons more than in June, 1912. For the season to July 1 the shipments were as follows, in long tons:

Port	1912	1913	Change
Escanaba.....	1,641,948	1,800,601	I. 158,653
Marquette.....	918,890	1,059,776	I. 140,886
Ashland.....	1,332,801	1,509,702	I. 176,901
Superior.....	4,344,331	4,677,349	I. 333,018
Duluth.....	2,845,478	3,995,948	I. 1,150,470
Two Harbors.....	2,607,223	3,081,666	I. 474,443
Totals.....	13,690,671	16,125,042	I. 3,434,371

Receipts at Lake Erie ports in June were 6,214,648 tons, or 77.9% of the shipments for the month.

**COKE**

There is no change in the situation as to Connellsville coke. Only short contracts for furnace coke have been closed at the \$2.50 price, but producers continue to hold firmly for that price.

**Anthracite Shipments** in June were 5,978,047 long tons, a decrease of 221,599 tons as compared with June, 1912. For the six months ended June 30 the total shipments were 26,096,979 tons in 1912, and 34,851,854 in 1913; an increase of 8,754,875 tons, or 33.5%, this year.

**Coal Passing through Sault Ste. Marie Canals** season to July 1, short tons:

	1912	1913	Changes
Anthracite.....	224,908	1,004,028	I. 779,120
Bituminous.....	3,715,397	5,492,091	I. 1,776,694
Total.....	3,940,305	6,496,119	I. 2,555,814

Anthracite shipments last year were light, owing to the April-May suspension. The gain in bituminous this year is remarkable.

**CHEMICALS**

**NEW YORK—July 16**

The full effect of midsummer and the vacation season are seen in the general market, which is exceedingly dull.

**Arsenic**—Business is quiet and sales are few. Quotations are \$3.12½@3.50 per 100 lb., but are largely nominal.

**Copper Sulphate**—Sales have been good. Prices are steady at \$5.25 per 100 lb. for carload lots, and \$5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is still quiet, with only moderate sales. Quotations are unchanged at 2.37½c. for spot and August; 2.35c. per lb. for September and later deliveries.

The half-yearly report of W. Montgomery & Co., London, says: "Nitrate has had a heavy fall during the last few weeks—the belated supply has come too late for the season, and the continued increase in production, notwithstanding the outcry about labor difficulties which persistently came over

from Chile makes buyers more chary of entering into new engagements. The consumption of the world during the past three years ending June 30, has been as follows in long tons:

	1911	1912	1913
Continent of Europe.....	1,575,000	1,711,000	1,666,000
United Kingdom.....	129,000	132,000	125,000
United States.....	535,000	503,000	550,000
Other Countries.....	85,000	114,000	110,000
Total.....	2,324,000	2,460,000	2,451,000
Shipments.....	2,322,000	2,456,000	2,666,000

"Visible stocks of nitrate in Europe on June 30, including cargoes afloat, were 405,000 tons, against 318,000 tons a year ago."

**COPPER SMELTER'S REPORTS**

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

	Feb.	March	April	May	June
Alaska shipments.....	660,250	472,293	1,730,252	1,771,508	2,203,191
Anaconda.....	21,250,000	22,900,000	23,800,000	25,600,000	25,600,000
Arizona, Ltd.....	3,000,000	3,200,000	3,100,000	3,200,000	3,000,000
Copper Queen.....	6,810,706	7,558,709	8,210,166	8,301,605	7,477,936
Calumet & Ariz.....	4,050,000	4,250,000	4,500,000	4,300,000	4,300,000
Chino.....	3,898,998	4,464,723	3,925,409	3,883,611	3,787,157
Detroit.....	1,689,277	1,640,671	1,856,517	2,001,633	1,750,601
East Butte.....	1,325,000	1,400,000	1,400,000	1,268,595	1,268,595
Mammoth.....	1,661,150	1,641,091	1,450,000	1,700,000	1,750,000
Giroux*.....	600,000	625,000	600,000	625,000	625,000
Mason Valley.....	1,348,070	1,608,492	1,264,304	1,186,560	1,186,560
Miami.....	.....	.....	.....	1,943,900	2,612,000
Nevada Con.....	4,798,537	5,555,320	5,650,000	5,933,275	5,933,275
Ohio.....	380,849	591,651	690,001	650,071	650,071
Old Dominion.....	2,381,000	2,853,000	3,040,000	2,749,000	2,511,000
Ray.....	3,610,000	4,287,000	4,379,128	4,384,400	4,384,400
Shannon.....	1,152,000	1,260,000	1,238,000	1,080,000	924,000
South, Utah.....	nil	62,224	132,267	200,000	200,000
Tennessee.....	1,600,151	1,796,394	1,718,188	\$1,037,115	1,379,220
United Verde*.....	2,750,000	3,000,000	3,000,000	3,000,000	3,000,000
Utah Copper Co.....	7,585,303	8,248,880	9,539,847	10,003,227	10,003,227
Lake Superior*.....	19,000,000	19,000,000	17,000,000	18,705,000	16,500,000
Non-rep. mines*.....	5,399,849	6,203,606	6,000,000	6,300,000	6,300,000
Total prod.....	94,951,140	102,619,054	104,224,079	106,824,500	106,824,500
Imports, bars, etc.....	21,372,292	24,215,480	25,578,297	.....	.....
Total blister.....	116,323,432	126,834,534	129,802,376	.....	.....
Imp. ore & matte.....	9,459,432	11,911,041	7,177,363	.....	.....
Total Amer.....	125,782,864	138,745,575	136,989,739	.....	.....
Miami†.....	2,817,200	3,102,200	2,312,900	.....	.....
Shattuck-Arizona.....	1,136,480	1,234,450	1,158,326	1,026,170	.....
Brit. Col. Cos.....	.....	.....	.....	.....	.....
British Col. Cop.....	688,312	844,735	794,000	.....	.....
Granby.....	1,740,000	1,967,962	1,857,452	1,782,570	1,789,000
Mexican Cos.....	.....	.....	.....	.....	.....
Boleo‡.....	2,535,680	2,204,720	2,811,200	2,424,800	.....
Cananea.....	4,880,000	4,772,000	3,581,690	272,000	.....
Mocetzuma.....	2,730,914	3,062,159	2,733,240	2,695,881	3,438,793
Other Foreign.....	.....	.....	.....	.....	.....
Braden, Chile.....	1,178,000	1,472,000	1,512,000	1,150,000	1,804,000
Cape Cop., S. Af.....	712,320	732,480	586,880	387,520	.....
Kyshtim, Russia.....	1,352,960	1,478,400	2,544,640	.....	.....
Spassky, Russia.....	1,003,520	974,400	974,400	721,280	.....
Exports from.....	.....	.....	.....	.....	.....
Chile.....	5,824,000	7,840,000	7,616,000	3,584,000	5,824,000
Australia.....	5,512,000	6,944,000	6,608,000	7,004,000	7,616,000
Arrivals—Europe‡.....	8,509,760	15,585,920	10,545,920	13,661,760	5,277,440

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines.  
‡ Does not include the arrivals from the United States, Australia or Chile.  
§ In operation only 20 days in May.

**STATISTICS OF COPPER**

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VI '12.....	122,315,240	66,146,229	61,449,650	49,615,643	117,801,600	167,417,244
VII.....	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.....	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.....	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.....	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.....	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.....	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912.....	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.....	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,804,422
II.....	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.....	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.....	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.....	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.....	121,860,853	68,452,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.....	.....	.....	.....	52,904,606	71,904,000	124,808,606

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Table with columns: Company, Delinq, Sale, Amt. Lists various companies and their assessment details.

Monthly Average Prices of Metals

SILVER

Table showing monthly average prices for Silver in New York and London from 1911 to 1913.

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

COPPER

Table showing monthly average prices for Copper in New York and London from 1911 to 1913.

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Table showing monthly average prices for Tin in New York and London from 1911 to 1913.

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Table showing monthly average prices for Lead in New York, St. Louis, and London from 1912 to 1913.

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

SPELTER

Table showing monthly average prices for Spelter in New York, St. Louis, and London from 1912 to 1913.

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

PIG IRON IN PITTSBURG

Table showing monthly average prices for Pig Iron in Bessemer, Basic, and No. 2 Foundry from 1912 to 1913.

STOCK QUOTATIONS

Table of stock quotations for Colorado Springs and Salt Lake, listing company names and bid/ask prices.

Table of stock quotations for Toronto, listing company names and bid/ask prices.

SAN FRANCISCO

July 15

Table of stock quotations for San Francisco, listing company names and bid/ask prices.

N. Y. EXCH.

July 15

Table of stock quotations for New York Exchange, listing company names and bid/ask prices.

BOSTON EXCH.

July 15

Table of stock quotations for Boston Exchange, listing company names and bid/ask prices.

N. Y. CURB

July 15

Table of stock quotations for New York Curb, listing company names and bid/ask prices.

BOSTON CURB

July 15

Table of stock quotations for Boston Curb, listing company names and bid/ask prices.

LONDON

July 3

Table of stock quotations for London, listing company names and bid/ask prices.