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Arizona Copper Co.'s Dorr Thickener

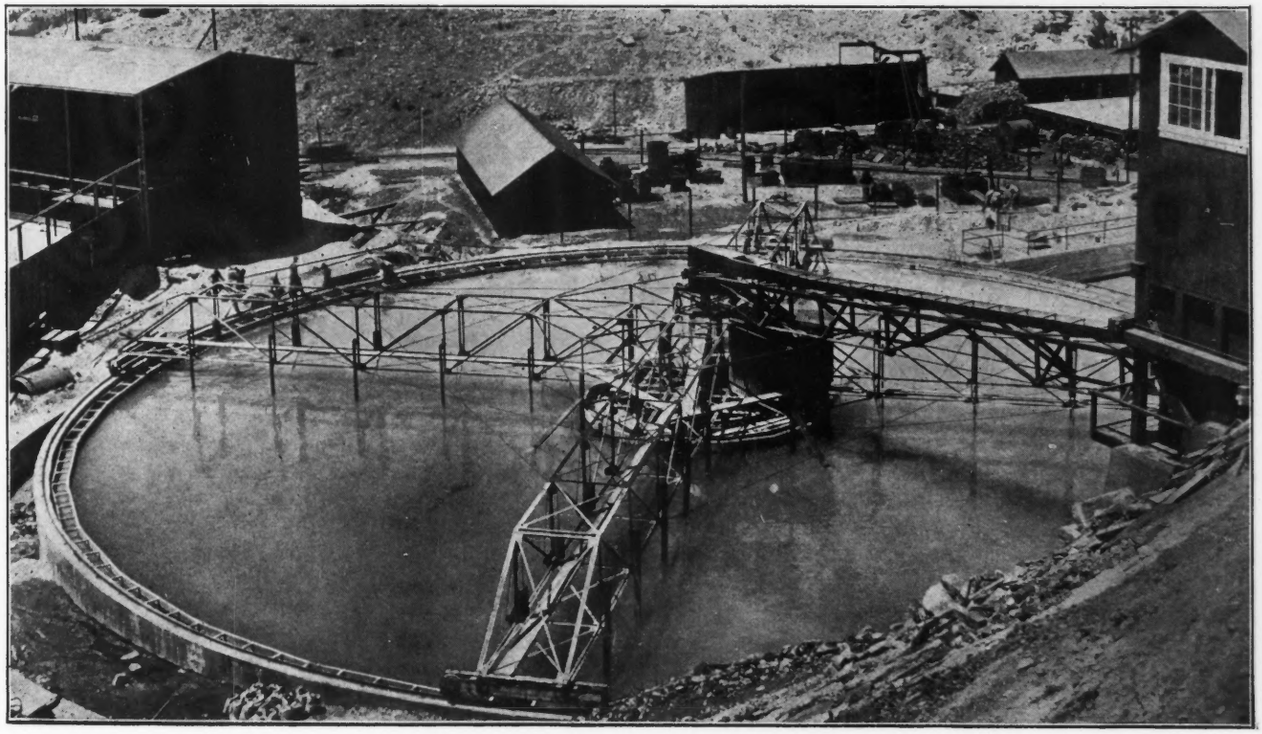
By David Cole*

SYNOPSIS—The largest Dorr thickener ever constructed, 130 ft. in diameter, is used to recover water from the tailings of the concentrating mill. The tank is built of concrete, with a central pier and a peripheral track for sustaining the trusses which carry the scrapers. The operation of the machine has been entirely successful.

All of the milling in the Clifton-Morenci district was primarily done in the drainage area of Chase Creek on rough ground so situated that the tailings would gravitate into the San Francisco River, which empties into the Gila within a few miles of Clifton.

On the Gila, below the mouth of the Frisco, a prosperous farming community has grown up, using the river water for irrigation purposes, and as the irrigation system became more fully developed and all of the low-stage water of the Gila used, the tailings became a menace to the operations of the farmers. Realizing this, the mining companies constructed impounding dams, but on account of the long drainage areas above them, and the precipitous ground upon which they were built, these dams could not be sufficiently protected against floods. A serious break in 1906 brought the matter into the courts and the companies were forever enjoined from allowing any of the tailings to enter the streams.

The Detroit Copper Mining Co. found it feasible to tunnel a small divide and, by using a long flume suspended on the sides of a cliff, reach suitable ground in the drainage area of Morenci Cañon, upon which the tailings could be successfully impounded; but the Arizona Copper Co.'s No. 5 mill was not so favorably situated and this company found it necessary, in order to reach suitable ground upon which to deposit tailings, to move its milling operation to Morenci. Since the mill and mine would then be close together it was decided to fill the square-set stopes of the



ARIZONA COPPER CO.'S DORR THICKENER

A view of the machine from above, showing the trusses which carry the rakes

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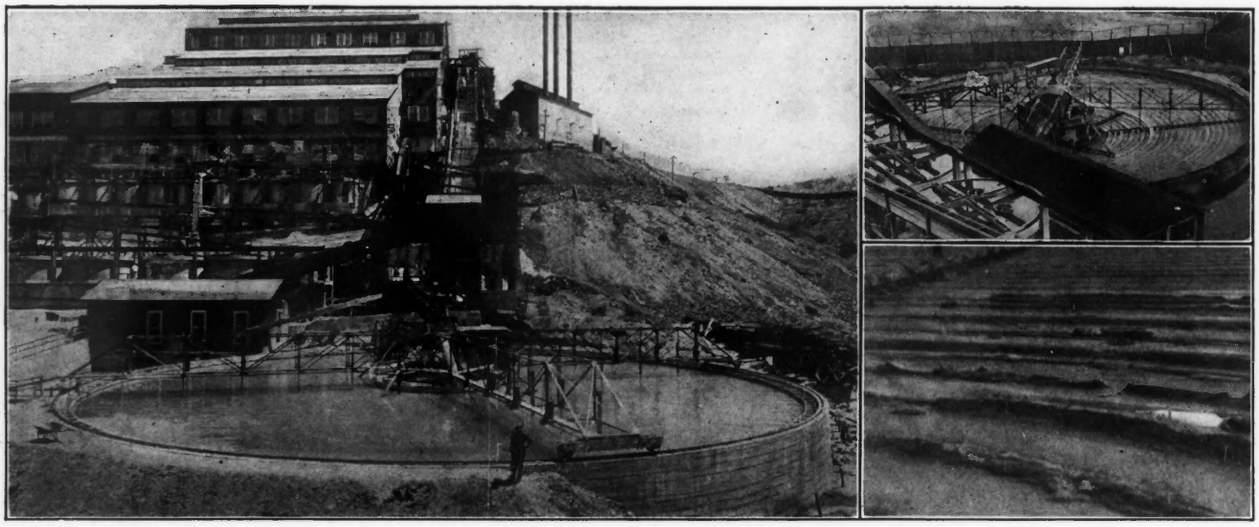
Longfellow mines with the coarsest part of the sand tailings made at the mill, and the large circular tank, which has now been transformed into the largest Dorr thickener and is the subject of the following remarks, was constructed as part of the apparatus devised for reclaiming the sands.

The tank is 130 ft. in diameter and 10 ft. deep, and is divided into several compartments so that one can be emptied while the others are filling. A hollow pier 21 ft. in diameter was constructed in the center of the tank, and a powerful revolving electric crane with long boom and grab bucket was put upon this pier and used for dipping out the sands and delivering them to the skips provided for hoisting the product to the mine level. It was soon discovered that the wet tailings were not good in the mine, and that earth embankments on the tailings ground made poor as well as expensive dams in which to impound slimes, and that the value of the sands in the construction of the tailings dams outweighed their value as filling material. So the electric hoist was removed from the pier and the round tank was arranged with a bottom as illustrated by the accompanying photographs, which show clearly the method of construction and how the thickener appears when in operation.

No trouble has been experienced with it, and although it has been in steady operation for more than a year, the repairs have been exceedingly small. The valves were originally made 8 in. in diameter, with a 3-in. plug opening in each. It was found advantageous to change these valves so as to make the openings 3 in. and dispense with the continuously spouting plug. The new 3-in. valves were arranged to have ball instead of flat seats, and bronze is used instead of old belting for the contact parts. These valves are opened intermittently and are controlled by cams which are adjustable as to number and period. The drive was originally by chain, but this was noisy and otherwise undesirable, and since it developed that a belt would have ample traction, the chain was changed to belt drive.

The rabbles are carried on 3x10-in. fir stringers and these are suspended from the bottom of vertical members hinged at their top ends as shown in drawings, and are

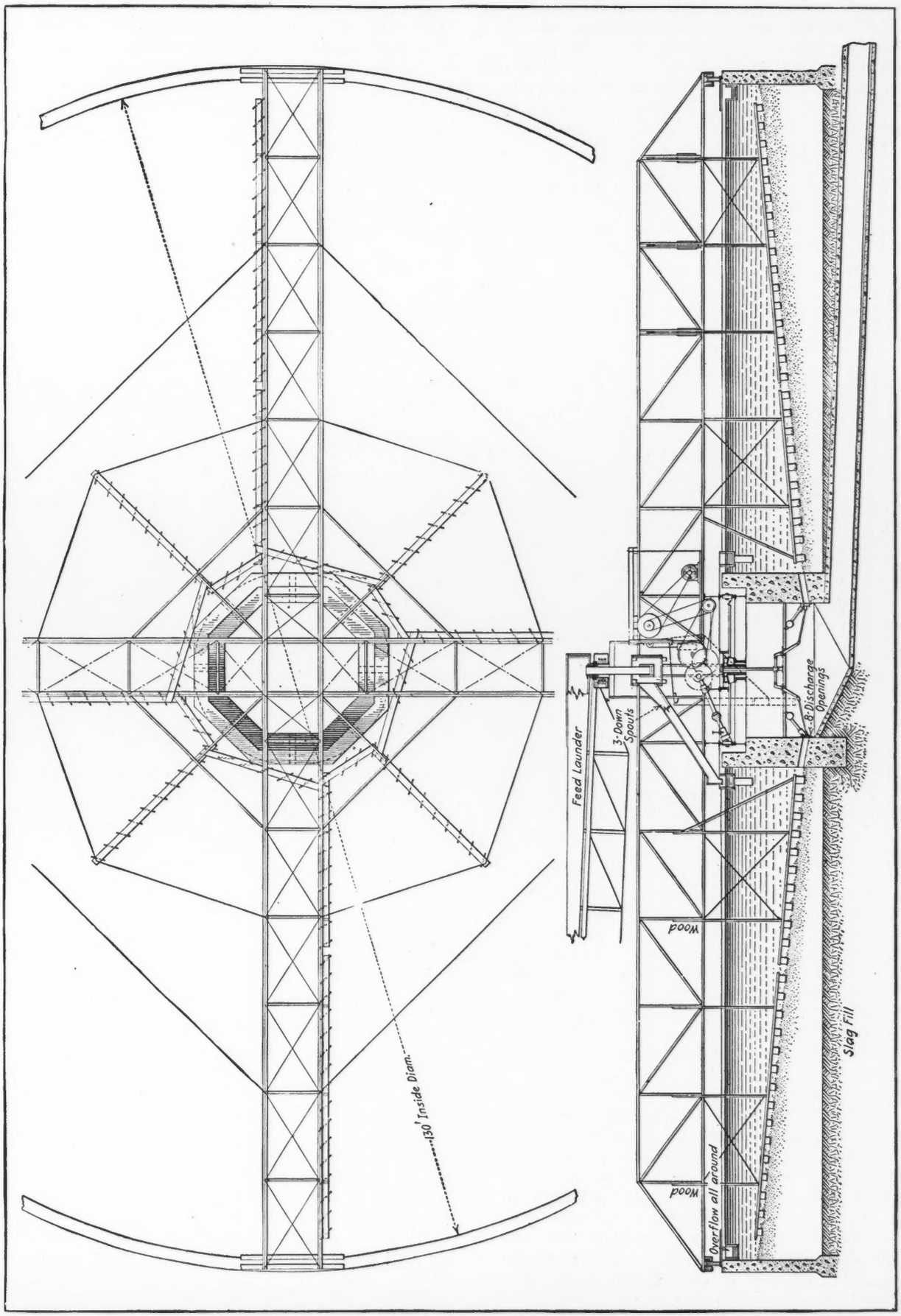


SITUATION OF THE THICKENER WITH REGARD TO THE MILL
The two smaller views show the thickener empty and illustrate the rake action

cut up into V-sections with a multitude of valves communicating with a drainage-pipe system, which did not meet expectations for reasons that are now entirely obvious.

In the work of remodeling and enlarging the milling plant, recently completed, I decided that the large circular tank could be made most useful by converting it into a Dorr thickener. It seemed rather bold to attempt one so much larger than had previously been tried, but conditions were favorable. It would be possible to use the central pier to advantage; the machinery provided for carrying the crane would carry the mechanism of the thickener; and much of the old crane framework and gearing could be used. There was a good T-rail around the rim of the tank to support the outer ends of the cruciform bridge required, etc., so the plans were drawn and the matter laid before Mr. Dorr, who was inclined to hesitate a little at first, but on further study decided that it was a splendid chance to try out the new questions involved, so we bought a nameplate of him, conditioned on the success of the "leviathan," and carried out our plans held back by using copper guy-lines with weights so that in case a rabble-arm should be caught or offer too much resistance, the weight would be raised and the arm would pass the obstruction through the operation of the hinge provided. This now appears to be unnecessary, for, in our experience, the vertical members have never moved from their seats against the trusses. A Reeves variable-speed countershaft was made part of the driving mechanism and experiments were made with several speeds. They all worked satisfactorily, but we finally settled upon one revolution in 30 min. as best for our work. There is little difference between two and three revolutions per hour in the results obtained.

The heavily reinforced-concrete wall of the tank was built upon a slag dump, which is substantial but notoriously porous. Sand tailings quickly sealed the bottom and the hardening slimes finished the job, so that there is no loss of water through seepage. It will be noted that since the bottom of the old tank is flat and the bottom maintained by the rabbles in the thickener is sloping, there is a deep deposit of slime near the outer wall afford-



DETAILS OF ARIZONA COPPER CO.'S DORR THICKENER AT MORENCI, ARIZ.

ing a good surface sloping toward the center with about 2 ft. of hardened deposit on top of the slag around the central pier. So it is at once suggested that these lines might be extended; the upper end of the slope of the cone rim could be extended to where it would be within one foot of the surface, and the central hollow pier could be decreased in size to, say, 10 ft. inside diameter, equipped to discharge the tank in the same way. Then a circular track supported by a small circular wall at the water's edge on the outer rim would support the light truss members of the cruciform bridge. The trusses would be tied together so as to move in unison and the tractive force would be applied on the outer circular track through wheel friction, the same as in railroad practice. The hollow central pier would be connected by large tile or reinforced-concrete conduit to a point of discharge outside of the rim. This may be a pit fitted with centrifugal pump or elevator for raising the discharge to sufficient height so that it may be handled to its destination by gravity. In this way Dorr thickeners up to 200 ft.

STATISTICAL DATA OF THE DORR THICKENER

Diameter of settling pond	130 ft.
Outer depth	4 ft.
Inner depth	8 ft. 6 in.
Diameter of pier (octagon)	21 ft.
Revolutions per hour	2-3
Number of 3-in. discharge valves	8
Number of rabble arms (4 long and 4 short)	8
Size of motor	5 hp.
Size of discharge conduit (to allow man to go in.)	2 ft. 6 in. by 2 ft. 6 in.
Settling area	13,000 sq.ft.
Average feed (tons dry colloidal slime per 24 hr.)	700
Average per cent. solids in feed	5.93
Average per cent. solids in discharge	30.65
Water recovery	85.75%
Gal. recovered per min. (approximately)	1,700
Power required (motor input)	4.7 hp.

Moisture in the discharge can be reduced to 50%, but the tailings are flumed two miles, for which reason the discharge is not made thicker.

in diameter or more can be installed on suitable ground at relatively small construction expense, and such machines should have large capacity, require little power and be cheaply maintained, thus giving the maximum results with the minimum expense.

It is, of course, much more expensive to house the large-diameter machines than the multiple units, but I believe that the large units consisting of relatively shallow ponds with conical bottoms built in the earth would be very readily kept from freezing by the application of the heat to the solutions being handled instead of to the air in contact with the solutions. I believe that less heat would be required by applying it in this way, and when so applied I believe that open-air construction and operation would be best, even in the North. Extremely large ponds should be fenced to break the force of the winds, otherwise a wave action is set up which interferes with settling to some extent.

The full capacity of our big thickener has not been determined. It discharges as much water as the electric pumps provided will handle, and if more feed is given the thickener, water would run to waste. Since this water has to be pumped seven miles against a pressure of nearly 1800 ft., it is expensive, and therefore carefully husbanded.

I have every reason to believe that with tailings as coarse as 40-mesh sand—when the coarse sand is not in larger volume than, say, 30% of the whole—the capacity in terms of tons handled would be found to be greatly augmented, nearly doubled, in fact. The amount of water clarified is, of course, dependent upon the percentage of colloidal material in the feed to the machine. Thus, much additional solids in the form of sands could be added to the present tonnage of real slime without changing any of the prevailing conditions except to greatly augment the tonnage handled.

In our case the man in charge of the pumping station oils the thickener and adjusts the cams controlling the discharge valves occasionally. Practically no labor is required.

Low Cost of Maintenance

The repairs required for 14 months' operations, including the changes mentioned above, are represented in a total sum of $682, which is 0.2c. per ton of dry solids handled in the period. Most of this expense is for valves destroyed by the water handled.

When the war broke out milling was reduced to six days a week and the thickener was stopped on Saturday night and started again Monday morning, and on one or two occasions the machine has stood idle for 48 hr., but it has always started again without difficulty of any kind and without lifting the weights which hold the rabble stringers against their seats.

There has been much interest manifested in the big thickener, and I had hoped to arrange temporarily feed- and water-handling facilities so that tests could be made definitely to determine the capacity, or range of capacities with different classes of feed, before writing a description of the apparatus; but this has not been possible. The extra recovery of water resulting from the use of the large thickener returned its cost in less than two months. It has therefore been highly successful and advantageous.

Dimensions, Weights and Costs of Steam Turbines*

Tables 1 and 2 were compiled from data supplied by manufacturers and should prove of value in connection with preliminary estimates. The dimensions, weights and cost data are for condensing units and include the turbines and alternating-current generators.

The values in Table 2 were plotted and the following equations were deduced, giving the cost in dollars (C) of the turbine and generator, in terms of the capacity in kilowatts:

Impulse types, C = 5040 + 9.2 kw. (Dollars)
Reaction types, C = 7400 + 8.26 kw. (Dollars)

TABLE 1. DIMENSIONS AND WEIGHTS OF CONDENSING STEAM TURBINES, INCLUDING GENERATORS

	Impulse Type							Reaction Type						
Size Kw.	Length, ft.	in.	Width, ft.	in.	Height, ft.	in.	Weight, lb.	Length, ft.	in.	Width, ft.	in.	Height, ft.	in.	Weight, lb.
300	15	10	5	0	5	4	18,500	16	0	6	0	..	..	24,000
300	..	..	..	..	..	..	.....	20	0	6	0	5	10	37,900
500	..	..	..	..	..	..	.....	18	0	6	0	..	..	30,000
500	16	1	7	3	6	6	34,800	20	9	6	0	5	10	42,600
1,000	..	..	..	..	..	..	.....	24	0	6	0	..	..	60,000
1,000	16	0	6	10	7	6	45,000	18	4	6	9	6	8	52,250
2,000	20	6	9	0	7	9	75,000	25	6	9	4	7	9	105,000
2,000	..	..	..	..	..	..	.....	26	0	7	0	..	..	90,000
5,000	25	1	10	7	9	8	175,000	34	9	11	5	9	1	236,000
5,000	..	..	..	..	..	..	.....	34	0	8	0	..	..	190,000
10,000	32	5	12	9	12	0	310,000	45	0	10	0	..	..	320,000

TABLE 2. COST OF CONDENSING STEAM TURBINES AND GENERATORS

	Impulse Type		Reaction Type	
Size, Kw.	R.p.m.	Cost	R.p.m.	Cost
300	3600	$8,000	3600	$7,650
500	3600	9,600	3600	9,550
1,000	3600	14,000	3600	13,750
2,000	3600	23,000	3600	22,800
5,000	1800	55,000	3600	48,700
10,000	1800	95,000	1800	90,000

Orebodies of the Mesabi Range--II

By J. E. Wolff*

SYNOPSIS—Vertical sections through developed orebodies from different parts of the range illustrate relations existing between orebody and unaltered iron formation; rock walls; "horses" and "islands"; faults; folds; the slump and other structural features. Western Mesabi orebodies differ in some points of structure, notably in the absence of slump.

Following the discussion of typical structure in Part I, there may be taken up some actual illustrative examples in the form of vertical sections through orebodies from various parts of the Mesabi range, including the sandy ores of the western end.

Figs. 11 to 16 inclusive show sections of orebodies actually developed in different parts of the range by drilling and mine workings. Some of the bodies are nearly worked out at the present time. The sections taken transverse to the long axis of the orebody, that is, across the trough, show the slump markedly; those taken along the axis of the trough do not show it. All of the sections show the typical structure illustrated in Figs. 6 and 7 (Part I).

Fig. 11 shows the cross-section of an orebody now partly worked out. The marked slump and sharp rock walls are features actually observed in the mine. Some idea of preglacial erosion of the taconite, and of ore also, can be formed by comparing this section with Fig. 6. A thickness of 350 ft. to 500 ft. of taconite has been eroded.

Fig. 12 shows two troughs separated by taconite. West of this cross-section these two troughs connect into a larger orebody. An anticline and syncline in the quartzite are shown. This was worked out from drill holes not occurring on the cross-section. Close study of drill records has disclosed many such minor flexures of the formations. Attention is called to the lower nonbessemer ore extending to the south under taconite. This is a characteristic flat-layered body, mentioned before. More frequently the ore occurs immediately below the Intermediate slate layer (Fig. 20).

Fig. 13 shows a cross-section of an orebody now nearly mined out. Notable features are the sharp rock walls, as actually defined by mine workings, and rock layers and horses or pillars in the lower blue orebody. Preglacial

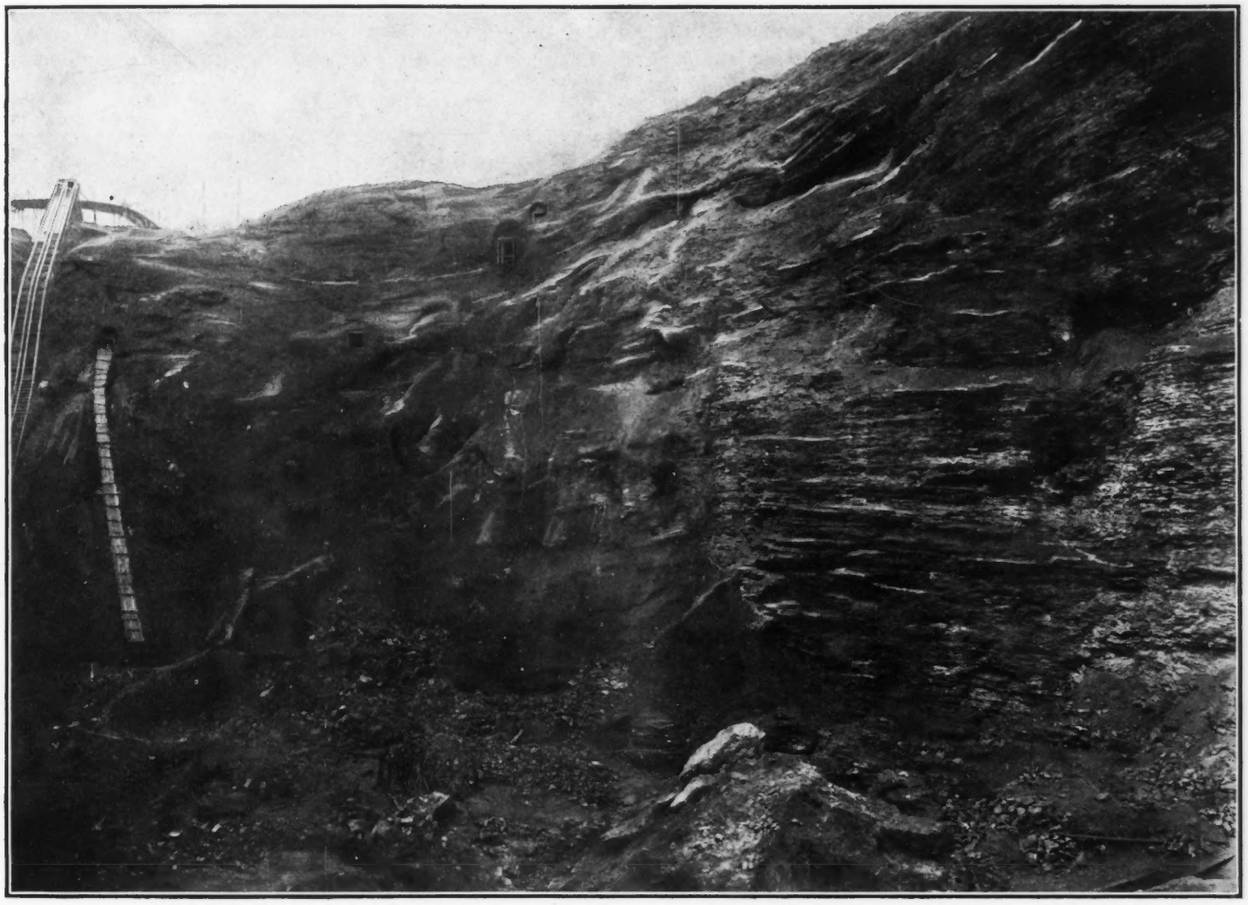


FIG. 8. SHARP ROCK-WALL OF A DEEP TROUGH OREBODY ON THE EAST CENTRAL PART OF THE RANGE
Note face of wall. Left half of picture shows ore

*Mining engineer, Oliver Iron Mining Co., Duluth, Minn.

erosion is marked here also. Note the slump at the rock walls and on both sides of the "taconite island." In connection with this compare Figs. 8 and 10.

Fig. 14 is a cross-section of an orebody of which the east wall is an altered granite dike. In places some concentration was found by mine workings east of the dike also. Samples of the dike assayed 3.65% titanium, which is practically unknown in the iron formation proper.

Fig. 15 is a section transverse to the length of an orebody but does not show the slumping feature except at its south rock wall, because of the steep dip of the formation. Attention is called to the ore "making" under the Virginia slate. This orebody with its eastern continuation is one of the few in which this condition is known to exist. In this body one drill hole showed ore to a depth of 900 ft., the deepest known on the range. This cross-section will be referred to later in connection with the fault shown by Fig. 17.

Fig. 16 shows a longitudinal section of a typical Western Mesabi washable orebody. A comparison of this section with any of the foregoing shows their analogous structure. A transverse section of a Western Mesabi

FIG. 9. SOUTH END OF TACONITE ISLAND IN ALPENA PIT

FIG. 10. ANOTHER VIEW OF THE MINE SHOWN IN FIG. 8

Fig. 9—Note steep west dip of rock and ore layers. Fig. 10—Looking northwest, showing south and part of north rock walls. Note taconite horse and pillars and large amount of rock sorted from lower orebody. Orebody nearly mined out. Old steam-shovel approach in ore shown in distance. Same orebody as shown in Fig. 13

body does not show the sharp rock walls or marked slumping observed in bodies in the central and eastern part of the range. The western bodies are shallower than the central and eastern. In the western bodies the silica has been leached out of the taconite and the iron well oxidized and concentrated into seams and layers; the silica, however, has not been transported but remains as extremely fine, almost impalpable, white powder. This is the condition in both upper and lower blue orebodies. The upper slaty taconite becomes altered in a washable orebody to decomposed taconite which yields a fairly good product after being washed. The lower yellow taconite alters to an extremely sandy washable ore. The upper 10 ft. of this layer contains so much silica and so little ore as to be worthless by itself as washable ore; it resembles common building sand. The upper and lower blue ores in a washable orebody are known as typical washable ores. The silica separates easily from the pieces of hard hematite and the problem of concentration is a simple one.

From the sections presented, covering all parts of the range, it is evident that the same structure exists from one end to the other. Structurally the range and its orebodies are remarkably uniform. The same structure as here shown can be worked out for any orebody if drill and mine exploratory work and records are complete enough. This matter will be discussed more in detail in Part III.

LEGEND OF FORMATIONS OF OREBODY CROSS-SECTIONS

B.O.	Blue ore	O.	Ore
B.T.	Broken taconite	P.Q.	Pokegama quartzite
C.	Conglomerate	P.R.	Paint-rock
Cret.	Cretaceous	P.R.L.	Paint-rock layer
C.S.	Cretaceous shale	P.R.O.	Paint-rock ore
C.T.	Cherty taconite	Q.	Quartzite
D.S.	Decomposed slate	S.	Slate
D.T.	Decomposed taconite	S.T.	Slaty taconite
G.	Greenstone	T.	Taconite
G.D.	Glacial drift	T. & O.	Taconite and ore
H.G.O.	High-grade ore	U.H.G.O.	Upper high-grade ore
I.P.R.L.	Intermediate paint-rock layer	U.N.L.	Upper nonbessemer layer
		U.N.O.	Upper nonbessemer ore
I.S.L.	Intermediate slate layer	U.S. & C.T.	Upper slaty and cherty taconite
L.B.O.	Lower blue ore		
L.C.T.	Lower cherty taconite	U.S.T.	Upper slaty taconite
L.H.G.O.	Lower high-grade ore	U.Y.O.	Upper yellow ore
L.H.S.	Lower huronian slate	U.Y.T.	Upper yellow taconite
L.N.O.	Lower nonbessemer ore	V.S.	Virginia slate
L.O.	Lean ore (40%-49% iron)	W.O.	Wash ore
L.Y.O.	Lower yellow ore	Y.O.	Yellow ore
L.Y.T.	Lower yellow taconite	Y.T.	Yellow taconite
		U.B.O.	Upper blue ore

Fig. 17 shows a normal fault with a throw of 200 ft. or more in which the quartzite and underlying greenstone have been faulted up against the orebody. This fault is the eastern continuation of the Biwabik mine fault, the throw of which is probably 300 ft. or more. It goes off west into the underlying rocks just north of the Duluth mine (NW ¼ of NE ¼, Sec. 3, T. 58 N, R. 16 W). Eastward it dies out before it reaches Embarrass River and gives way to a steep inclination of the formation, as shown by Fig. 15, a cross-section east of this river. Thus it is a fault of the hinge type. This fault and the steep dip are the cause of the quartzite tongue on the geological map in Secs. 33 and 34, T. 59 N, R. 15 W, and the sharp bend in the formation at this place. The deformation produced an anticline in the iron formation and the quartzite. Erosion truncated the series, exposing the tongue of underlying quartzite and the bend in the formations.

Fig. 18 shows a thrust fault in the Alpena mine, a mile north of the city of Virginia. This is the greatest known fault of the Mesabi range. The stratigraphic

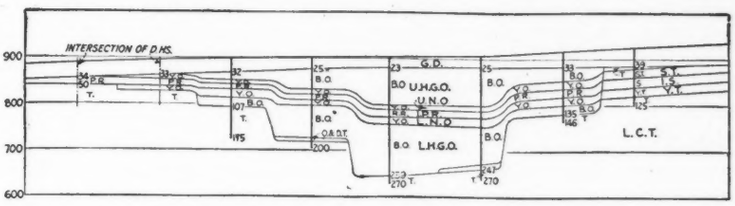


FIG. 11. CROSS-SECTION OF OREBODY IN T. 58 N, R. 20 W, LOOKING WEST. MARKED SLUMP AND SHARP ROCK-WALLS OBSERVABLE IN THIS MINE

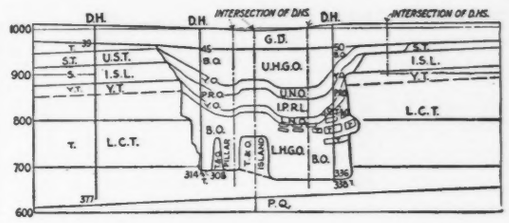


FIG. 13. CROSS-SECTION OF OREBODY IN T. 58 N, R. 17 W, LOOKING NORTHWEST

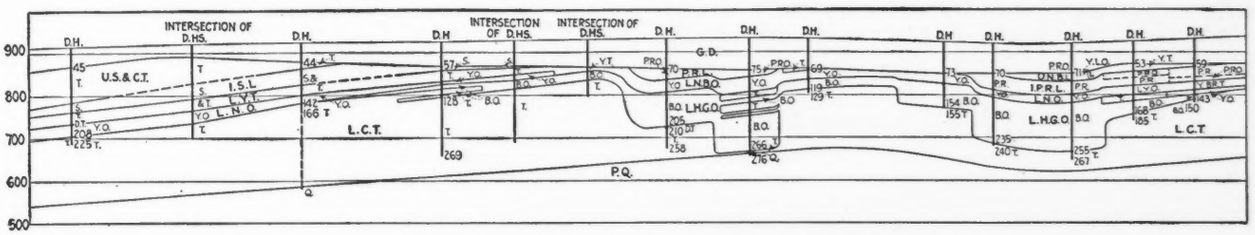


FIG. 12. CROSS-SECTION OF OREBODY IN T. 58 N, R. 20 W, LOOKING WEST

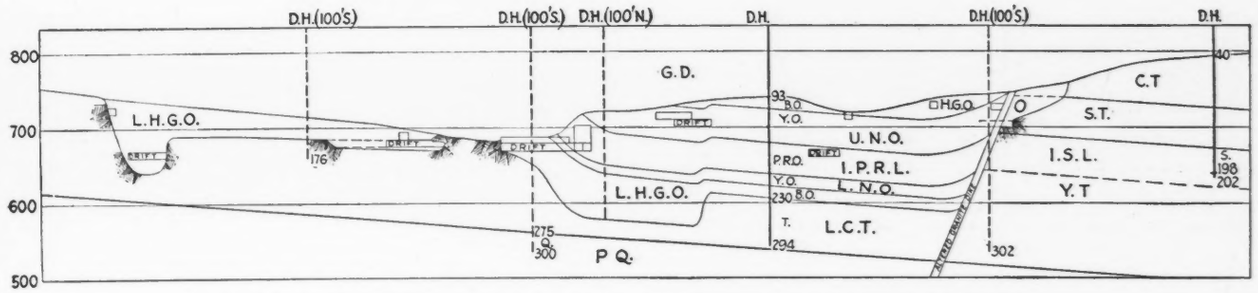


FIG. 14. CROSS-SECTION OF OREBODY IN T. 58 N, R. 16 W, LOOKING NORTH

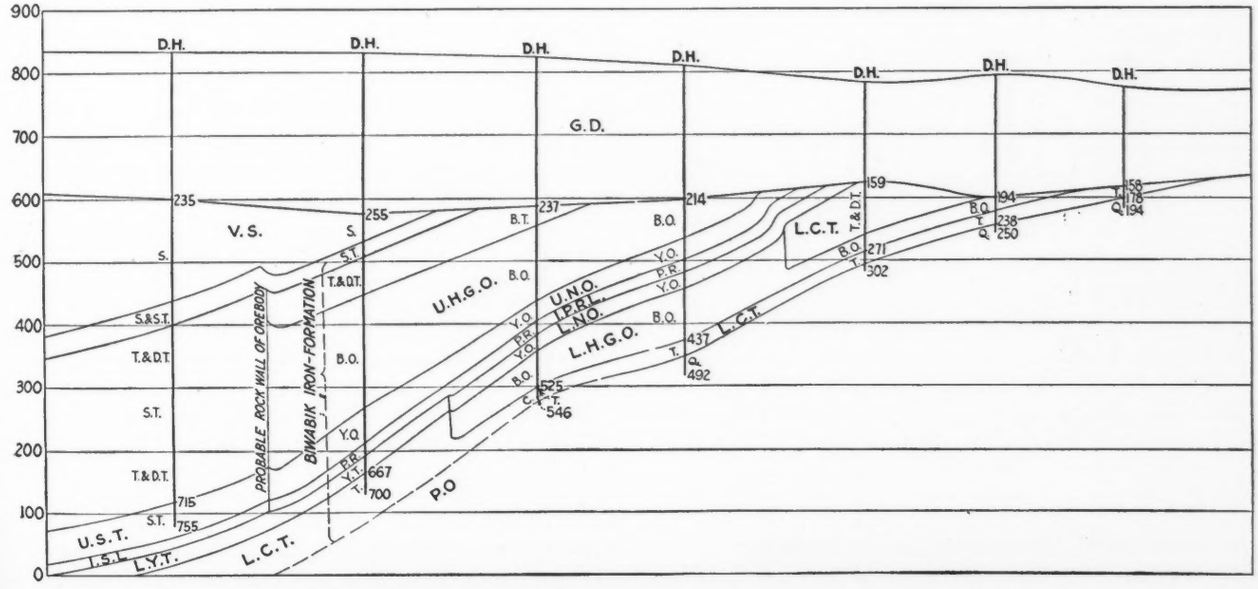


FIG. 15. CROSS-SECTION OF OREBODY IN T. 58 N, R. 15 W, LOOKING WEST

throw is 350 ft., and the vertical throw at least 600 and possibly 1000 ft. This fault is visible in the Sliver mine, north of the Alpena, and has been traced by explorations a half mile south of the Alpena. Fig. 19 shows the probable development of this fault. Its development is directly related to the folding or deformation which produced the large bend in the iron formation between Virginia and Eveleth, known as the "Virginia horn." This deformation is a big drag-fold. The sharp bend in the iron formation northeast of Virginia caused compression and consequent crumpling in the layers of the formation, and necessitated shortening somewhere. The shortening took place in this fault. Diagrams *A*, *B* and *C*, of Fig. 19, show the development of this fault. As the deformation started to develop the Virginia horn, a small drag fold developed as shown in *B*, thus shortening the layers in response to the compression in them. (It is a well established fact in structural geology that in a folded formation the small folds are of the same type as the large folds upon which they are superimposed.) As the deformation increased, the brittle quartzite and iron formation faulted on a plane through the axis of the small drag fold, into the position shown by *C*. Erosion has since cut the top of the fold as shown. Without doubt the fault continues down into the underlying rocks, slates and greenstone. The fault occurred prior to the formation of the orebody, as along the fault plane there is no evidence of movement in the layers of ore. Along the east side of the taconite island (Fig. 18), at the contact of rock and ore, is found a layer of powdered silica several inches thick. This was the fault plane and this powdered silica was produced by the rubbing of the broken taconite in the faulting process. Some slipping within the beds of iron formation undoubtedly occurred also. The fault probably occurred during Upper Huronian or not later than Keweenawan time. It is a fair assumption that the deformation which caused the Virginia horn, the Alpena fault, the Biwabik fault and the steep dip of the formation east of it, was contemporaneous with the intrusion of the Embarrass (Keweenawan) granite and the Duluth (Keweenawan) gabbro.

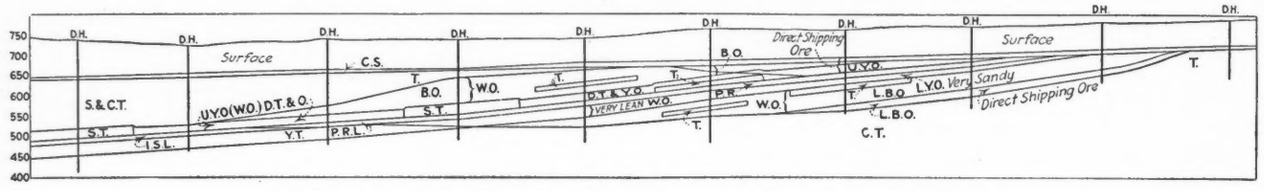


FIG. 16. TYPICAL CROSS-SECTION OF WESTERN MESABI OREBODY

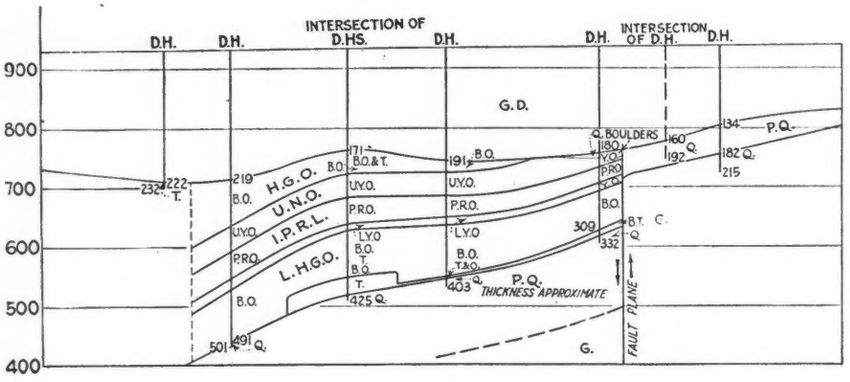


FIG. 17. CROSS-SECTION LOOKING WEST OF OREBODY IN T. 58 N, R. 15 W, SHOWING NORMAL FAULT, WITH THROW OF 200 FT.

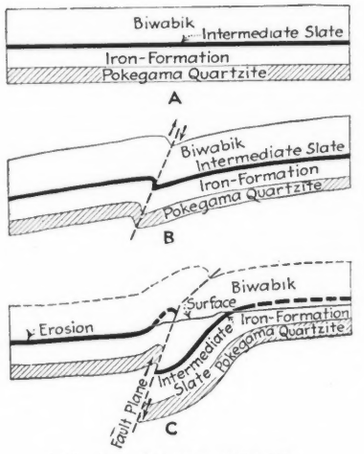


FIG. 19. FAULT DEVELOPMENT

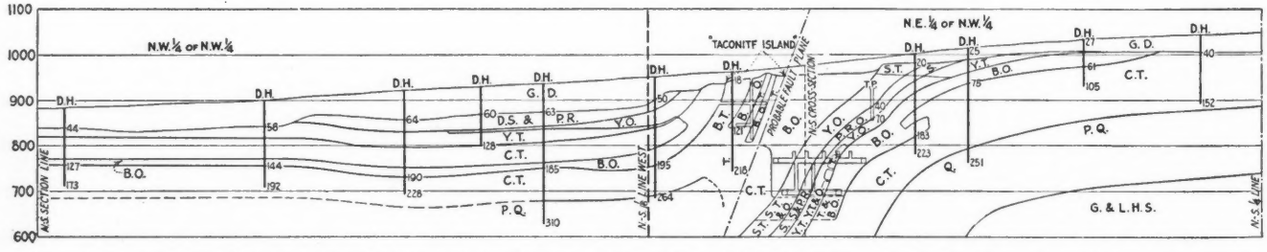


FIG. 18. SECTION LOOKING NORTH, SHOWING FAULT IN ALPENA MINE. N. ½ OF N.W. ¼, SEC. 5-58-17

Fig. 20 shows a cross-section of an orebody in which the whole formation is bent into a sharp monoclinal fold. This fold was worked out entirely from the drill records; it was followed for a half mile each way from the cross-section. The orebody beneath the Intermediate slate, or paint-rock layer, is a typical example of a flat-layered orebody. A thousand feet north this ore connects with a large trough orebody similar to that shown by Fig. 12. The ore above the Intermediate slate connects each side of the cross-section with elongated bodies of ore. The conglomerate at the top of the iron formation is not Cre-

taceous; it is later in age and the pebbles are not cemented together as in a Cretaceous conglomerate. It is probably a bed of iron pebbles deposited in a local, preglacial lake on top of the iron formation. Numerous occurrences of the kind have been found in drilling and mine operations.

Other exceptional structural features are known in different parts of the range. In the Hawkins and La Rue orebodies at Nashwauk in T. 57 N, R. 22 W, there is a marked faulted fold, which, by means of drilling, has been followed in the taconite between the two orebodies. At the north end of the Agnew mine (NE ¼ of NE ¼, Sec. 11, T. 57 N, R. 21 W), the face of the ore on the Hull forty shows a small faulted drag-fold in the middle of the trough of the orebody (Fig. 3, p. 91). In the Graham mine (Sec. 21 T. 59 N, R. 14 W) on the eastern end of the range, a fold extends the length of the orebody. It is a thrust fold, the south side being thrust up undoubtedly by the great gabbro intrusion 1¾ miles southeast. As the top of the fold is eroded it is not possible to tell how close the fold was.

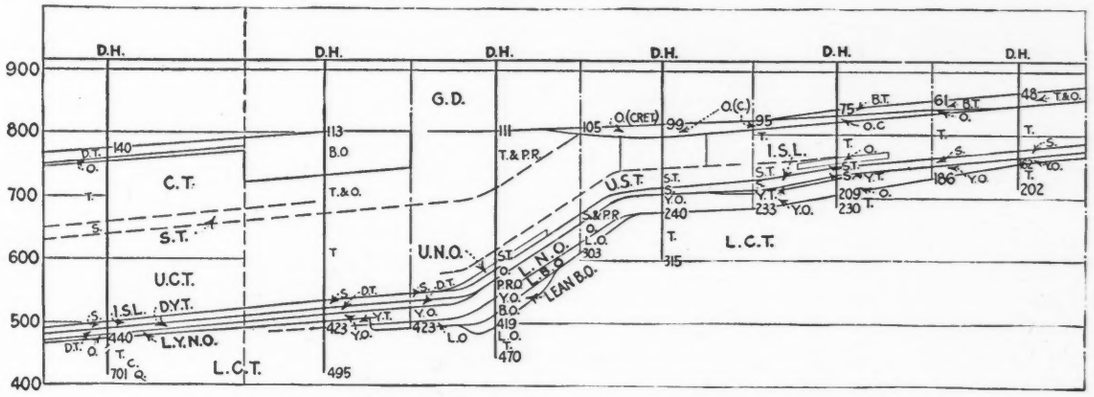


FIG. 20. CROSS-SECTION OF OREBODY IN T. 57 N, R. 21 W

(To be continued)

Domestic Sulphur Consumption

The sales or marketed production of sulphur in the United States in 1914, according to the Geological Survey, was 327,634 long tons, valued at $5,954,236. These sales were the largest in the history of the industry and 16,044 long tons greater than those of 1913. The sulphur mined in 1914 but stocked at the mines is not included in these figures. In 1914 four states produced sulphur, namely, Louisiana, Texas, Nevada and Wyoming. [One company in Louisiana alone produced more than the total consumption in the United States, as it has done for several years past.—Editor.]

The total imports for 1914, entered for consumption, were 26,135 long tons, valued at $477,937, of which 23,610 tons, valued at $398,984, were crude sulphur. Corresponding figures for 1913 were 22,605 long tons, of which 15,122 tons were crude sulphur. In 1914 the great bulk of the imports was, as usual, from Japan.

In 1914 the exports were 98,153 long tons, and would probably have been considerably greater but for the disturbed conditions in Europe. Even with such adverse conditions the excess of exports over imports amounted to 72,018 long tons, the balance of trade in favor of the United States being $1,329,397.

Ore Reserves of the Rand

By A. Cooper Key*

The table presented herewith shows the quantities of payable ore reserves at the principal Rand mines at the end of last year, or the latest figures available in certain instances where the company's year does not correspond with the calendar period, as well as at the end of 1913. The method of expressing ore reserves varies somewhat among different groups and engineers. For instance, there are stoping tons and milling tons, the latter not frequently. There is considerable difference between the two, and sometimes insufficient information is afforded to enable the comparative significance to be grasped. It is necessary to know the average percentage of waste rock discarded. In spite of many difficulties, the ore-reserve position has been well maintained. The feature of the table, however, is the increase which has taken place in the two mines of the far East Rand which have recently joined the ranks of producers. We have the Modder Deep and the Government Areas, each with 2,450,000 tons in sight, but the former has 8 dwt. rock against 5.8 dwt. in the latter, besides an advantage of 9 in. in the thickness of the reef. Springs Mines for the first time commits itself to an ore reserve estimate—550,000 tons of 10 dwt. rock over 52 inches.

Alone among the three big consolidations has the Randfontein Central been able to maintain its reserve aggregate. The Crown Mines' is less by 427,000 and the East Rand's by half that quantity. More serious, however, is the drop of 3s. 6d. on the valuation at the Crown Mines. Brakpan has increased its aggregate by 266,000 tons and maintained the value. City Deep has added 343,000 tons; the value is 0.3 dwt. lower, but still 1 dwt. higher than at the end of 1912. Modder B.'s value has improved by 0.3 dwt. In 1912 the New Modderfontein had 3,900,000 tons exposed; in 1913, 4,547,000; and in 1914, no less than 6,334,500 tons, the value having improved from 8.1 to 8.4 dwt. Kleinfontein gains 1,100,000 tons from the amalgamation with the Apex and Benoni, but the value is 0.7 dwt. less than that of the Kleinfontein alone a year ago. Taking Kleinfontein section by itself, the drop in value is rather greater.

Nourse Mines, Wolhuter and Village Deep are conspicuous for substantial increases, while at the City & Suburban and the New Heriot position is well maintained.

*Editor, "South African Mining Review," Johannesburg.

On the west, the West Rand Consolidated has 1,800,000 tons in sight, some partially developed, which compares with 1,445,000 tons of two years ago.

The Meyer & Charlton and the Robinson share the distinction of being mines with reserves exceeding 10 dwt. The former is in the stronger position, having 105,000 tons more of definitely valued ore; moreover, the value is 59s. compared with 45s. 6d. Of course, the Charlton

RAND ORE RESERVES IN 1913 AND 1914

Producing Cos.:	—As at December, 1913*— Tons	Dwts.	In.	—As at December, 1914*— Tons	Dwts.	In.
Aurora West	554,909	5.7	..	614,610	5.26	44
Bantjes Con.	974,700b	6.3	42	800,400b	6.1	41
Brakpan	2,224,000	6.7	61	2,490,000	6.73	62
City Deep	2,167,650b	10	..	2,510,800b	9.7	55
City and Suburban	786,500	8.3	..	758,700	8.5	..
Con. Langlaagte	2,194,400	6.4a	..	2,220,707	6.9	..
Cons. Main Reef	614,470	7.32	48	693,460	7.3	49
Crown Mines	10,449,000b	6.82	63	10,022,000b	6.0	66
Durban Rood. Deep	1,312,700b	6.7	47	1,303,400b	6.7	47
East Rand Prop.	5,600,000	6.7	54	5,400,000	6.6	55
Ferreira Deep	1,974,400b	8.7	68	1,893,100b	8.5	68
Geduld Proprietary	1,757,000	6.9	58	1,900,000	7.1	59.5
	106,000	6.3	59	.....	....	..
Geldenhuis Deep	1,669,500b	6.4	49	1,613,000b	6.4	..
Ginsberg	312,540	6.0a	..	278,213	6.7	..
Glencairn	587,920	3.6a	..	440,520	3.3a	..
Govt. G.M. Areas (M)	559,500	6.6	50	2,451,581	5.8	60
Knights Central	539,100	6.0	60	430,500	5.7	63
Knights Deep	2,777,000c	4.3	..	2,480,000c	4.2	..
	259,000g	3.7	..	200,000g	3.9	..
Langlaagte Estate	1,512,360d	...	..	886,396	5.97	50
				187,221h		..
Luipaardsvlei Estate	581,800	5.5	..	660,365	5.5	..
Main Reef West	591,830	6.02	55	526,440	5.7	53
Meyer & Charlton	471,844	11.7	..	469,839	13.9	55
Modder B	2,800,400	8.3	55	2,772,540	8.6	55
Modder Deep	982,000	7	75	2,450,000	8	69
	191,000g	10.5	62			
New Goch	917,088	5.16	..	825,900	5.27	84
New Heriot	581,124	8.1	46	588,315	8.1	..
New Kleinfontein	1,658,481c	6.3	59	2,890,731c f	5.6	58
New Modderfontein	4,547,000b	8.1	62	6,334,500b	8.4	63
New Primrose	401,045	6.2a	..	335,463	6.8	..
New Rietfontein	51,737	7.55	..	31,131	....	..
New Unified	387,500	5.9a	..	371,037	5.5a	..
Nourse Mines	1,795,600b	6.6	..	2,473,700b	6.4	..
Princess Estate	614,000	7.2	28.6	553,000	7.1	28.2
Randfontein Central	6,818,929	6.5	..	6,826,644	6.6	..
Robinson, Leader & S. Reef	358,500	10.4	..	364,700	10.7	..
Robinson Reclaimable	469,100	....	..	330,100	....	..
Robinson Main R	772,900	4.3	..	534,300	4.4	..
Robinson Deep	1,538,000c	6.0	..	1,533,000c	5.9	..
	346,000g	5.88	..	407,000g	5.8	..
Roodepoort United	370,732	5.3	45	590,000	5.9	45
	189,000e	5.4	45	227,000	5.9	45
Rose Deep	3,828,400	5.8	56	3,957,100b	5.5	..
Simmer & Jack	2,524,000c	5.4	..	2,320,000c	5.4	..
	406,700g	4.7	..	348,000g	4.6	..
Simmer Deep	1,670,000	4.3	..	1,429,000	4.3	..
				302,000g	4.6	..
Van Ryn	2,064,500	6.5	..	1,973,312	6.5	53
Van Ryn Deep	1,953,845	8.6	55	1,692,349e	8.5a	..
Village Deep	2,662,600b	6.6	60	2,853,470b	6.8	60
West Rand Cons	1,364,956	6.16	..	1,453,000	6.05	49
	213,360g	....	..	340,000g	7	..
Witwatersrand	1,225,688	6.4a	..	1,221,879e	6.6a	..
Witwatersrand Deep	1,666,000	6.8	50	1,707,400	6.2	50
Wolhuter	784,100	6.1	51	999,400	5.9	53
Non-Crushing Cos.:						
Cinderella Cons.	613,000	6.35	..		i	..
	231,000g					
Jupiter	1,273,000	4.5	..		i	
	161,000g	4.1	..			
Developing Cos.:						
Springs Mines	.....	..	..	553,000	10.3	52

*Or latest date in respective years. a Estimated recovery value. b Includes shaft and boundary pillars, and also valued ore to be rendered available for stoping by current development. c Mining tons. d Payable and unpayable. e Milling tons. f Includes Apex and Benoni, Kleinfontein Section alone, 1,781,231 tons, 5.47 dwts, over 59.6 in. g Partial. h Probable. i Unchanged.

has a considerable life, whereas the Robinson is nearing the close of its remarkable career. By June next it will have produced £20,000,000 worth of gold, of which about £13,000,000 constitutes profit. For the first seven years of its existence the recovery was more than an ounce, sometimes more than two ounces. For the last three years it has been under 10 dwt. But working costs are now 14s. per ton against 25s. in 1898 and 35s. to 40s. in the earliest years of crushing.

Mica of Good Quality, according to U. S. Consul E. C. Baker at Chungking, is found near Sungpan, in the Szechwan Province, and one of the large Chinese firms at Chungking with a branch office in Shanghai is prepared to export this product. The price delivered at Shanghai is between 9 and 10c. U. S. cy. per lb. About 15,000 lb. can be delivered every year.

New Sampling Plant at Hamburg

A new and unique sampling plant was erected last year at Hamburg, Germany. There is a large tonnage of pyrites imported, and the plant has been erected primarily for the purpose of sampling it. The pyrites consists of hard lumps so that substantial crushing machinery is required.

The ore is imported in large steamers which discharge into lighters in one of the main harbors, whence it is conveyed inland. A certain portion of the ore is discharged from the ship into special lighters for sampling. These special sample lighters are towed to the sampling plant, which is shown in the illustration. The ore to be sampled is discharged from the lighter by means of a jib crane, as shown. The crane is provided with a self-discharging bucket which empties the ore through a trap-door in the roof of the building into a bin.

The progress of the ore may now be followed by referring to Fig. 2 which shows the layout of the plant inside the sampling building. The ore passes from the bin into a jaw crusher, which reduces it to 2-in. lumps.

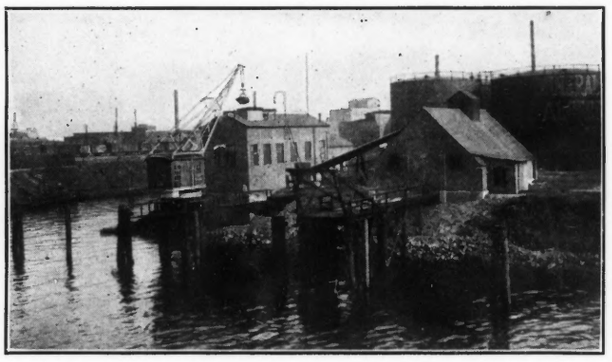


FIG. 1. SAMPLING PLANT AT HAMBURG

It then travels up a bucket elevator and through a Brunton sampler, where four-fifths of the stream is rejected. The remaining fifth goes through the gyratory crusher, which brings it down to ⅝-in. lumps; thence up a second inclined elevator to the top of a special automatic sampling machine.

It is at this point that the unique and especially interesting part of the process begins. This sampling machine consists of a large steel frame about 14 ft. high, in which are arranged three pairs of rolls. The largest, at the top, are 20 in. in diameter and the other two pairs are 16 in. and 12 in. respectively. Above the top pair of rolls and intermediate between the different sets there are three flat reciprocating vanes, or dividers, connected together and arranged to flap from side to side, so that during a portion of the time the ore striking them is diverted in one direction and during the remainder of the time in another. These reciprocating vanes will be called flaps.

The first thing that happens to the stream of ore entering the top of the machine is that four-fifths of it is rejected by the reciprocating flap *A* (Fig. 3) in the drawing. All three of these flaps are driven by cams connecting rods in such a way that during one-fifth of the time they are deflecting the stream of ore into the rolls and during the remaining time they are diverting

it out of the left-hand side of the machine. The first pair of rolls crushes the ore down to about $\frac{3}{16}$-in. lumps. This crushed product then passes over the second flap, the sample going through the second pair of rolls. After another reduction it is finally crushed to the desired degree of fineness by the last pair of rolls, when it goes through the shaking screen *B* and thence to the bottle filler *C*. If there are any particles of ore which have not been sufficiently reduced in size by the last pair of rolls, they slide off the side of the shaking screen upon a little rubber-belt elevator, which carries them up and again passes them through the final pair of rolls. In this way the whole of the final sample is crushed to any requisite fineness for the sample bottles.

One of the most interesting features of the machine is the bottle filler. This consists of a revolving table on which the bottles are placed and over them an annular hopper divided into compartments so arranged that a certain portion of the final sample is diverted and fed into the bottle in such a way that a definite quantity goes into the bottles and each bottle gets its correct proportion. Another feature of the machine is the provision of automatic adjustable feeders between the sets of rolls for keeping the stream of ore practically uniform. When each set of bottles is filled it is immediately removed, corked and sealed by the representatives of both parties.

The rejects from the plant are all discharged on an inclined belt conveyor, which carries them out through the side of the building and up to the top of an adjacent one, shown at the right of Fig. 1, the left-hand structure in that photograph being the sampling building proper. Probably this is the first time that a machine combining in itself complete crushing and sampling-plant functions has been built. The building containing it is of simple, construction, carries only one line shaft and does not have to support any machinery whatever, the latter being set upon foundations on the ground. From careful tests made the results obtained have been extraordinarily accurate, with only a minute difference in the analyses from different bottles filled at the same time by this machine and representing the same parcel of ore.

Before this plant was installed the work in Hamburg was done in a semi-automatic plant consisting of two crushers and a set of rolls, the ore being coned and divided by hand, by the old method, between crushings. One tub in every 15 was taken from the ship and put through this plant, and carrying on the process in this way it took 7 men in the plant working about 14 days to get through the sampling of a 5000-ton cargo. With the new plant the same operation is performed in 3 days by 3 men. The whole plant is driven by a 65-hp. motor, the normal load of which, however, is only about 40 horsepower.

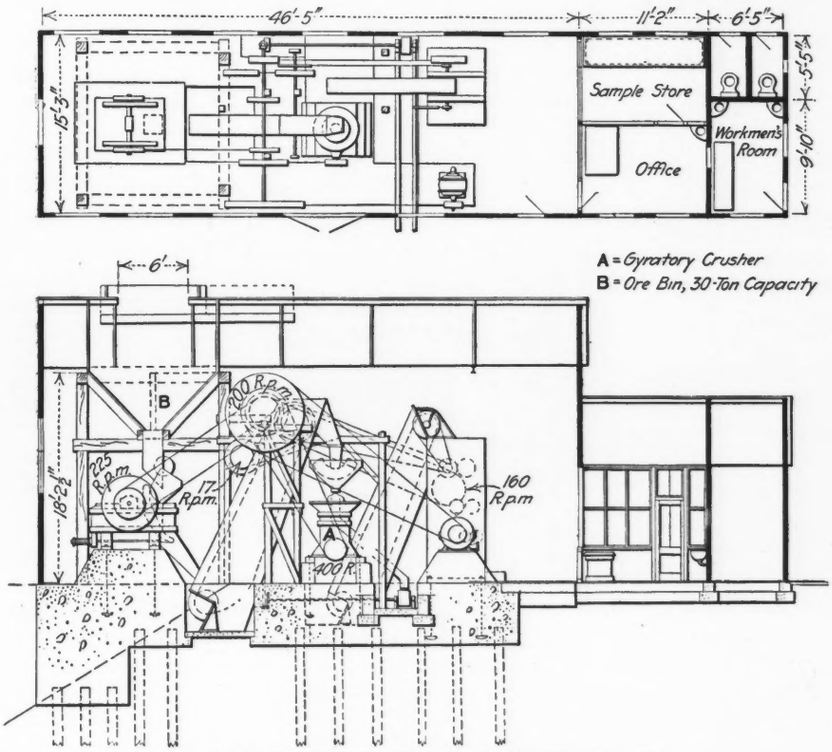


FIG. 2. ARRANGEMENT OF THE SAMPLING PLANT

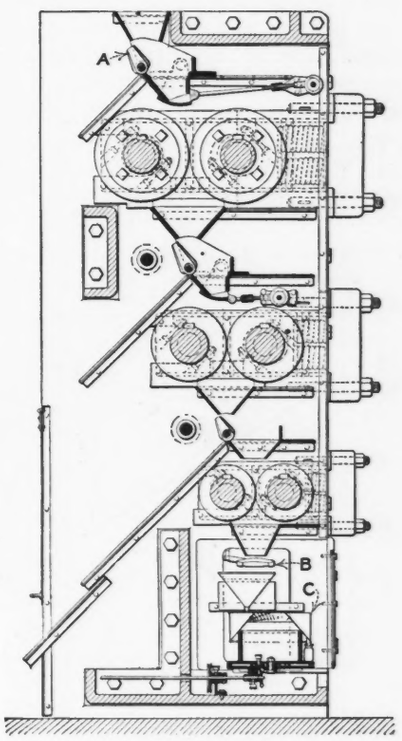


FIG. 3. SAMPLING MACHINE

Negligence of Co-Employees

By A. L. H. Street*

A trammer in a Michigan copper mine having been killed by the rolling of a large rock from a place in a stope where it had been deposited for subsequent loading by him and his crew, his widow brought suit against the mining company. It appears that decedent had been assured by the miners who excavated the rock and passed it down to the level that the rock was safe, and that it would be blasted in a few minutes to facilitate its loading. The accident occurred before blasting.

*Attorney, St. Paul, Minn.

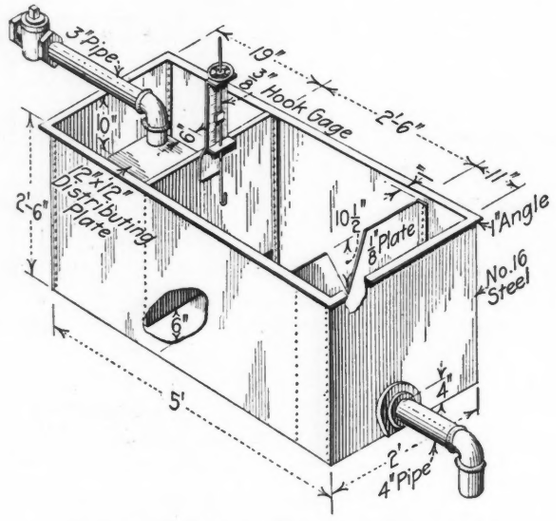
In denying that the mining company was liable for the accident, the Michigan Supreme Court holds that the miners and trammers were fellow-servants in the sense that the company was not liable for negligent failure of the miners to blast immediately. It was further decided that the miners' assurance concerning the safety of the rock could not be deemed to have been given in the capacity of representatives of the company, so as to make it binding upon the company. (Lesh vs. Tamarack Mining Co., 152 Northwestern Reporter, 1021.)

The V-Notch Weir

By John E. Rothwell*

For measuring the continuous flow of water or solution in a concentrating, cyanide or leaching plant, the V-notch weir is probably as simple and accurate a device as can be used. The accompanying isometric drawing shows the general features and dimensions of a measuring box suitable for a flow of 200 gal. per minute, or 1200 tons per day.

The box shown is made of light sheet steel with a 1-in. angle around the top. It can also be built of 1½- or 2-in. plank and made water tight when intended for hand-



CONSTRUCTION OF THE V-NOTCH WEIR

ling acid solutions or when light sheet steel is not available. The weir partition is made of steel plate for use with water and cyanide solution and is fastened into the box by riveting or bolting, the joint all around being made water-tight. The notch must be carefully and accurately made at an angle of 45° and one side beveled back at an angle of about 60°, the beveled side being placed down stream, or on the overflow side.

The baffle partition is placed as shown, and has a space of about 6 in. between its bottom edge and the bottom of the box. This, together with the distributing plate, serves to give a quiet surface ahead of the weir to which the measurements can be made.

The hook gage is made of ⅜-in. round iron, steel, copper or bronze as seems necessary, with a hook about 3 in. long and 1½ in. wide, the end of the hook being pointed

*Mining engineer, 850 W. Broadway, Butte, Mont.

THE V-NOTCH WEIR USING 45° NOTCH

Formula: Gal. per min. = $1.14452\sqrt{H^5}$

Cu.ft. per min = $0.0153\sqrt{H^5}$

H equals head, vertically above bottom of notch to level of surface of quiet water

Head, In.	Fractions of an Inch																								Head, In.
	0.00		0.05		0.10		0.15		0.20		0.25		0.30		0.35		0.40		0.45						
	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.					
0											0.0000	0.0000													0
1	0.153	1.144	0.1729	1.292	0.1942	1.452	0.217	1.623	0.2413	1.805	0.2672	2.00	0.2948	2.205	0.324	2.423	0.3548	2.654	0.3873	2.897					1
2	0.865	6.472	0.920	6.885	0.977	7.311	1.037	7.756	1.063	8.22	1.161	8.69	1.227	9.18	1.295	9.68	1.365	10.21	1.437	10.75					2
3	2.385	17.84	2.485	18.59	2.589	19.36	2.694	20.15	2.802	20.96	2.913	21.79	3.027	22.64	3.142	23.51	3.261	24.40	3.382	25.30					3
4	4.896	36.62	5.05	37.77	5.205	38.93	5.365	40.13	5.530	41.36	5.697	42.62	5.865	43.87	6.035	45.14	6.21	46.45	6.39	47.80					4
5	8.557	63.97	8.77	65.60	8.985	67.21	9.21	68.84	9.435	70.57	9.662	72.26	9.895	74.02	10.13	75.77	10.365	77.55	10.61	79.36					5
6	13.496	100.92	13.775	103.03	14.06	105.17	14.35	107.34	14.64	109.51	14.94	111.77	15.24	114.00	15.54	116.27	15.85	118.60	16.17	120.91					6
7	19.83	148.37	20.19	151.02	20.55	153.72	20.91	156.44	21.28	159.18	21.65	161.98	22.03	164.78	22.41	167.62	22.79	170.47	23.18	173.38					7
8	27.69	207.18	28.13	210.41	28.57	213.70	29.02	217.03	29.46	220.36	29.91	223.75	30.46	227.13	30.82	230.56	31.29	234.04	31.75	237.51					8
9	37.18	278.12	37.70	282.00	38.22	285.88	38.74	289.81	39.27	293.80	39.81	297.84	40.35	301.85	40.90	305.93	41.45	310.05	42.00	314.20					9
10	48.38	361.93	48.99	366.45	49.60	371.00	50.22	375.61	50.83	380.25	51.46	384.92	52.09	389.63	52.72	394.38	53.36	399.17	54.01	404.00					10
11	61.40	459.29	62.11	464.55	62.80	469.78	63.51	475.09	64.23	480.40	64.95	485.79	65.67	491.21	66.40	496.67	67.13	502.18	67.87	507.17					11
12	76.32	570.88																							12

Head, In.	Fractions of an Inch																								Head, In.
	0.50		0.55		0.60		0.65		0.70		0.75		0.80		0.85		0.90		0.95						
	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.	Cu.Ft.	Gal. per Min.					
0											0.0742	0.555													0
1	0.0271	0.203									0.62	4.63	0.665	4.975	0.712	5.325	0.761	5.92	0.8125	6.027					1
2	0.4216	3.153	0.4576	3.423	0.4954	3.705	0.535	4.00	0.5765	4.3	1.919	14.35	2.007	15.00	2.098	15.69	2.191	16.39	2.287	17.10					2
3	1.512	11.31	1.588	11.88	1.667	12.48	1.749	13.08	1.833	13.71	4.166	31.16	4.306	32.22	4.449	33.28	4.590	34.37	4.744	35.49					3
4	3.506	26.23	3.633	27.17	3.762	28.19	3.894	29.13	4.029	30.14	7.523	56.27	7.72	57.75	7.925	59.26	8.13	60.81	8.34	62.38					4
5	6.572	49.16	6.755	50.52	6.945	51.95	7.135	53.37	7.325	54.79	12.13	90.87	12.395	92.72	12.67	94.73	12.93	96.75	13.21	98.81					5
6	10.85	81.19	11.10	83.03	11.35	84.89	11.61	86.88	11.87	88.88	18.11	135.49	18.44	137.97	18.79	140.51	19.14	143.13	19.48	140.71					6
7	16.48	123.27	16.80	125.66	17.12	128.06	17.44	130.50	17.78	133.00	25.17	188.27	25.99	194.41	26.41	197.58	26.83	200.72	27.26	203.94					7
8	23.57	176.31	23.96	179.22	24.36	182.21	24.76	185.24	25.17	188.27	34.65	259.06	35.15	262.92	35.65	266.66	36.15	270.44	36.66	274.25					8
9	32.23	241.08	32.70	244.63	33.18	248.22	33.67	251.84	34.16	255.50	45.41	339.73	46.00	344.08	46.59	348.57	47.18	352.94	47.78	357.40					9
10	42.56	318.37	43.12	322.54	43.68	326.77	44.26	331.06	44.83	335.37	57.97	433.61	58.64	438.66	59.32	443.75	60.01	448.87	60.70	454.07					10
11	54.65	408.82	55.31	413.72	55.97	418.65	56.63	423.59	57.30	428.60	72.41	541.62	73.18	547.39	73.95	553.18	74.74	559.05	75.52	564.83					11
12	68.62	513.32	69.36	518.85	70.11	524.46	70.87	530.15	71.64	535.87															12

about as one points a lead pencil. The extreme point is made spherical, about $\frac{1}{32}$ in. diameter. A thread is cut on the long part for about 12 in., and a handwheel, similar to that used on a 1-in. globe valve, is threaded to screw on the rod. A vernier plate of brass is attached to the rod as shown, and a gage plate, also of brass, about 12 in. long by 1½ in. wide, accurately marked in inches, tenths and twentieths, is made and the whole mounted on a bracket as shown attached to the baffle partition.

The box is now ready to be placed in the circuit of the flow to be measured. It is leveled lengthwise, and a vertical line from the apex of the notch should bisect the base or widest part of the notch. Then with a transit or level and a special rod the point of the hook gage is set absolutely level with the apex of the notch, and the gage adjusted to the zero of the vernier. It is now ready for the water or solution to be turned in.

The flow is measured by turning the handwheel, thus raising the hook, until it is observed to form a small "pimple" on the quiet surface of the water just above its point. The reading of the gage is then made and noted. Reference to the table with this reading or its nearest twentieth gives the cubic feet and U. S. gallons per minute with reasonable accuracy.

Then

$$\frac{GPM}{4} = tons\ per\ hour$$

$$GPM \times 6 = tons\ per\ day\ (24\ hr.)$$

If the tonnage flow for 24 hr. to zinc boxes is required—this flow is usually a fairly constant one—take the reading every hour and note it on a record sheet. Then the sum of the cubic feet represented by the individual readings × 1.875 = tons per 24 hr. The factor used is based on 32 cu.ft. per ton of solids of specific gravity 1.0032 at 60° F.

Having the assay per ton of the solution in Au and Ag entering the boxes and the value per ton in the overflow, which tonnage will be the same, the value deposited in the boxes can be determined and a close check on the mill operation obtained.

It is also possible, when a plant is so arranged to obtain a check on the dry tonnage handled by determining the specific gravity of the pulp in transit. An accurate knowledge of the quantity flow is invaluable in both the "counter-current agitation" system and the "counter-current dilution and washing" systems. In wet concentration the measuring box is valuable in the control of water flow at different points.

Automatic recording devices attached to the box will give a fair check on the work of the mill, and increase the vigilance of the men operating in the department so controlled. The recorder should, however, be used only to supplement the hook-gage measurement when solutions are measured, as the float-operated or pressure-operated recorder results may be vitiated by the accumulation of a deposit on the float, or a condition analogous to adsorption, in which air or gas bubbles attach themselves to the float changing the displacement and thus the record. The same reasons apply to the pressure diaphragm recorder.

A manufacturer in the East makes a "water-flow recorder," using the V-notch weir in connection with an ingenious recording device that has calculation-saving features, which, for such operators as can stand the investment, is probably the most accurate device on the market. For the small milling company whose treasury will not permit such an expense, but whose mill operator is desirous of a better control of the working of his plant, the box described here in connection with the accompanying table offers a simple, accurate and comparatively inexpensive substitute.

Russian Copper Output in 1914*

The report of the Russian Copper Syndicate, "Medj," for 1914 shows that copper smelteries failed to reach their predicted output. Instead of exceeding that of the previous year by about 15,000,000 lb., the production decreased, as is shown in the accompanying table.

STATISTICS OF RUSSIAN COPPER PRODUCTION

1910	49,773,990 lb.	1913	73,967,471 lb.
1911	56,476,401 lb.	1914	71,088,312 lb.
1912	74,485,216 lb.		

The 4% decrease of 2,879,158 lb. last year is attributed by the report to the war, which caused the shutdown of the Dzansul plant of the Caucasus Copper Co., prevented resumption by the Kwarzchana works of Siemens' Successors and reduced the working forces in general. There was a recession in the first half of the year on the part of the smelteries, excepting Kyshtim and Werk-Issetsk.

The production of the smelteries for 1915 is estimated in the report as follows:

ESTIMATED RUSSIAN COPPER PRODUCTION IN 1915

	Lb.	Inc. or Dec.
Demidov Estate	2,708,256	—86,844
Bogoslov Works	7,222,000	—1,279,629
Werk-Issetsk Works	11,555,200	+5,276,682
Kyshtim	24,554,800	+7,360,120
Spassky Copper Mine	10,833,000	+359,402
Siberian Copper Co.	1,444,400	+544,249
Alexejev	1,444,400	+609,789
Caucasus Ind. & Metal Co.	10,110,000	+1,113,235
Siemens' Sucessors	1,083,300	—695,045
Caucasus Copper Co.	.....	—6,952,547
Various works	7,222,000	+840,424
	78,177,350	+7,089,334

According to the report, 91.8% of the total Russian copper production was by Medj Syndicate works, against 95.7% in 1913. The total Russian copper consumption amounted in 1914 to 74,831,402 lb., which is 383,271 lb. more than in 1913 and 9,956,916 lb. more than in 1912. It appears that the domestic production of smelteries and electrolytic refineries is not sufficient to meet the home demand.

Aluminum and Bauxite in 1914

The Geological Survey reports that the quantity of aluminum consumed in the United States in 1914 was 79,129,000 lb., against 72,379,000 lb. in 1913 and 65,607,000 lb. in 1912. The value of the exports of aluminum and of manufactures of aluminum amounted to $1,546,510 in 1914, as compared with $966,094 in 1913. The quantity of crude and scrap aluminum imported in 1914 was 16,241,340 lb., against 23,185,775 lb. in 1913. In addition manufactures of aluminum valued at $1,308,036 were imported in 1914, an increase of $217,807 over the previous year.

The production of bauxite in 1914 was 219,318 long tons, an increase of 9077 tons over 1913, and the largest quantity ever reported.

*Translated from the German.

Details of Practical Mining

Cheap Method of Transporting Cordwood and Timbers

By J. D. Hubbard*

The cordwood problem at many mines is more or less a serious one in relation to costs. The majority of mines are situated in mountainous regions where steep grades obtain, making hauling of any kind a serious cost factor.

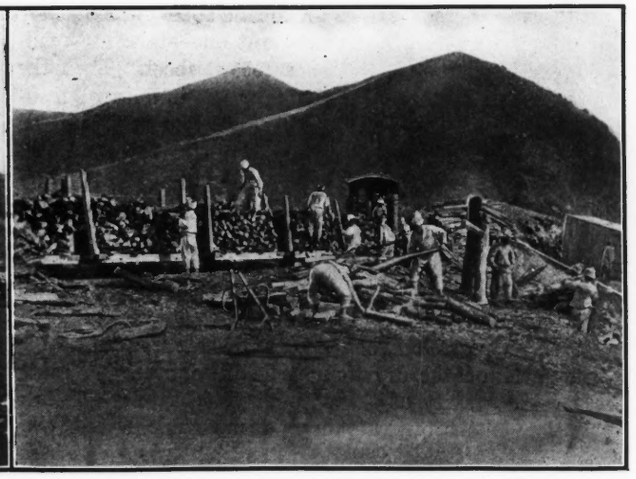
At the Oriental Consolidated mines in Chosen a great amount of cordwood is consumed annually. The cost of hauling cordwood and timbers in carts and on pack trains on the steeper trails became greater as the more available timber was cut off. Finally an employee of the company suggested the present plan, which was adopted and which resulted in a great saving to the company.

A steel cable was swung and well anchord at both ends, with sufficient height above ground to keep the bundles of wood from striking, and with a grade of at least 25°. Spans of 4000 or 5000 ft. are not too long. Old steel cables, after being used to their limits for hoisting, may be used for this work. They are worn out by friction eventually, but greasing the cable from the upper end lessens the wear on the rope.

The wood is placed in bundles on a frame, a short length of hemp rope slung around it and fastened to the "rider" by a simple timber hitch. The rider is notched at the proper place to receive the hemp rope, and at another place to ride the cable. The bundle of wood is then tripped and gravity does the rest, the bundle taking care of itself upon striking a bumper at the lower end. The wood is spread over the landscape somewhat upon striking, but is easily gathered up. The amount of splintering depends on the kind of bumper used, and experience shows the best plan.

The hemp ropes are used over and over again, being gathered up and returned to the top landing by the coolie carriers employed for the purpose. Mining timbers of average length are transported the same way. The whole device is simple in the extreme and can be readily installed with a small amount of labor. The illustrations exemplify the simplicity of the operation.

"TRIPPING" LOAD OF CORDWOOD BY CABLE



UNLOADING WOOD AT UPPER END OF CABLE

*Mining engineer, 832 Mills Building, San Francisco, Calif.

Application of Roller Bearings to Mine-Car Haulage

By Phillips N. Case*

A few years ago the average mining operator considered a roller-bearing mine car a luxury to be indulged in only by the most fastidious. Today roller bearings in mine cars are acknowledged to be essentials in obtaining maximum efficiency. In metal mines the use of roller-bearing cars is now felt to be imperative; the reduction of haulage expense also constitutes a vital problem in coal mines on account of the long hauls, heavy tonnage and motor haulage now usually encountered in the large operations. In a recent tour of practically every important Western mining district, I did not find a single locality in which roller-bearing mine cars were not in evidence. As the mining profession has now come to realize that the consideration of roller bearings in connection with haulage problems is of paramount importance in the economy of power, oil, labor and maintenance, an outline of the several standard methods of applying roller bearings to mine cars, together with a brief statement of the conditions under which each is especially applicable, may not be amiss.

The methods of installing roller bearings in mine cars may be classified under three heads—(1) wheel hub, (2) inside box and (3) outside box. The wheel-hub applica-

*Sales engineer, Hyatt Roller Bearing Co., Newark, N. J.

tion (Figs. 1, 2 and 3) is at present in most common use, owing in part to the fact that it is a simple, economical construction that does not materially alter the design of the car boxes and trucks in use previous to the adoption of roller-bearing equipment. Moreover, as the bearing is in the hub, the height of the car body is not necessarily increased over that required with the use of a plain bearing. This point is particularly advantageous in cases where the head room is limited. In addition, this construction does not involve incasing the axle, as in the construction shown in Fig. 4. Where the track gage is wide such casing would prove heavy and cumbersome.

Considerations in Designing Applications of the Wheel-Hub Type

Though the wheel-hub application has in its favor the points enumerated, there are several factors that must be carefully considered when designing a wheel-hub installation in order to obtain a high efficiency. The most important of these is the thrust exerted by the flange when the car is rounding a curve. As the wheel hub is not a rigid box, the thrust that the flange receives from the track on the curve exerts a turning moment against the inside end of the bearing. Therefore, in order that the rollers may not be injured by this thrust, it is essential that the bearing project far enough inside of the load line to take care of this severe duty. To accomplish this, it is best to place the bearing in the hub in such a way that the center line of the bearing coincides with the track gage. Moreover, if this rule be followed, the load is centered, resulting in a uniform distribution of the weight, in the case of flexible bearings affording a full line of contact, when the car is traveling on a straight track. It may be readily understood that because of the resilience inherent in the construction of hollow-spiral rollers, this type of roller bearing is superior to any solid-roller bearing in resisting effectually the severe flange thrust. Another point to be considered is the fact that with a bearing in the hub of a wheel, it is usually difficult to exclude dirt, this being particularly true in cars which are side-dumped. This point should therefore be weighed when designing a wheel with such a bearing. Moreover, with the wheel revolving about the bearings, there is a tendency for the oil to leak out unless well packed. The hollow-spiral rollers of the Hyatt bearings constitute oil reservoirs and as the spirals are alternately right and left hand, a thorough circulation of oil is assured.

Three Wheel-Hub Applications

There are many methods by which bearings may be properly installed in the wheel hub—more, in fact, than I shall attempt to describe here. However, Figs. 1, 2 and 3 illustrate three efficient methods of applying roller bearings, either solid or spiral, in the hub. The cotter-pin application (Fig. 1) presents small opportunity for friction at the outer end of the wheel hub, while the large plate washer at the inside end affords a broad surface for receiving thrusts and in this application is well lubricated by oil from the bearings. At the outer end of the hub, a steel compression ring fits around a leather washer on the axle, thus effectually eliminating leakage of oil at this point.

The application in which the wheel is held on the axle by means of a collar (Fig. 2) is an example of a strong wheel embodying simple construction, with a solid hub at the outer end, affording no opportunity for dirt to enter or oil to leak at this point. In this case the thrust is taken by the collar.

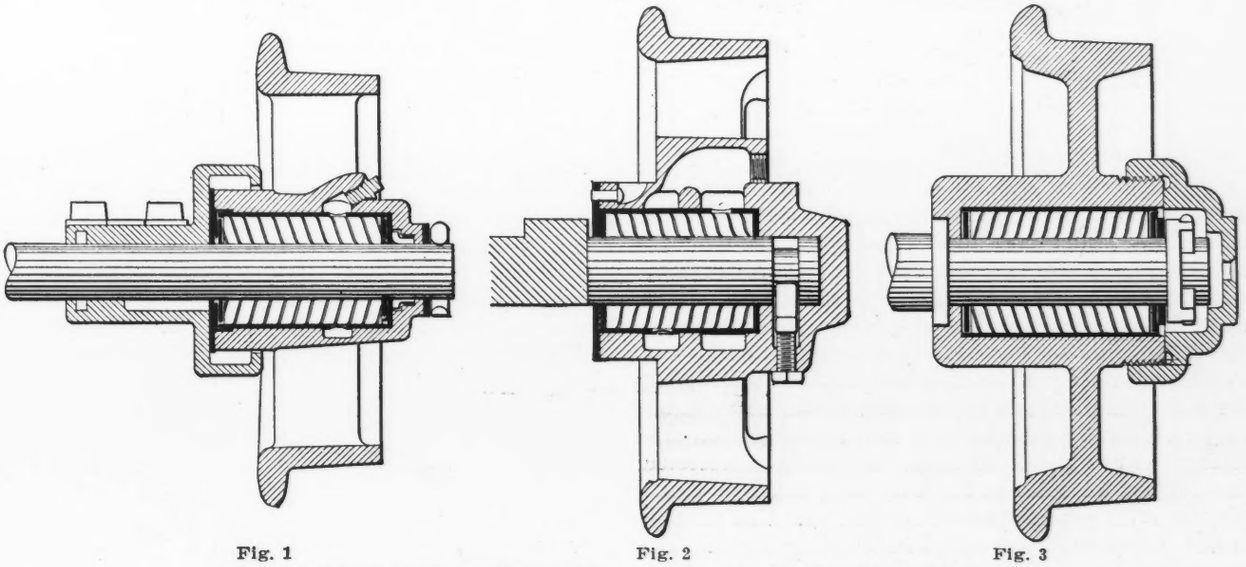


Fig. 1 Fig. 2 Fig. 3

THREE WHEEL-HUB APPLICATIONS OF ROLLER BEARINGS TO MINE CARS

Fig. 3 illustrates a well-designed application of the cap type. Where a cap is employed at the outer end of the hub, it is essential that it be held securely. In this design this is accomplished by threading the cap on the hub, and yet the bearing is readily accessible by simply unscrewing the cap. The end thrust is taken by the collar on the axle.

Selection Depends Upon Operating Conditions

The wheels above described are representative examples of applications in common use, a selection depending upon the conditions at the particular mine in which they are to be used and also upon the ideas of the mine operator. Whatever methods of applying roller bearings in the wheel hub may be favored by any particular mining man, in my opinion it is an advantage to employ a round axle which

is free to turn and thus slips around slightly from time to time, evenly distributing around the axle the load transmitted by the rollers.

Inside-Box Applications

Considering the application of the inside box to the roller bearing, this may be subdivided into two classes—(1) the Anaconda type of wheel and axle shown in Fig. 4, and (2) the angle-iron type shown in Fig. 5, in which the boxes at opposite ends of the axles are braced by angle irons. In the latter type it will be noted that a beveled, self-aligning box is used. This has a decided advantage on uneven tracks, as an opportunity is afforded the box to maintain its alignment. However, except in the case of a wide-gage track, the Anaconda design is undoubtedly preferable, for here the casing affords a rigid box and the whole design is therefore more conducive to stability. In connection with the Anaconda type, the self-aligning box would undoubtedly be an improvement. The thrust in the Anaconda wheel and axle is taken on the heavy flange washers which are threaded over each end of the box protecting the end of the bearings. It should be observed that one wheel is loose on the axle, being held by a cotter pin, while the other is pressed on the axle. The purpose of this is to afford a differential in rounding curves. Owing to the fact that the inside-box applications necessitate slightly greater head room over that required in the case of a plain bearing, there are some instances where they are inapplicable. However, the inside-box type represents in many respects a more efficient application than any wheel-hub type and has become popular in the metal mines in such districts as Montana, Arizona, Idaho, Colorado and Lake Superior.

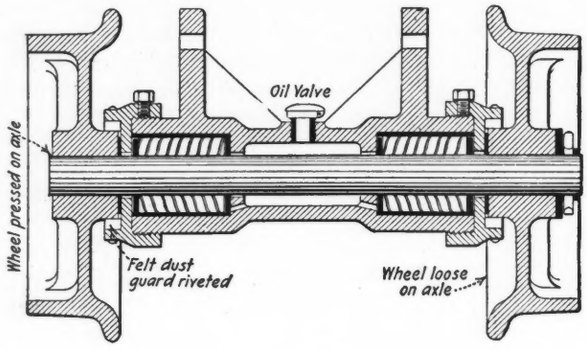


Fig. 4

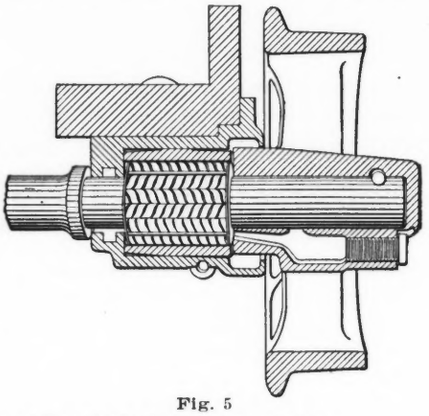


Fig. 5

INSIDE-BOX TYPES OF ROLLER-BEARING WHEELS AND AXLES FOR MINE CARS

Outside-Box Type Most Efficient

In considering the outside-box application (Fig. 6), it may be stated at the outset that where applicable this is the most efficient installation. In the design illustrated, the thrust is taken at the inside end of the box (*A*, Fig. 6). But this point could be easily modified so that the thrust would be taken between the end of the axle and the cap, in which case the surfaces would be well lubricated by oil flowing from the bearings. In regard to the felt packing at the inner end of the box, it may be well to call attention to the method of compressing a square felt packing into a tapered recess.

It will be observed that in the case of the outside-box applications, the bottom of the car body must necessarily be raised above the wheel and the axle must project beyond the wheel, so that this type of equipment is prohibited in narrow or low haulageways. However, many mines employ spacious main-haulage tunnels, through which trains may be hauled by motors at considerable speed, thus affording ideal opportunity for the use of this installation. As an illustration of the efficiency which may be obtained under these conditions, a mine in Idaho may be cited. The entrance is by a tunnel about two miles in length, through which long trains are hauled at a high rate of speed by electric motors. Upon a recent visit to this mine I was informed that the first of these tunnel cars—equipped with Hyatt roller bearings in outside boxes—covered 3000 miles in four months, without any attention and without any ill effects. At present all the cars in this tunnel are equipped with these bearings. The capacity of the cars ranges from 3 to 4 tons of ore, and the service is severe; nevertheless, excellent results are being obtained. Such experiences prove that it is possible in the case of an outside-box application, and to a lesser degree in the case of an inside box, to use with perfect safety bearings of shorter length than would be required were they installed in the wheel hub. With large cars and heavy loads this is a decided advantage.

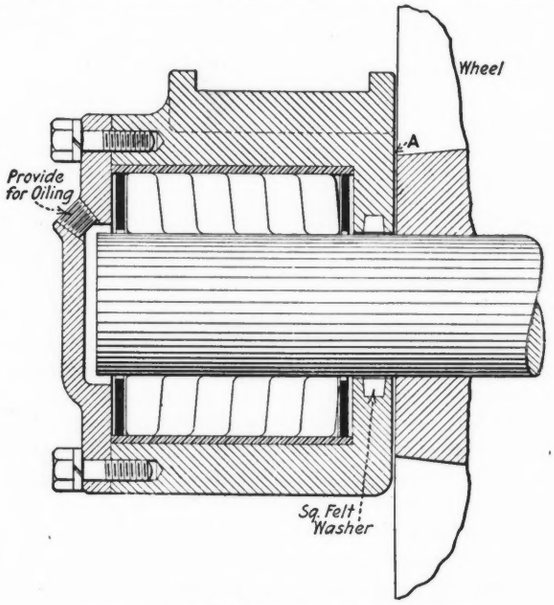


FIG. 6. OUTSIDE-BOX APPLICATION

Details of Milling and Smelting

Marcy Ball Mill Described

Mill operators have been patiently awaiting some technical description of the Marcy ball mill, which has been tried with apparent success and is being installed in some of the larger plants at the present time. No description by the inventor has been forthcoming, because of pending patent applications, but U. S. pat. 1,137,878, granted to F. E. Marcy on May 4, 1913, gives a general description of the mill in question.

The Marcy ball mill is of the drum-type, equipped with the usual spiral feeder and loaded with pebbles or balls as may be required. The drum is divided into two parts—the crushing compartment, equipped with lifters to insure the elevation and dropping of the balls to secure maximum crushing efficiency, and a small compartment at the end of the mill, separated from the crushing space by means of a manganese-steel plate and

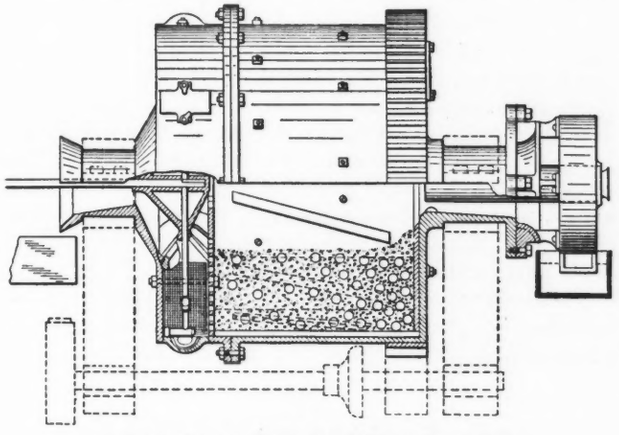


DIAGRAM OF THE MARCY BALL MILL

having perforations about 1/8-in. wide. In this end compartment there are radial screens and lifters, the lifter forming the bottom of a box the top of which is formed by the screen itself. These are the finishing screens, and material which will pass through them is considered as being of finished size. The material passing through the screens is diverted by arrangement of the compartment so that it will be discharged through the central orifice; while the oversize—material which remains on the screen—is diverted back into the mill through a proper opening. The screens and lifters form a box, as has been stated, and are placed so that they may be removed from the outside of the mill for rearrangement or cleaning. In order to give the screens maximum efficiency and to increase their life, an arrangement of pipe is made so that water or solution under head can be thrown against them while the screen is passing through the upper half of the circle formed by a cross-section of the mill.

The action of the lifters, in addition to forming the bottom of the box and assisting in the screening operation, is to maintain a low pulp level in the mill. It is clear that by constantly removing the solution and pulp from the bottom of the crushing drum, a removal of the material already sufficiently finely ground is accomplished rapidly and no energy is lost in doing work where it is not required. The coarser material is left in a comparatively dry state upon the balls or pebbles, and the crushing and grinding action of the mill can have maximum effect upon it. The accompanying drawing shows a longtitudinal view and partial cross-section of the mill, giving a clear idea of its construction and operation.

Improvements for Ropp Roasters

By Edgar Hall*

The Ropp roaster although extravagant in fuel has many good points. It can be built cheaply, costs little for repairs and requires no great amount of brains to keep it at work. The use of producer gas reduces the fuel bill, and doubtless it would not be difficult to devise means of conserving heat and lessening the excessive influx of cold air, which would effect further economies. Possibly they have already been introduced, although as yet undescribed in the technical journals. About 10 years ago a Ropp roaster, supplied to the Mount Morgan Gold Mining Co., was purchased by the Silver Spur Mining Co., and has been in use ever since, roasting a complex zinc-lead-copper ore in preparation for matte smelting.

The machine as supplied by the patentees was fed by two Challenge ore feeders—one on each side of the slot—and the four rake carriages had flangeless wheels which were prevented from running off the semi-circular turns in the rails at each end of the furnace by small bogie under-carriages of an elaborate character. Both feeders and rakes had numerous wearing parts requiring constant attention and lubrication, particularly the bogies on which the consumption of oil, owing to the heat in passing through the furnace, was enormous for the work done. It was soon evident that improvement was possible in these parts of the machine.

The Challenge feeders were abandoned for the single, overbalanced, tripping type of feeder shown in the accompanying drawings. This is an advantage in every respect. It requires less power, less attention, feeds more evenly on each side of the slot and has cost nothing for repairs and practically nothing for lubrication, only an occasional drop of dirty oil from the engine being required. In first cost the comparison is as great, since only one storage hopper is needed and the feeder itself can be made in a day by a skillful blacksmith, using short ends of plate and rod.

Feeders of this type were in use long ago, in tin-dressing sheds for supplying water to slime tables, but

*Silver Spur Mining Co., Silverspur, Queensland, Australia.

I have not heard of any being used for dry material. There is no reason why they should not be more generally used. For finely crushed ore they work well and probably would be satisfactory on any fairly uniform material of moderate size. At Silverspur the ore was crushed to pass $\frac{5}{16}$-in. square holes, but at times the feed was larger. The feeder consists of two short chutes (*GHNM* and *HJPN*, Fig. 1) of steel plate set together at an angle and placed immediately over the slot and under the mouth of a storage hopper, to the timber frame of which it is fastened. It is free to move on the axle *B*, but is kept in position by the pin *C*, Fig. 2, acting against the shoulder of the block *A*, Figs. 1 and 2, rivetted to the outside of the chutes. The pin *C*, is held in position by the spring *D* and is moved by the cam *E* acting on a small disk *F*, revolving loosely in a slot in *C*. The cam *E* is attached by a rod *L* to a shoe (not shown) which is struck by a cam on the rope sheave which drives the rakes.

The revolution of the sheave brings the cam over the shoe connected with rod *L*, which pushes the pin *C* out from one side of the block *A*, releasing the chute *GHNM*, which then tips over and is again fixed by the return of pin *C*—through the action of the spring *D* as soon as the

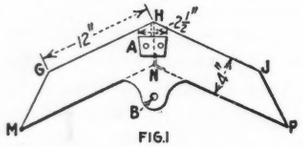


FIG.1

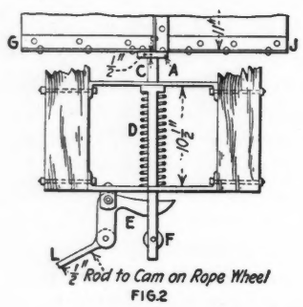


FIG.2

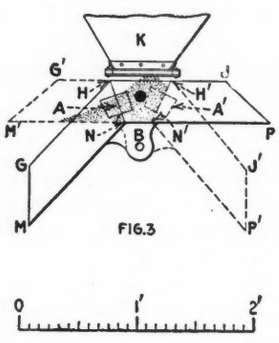


FIG.3

FEEDER FOR ROPP ROASTER

cam on the rope wheel has passed the shoe—to the other side of the block *A*. The next movement of *E* reverses the action. The mouth of the hopper *K*, Fig. 3, is provided with a sliding shutter worked by a screw by which the feed can be adjusted to fill the chute to the amount required for easy working of the feeder.

It is obvious that one side or the other of the chute is always level and parallel with the mouth of the hopper, and that when the slide is open the crushed ore will fall through and pile up on the chute until the opening is blocked by the natural slope of the small pile so formed. Fig. 3 illustrates in diagrammatic form the working of the appliance. The mouth of hopper *K* being open and the chute shown in dotted lines in the position *G'H'N'M'*, a small pile of ore *O* forms and blocks the openings. Presently the revolution of the rakes causes cam *E* to move pin *C*, when the weight of ore on the chute *G'H'N'M'* overbalances the chute and it falls over and discharges its load on the floor of the furnace on the left side of the slot. . The chute now has the position *GHJ* and is filled with ore on the side *HJPN* in like manner, and at the next movement of cam *E* falls over and discharges an equal quantity of ore on the floor of the furnace on the right side of the slot. By increasing the number of cams on the rope wheel the quantity fed can be multiplied to any extent, and will remain equally divided between the two sides of the furnace. The feeder of the size shown was equal to 20 tons per day with one cam only on the rope wheel.

I next tackled the rakes which, in spite of the elaborate bogies, would not keep on the rails. The ubiquitous greased flat-sheet of the miners suggested itself. It was easy to try it and I did; the experiment succeeded. The result was that the semicircle of rails at each end of the furnace was taken up and circular tracks of smooth-faced cast iron put in their places. The bogies were removed and the rake carriages placed on fixed axles carrying ordinary mine-truck flanged wheels. The flanged wheels run in the usual manner over the straight lines of rails under the slot and on the return line outside the furnace, but in turning at the ends of the furnace they run on the rims of the flanges over the cast-iron plate tracks, the greased surface of which allows the revolving wheels to perform easily the small slithering movement needed to enable them to follow the rope around the semicircle. Wooden guides fitted at the side of the entrance of the straight lines of rails lead the wheels safely off the plate track to the rails.

The improvement is immense. By dispensing with the bogies the weight of the four rakes is lessened by 1064 lb., nearly half a ton less to be hauled constantly around and through the furnace, and friction is much reduced. There is a great saving of time as the rakes seldom leave the rails and there is no stoppage for oiling the many moving parts of the bogies. The cost for lubricant falls to almost nothing, as waste oil from other machinery can be used for the tracks and the constant renewal bill for bogie parts and rollers disappears.

These alterations have stood the test of years, and are described on the chance that the methods may be applicable to other machines involving similar movements.

Lead Acetate vs. Litharge

By C. R. Morris*

During a series of experiments carried out at the Mexican mill, Virginia City, Nev., it was found that there was not much difference in the mill between using one or two pounds of lead acetate. Our acetate supply

EFFECT OF LITHARGE AND LEAD ACETATE ON EXTRACTION

	Aug.	Sept.	Oct.	Nov.	Dec.
Heads, oz. Ag	629	714	728	661	878
Tails, oz. Ag	108	112	135	65	79
Extraction, per cent	83	84	82	90	91
Lead acetate, lb	1¼	2	..	¼	¼
Litharge, lb.			..	¾	¾
Cost per ton, c	.14	.22	..	.09	.09

failed in October and on this account we were compelled to use litharge, putting it into the tube mill three times a day. The extraction appeared to be as good as with the use of lead acetate. In November we received a supply of lead acetate and used both salts, ¾ lb. of litharge in the tube mill and ¼ lb. of lead acetate in the agitators. This combination of salts gave a better extraction. Results are shown in the accompanying table.

*Superintendent, Mexican mill, Virginia City, Nev.

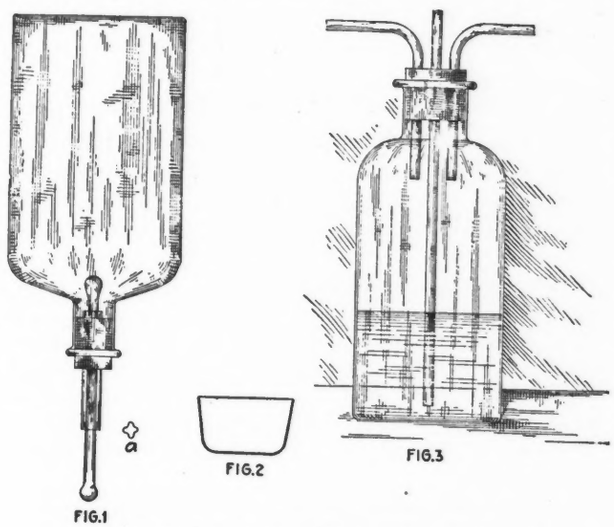
The Assayer and Chemist

A Rapid Method for Washing Gold Beads

By E. J. Hall*

The suggestion by W. S. Black, in the *Journal* of Dec. 26, 1914, for an improvement in the time-honored method of parting and washing gold-silver beads appeared so attractive that I immediately set up his apparatus, except for the interposition of a bottle containing a solution of sodium carbonate between the suction bottle and metal piping to the pump—the fumes from hot acid were strong—and found that the method met all his claims.

I believe, however, that the proposals mentioned below are improvements. As stated by Mr. Black, there is



APPARATUS FOR WASHING GOLD BUTTONS

little trouble from the loss of fine gold, and the saving is closer than by decantation. If the fine gold starts to move across the bottom of the cup, the velocity of the liquid may be retarded or stopped by pinching the rubber tube. Here there may be some trouble with the apparatus as described, with a good head of water, since the Richards pump is capable of giving a vacuum of nearly 30 in. of mercury, and when the pressure on the tubing is released, everything in the cup is likely to disappear if the suction tube is not instantly removed. To overcome this difficulty a vacuum regulator is inserted in the line beyond the suction bottle. This is the common mercury bottle illustrated by Fig. 3, and is frequently used in suction filtration and where such apparatus as pipettes and burettes are filled by suction. The suction is regulated by the height of mercury above the bottom of the relief tube, and will be found satisfactory for this work at one inch.

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The common practice in parting is to add strong acid or wash water as soon as the liquid has been decanted and to put the cups back on the hot plate, or else after decanting to place the cups on a table until this operation is completed. Then the succeeding liquid is added and the cups replaced on the stove. For dispensing the liquid either a beaker or the method suggested by Mr. Black is used, though the latter cannot be successfully employed for strong nitric acid. This procedure is at variance with Mr. Black's treament—where the cups are allowed to dry and bake between applications—and, on the average, will give cleaner gold.

The addition of acid and water from a beaker to the cups without taking them from the stove, immediately following removal of the solution, proved unsatisfactory and therefore the liquid-dispensing bottle illustrated in Fig. 1 was constructed. The bottom of a narrow-mouth glass bottle was cut off. Next a piece of 5-mm. glass tubing was cut true on one end and the edges slightly rounded in a blow-pipe flame. The other end was softened and pressed in with a pointed instrument at four places (*a*, Fig. 1), leaving just sufficient clearance for a 3-mm. glass rod to pass freely. The top of a 3-mm. glass rod was held vertically and rotated in the blow-pipe flame until a ball 6 to 7 mm. in diameter had formed. The rod was inverted and ball heated till it assumed a pear shape and was then allowed to cool. This was inserted into a tube, a paste of 60-mesh emery applied at the point of contact between bulb and tube and ground to a good seat, then polished with a paste of 150-mesh emery, obtaining a perfectly tight valve. Almost any abrasive may be used. A ball formed on the other end of the rod prevents it slipping from the tube. To cement the valve in place it is inserted in the small end of a cork about 3/8 in. and introduced into the neck of the bottle from the inside; the neck is then filled from the mouth with sulphur-sand cement and when set the cork is removed. The dispensing bottle is then set in a wide-mouth bottle, its shoulders resting on the top, and may be filled with any desired liquid.

The details of parting with the apparatus are as follows: After the action of the weak acid on the beads has ceased, the cups are filled with distilled water—to dilute the silver nitrate—by lowering the glass rod of the dispensing bottle into the cup and pressing on the bottom, thereby opening the valve. When a cup is full, the bottle is raised and the valve closed. When the cups are full the water may be changed and strong parting acid used or another dispensing bottle procured.

If 4-cm. Royal Meissen capsules (Fig. 2) are used instead of the customary crucibles, a slight pressure with the suction tube at the point where the bottom curves into the side of the cup will cause the cup to tilt sufficiently to permit complete removal of the liquid. Another advantage of these capsules is their self-righting character, which makes them more convenient to handle. The suction tube is then moved to the next cup, and while

the solution is being removed, strong parting acid is added to the preceding cup from the dispensing bottle, thus preventing premature drying of the gold and enabling the carrying out of two operations at once. After all the cups have been treated in this manner the acid is diluted and the operation repeated, using water instead of acid. If the beads are sufficiently high in silver to part completely or nearly so in the weak acid, one water wash will usually be found sufficient, particularly if the silver is not over 50 mg. We found that the working time of parting had been reduced approximately one-half by the above procedure and its unpleasantness by 90%. Therefore, Mr. Black is to be commended for his suggestion on a process which is so old that no one imagined it could be improved.

Assaying Gold-Bearing Cyanide Solutions*

The method here described has been used at the plant of the St. John del Rey Company, at Morro Velho, Brazil, and has proved satisfactory. It is operated by native assistants without any difficulty and yields accurate results which have been carefully checked against the evaporation methods. The method is based on the precipitation of gold by means of zinc shavings, or rather by a zinc-lead couple, from the boiling solution, in the presence of considerable quantities of silver and lead salt. Sufficient silver is introduced to yield with the gold a suitable parting alloy. The presence of lead salts causes the formation of a zinc-lead couple which facilitates the complete liberation of the metallic gold from the solution and yields a bulky precipitate of lead and precious metals which settles easily and thus insures the ready and complete carrying down of the precipitated gold.

The stock solutions consist of a silver solution containing one grain of silver for each 10 c.c. Thirty-six grams of silver-nitrate crystals are dissolved in water, sodium cyanide added in small quantities until the precipitate which first forms is redissolved, and the solution then diluted to 2½ liters. The sodium cyanide solution is a 10% mixture, 250 to 260 grams of sodium cyanide being dissolved in water and diluted to 2½ liters. Sodium-plumbite solution contains 65 grams of lead acetate dissolved in water with sodium-hydrate solution added until the precipitate first formed just redissolves, and the solution diluted to 2½ liters. This solution is preferred to the simple acetate solution usually employed, since it insures the alkalinity of the liquid and the consequent absence of free hydrocyanic acid which might otherwise tend to carry back some gold into the solution.

The procedure is to take one pound, or 7000 grains, or 453.6 c.c. of the solution for assay; this volume is poured into a flask of 1¼ liters' capacity and the silver solution added. For rich solutions, 15 c.c. of the silver solution is used, and for the poorer solutions and for wash waters only 5 c.c. Next, 10 c.c. of the sodium cyanide solution is added, then 5 c.c. of the plumbite solution, and the mixture shaken.

Then, 20 grams of zinc shavings is placed in the solution and the contents of the flask gently boiled for half an hour and then filtered at once through a 9-in. filter paper, the clear filtrate being rejected. To the flask containing the solution and shavings, a little water is added, about 20 c.c., only just so much being required as will prevent the cracking of the flask by the drying and heat produced on the subsequent addition of the acid, then 70 c.c. of commercial hydrochloric acid. After the complete solution of the zinc, the contents of the flask are poured on the filter, flask and filter being subsequently well washed with water.

The wet filter is transferred to an assay crucible, dried slowly in the furnace and carbonized at moderate heat. The crucible is withdrawn from the fire and a flux is then added, consisting of this mixture:

FLUX FOR MELTING THE PRECIPITATE

Red lead.....	12½ grams	Flour	2 grams
Borax	22½ grams	Powdered glass...	2 grams
Sodium carbonate.	12½ grams	Potassium nitrate.	2 grams
Sodium chloride..	2 grams		

The crucible is then returned to the furnace and the charge run down in the usual manner, from 20 to 30 minutes being required to complete the fusion, after which the contents of the crucible are poured into a conical mold, the metallic button detached when the mass has cooled, and cupelled in a small magnesite cupel, the resulting beads being parted directly in the usual manner. usual manner.

Electrolytic Method for Copper in Nitric-Acid Solution

The following note on copper determination by electrolysis is by H. Clonkey of the Forest Products Laboratory, Madison, Wis. (*Journ. Ind. Eng. Chem.*, March, 1914):

In the electrolytic determination of copper from nitric-acid solutions the deposit is bright and adherent, if the correct acidity-concentration conditions have been maintained. When the acid concentration is too low the film has a dull look and may not be adherent. If the acid concentration is too high a long time will be required completely to deposit the metal, although the deposit will be bright.

In those cases where it is inconvenient to limit the amount of free acid in bringing the copper into solution in preparing for the electrolysis, and where the results of the analysis are needed in the shortest possible time for control work, this excess acidity can be easily controlled by a little powdered sodium acetate.

In preparing the solution for electrolysis all the nitric acid can be used that is necessary to bring quickly into solution the copper, copper salts, or compounds containing copper. Then, after the electrodes have been mounted, the current switched on and current density adjusted, if the copper does not promptly start to plate out, a little sodium acetate dusted into the solution will fix the excess of nitric acid which is dissolving the copper film as fast as formed.

The change in the character and speed of deposition will be almost instantaneous, and the deposit will be bright, adherent, and formed in the minimum of time. The treatment of the solution with an excess of sodium acetate at the end of a deposition in order to change the free nitric acid to sodium nitrate, and thus enable the electrodes to be removed without previous washing, has been recommended often, and the action is the same in both cases, differing only in degree.

*Excerpts from an article by D. M. Levy and Harold Jones, in "Bulletin No. 128" of the Institution of Mining and Metallurgy, May 13, 1915.

Broken Hill Milling Practice*

SYNOPSIS—The Broken Hill lode is not of great extent, but the large variety of ore produced makes necessary a diversity of milling practices. Breaking, crushing, grinding and regrinding are about in conformity to usual practice. Screen sizing is preferred to hydraulic classification. Both jigs and concentrating tables are used.

Although the Broken Hill lode in New South Wales, Australia, is only two miles in extent, the characteristics of the ore in the various mines render the adoption of a standard method of treatment impracticable. The ore consists mainly of lead and zinc sulphides, quartz, rhodonite and garnet sandstone, and it is the varying quantities of the gangue constituents, as well as the variation in degree of crystallization of the mineral contents, which enforce the need of different methods.

Power and Crushing Systems

Some of the mills are driven by steam engines directly connected with the main mill shaft by rope drive. Of late years, however, the general tendency has been toward the installation of three-phase induction motors, each important machine or group of machines being driven by a separate motor. The current for driving the motors in the mill is usually generated at a central power plant. The practice is to run each mill in sections, usually of about 1500 tons per week capacity, so arranged that a breakdown in any section only temporarily stops that section and not the whole mill.

Magnets are used at the head of the crushing system to remove lumps of iron, and grizzlies are in general use. The gyratory crusher is preferred to the jaw type. The present tendency is to crush finer than formerly with the gyratory breaker so as to increase the roll capacity, the size of the product leaving the gyratories being about 1½ in. With an ore such as that in the Junction North mine, containing a high percentage of extremely hard rhodonite, this is particularly desirable. In such a case it is usually necessary to have two gyratory crushers in series, a grizzly at the head of each machine. With a moderately hard ore, a single gyratory will crush 45 tons per hr. from 8 in. down to 1½ in. The average horsepower per machine is about 30, but there is often a peak load as high as 50 hp. A small jaw breaker following the gyratory for intermediate reduction, which used to be a feature of Broken Hill practice, has been dispensed with almost entirely.

Extensive Use of Rolls

The roller system is usually employed for feeding the ore from the bins to shaking screens at the head of the rolls. A flange roller, 10 in. in diameter and 15 in. long, traveling from 4 to 8 r.p.m.—the rate being regulated by a ratchet and pawl—is used. The quantity of feed is regulated by a door worked by a rack-and-pinion over the roller, and in some cases the door is tapped automatically by a rod from the shaking-screen gear so as to keep the ore in motion. Shaking screens at the head of the rolls are now universally used. The importance of efficient screening ahead of the rolls is often overlooked, but bad screening at this point causes undue sliming and is often the cause of low recovery, especially in the case of a hard ore. Shaking screens, suspended from above by hickory springs or eye-bars, are rigidly connected to the eccentrics which drive them.

In the South mill the feed is first treated on a narrow shaking screen and the reground oversize is afterwards separately treated in trommels. In the British mill a corrugated screen is used to keep the ore well agitated in passing over the screen. The average number of bumps given to the shaking screens is 250 per min. The screens are usually lined with steel-slotted material having a 3-mm. aperture, although in the softer types of ores it is screened to 4 mm. for jigging purpose.

Cornish slow-speed rolls, 36 in. by 18 ft., are almost always used on this field. Their speed is 15 to 25 r.p.m. The shells are made of toughened chrome steel and have double-cone centers bolted together, so that when worn they are easily removed. In some cases the rolls are both gear driven. In other cases one of the rolls is driven by friction. The general practice is to have one roll plain and the other flanged, the plain roll working inside the flanged one. Strong rubber or iron springs are used in all cases. Running the rolls fairly wide open, with a large oversize return, is the usual practice. No lateral movement is given, as the shaking screen at their head provides for even wear.

Series Crushing to Reduce Sliming

Series crushing in rolls, theoreticaly supposed to reduce sliming, has been proven by practical tests to be uneconomical. One large Broken Hill mill which for years has been working two sets in series has now gone back to a single set, the feed being crushed finer in the primary reduction of the ore. Experiments with high-speed rolls have demonstrated their inferiority. The average capacity of a set of rolls is 1500 tons per week, crushing from 1½-in. size through a 3-mm. slotted screen; the average horsepower is 30.

From the roll screens the ore goes into the jigging system. It has been found essential to remove fine sand and slime from the jig feed, otherwise it is a matter of difficulty to prevent them passing through the lead hutches and spoiling the final lead product of the jig. Here the practice is divided. Some of the mills use hydraulic classifiers at the head of the jig, a double-cone classifier being preferred. Others use King screens to classify the jig feed, the product screened out being usually 5 to 10% plus 40 mesh. In some isolated cases where screening or classification at the head of the jig is imperfect the jig lead is classified in a hydraulic classifier, but this system is not to be commended.

Characteristics of Jig Practice

Jigging practice has been greatly modified in the last few years. May jigs have now completely supplanted the Hancock machines formerly in use. Jigging has been developed along two entirely different lines, because of the difference in the nature of the ore treated. In the first practice, which is used on most of the mills and is especially adapted for fine-grained ores, the jig

*Excerpts from an article in "Mining and Engineering Review," Melbourne, May 5, 1915.

is used for recovering coarse lead, no attempt being made to produce on the same primary jig a worthless tailing. The whole of the product, except of course the lead, is recrushed for after-treatment in the tabling system. In some cases a middling product is made and returned to the jig. It has been found that by working the jig on these lines five hutches are not required, and only three, or at the most four, are used. In the second practice two sets of jigs are used, the five hutches in each set being employed. On the primary jig, as in the first system, no rejects are made, the tailings produced being reground and treated on tables. Thus the first jig makes the following products: Nos. 1 and 2 hutches, lead; No. 3 hutch, middlings, which are returned; No. 4 hutch, middlings, which are crushed in positive pans and sent to No. 2 jig; No. 5 hutch, tailings, which are recrushed in tube mills. The object of the second, a fine jig, is to make quartz tailings, which are discarded. In the case of a poorer ore this system may be modified, No. 4 hutch going to the tube mills and No. 5 hutch to the positive pans and then after classification to No. 2 jig. This enables a large rejection of quartz tailings to be made.

The advantages of the second practice are the recovery of the maximum amount of lead before undue sliming has taken place and the saving in crushing costs by the rejection of comparatively coarse quartz tailings. The rhodonite being of high specific gravity must be crushed finer to make a saving of further lead values, and also to make a product suitable for flotation treatment of the zinc which cannot be separated from it by mechanical means. It will therefore be realized that this method is not applicable to ores containing a high percentage of rhodonite. The use of the system mentioned has resulted in large capacity increase per jig, and 2000 tons per week of 144 hours is not uncommon. The speed of the May jig is usually 180 strokes per minute, the length of stroke being variable.

Types of Regrinding Machines

Tube mills and grinding pans are used for regrinding. The normal size of the tube mills used at Broken Hill is 10x5 ft., traveling 28 r.p.m. and using 28 to 30 hp. Both trunnion- and roller-type mills are in use. Cast-iron liners are employed, the general size being 20x13x1¼ in. In some cases longtitudinal bars are used to lift the pebbles, while in others the projection forms part of the liner itself and serves the same purpose. Pebbles in the tube mill are usually kept 2 in. below the center at the feed end and 4 in. below the center at the discharge end, the load of flint weighing approximately 4 tons. A coarse screen is used on the discharge end to prevent small pebbles from going out with the crushed product. Moisture in the tube-mill feed varies from 50 to 60%, being higher than in the case of Rand tube mills, which crush finer. Scoop feeds are used satisfactorily. Pebbles are fed in by hand through the manhole door once a day. This method is satisfactory, as pebble consumption is low, 1½ to 2 lb. per ton of ore crushed. Iron consumption is ⅛ to ¼ lb. per ton.

As a rule the ore is ground from jig size to a size suitable for table operation—that is, 5 to 15% plus 40 mesh—in a single tube mill. On some plants tube mills are worked in series with 5-ft. pans. The tonnage treated under these conditions varies from 5 to 8 per hour.

Grinding pans 8 ft. in diameter are used in some mills. They are of two types: Positive pans, in which the feed enters at the center of the pan and passes straight through between shoes and dies and out of the pan, no classification being attempted by raising the overflow of the pan above the level of the shoes and dies; and ordinary pans, in which the feed is not necessarily in the center and where the grade of crushing is regulated by the height of the pan overflow. The stage-grinding system is in use, and it has been found to be much more efficient than a single-step system. The jig-reject product is run, after a classification, into two 8-ft. positive pans, and the classified product from these pans is further crushed in an 8-ft. ordinary pan.

The Forwood-Down Grinding Pan

The pans of the Forwood-Down type have a speed of 32 r.p.m. In the stage-grinding system they crush 2 to 2½ tons per hr. from through 3 mm. to 10% plus 40 mesh. Shoes and dies used are cast iron. As to the 5-ft. grinding pans, both positive and ordinary types are in use. They are used both singly and in series to crush the feed from jigs to the size required for tables. In each case the product is classified on screens before it passes to the pans. The capacity of the Forwood-Down pans is 1½ tons per hr.; speed, 50 r.p.m.; horsepower, 8. Shoes and dies of cast iron last from 6 to 8 weeks, although manganese steel lasts longer. The cost per ton is practically the same in each case. With cast-iron liners 2½ to 3 lb. of metal per ton is usually worn off.

Tube mills are considered preferable to pans. The crushing may be better regulated, as it depends on the load of flint or pebbles and the proportion of water running to the mills, and not, as in the case of pans, on the state of wear of shoes and dies. Costs, while high with tube mills, are much lower than with grinding pans.

The increased capacity of grinding pans while crushing in series leads one to believe that the most efficient crushing system is stage-crushing with tube mills. Two short-tube mills with classified feed supplying a classifier, the underflow of which delivers into a 10x5-ft. tube mill, should give a high capacity and reduced wear with low power consumption.

Necessity for Efficient Classification

A fact that is often lost sight of is the extreme importance of efficient classification at the head of fine-crushing machinery, for tests with grinding pans have proved that it greatly increases the tonnage treated per machine, and also lessens the amount of slime produced. Screening seems preferable to hydraulic classification, as fine lead will pass through the discharge of a classifier and be crushed to slime, whereas this fine lead will be more readily recovered by efficient screening.

The pulp from the fine-grinding section is thickened if necessary and directed to tables without classification, the slime overflow at the top end of each table being separately treated on special machines. The whole feed is split up either by automatic distribution or cut-off gates so as to give an even feed to each table. The tables are all set at a constant slope, having practically a fixed point of cut-off of the lead. These modifications have resulted in the cutting down of labor costs and an increased efficiency of working.

Both riffle and grooved tables are used, and there is still a great difference of opinion as to their relative

merits. Instead of riffles being cut off diagonally across the table, some of them are extended at the far corner of the tables to its full length, the remainder being cut off in the form of a curve. Middlings from the first set of tables are treated on separate ones, and the middlings formed by the latter tables are returned to their own feed. The usual proportion is three primary tables and one table to treat the middlings. The section of a mill crushing 1500 tons per week usually has 12 primary and 4 middling tables. It has been proved that recovery on the table system is proportionate to the area of concentrating surface.

For the settlement of slimes Dorr thickeners and cone settlers are used. The efficiency and regularity in the working of the Dorr thickeners show such a marked improvement over other slime-settling machines on Broken Hill ores that it is doubtful if in future designs of mills any other machine will be thought worthy of consideration.

The enhanced value of the slime product of late years, owing to selective flotation, has turned the attention of some of the managers to the importance of classifying the slimes from all zinc and tailings products. As the slimes are in all cases higher in lead than the coarser product, the thorough removal of slimes results also in a higher grade of zinc being produced from the coarser products. Tailings are either separated in Caldecott diaphragm cones and thickened pulp run out on the dump on a conveyor belt, or the tailings are run into round vats with filter bottoms and bottom-discharge doors which feed a conveyor running under each vat.

The concentrate from each set of machines is, in the most uptodate methods, run to a system of small draining conveyor belts. These all deliver to a main elevator or conveyor, the drained product being discharged into circular or V-shaped concentrate bins with bottoms of coco matting. These bins are elevated along the railway lines, so that on opening the bottom-discharge doors the concentrate may be rapidly loaded in the cars. Future development in lead recovery lies in selective flotation rather than in improved milling methods.

Gypsum Production in 1914

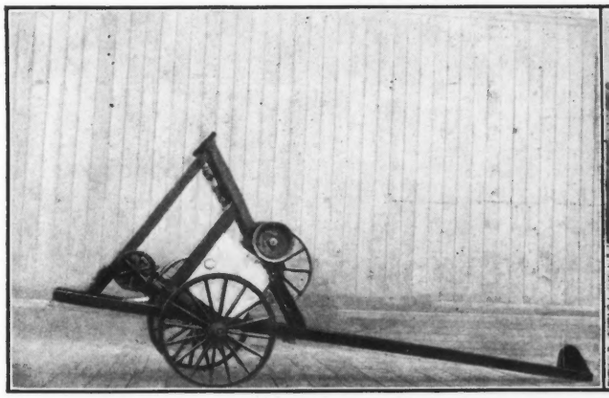
According to the Geological Survey the production of gypsum in the United States in 1914 decreased in tonnage but increased in value. The quantity of crude gypsum mined in 1914 was 2,476,465 short tons compared with 2,599,508 tons in 1913. The gypsum sold without calcining and used principally as land plaster and as an ingredient in portland cement and paint amounted to 443,687 short tons, valued at $646,799. The material marketed as calcined plaster was 1,656,066 short tons, valued at $6,249,190. The total value of all gypsum marketed in 1914 was $6,895,989.

Gypsum was produced in 18 states and in Alaska in 1914, the same states reporting output in that year as in 1913. The relative rank of the three leading states has remainded unchanged for the last four years, New York ranking first, Iowa second, and Michigan third in the output of crude gypsum.

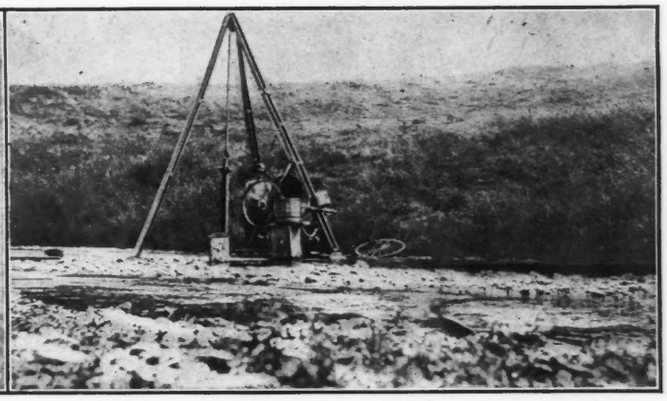
There were 78 gypsum mines, including quarries and pits, reported active in the United States in 1914, one of which is in Alaska. These mines supplied 68 domestic mills, of which 61 were calcining plants and 7 produced ground gypsum only. Four new mills were reported in operation last year, three in California and one in New York. One mill was reported under construction in Nevada.

Prospecting Drill for Alaska Placers

The Flume Dredge Co., Mills Building, San Francisco, has designed a portable drill especially to meet the requirements of prospecting dredging ground in Alaska, built for it in the shops of the Straub Manufacturing Co., Third Street, Oakland, Calif. Fifteen of them have been installed in Alaska and the demand for the drills is increased by the simplicity of handling, setting up and operating. The total weight of this drill, including poles, casing, etc., is 1300 lb. The shear legs are 16 ft. long. The hammer weighs 200 lb. Operation of the stroke is caused by winding the drill rope on a gypsy turned by the engine, which is a 4-hp. distillate engine, stationary on the drill. Casing is usually 4 in., which is considered the most practical, but 5-in. casing can be used. The drill is designed to dig 22 ft.; but the essential digging depth in Alaska dredging fields is usually less. The whole is mounted on wheels for moving and the wheels are removed when the drill is set for action. Two men easily wheel the drill about, set it up and operate it, and can put down six holes in a working day. The accompanying photographs show the drill mounted on wheels ready for transporting to the field, and also set up for actual drilling.

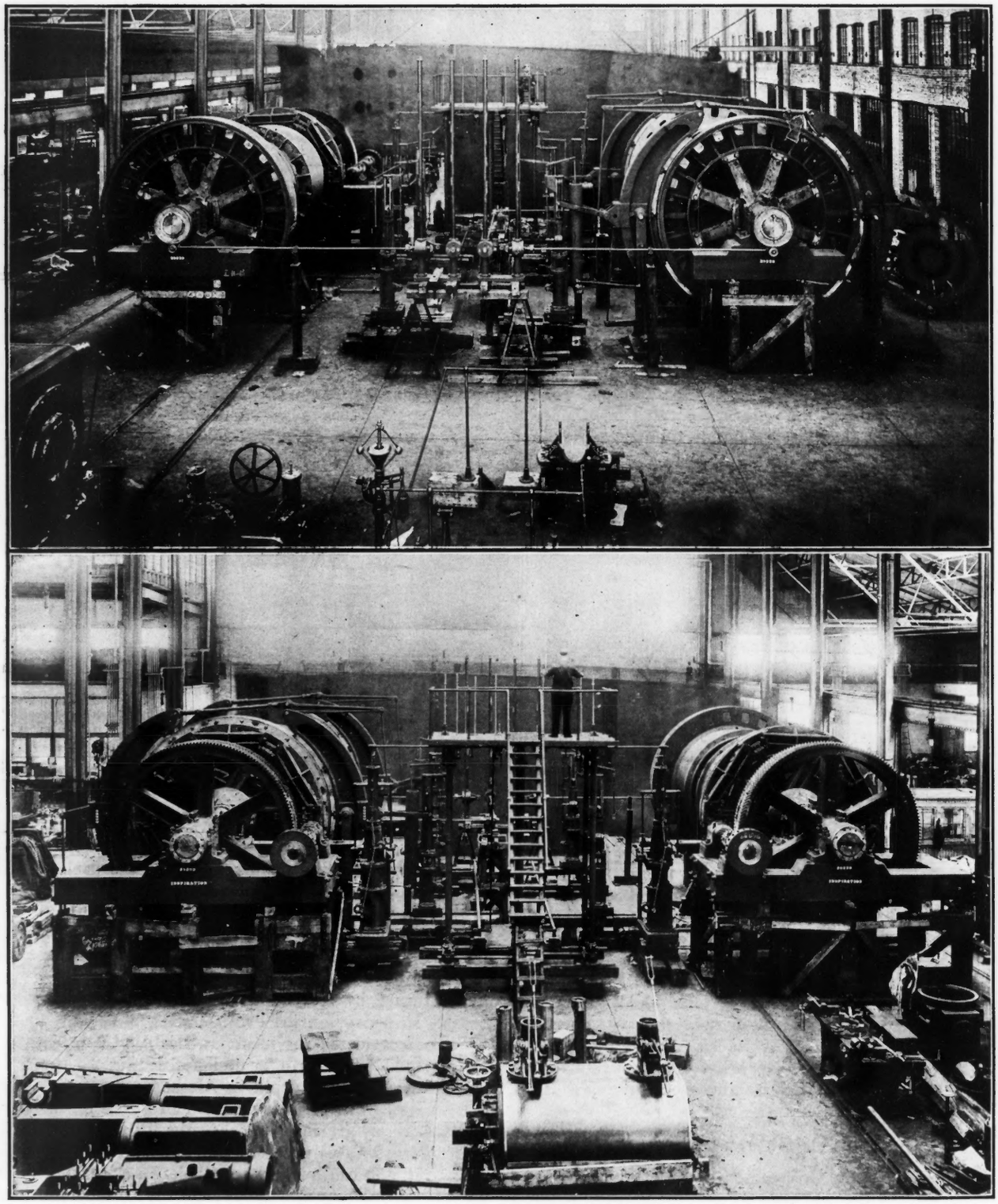


PROSPECTING DRILL READY TO BE MOVED



DRILL SET UP FOR OPERATION IN THE FIELD

Photographs from the Field

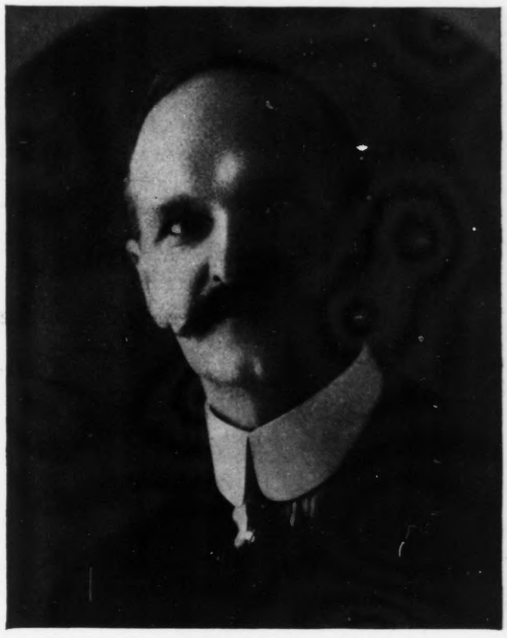


INSPIRATION CONSOLIDATED COPPER CO.'S ELECTRIC HOIST ASSEMBLED IN THE SHOP

This hoist, built by the Nordberg Manufacturing Co., Milwaukee, Wis., has double 10-ft. drums, 65-in. face, and carries on each 1000 ft. of 1¾-in. rope. Rope pull is 40,850 lb., hoisting normally in balance with a rope speed of 750 ft. per min.

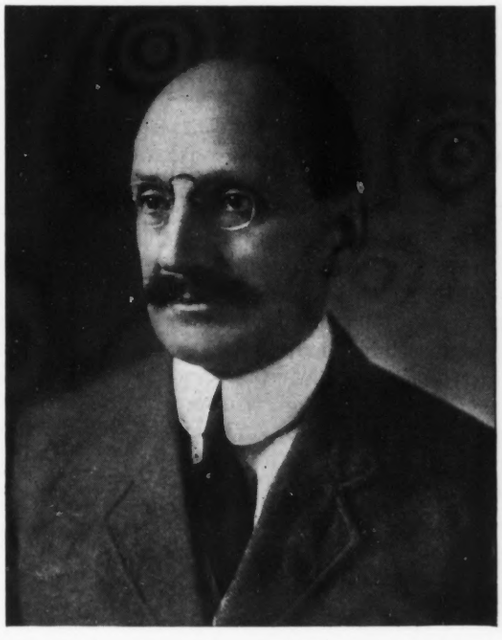
Mining Men in the Public Eye

CHARLES HAYDEN



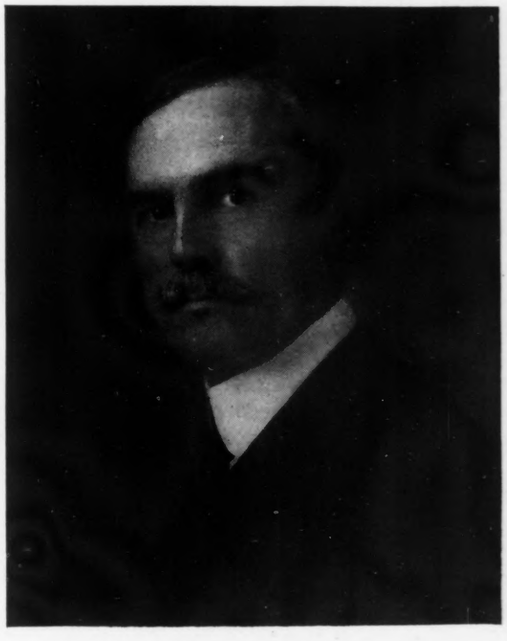
T. COLEMAN DU PONT

Messrs. Hayden and du Pont, together with S. Pierre du Pont, recently gave $250,000 to the Massachusetts Institute of Technology for a mining building, thus contributing to the maintenance of the prestige of the Institute, of which these three men are distinguished alumni



H. M. WILSON

Mr. Wilson recently retired from the position of engineer in charge of the Pittsburgh Station of the United States Bureau of Mines to become director of the department of inspection and safety of the Workmen's Compensation Insurance for Coal Mines



JOHN D. RYAN

Mr. Ryan lately became president of the Anaconda company, which displaces Amalgamated, and is the leader of Montana's industries. Indeed, it would be no stretch of the truth to characterize him as the leader of the copper-producing industry of the United States

Zinc and Lead Imports

An advance report from the Department of Commerce gives the imports and exports of zinc for the United States in the month of May as below, in pounds:

Imports from:	Ore: Gross Tons	Ore: Contents, Lb.	Metal, Lb.	Total, Lb.
Canada	744	616,600	11,693	628,293
Mexico	4,568	2,924,979	423	2,925,402
Australia	6,974	5,740,000	.....	5,740,000
Cuba	.....	.....	12,167	12,167
Brazil	.....	.....	29,536	29,536
Uruguay	.....	.....	69,467	69,467
Total	12,286	9,281,579	123,286	9,404,865
Zinc dust, Germany	.....	.....	99,092	99,092

Exports:	Domestic Lb.	Foreign Re-exported, Lb.	Total, Lb.
Blocks, pigs, sheets, etc	15,270,854	2,207,903	17,479,757
Zinc dross	1,147,385	.....	1,147,385
Zinc dust	.....	7,168	7,168

In addition manufactures of zinc to the value of $444,968 were exported. No exports of ore are reported. In May, 1914, the exports of domestic material were 214,201 lb. metal and 1436 tons ore, contents not reported; reëxports of foreign material were 224,000 lb. in ore and 3420 lb. zinc dust. For the five months ended May 31, the total exports of zinc metal, excluding contents of ore, were 588 short tons in 1914 and 59,263 tons in 1915; an increase of 58,675 tons this year.

Lead Imports

The statement gives the imports of lead into the United States in May as below, in pounds:

From	In Ore, Lb.	In Base Bullion, Lb.	Total, Lb.
England	54,320	.....	54,320
Canada	143,000	.....	143,000
Mexico	406,516	10,913,000	11,319,516
Chile	1,009,457	.....	1,009,457
Peru	24,155	18,088	42,243
Total	1,637,448	10,931,088	12,568,536
Pigs, bars and scrap			1,480
Total lead imports			12,570,016

The total weight of ore imported was 7842 tons; of base bullion, 11,119,282 lb. Total imports of lead in May, 1914, were 5,619,050 lb.; in May, 1913 they were 8,822,722 lb. For the five months ended May 31 the total imports were 10,346 short tons in 1914, and 28,607 in 1915; an increase of 18,261 tons this year.

Shuman-Boys Sun-Power Plant at Meadi, Egypt

The history of the utilization of solar energy is outlined briefly by A. S. E. Ackermann (*Journ.* Roy. Soc. Arts, 1915, 63, 538-565; abst. *Journ.* Soc. Chem. Ind., May 31, 1915). Special reference is made to investigations culminating in the establishment of the Shuman-Boys sun-power plant at Meadi, near Cairo, during 1912 and 1913. This apparatus consists of five parallel units arranged with their axes N and S and mounted so as to "follow the sun" automatically. Each unit, 205 ft. long, is composed of a boiler placed on edge in a channel-shaped reflector of parabolic cross-section; and each boiler, placed at the focus of its reflector, is surrounded by an air space enclosed by a single thickness of glass. The total area of sunshine collected is 13,269 sq.ft., the concentration effected by the reflectors being 4½ to 1. In an extended series of trials made with this plant, the maximum quantity of steam produced was 12 lb. per 100 sq.ft. of sunshine per hour, or 183 sq.ft. of sunshine per b.hp. (1 b.hp. = 22 lb. of steam at atmospheric pressure); the maximum thermal efficiency was 40.1% (solar constant = 7.12 B.t.u. per sq.ft. per min.). In the best 1-hr. run, 1442 lb. of steam at atmospheric pressure was produced. The utilization of solar energy is regarded as almost a solved problem where sunshine is plentiful and coal only obtainable at about $17 per ton.

Australian Action on German Ore Contracts

The speech of Attorney-General W. M. Hughes of Australia, at the second reading of the Enemy Contracts Annulment bill introduced in the Commonwealth Parliament on May 5, is reported by the London *Mining Journal,* in part, as follows:

"The effect of war on contracts is to suspend some and terminate others, according to their nature. Some contracts are not contracts between enemies of the Empire, but between British subjects, but they are nevertheless contracts for the benefit of the enemy. These latter contracts are not affected legally by the war, but great uncertainty prevails as to the effect of the war on contracts, and it is to remove these uncertainties that the measure is introduced.

"It was impossible to tell what Germany was doing with regard to contracts, but if what was heard was to be believed, there could be no doubt that contracts were being voided, as well as the rights of private individuals. This bill cannot be judged fairly unless it is looked at in the lurid glow that rises from the gigantic battle in which the hosts of Christendom have arrayed themselves for the purpose of mutual destruction. It is a world-war, which is being waged for world-power—power that is not military power alone. It is waged by Germany for achieving commercial and industrial domination of the earth.

"The position is this: The mining companies of Australia, at least the majority of them, had entered into contracts for the disposal of their products up to the year 1921. In many of these contracts there are clauses which suspend them during the period of war, but which, after the termination of the war, enable the period of the duration of the war to be added to the term of the contracts. Thus, in a contract extending to 1921, a three years' war would mean that the contract would be extended to stretch out until 1924. Whether any of those contracts are discharged by the war I am unable to say. There is uncertainty and doubt about it all, and that uncertainty affects, not only the present operations of mining companies, but their future development, for no English capitalist would, for instance, invest money in a smelting works unless he was assured of a continued supply of metal.

Alleged German Domination of Markets

"The other way in which the position is affected is because these companies are unable to divert their produce from Germany, not only owing to contracts relating to supplies of metal, but because they have contracts for the sale of their metals which prevent them selling except through recognized persons and authorities. The price of lead today is fixed by the same people who fixed it before the war, although they are not outwardly the

same people. Every pound of lead the Admiralty or the War Office buys has to be bought through that one channel, and through that channel alone. The position originated with a German firm at Frankfort-on-Main, a firm whose methods were typical of the German character—systematic, thorough, and far-reaching. This German firm, or group of firms, exercised its powers in every important country of the world. The Metallgesellschaft, the American Metal Co., and the Australian Metal Co., were practically one and the same firm. The Australian Metal Co. is a company registered in Australia, though to all intents and purposes it is an offshoot of the one great concern. In London, the name of the firm is Merton, but Merton, though registered in London, is only one branch of the same power.

"The Broken Hill Proprietary has contracted to supply the Australian Metal Co. with its ores; that is an official fact. The greater number of that company's shares are held by Germans. The output of lead is still controlled by the Lead Convention, which is essentially German. The German element in London practically controls the sale of metal. Merton is the only selling agent for lead, and it is a fact that British buyers have been refused supplies since the outbreak of war because sellers are bound to Merton.

Legislation Necessary to Cancel German Contracts

"There is not the shadow of doubt that nothing but the sharp edge of legislation can cut the contracts which bind Australian commercial men to the agreements they have entered into. The Broken Hill Proprietary Co. has given notice of its intention to annul its contracts. But it does not know its position in law; neither does anyone else.

"The Government does not propose to act against the interests of any of the Australian companies. Just the opposite. The Government intends to use all the power in its possession to bring about a termination of German influence in Australian trade. The Broken Hill Proprietary Co. has undertaken to give three months' notice to sever its connection with the companies influenced by Germans or German capital, but the mere giving of notice does not legally terminate the agreement. Elder, Smith & Co. have also 'broken contracts,' but are still liable.

"The firm of Merton's, British in origin as well as name, is merely the conduit pipe through which the profits are taken to Germany. The Government has ample proof of that. The bill provides that all enemy contracts shall be null and void. It provides also, in Section 4, for another class of contracts—that is, for contracts that can be determined if one of the contracting parties so desires. That is to meet the case where war has made it impossible to carry out certain of the conditions agreed on."

[The above summary of Mr. Hughes' speech outlines what it is proposed to do in Australia with respect to the disputed ore contracts. There are not a few inaccuracies of statement contained in it. It should be remarked also that the Lead Convention, in which the American Smelting & Refining Co. and the Spanish producers were participants, was disrupted July 1 by the secession of the Australian producers.—Editor.]

NEW PATENTS

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

AGGLOMERATING—Treatment of Subdivided Ores for Agglomerating or Reducing Them and Apparatus Therefor. Gustaf Gröndal, Djursholm, and Herman Nilsson, Nyhammar, Sweden. (U. S. No. 1,142,324; June 8, 1915.)

ALUMINUM NITRIDE—Process for the Manufacture of Aluminum Nitride. Paul Bunet, Whitney, N. C., assignor to Société Generale des Nitrures, Paris, France. (U. S. No. 1,145,747; July 6, 1915.)

ALUMINUM SOLDER. Jonas F. Gross, Allentown, Penn. (U. S. No. 1,145,307; July 6, 1915.)

ASBESTOS PACKING. Alexander Warrell, St. John, N. B., Canada, assignor to Continental Asbestos Corporation, Worcester, Mass. (U. S. No. 1,143,153; June 15, 1915.)

CONCENTRATION—Improved Apparatus for the Water Concentration of Ores or the Like. W. M. Martin, Redruth, Cornwall. (Brit. No. 2844 of 1915.)

CONCENTRATOR—Ore Concentrator. Joseph Weatherby, New Cumberland, Penn., assignor to Electric Ore Separator Co., New Cumberland, Penn. (U. S. No. 1,145,046; July 6, 1915.)

CONDENSER for Zinc and Lead Vapors. Edvin Andreas Johansson, Trollhättan, Sweden. (U. S. No. 1,145,685; July 6, 1915.)

COPPER MATTE—Improvements in the Process of Bessemerizing Copper Matte. J. B. Herreshoff, Richmond Hill, N. Y. (Brit. Nos. 12,916 of 1914 and 2219 of 1915.)

CRUSHER—Stone Crusher and Pulverizer. Edgar B. Symons, Milwaukee, Wis. (U. S. No. 1,145,629; July 6, 1915.)

CRUSHING—Improved Apparatus for Feeding Ores to Stamping Batteries and Other Pulverizers and Mixers. H. Standen, Zuitspanburg, Transvaal. (Brit. No. 18,622 of 1914.)

CUPOLA FURNACE. Michael Zippler, Jr., Pittsburgh, Penn. (U. S. No. 1,145,648; July 6, 1915.)

DREDGES — Floating Discharge Pipe for Hydraulic Dredges. Arthur Wells Robinson, Montreal, Quebec. (U. S. No. 1,143,321; June 15, 1915.)

DRILL—Core Drill. Clinton E. Wilder, Erie, Penn., assignor to National Forge & Tool Co., Erie, Penn. (U. S. No. 1,145,822; July 6, 1915.)

DRILL—Pulsatory Percussive Drill. Lewis Condict Bayles, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,144,990; July 6, 1915.)

DRILLS—Exhaust-Closing Valve for Hollow Steel Percussive Drills. Lewis Condict Bayles, Easton, Penn., assignor to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,144,991; July 6, 1915.)

DRILLS—Core Holder for Tubular Rock Drills. John F. Lindberg, Hibbing, Minn. U. S. No. 1,145,323; July 6, 1915.)

ELECTRIC FURNACE. Paul Bunet, Whitney, N. C., assignor to Société Generale des Nitrures, Paris, France. (U. S. No. 1,145,748; July 6, 1915.)

GRAPHITE—Process of Purifying Graphite. Edouard Napoléon Lainé, Paris, France. (U. S. No. 1,145,024; July 6, 1915.)

HAULAGE—Improved System of Electric Signs for Main and Tail Haulage in Mine and Like Places. G. B. Burrows, Wellingham, Durham, Eng. (Brit. No. 13,310 of 1914.)

HOISTING—Improvements in Safety Devices for Mine Cages. E. Tillack, Berlin, Germany. (Brit. No. 20,254 of 1913.)

LEVELING INSTRUMENT for Use in Underground Workings. James Graham Bower, Johannesburg, Transvaal, South Africa. (U. S. No. 1,145,664; July 6, 1915.)

MINE-CAR WHEEL and Axle. Frederick A. Sweet, Salt Lake City, Utah. (U. S. No. 1,141,990; June 8, 1915.)

MINE DOOR—Electrically Operated Mine Door. William W. Murray and James F. Dillon, Dearing, W. Va. (U. S. No. 1,145,787; July 6, 1915.)

NITRATE OF SODA—A Two-Stage Evaporation Process for Recovering Nitrate of Soda from Liquors Containing It and Sodium Chloride in Solution, and an Apparatus for Carrying Out Such Process. Gibbs & Co., Valparaiso, Chile; Kestner Evaporator Engineering Co., Ltd., London. (Brit. No. 12,475 of 1914.)

NITROGEN OXIDES—Improvements in the Manufacture of Oxides of Nitrogen and of Catalysts to Be Employed in Such Manufacture. Badische Anilin & Soda Fabrik, Ludsvigshafen-on-Rhine, Germany. (Brit. No. 13,848 of 1914.)

PERCUSSIVE TOOL—Pulsator-Driven Percussive Tool. Arthur H. Gibson, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,142,514; June 8, 1915.)

SULPHIDE ORES—Process of Treating Mixed Sulphide Ores. Erich Langguth, Neerpelt, Belgium. (U. S. No. 1,144,481; June 29, 1915.)

WELDING—Electric Welding and Fusion Deposition of Metals. Arthur Percy Strohmenger, Westminster, London, England, assignor to Slaughter & Co., Ltd., London, England. (U. S. No. 1,144,390; June 29, 1915.)

ZINC—Mechanism for Removing Residue from Vertical Retorts. Alexander Roitzheim and Wilhelm Remy, Duisburg-Ruhrort, Germany. (U. S. No. 1,144,065; June 22, 1915.)

ZINC—Method of Smelting Zinc and Other Ores. James M. Hyde, Berkeley, Calif. (U. S. No. 1,144,037; June 22, 1915.)

ZINC-SMELTING FURNACE. James M. Hyde, Berkeley, Calif. (U. S. No. 1,144,036; June 22, 1915.)

ZINC SULPHATE—Production of Zinc Sulphate. Ramon Bonastre Llopart, Cordoba, Argentina. (U. S. No. 1,140,354; May 25, 1915.)

Correspondence and Discussion

Which Is the More Useful--Steam or Explosives?

Say dynamite to the average man and he turns pale and gets ready to run; say it to the average woman and she shrieks.

Dynamite is not a gentle creature. It is always ready for a fight and it's a hard hitter. Jess Willard isn't in old Bill Dynamite's class as a biffer. Few people realize how indispensable a commodity dynamite really is. In Philadelphia recently a debate was held, the subject being: "Which is the more useful to mankind—steam or explosives?"

At first thought, ninety-nine people out of a hundred would answer without a moment's hesitation:

"Why, steam, of course; how could we do without it? It's the motive power of our passenger and freight trains; of our mills and factories; it heats our apartments and it propels our steamboats. Without it, manufacturing and shipping—the most important industries of the world—would stop.

"And dynamite—why all that's good for is to enable burglars to blow up safes and anarchists to destroy buildings."

Yes, that's the average thoughtless, uninformed person's idea of the high explosive. But not so fast. A little investigation, a little thought discloses that there is much to be said on the other side of the question. The debate isn't so one-sided as it might appear.

What is steam? A vapor generated by superheating water. How is it heated? By burning coal under the boiler. By what means is the coal obtained? By blasting with explosives. All right, then score one for the "big noise"; without it we would not have coal in sufficient supply to generate steam equal to the commercial requirements of modern times. Thus it would appear steam is dependent upon explosives.

Ores from which are made the raw materials most largely used in many of the mills and factories are equally dependent upon explosives for their production. Therefore, without explosives, many of the mills now in active operation would not exist.

And the passenger and freight trains. The locomotives are made of iron and steel, the ores for making which are mined with explosives; the coal that furnishes their power is mined with explosives. Sections of roadbeds on which they run were blasted through rock with explosives; the rails were made from ores which were mined with explosives; the ballast was quarried with explosives; the bridges along the lines are made of steel, made from ores, mined with explosives. Could we do without them?

And now as to steam. Electric locomotives will do nearly everything steam engines will do. They will pull the passenger and freight trains, and electric motors will run the machinery in mills and factories. There are many hydro-electric plants in the country and water power is available for many more.

Recently, dynamite has begun to play an important part in agriculture. Before the seed is planted, before the surface is even plowed, the subsoil is broken up by blasting, the idea being to improve drainage, aeration and increase the water-storage capacity of the soil. The holes in which nursery stock is planted are blasted to improve drainage, aeration and moisture storage and to enable the roots to spread out in the soil normally and easily.

Ditches are blasted with dynamite, drainage sink-holes are put down and stumps and boulders encumbering farm land are disposed of with it. Many millions of pounds yearly are used for these agricultural purposes.

Now, if we really had to do without one of them, could we not do without steam better than without explosives?

F. W. Wilson.

Wilmington, Del., July 8, 1915.

Classification of Technical Literature

The Joint Committee on Classification of Technical Literature is extremely desirous of obtaining the assistance of the *Journal* readers in making a collection of classifications of applied science which have been developed independently in the offices of manufacturing plants or engineering firms, especially those which exist in manuscript form, and have been used for filing or indexing data.

The committee would especially like to have copies of any extensions of present systems pertaining to any special industry or branch of engineering not now fully covered by the published classifications. Send data to 29 West 39th St.

W. P. Cutter.

New York, June 21, 1915.

Gold Dredging in Philippines

May I call attention to a slight error in the matter of fixing credit for an article on gold dredging in the Philippine Islands which appeared in the *Journal* of Apr. 17, 1915, p. 685, and was credited to the *Philippine Journal of Science?*

The original article was published through the courtesy of William Kane, the author, in the "Mineral Resources of the Philippine Islands" for the year 1913. The "Mineral Resources of the Philippine Islands" is an annual publication of the Division of Mines, Bureau of Science, Manila, P. I. It is distributed free of charge and reaches a different set of readers than the *Philippine Journal of Science*—to which all divisions of the Bureau of Science contribute. It is true that papers are occasionally published in both periodicals, but I believe that Mr. Kane's data appeared only in the "Mineral Resources of the Phillippine Islands."

Wallace E. Pratt.

Manila, P. I., June 7, 1915.

Editorials

Position of the Steel Industry

From present indications the steel industry of the United States, which for nearly two years has been passing through a period of great depression, is now well started on the up-grade. It was generally believed that the lowest point had been touched early in 1914, when the reaction caused by the overproduction of the previous year had nearly reached its limit, and prospects had begun to improve, when the outbreak of war disorganized all business temporarily and left the trade in worse condition than it had ever been. About November last the depression was greatest and production was at the lowest level.

Matters began to revive slowly and production to increase as domestic demands gradually improved; but as spring advanced, it became evident that the great war, which had for a time helped to depress our steel manufacturers, was going to give them some important aid in starting the revival. Foreign orders were booked at an increasing rate. Not all of them were for finished war material; many of them were for the iron and steel needed for making such material elsewhere, and many for railroad equipment and track material. Just how large a proportion of the increase of business is due to these war orders it is difficult to say. Not all of them are made public, and in some cases the recipients do not care to make the sources known. It is quite plain, however, that they have had much to do with the present revival of trade.

The value of the iron and steel exports has been creeping up. In the month of May the total tonnage of exports was 262,844 tons, against 138,514 tons in May, 1914—an increase of a little more than 90% being shown. It is probable that later months will show an equal—possibly a larger—gain.

War orders or foreign orders have not been the only source of improvement in the iron trade. There has been a fairly steady gain in the demand from domestic consumers, notwithstanding the fact that large construction enterprises have been rather slow, and that buying by the railroads has been on a moderate scale only, at least on the surface. The rate of operation of the mills has been gradually increasing, until at present it is approaching full capacity in most of the mills in the Central West. The Steel Corporation's monthly reports—which are generally considered an index to the condition of the trade—in June showed a noteworthy increase, indicating a large excess of orders over deliveries. The chief independent producers are in much the same condition.

To go back to the foundation, the production of pig iron, which was at its lowest point in January—at the rate of 57,200 tons daily, or about 20,850,000 tons yearly—has advanced month by month until on July 1 the make of pig iron was 81,300 tons daily, or at the rate of 29,650,000 tons a year. Notwithstanding this gain in the rate of production, the total make for the first half of 1915 was almost the same as the first half of 1914, the estimated total this year being 12,248,000 tons, while the completed report in 1914 gave 12,536,000 tons for the first half. For the second half of 1914 the actual make was only 10,796,000 tons, and the present indications are that the current six months will show a much higher figure than that. It does not seem probable, however, that the total for 1915 will reach the high point of 30,966,000 tons attained in 1913, though it may approximate it closely if the present rush continues.

The demand during the present year has been mainly for steel products, and the increase in pig-iron production has come chiefly from the steel-works furnaces. There has been complaint all along from the merchant furnaces that make pig iron for sale, that their market was slow and dragging behind the steel market. They also claimed that while the steel makers had been able to advance their prices from time to time and were securing from 15 to 25% more money for their product than they received at the opening of the year, pig-iron prices remained at a low level, and that it was hard to secure any advance. There seems to be ground for this contention. The general rate of production has advanced over 40% since January. That of the merchant furnaces has increased from about 16,000 tons a day in January to 20,500 in July, or less than 30%, while prices have remained low because a number of furnaces are ready to start at the first indication of improvement.

The demand, as has been stated, has been for finished steel, and so far the steel companies have been able to supply it from their own stacks without buying from outside makers. The foundry trade, on which the merchant furnaces largely depend, has been much slower to respond to improvement, as is indeed usually the case after a time of depression. Nevertheless, their position has not been altogether bad. Lake ore and coke prices have been cheap, and costs as well as selling prices have been low. It looks now as if the improvement in the pig-iron market was nearly due and that it would shortly follow the course upon which steel has already started so actively. In fact the present week brings reports of some large purchases of both bessemer and basic pig from outside furnaces, made by large steel companies.

Chromium Supplies Limited

There is probably going to be a scarcity in chromium and chromium compounds soon. The supplies of this material ordinarily come from New Caledonia, Turkey and Rhodesia. The Rhodesian and New Caledonian supplies have probably been commandeered to supply France and Great Britain. Turkish commerce is in eclipse. We know of only one mine operating in this country and two more which might be operated. As we understand that some of the brick manufacturers have notified their customers that they can only supply chrome brick for a little while longer and that some shapes already cannot be obtained, it would appear that the man with a chromium prospect might profitably spend some money on exploration and further development.

Increased Zinc Smelting Capacity

As the price of spelter moved upward during the first half of 1915, surpassing the price for copper, the *Journal* prophesied that the conditions would inevitably develop an increase in spelter production, and especially that this would be brought about by smelters adding furnaces to their plants. In previous reviews of the situation it was not considered likely that new works would be built, in view of the general opinion that the existing conditions would be so ephemeral that it would be unsafe to enter upon the construction of new plants and that no one would be likely to do so, having in mind the long time bound to elapse before production could be begun. These forecasts have been borne out in the main, as has been chronicled in this paper, but they were at fault in not reckoning upon the surprising number of supposedly defunct plants that have been restored to usefulness—some of them after idleness of 15 years—and there are two new plants being built. With respect to the latter, one is being built in Oklahoma by George E. Nicholson—an experienced and successful smelter—who appears to be able to build zinc smelteries in a marvelously brief time; and the other is a great plant that has been started at Donora, Penn., by the United States Steel Corporation.

The Donora plant has probably been planned less as a means of reaping fabulous profits out of the present extraordinary situation than as a method of insuring the supply of the largest consumer of spelter and relieving it from the vagaries and vicissitudes of a troublesome market. It will be a modern, efficient and substantial plant, wherefore its construction period will be lengthy and its production may not begin until spelter has regained a more nearly normal level. However, the construction is being pushed ahead vigorously and a large supply of Australian zinc ore has already been contracted for, indicating that no great delay in the ability to convert it into spelter is anticipated.

It is useful now to summarize what the recent and the prospective additions to smelting capacity amount to. At the first of this year it was estimated that the United States possessed a smelting capacity for producing about 500,000 tons of spelter in a year, that capacity being classified as active, operated irregularly, inactive, and new—the total number of retorts being about 120,000. In the inactive class were not included several old plants in Kansas and Missouri, most of which had been idle for more than 10 years.

At the middle of 1915, all of the smelting capacity listed at the beginning of the year was in use, and there had been revivals and additions—consummated and in process—of about 14,000 retorts, corresponding to about 60,000 tons of spelter a year. Adding to this the 40,000 tons that Donora is expected to produce, there is now in sight the means for making 100,000 tons more spelter annually than there was six months ago.

As to the status of this new capacity for production, a fairly large part of it is already available; another large part is expected to be ready by the end of August; the new Nicholson works will probably be fired up by October; Donora will surely not be ready until some time in 1916.

It may be assumed that the production of spelter in the United States is at present at the rate of 500,000 tons per year and that in the fourth quarter it will be at least at the rate of 560,000 tons per annum. Incidentally it may be remarked that the entrance of new companies—large and small—into the business is prima facie evidence that no combination in restraint of trade exists in this industry, as has always been known by every well-informed person. The ore supply is bountiful, as is reflected by the wide smelting margin that continues to exist. Miners have difficulty in placing their ore rather than do smelters find trouble in getting what they need. Of course many of the smelteries that have lately been put in operation are uneconomical and a large margin is necessary for anybody to be able to operate them. A return to normal conditions will extinguish them, as a strong wind blows out a candle.

Explosives Used in Mining

No one of the implements of his profession is shrouded in more mystery than the explosives which the mining engineer uses in his work. Originally this was due to the disinclination of competing manufacturers to give out any technical data relative to their product. The subject is still very much clouded by the sales policy of various companies and the idiosyncrasies of the many powder salesmen in the field. There are now so many brands of dynamite on the market, and there is so little correlated information at hand on the subject, that the buyer of dynamite is almost wholly at the mercy of the powder salesman or of a mine superintendent "wedded" to a particular brand.

It is an everyday occurrence for the salesman to advocate the use of some brand because, for instance, it has low-freezing properties or because it makes less gas, either one of which troubles may be giving the mine management a lot of worry. Because the mining engineer has been afforded no opportunity properly to compare and study the various classes of dynamite, he has had to rely largely on the salesman for such information, and frequently he has gone astray.

Very elaborate and artistic trade publications issued by dynamite manufacturers, while full of interesting and valuable information, fail to "fill the bill" despite the promise of their attractive exteriors. The Bureau of Mines has done much by analyses, tests and experiments to disseminate this much-needed information, but unfortunately its results are scattered through a considerable number of publications and the valuable nuggets of information therein are buried in a mass of repetition and information on extraneous subjects, which makes a lot of research necessary to get the benefits of their valuable work.

The day of indiscriminate dependence upon what the powder salesman thinks he knows is past, at least for the larger companies, and it is not too much to hope that it is nearly over for all companies that have progressive management. The cost of the explosives, the time lost waiting for powder smoke to get out of the working headings, the danger of asphyxiation from noxious gases, not to mention the disruptive effect of the powder itself, are each important enough to secure for this problem the attention and study which it deserves and which it has too long been denied.

BY THE WAY

Dispatches of July 16 announce the arrest of George S. Speets in Berlin. Speets had an American passport and was alleged to be doing a general brokerage business in American copper. If he were really selling American copper there, a number of people here would like to know how he did it. There seems, however, to be some doubt about Speets' copper sales, his citizenship, and his passport, all of which have been under investigation by Ambassador Gerard, as well as by the German Government.

Among the war news of the day is the report that the famous old bronze lion that stood on the battlefield of Waterloo has been pulled down and is being converted into German shells. The "Lion of Waterloo" was cast by Cockerill of Seraing, and stood on a mound 200 ft. high, marking the spot where the Prince of Orange was wounded in battle. It was made of the metal of captured French cannon and weighed 28 tons. Another writer calls attention to the fact that if the Germans had really taken the Belgian lion at Waterloo to make shells, it was only a final episode in a sad career. A few years after the famous battle, French troops marching to the siege of Antwerp deprived him of his tail.

The New York *Evening Post* of July 17 expressed the following appreciation of Doctor Holmes and his work:

A tribute of unusual and touching character is being paid today to the memory of a life of rare beneficence and self-sacrifice. Coal mines will be closed throughout western Pennsylvania and West Virginia, and owners and miners will do homage to the devoted labors of Joseph Austin Holmes, director of the United States Bureau of Mines, in behalf of the health and safety of the mine workers. Doctor Holmes' death last Tuesday, at the age of 55, was directly traceable to his zeal in this work, which led him, in the pursuit of his researches, to expose himself personally to those dangers and hardships which it was his purpose to avert or reduce to a minimum. Both as an administrative organizer and as a scientific investigator, his endeavors have borne rich fruit in the improvement of conditions and the perfecting of safety appliances. His death from tuberculosis must be set down as a result of overwork under conditions which would have been trying to a more robust constitution. It is in the contemplation of lives like this, sad as is the sense of loss, that one is heartened by the realization of the great store of unselfish devotion that is being unobtrusively expended by hundreds of quiet workers, in public and private station, for the betterment of the lot of mankind.

Real get-rich-quick schemes differ from the "get-rich-quick" variety in several ways, most prominent among which is the offer on the part of promoters of the latter to share the great benefits with the public at large. This seems to be the difficulty with the Nevin Electric Survey Co., the shares of which are now being offered to the public at 75c. each. The officers of the company are said to be men of the highest financial standing, but so generous that they wish to share with the public the great emolument that is to be received for the discovery of mineral deposits through the instrumentality of an electrical device invented by James E. Nevin. Mr. Nevin is quoted as saying that with this device "any deposit of matter contained in the earth can be defined with great accuracy as to area, depth and thickness of the deposit." Doubtless some people will buy the shares without stopping to think that anyone who could locate all the hidden deposits of gold, silver, copper, zinc, etc., would over night become the Pied Piper of the mining industry.

These are the greatest days the zinc miners have ever known—in more ways than one. Down in the Joplin district they are now finding ore in their dreams. Utah has long been known as the land of the revelator, and the story of the discovery of the Beck Tunnel mine by revelation is well known. That discovery proved so profitable that the principal owner secured a large following locally for the development of other Tintic mines, notably the Iron Blossom and the Colorado. But according to a Joplin dispatch, Missouri is now infringing on Utah's prerogative. The wife of one of the owners of the old Ethel S. mine, near Cooper Hollow, had a dream which, the dispatch states, is going to bring riches to the owners of that property. The mine is reported to have been paying fairly well until a few weeks ago, when the ore became very thin and finally gave out altogether. One morning Mrs. J. C. White told her husband, who owns a half interest in the Ethel S. mine, that she had dreamed of finding another great face of ore, but at the spot pointed out there was only a limestone wall. At night Mrs. White was lowered to the bottom of the mine, and while asleep she walked into the drift she had dreamed of. A single shot the next day broke "through the limestone wall into a great deposit of ore," and now the Ethel S. is the "Dream Lady" mine.

A writer in *World's Work* for July quotes Harry E. V. Brittain, one of the English founders of the Pilgrim Society, and who recently visited this country, as saying the following about H. C. Hoover and his Belgian relief work: "Do not think because we say little that we are not grateful. We know at home in England that to the American Commission for Relief in Belgium we owe the safety and the lives of the bulk of the Belgium nation. Our government takes the personal word of honor of your fellow-countryman, Mr. Hoover, as an international assurance in a way which has no precedent and no parallel in the history of peace or war. On the pledge of one American, we have allowed to go into Belgium millions of dollars' worth of food which would be of priceless military and other value to the Germans who occupy the country. Mr. Hoover, in the name of the commission, tells us this will go only to the Belgians. We take his word and have no reason to regret it. But our military and naval authorities would never be justified in taking the word, under the circumstances of a life-and-death struggle, of one American, or even of the American nation, unless they were convinced that with it went the power and ability to 'make good.' We have found that you are as good as your word. Your flag has safeguarded more relief than the philanthropy of the whole world ever dreamed it would be asked to supply. Under the Stars and Stripes a distressed civilian army, greater than the combined militant armies of France and Germany, is being kept alive. Impelled by humanity and guided by an efficiency that is the envy of every European government, you have pierced the lines of all armies, broken all blockades, and gained the first really decisive victory of the war."

PERSONALS

C. W. Purington has gone to Petrograd on his way to the Lena district, Siberia.

W. H. Staver recently examined and sampled the Suffolk mine near Ophir, Colorado.

Roy C. McKenna has been elected president of the Vanadium Alloys Steel Co., Pittsburgh, in place of E. T. Edwards.

Faris V. Bush, of Lordsburg, N. M., one of the New Mexico contributors to the "Journal", has been chosen a director in the Arizona Eastern Ry. Co.

C. W. Wright, the general manager of important lead mines in Sardinia, has arrived in this country for his annual visit. He will return to Sardinia in September.

James Bowron, president of the Gulf States Steel Co., and a pioneer among Alabama iron men, is making an extended trip through the North, and expects to visit Alaska.

Lawrence H. Underwood, late with the Indiana Steel Co., at Gary, has been appointed superintendent of the byproduct coke plant of the Youngstown Sheet & Tool Co., at Youngstown, Ohio.

James McEvoy, formerly of the Canadian Geological Survey and more recently manager of the Crow's Nest Pass Coal Co., has become attached to the Canadian expeditionary forces as instructor in engineering.

J. F. McNamara has been appointed general manager of the Bayonne Castings Co., Bayonne, N. J., which puts the Monel metal made at the Orford Copper Co. works, in finished form. He succeeds W. E. Oakley, resigned.

E. Hampton, superintendent of the Bunker Hill mine, Amador City, Calif., has recovered from his recent illness and is again in charge of the mine. B. C. Clark who was in charge during Mr. Hampton's sickness has gone to Nevada.

Eugene C. Templeton, a graduate of Stanford University in 1910, has taken a position with the Irtysh Gold, Zinc & Lead Mining Co. in Siberia, and will leave for that country in a short time, expecting to remain at least one year.

Dr. Horace B. Patton, professor of geology in the Colorado School of Mines, is spending part of his vacation in California. He expects to undertake some field work in August in a survey of the Platoro-Jasper district, southern Colorado, for the U. S. Geological Survey.

Arthur Clark Terrill, who has been employed the past year as field representative of the New York State Museum collecting and placing on display the large mining exhibit representing the Empire State at the Panama-Pacific International Exposition, has been appointed head of the department of mining engineering in the school of engineering, Kansas University, Lawrence, Kansas, beginning with September.

OBITUARY

Cecil Chaplin, one of the pioneers of Tonopah and a partner of George Wingfield in opening the camp at Goldfield, died at Los Angeles, Calif., July 15, aged 60 years. He was also heavily interested in mining property in Montana.

Horatio Weber Baker, founder of the chair of mining engineering in the University of Nevada, died at San Francisco on July 8. For the past three years Mr. Baker was in the employ of the "Mining & Scientific Press" of San Francisco.

Judge J. P. Bradbury, who died at Pomeroy, Ohio, July 17, aged 77 years, was well known as a lawyer and for a number of years judge of the Ohio Supreme Court. In his earlier days, however, he was an active gold miner in Utah and California.

Col. Jack Faw, a well known character in western North Carolina and Virginia, was killed July 14 at Jefferson, N. C., by the premature explosion of a blast. He was opening a mine there. He was 60 years old and had been a prospector and promoter for a number of years.

Prof. Frederick Prime died at Atlantic City, N. J., July 14, aged 65 years. He was born in Philadelphia, graduated from Columbia College, New York, in 1865 and later received degrees from Lafayette College and the Bergakademie at Freiberg, Germany. He was instructor in assaying at the Columbia School of Mines for some time and was professor of geology and metallurgy at Lafayette College for nine years. He was president of several iron and electrical companies in Alabama and Pennsylvania. In 1895 he was appointed professor of natural history at Girard College in Philadelphia and had since held that position. He was a manager of the Academy of Natural Sciences of Philadelphia and had been for some years one of the secretaries of the American Philosophical Society. He edited the English edition of Von Cotta's "Treatise on Ore Deposits."

Joseph Claybaugh Campbell died at San Francisco on July 1, from a ruptured blood vessel resulting from playing golf. Campbell was 63 years old, born in Oxford, Ohio. He studied for the bar at Frankfort, Ind., under his uncle Joseph Claybaugh, later a member of the Indiana Supreme Court. He had been in California for more than 40 years. In the early seventies he was elected district attorney of San Joaquin County. He served as chairman of the Republican State Central Committee and was once an aspirant to Congress. As an attorney he was identified with the Noyes-Alaska mining cases and was counsel for the defense in the Cœur d'Alene mining cases, and was chief attorney for Mayor Eugene Schmitz of San Francisco in the graft trials. He organized the law firm of Reddy, Campbell & Metson in San Francisco in 1889. At the time of his death the firm was known as Campbell, Weaver, Shelton & Levy.

SOCIETIES

American Institute of Mining Engineers—The Tintic trip of the Utah Section on July 15 was very successful and was attended by about 80 members and guests. After a welcome at Eureka by the mayor of that town, the members traveled around the district by automobiles and by the Knight railroad, going underground at the Mammoth, Silver City, Iron Blossom, Dragon Iron and Chief Consolidated mines. The banquet and a business meeting were held at Eureka in the evening, after which a dance and a moving picture show were given to the visitors. The party reached Salt Lake the next noon.

Lake Superior Mining Institute—The annual meeting for 1915 will be held Sept. 6-9. The first day will be spent on the Gogebic range, the second on the Cuyuna range and the third and fourth days in Minneapolis and St. Paul. This will be the first visit of the Institute to the Cuyuna. On the first day, a first-aid meet will be held at Ironwood under the charge of Edwin Higgins of the Bureau of Mines. Luther Brewer of Ironwood is general chairman of the Committee of Arrangements for the trip. L. M. Hardenburgh of Ironwood is president of the Institute this year and A. J. Yungbluth, of Ishpeming is secretary, as he has been for a number of years.

TRADE CATALOGS

Knox Motors Co., Springfield, Mass. Catalog. Tractors. 16 pp., illus., 9x12 inches.

International Nickel Co., 43 Exchange Place, New York. Catalog. Monel Metal. 12 pp., 4x8½ inches.

General Electric Co., Schenectady, N. Y. Bulletin No. 42,552. Motor Generator Sets. 28 pp., illus., 8x10½ inches.

Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin No. 1092. Synchronous Converters. 16 pp., illus., 8x10½ inches.

I. P. Morris Co., Beach & Ball St., Philadelphia, Penn. Bulletin No. 4. Hydraulic Turbines. 70 pp., illus., 8½x11½ inches.

Waterbury Co., 80 South St., New York. Catalog. Armored Wire Rope. 32 pp., illus., 3½x6 in. Catalog. Fiberclad Wire Rope. 24 pp., illus., 3½x6 inches.

American Roller Bearing Co., 416-20 Melwood Ave., Pittsburgh, Penn. Bulletin No. 1002. Roller bearings for power transmission devices. 4 pp., Illus., 7x10 inches.

Ingersoll-Rand Co., 11 Broadway, New York. Form No. 3031. Ingersoll-Rogler Class FR-1 Air Compressors. 24 pp., illus., 6x9 in. Form No. 4034. Leyner-Ingersoll Water Drill. 4 pp., illus., 6x9 inches.

The Chicago Pneumatic Tool Co. has issued Bulletin 34-X, relating to its Class A-G "Giant" gas and gasoline engines. The bulletin illustrates these engines in six sizes, ranging in horsepower from 16 to 130. The engines are similar in general design to the well-known Giant fuel-oil-driven engines manufactured by the same company with the exception that they are designed for operation with manufactured or natural gas.

Editorial Correspondence

SAN FRANCISCO—July 14

A Gold-Dredging Installation is contemplated on the Sältzer ranch, four miles south of Redding, by Lawrence Gardella of Oroville who is reported to have purchased the property. The Sältzers have owned the tract for 35 years. It contains 2150 acres of which 1500 acres of tillable ground is under ditch carrying 1700 in. A dam, said to have cost $5000, was built last year to replace the one constructed 35 years ago. Reported that Gardella will build a new hull and use machinery from one of his dredges to be dismantled at Oroville, where it has worked out its field. This tract of land is between Redding and the old Horsetown dredging field, and has been prospected for dredging, but no satisfactory negotiation had previously been reached. There is a large amount of good dredging ground in this section of Shasta County but from returns that are available it is believed that the gravel does not run to high values. This field is adaptable for small dredges of from 5- to 7½-cu.ft. bucket capacity, and is one of the numerous fields in California worked by early hydraulic and other placer-mining methods to shallow depths. But these fields are not inviting to large operators with dredges of 9- to 15-cu.ft. bucket capacity. They are not attractive for the further reason that the cubic-yard content of the ground, so far as has been prospected, is generally small compared to what has been recovered in many of the prominent dredging fields in the state.

Mount Lassen Eruptions reached the one hundred mark on May 31, at 10 o'clock in the morning. The 99th eruption occurred at five o'clock in the evening on the previous day. That of May 30 carried no mud. That of May 31 came from the new fissure on the northern slope, 500 ft. below the main fissure and it was reported from Hat Creek Valley that no further damage was done and no dust fell, nor was there any quaking of the earth. A rise of 8 in. in Hat Creek was not due to the eruption but to the fact that Big Springs were cleaned out by the Northern California Power Co. These springs are the main feeder of Hat Creek, supplying the creek with 3100 in. of water. The daily newspapers state that no fire was seen. This would give rise to the belief that during other eruptions fire had been seen. The red glow said to be visible on Mount Lassen at night is in fact the reflection of the setting sun. Other weird sights said to have been witnessed by people within 10 to 50 miles of the eruption were the results of sunshine and probably some moonshine. There has been no fire nor any red-hot fragments blown out by these fissure eruptions, nor has there been smoke. What has been claimed as ashes was really dust of the crumbled soft rocks and the supposed smoke is a combination of steam and dust and sulphur fumes. For the satisfaction of people who insist upon calling Mount Lassen a volcano, it may be classed as a mud volcano. That the mud is hot when it is poured out on the hillside, is true enough; but it has never yet assumed the condition of lava. A great deal of damage has been done and naturally farmers are anxious to reclaim the land and the water. A number of citizens of Hat Creek Valley have asked the Redding Chamber of Commerce to indorse them in a petition to the Federal Government for aid on account of the damage done by the mud flow of May 22. At the time of making this request at Redding it was reported that the choking up of Big Springs by the mud flow had shut off the water in Hat Creek. That was true enough, but as has been stated, the springs have been cleaned out and with the aid that may be given by the county and possibly the Government the water supply need be no further disturbed and destruction to the land may be overcome by proper methods of reclamation. A number of visitors at the Exposition have indicated the purpose to visit Mount Lassen, which may be of interest to tourists and which is not likely to be at all dangerous at proper distance.

BUTTE—July 14

The Butte Miners' Union Has Won the Suit brought by the Western Federation. The Supreme Court of Montana handed down a decision June 6 in Helena in favor of the Butte Miners' Union in its long litigation with the officials of the Western Federation of Miners. The order of the district court, recently made, turning over the property of the local union to Guy Miller as representative of Charles H. Moyer and the Western Federations of which he is president, is annulled and the property of the union is again placed in the hands of the local officers. Property is valued at $100,000.

Horace V. Winchell has been in Butte the past week creating interest in the special meeting of the Mining and Metallurgical Society of America, which will be held in Washington, D. C., Dec. 16. Mr. Winchell is chairman of the mining-law committee of the society and Charles W. Goodale, of Butte is also a member of it. Both are especially interested in securing a large attendance of mining men and those interested in mining for the purpose of formulating organized action to induce Congress to revise the existing and inadequate mining laws. Many individual and unorganized efforts have been made to get Congress to do something in the nature of needed revisions of the mining laws, but Congress has paid no attention to the matter or to the petitions of mining men. It is hoped that a united effort representative of many American mining and business organizations will be effective.

The Washoe Reduction Works at Anaconda is making extensive improvements and changes in many departments of the plant. A new box-type treater for the Cottrell system of precipitating dust and fumes from smoke has been installed which is less expensive than the one heretofore in use. In the concentrator, work is progressing rapidly on the remodeling of section No. 3. The filter plant for slime concentrates is being doubled and excavations for No. 3 roaster plant are completed and ready for concrete foundation work. The leaching plant for tailings is now running full capacity of 2000 tons a day, making a much better extraction than was anticipated. Plant for the Lavoisite process of manufacturing oxygen for oxyacetylene welding, recently completed, is proving satisfactory. Product is kept in tanks ready for shipment or for use in the works. In converter building, new repair shop is being built and the foundation for No. 4 Great Falls type converter is nearly completed. In the reverberatory department a new matte track and a new repair shop for the coal-pulverizing plant are being built. Two more dryers are also being added to that plant.

SALT LAKE CITY—July 16

Discovery of Zinc and Lead on Promontory Point 30 miles west of Ogden is reported to be exciting local enthusiasts. A territory 9 miles square is said to be dotted with locations. The Lakeview company is reported to have taken out $23,000 during the last three months.

Holdings of the Grasselli Chemical Co. at Park City have been taken under lease and bond by C. C. Broadwater, of the Merrill Metallurgical Co., of San Francisco, and associates. The property consists of a concentrating plant of 125 tons daily capacity and various tailings dumps. It is understood that an effort will be made by the San Francisco company to treat some of the latter. The principal value is in zinc with some lead and silver. Details as to the method of treatment have not been announced but tests have been made and it is thought probable that a flotation process will be used. A year or two ago another Grasselli mill—a zinc dry-concentrating plant—was sold to the Park City Mills Co., and remodeled for chloridizing-leaching.

SEATTLE—July 15

Fire Destroyed the Business Section of Valdez, July 15, with a loss of $500,000. United States troops from Fort Liscum aided in checking the flames with dynamite. No rain had fallen for weeks and the wooden buildings were dry as tinder.

Nineteen Tons of Gold were deposited in the Seattle branch of the U. S. Assay office during the fiscal year of 1915 ended June 30, according to official report. The coining value, smelted and resmelted into bars, is $8,850,454, representing 2288 deposits of a total of 555,323 oz. troy. The total valuation of Alaska contributions for the fiscal year is placed at $6,313,383 from the following districts: Kuskokwim, $2534; Circle, $54,022; Cook Inlet, $378,936; Copper River, $528,691; Eagle, $40,298; Iditarod, $1,437,038; Koyukuk, $114,894; Nome, $2,744,141; Southeastern Alaska, $104,769; Tanana, $908,061. The same districts also deposited 42,211 oz. of silver. British Columbia contributed $1,492,564 in gold and the Yukon territory, $843,968 in gold. Since 1898 the Nome district has deposited in the local assay office a total of $53,932,833 and the Tanana district, $45,990,912.

Shortage of Water caused considerable trouble in the Fairbanks district during the first part of June. On Vault and Dome there was scarcely enough water to feed the boilers. Cleary, Pedro and Fairbanks Creeks also suffered. In spite of this difficulty there was great activity on most of the old producers, especially at the mouth of Cleary, where Sam Weiss, Pete Malone, Scannel & Driscoll, Herman Magnusson, McConnell, Alex. Niemer, Keys & Rettig, and several smaller plants, were sluicing.

The Experiment of Water Transportation from Fairbanks to the Tolovana is working out well. The steamer "Dan" lands freight at the log jam for 2½c. per lb. Al. Lien is building a tramway past the jam and will transfer freight to navigable water above the jam for ½c. From the upper end of the portage the power boat "Doman" takes the freight to the West Fork of the Tolovana, about 8 miles from Discovery, Livengood Creek, for 2½c. Pack-trains transport it the rest of the way for 1c. a pound, making the total cost 6½c. from Fairbanks to the diggings. Dave Cascaden, Walter Fisher, Julius Hoffman, and J. H. McCord have incorporated the Tolovana Lumber Co. and will erect a mill near the mouth of Livengood Creek.

Another Stamp Mill Is to be installed in addition to the one now in use on Fairbanks Creek. The first installation proved so successful, although entirely too small to handle even the ore that is already waiting to be crushed, that it induced Thomas Gilmore to purchase a mill site on 13 Above, first tier, left limit Fairbanks Creek and the purchase of a five-stamp mill, the only one in the district, owned by Edward McConnell who had recently purchased it to work his ground on Garden Island. Several organizations are now figuring on purchasing small mills and shipping them from the outside this winter. Five more stamps will be added to the latest mill if the new one comes up to expectations and the quartz owners of the district are jubilant over the prospects of getting the values out of their properties. The first ore to be crushed will be taken from the O'Connor & Stevens property at the head of Fairbanks Creek where there is enough ore in sight to keep the mill operating for several months. The Mizpah and other properties are also preparing to ship ore as soon as the mill is installed.

BRISTOL, TENN.—July 18

The Interest in Southwest Virginia and East Tennessee has continued to increase, although no important undertakings have been developed. The Fall Branch mine, in Sullivan County, Tenn., is under option to Frank R. Walton and associates, of Philadelphia. This property is developed and has a mill. There is a peculiar asphaltum compound associated with the ore. The Haysville iron deposits in Greene County, Tenn., have been explored for zinc and it is reported that operations to mine the zinc and iron ore will be undertaken soon. The deposit is like that at Embreeville, about 20 miles to the northeast and on the same flank of the Unaka range The old iron mines at Embreeville which have been operated for several years for zinc are now controlled by the New Jersey Zinc Co.

The Carter Property at Ivanhoe, Wythe County, Virginia has installed an adaptation of the flotation process for the separation of the sulphide ores and the results are said to be satisfactory. Pittsburgh and Ohio men have options on the Jackson and Wissler properties at Ivanhoe and have done some developing. The Austinville properties, adjoining, are operating extensively under the ownership of the New Jersey Zinc Co. At Allisonia, about five miles southwest of Pulaski, the Forney-Caldwell interests have done considerable exploration work on an extensive deposit of zinc- and iron-sulphide ore, occurring in the limestone and crossing New River. The ore runs from 10 to 20% in zinc with a little lead. The property was recently examined by Kirby Thomas, of New York, and experiments with the treatment of the ore are being made. D. S. Forney, of Pulaski, has taken a lease on the old Clark ore bank, near Allisonia, and is shipping carbonate and silicate ore.

The Faber Mine, in Albemarle County, Virginia, has been recently taken under option by Philadelphia interests and is being unwatered. This property contains zinc ore and fluorspar and it is said that the present negotiation is with the view of operating the property for the latter mineral. State Geologist, Thomas L. Watson, will shortly undertake an investigation of zinc deposits of southwest Virginia.

ISHPEMING—July 19

Ore Shipments for 1915, it is now believed, will total close to 40,000,000 tons, which would be an increase of almost 7,000,000 tons over 1914. Up to July 1, this year, the tonnage that went down the lakes amounted to 11,521,283 tons, an increase of 1,897,167 tons over the same period last year. It is safe to predict that about 20,000,000 tons will go down the lakes during July, August and September, and from the way orders are being booked and vessels chartered there will be a fair movement during October and November. Large sales of ore have been made during the last few weeks, and many of the furnace companies that stated the early part of the season that they would not require all of the ore called for in their contracts are now demanding that everything ordered be shipped. The Oliver Iron Mining Co. is working its mines to capacity, and many of the independents are now getting into better shape and mining more ore. Mining men of the district are wondering how long it will be before ores of the bessemer grades cease to command a premium in the market. Most of the furnaces that have been constructed during recent years manufacture steel by the open-hearth process and it will probably not be long before there are few bessemer plants in existence in this country. The non-bessemer ores work just as well in the open-hearth furnaces as do the ores carrying low phosphorus content, and the opinion is now held that it will be only a few years before the bessemer grades will no longer bring higher prices in the market. The non-bessemer ores greatly predominate at the present time, there being only a few mines now that hoist much of the bessemer product. Some of the Marquette and Gogebic range mines still produce a good deal of the higher-priced ore, but the percentage of the total is small. A short time ago the Montreal Mining Co., Montreal, Wis., shipped two cars of ore, running 69%, to New York, where it will be used for checking purposes. This is as high-grade iron ore as was ever mined in the Lake Superior district. There are millions of tons of low-grade ores in the district, but the time is coming when they will all be in demand.

CUPRUM, IDA.—July 10

The Seven Devils Mining District is apparently coming into its own, due to renewed activity on account of the advance in the price of copper and the gradual disappearance of the disadvantages under which the district operated in former times. The mines of the district have shipped between 20,000 and 30,000 tons of copper ore, averaging from 10 to 40%, mostly hauled by wagons over distances of 45 to 100 miles to railroad transportation. The Peacock Mine, whose deepest working is a 150-ft. shaft, has a lens of ore, which on surface measures 100 ft. wide by 300 ft. long. The ore from this mine averages 6% copper, which of course will not stand a 100-mile wagon haul. This company is said to be under option to San Francisco people and its early resumption of operation is expected. Adjoining the Peacock on the south is the South Peacock, which is being operated by Butte men. This mine has a 300-ft. shaft and has ore of about the same grade as the Peacock, which can be sorted to make a 16% grade which would stand being hauled to the railroad at Homestead, 20 miles distant and would show a profit at the present price of copper. At the Queen mine a carload of 30% ore, extracted during the past winter, on a lease, is being shipped. There is talk of resuming work on the Decorah-Arkansas group, and work is being done on the Badger group nearby. At Deep Creek, 6 miles north of the Peacock mine and within 2 miles of Snake River, at a point 17 miles north of the railroad at Homestead, the Red Ledge mine is being developed with a small crew. Talk of railroad accommodation is again current, and the state mine inspector is quoted as follows: "To my notion the most feasible solution of a north and south railway is over the Snake River route, by extending the present branch from Homestead, Ore., via the Idaho side of the cañon to Lewiston. The distance to build would be shorter than the route already outlined further east, and it would have the advantage of a natural water grade of 8 ft. to the mile and while probably more expensive to build in initial cost, it would afford the most direct connection in a single system of control through to north Idaho."

KELLOGG, IDA.—July 14

Activity on the North Fork of Cœur d'Alene River has been stimulated by prevailing high prices for zinc and antimony. Theodore Brown and John Finnel are developing a promising 14-in. vein of stibnite in Pine Creek district on claims that were abandoned several years ago and recently relocated. A good strike of zinc ore has been made at the Terrible Edith mine, near Murray, under lease to Charles and W. H. Conn. The lessees have been shipping 50 tons of ore a month and plan to increase output to 100 tons. At the 1000-ft. station in the lower tunnel the Samson has opened an orebody for 100 ft. that contains streak of milling ore several feet wide. The Paragon is engaged in blocking out ore. Shipments were held up some time ago by trouble over smelting contracts, but it is hoped to have difficulty removed soon.

JOPLIN—July 17

Miners' Strike involving 5000 lead and zinc miners fell to pieces and work was resumed full force July 12.

The Mining News

ALASKA

NO. 3 BELOW, DOME CREEK (Fairbanks)—Frank Fisher has purchased interest of Al Rice in lay on 3 Below, Dome Creek; large dump was taken out during winter.

CHICHAGOFF MINING CO. (Chichagoff)—W. R. Rust, of Tacoma smeltery visited property recently to inspect increased and improved milling capacity, as well as new compressor installation. James Freeburn is superintendent.

SELCH, DIETZ & WALKER (Ruby)—These operators, who expected to clean up $80,000 from their winter dump, obtained $90,000 after sluicing about half of it. Alexander Larsen has found $7 ground on Long Creek and let it out on lays.

MIDWAY ASSOCIATION (Fairbanks)—Sjolseth Bros. have found good pay on this Ester Creek claim and plan to move their plant from Gold Hill at once. Owners of claim, E. A. Suter, P. C. Charles and L. B. Clough, have bonded claim to Jack Leach for $20,000, of which $1000 was paid in cash.

E. M. ALDRICH (Juneau)—Located mining and water rights at William Henry Bay on Lynn Canal. This property is practically due West of Berner's Bay and across from the Jualin property, near Comet. Property likely to be opened up in small way this summer.

RELIANCE MINING (Fairbanks)—Workmen employed on property of this company, lying at head of Dome Creek, during summer and fall of 1913 have been granted lien against property by order recently signed by Judge Bunnel in District Court. Claim owners plan to carry case to Circuit Court of Appeals. Validity of territorial lien law involved.

CACHE CREEK DREDGING (Cook Inlet)—First gold dredge to be taken into Yentna mining district is being shipped by this company for operation during next summer. Material will be held at McDougal until snow flies when it will be shipped overland to ground to be worked. It is 7-cu.ft. bucket machine with capacity of 3000 yd. per day.

BIG CHENA (Fairbanks)—Shamrock Creek, on which $1.50 ground was found last winter, has been staked from end to end and is expected to make an important production this summer. Van Curler, who has been working in the district for several years, will probably move his plant, the only one of any size available this summer, to new creek.

M. O. BARNEY (Juneau)—Attorney for H. W. Martin, of New York, has taken possession of Hallum, Dora, Salmon Creek and other properties for his client. These properties have been under supervision of George R. Noble. It is reported that R. A. Kinzie, former superintendent Alaska Treadwell, will eventually take complete charge of properties.

VALDEZ CREEK PLACER MINES (Valdez)—Are ready to enter ranks of producing companies in Valdez district, hydraulic plant having recently been completed. Development work during last year cost about $200,000 and was financed largely by Boston capital. Ground shows value of $2.70 per cu.yd. Plant will run steadily until Sept. 1 when first cleanup will be made.

ALASKA GOLD (Juneau)—President Hayden is quoted as authority for statement that in June mill treated 90,790 tons of ore. First section of mill treated 2500 tons per day until middle of month, when part of second section went into operation, when 3500 tons were handled, which has now been raised to 4000 tons, and will in a few days reach 5000 tons daily. Third section expected to start latter part of August. By end of September expected to treat 7500 tons daily. Total 10,000-ton capacity to be reached by Jan. 1. There is no intention of increasing mill beyond this capacity in near future.

AMERICAN TIN DREDGING (New Cape York)—New tin dredge has been shipped here by this company to operate on Buck Creek. New dredge is equipped with screen and double flumes so that no time will be lost in cleaning up and is third of its kind to be installed in district. Gravel on creek contains large percentage of tin ore and small percentage of gold. About 200 tons of tin ore have already been taken out from this creek and a 2-ton motor truck, the farthest-north automobile on American continent, was recently shipped in to haul ore to tidewater for shipment to tin smeltery to be built in Seattle.

ARIZONA

Maricopa County

YOUNG MINES CO. LTD. (Mesa)—Stamp mill is in operation; oil is now being used for fuel instead of coal.

ORO FINO (Phœnix)—Is taking out carload of high-grade ore for shipment to Douglas. Sinking main shaft continues. Hoist is to be installed.

CALIFORNIA

Amador County

KENNEDY (Jackson)—The 100-stamp mill is crushing good ore from the lower levels. Tailing wheels are in satisfactory operation and the dam is proving a satisfactory method of impounding the tailings.

TREASURE (Amador City)—Savo Kosich, 31 years old, an Austrian miner was killed July 7 by the explosion of a missed hole. Kosich's head was blown off. His working partner lost an arm and was otherwise injured.

MACE ASBESTOS MINING CO. (Ione)—New incorporation with capital stock at $75,000. Directors are W. C. Lilian, of Stockton, H. Herman, A. L. Harnett and John V. Powers, of Ione, and George W. Lucot, of Jackson. Company will operate asbestos deposits near Ione.

CENTRAL EUREKA (Sutter Creek)—Shaft has passed the 3260-ft. point and is being deepened. At 3300-ft. level station will be cut and drifts driven to pick up the orebody developed in the 3100 level. Probable that shaft will be deepened to 3400 ft. and new level run at that point. Forty stamps dropping.

Eldorado County

BURTON (Garden Valley)—E. G. Carlquist has purchased this mine near Sailor Flat adjoining the old St. Lawrence property. Reported that a good ledge has been disclosed since development began.

RYAN (Shingle Springs)—Property has been taken over by mining men of Manhattan, Nevada. Installation of modern machinery is contemplated, including the 100-ton ore crusher. Water will be supplied from the Oakland Terminal Power Co. ditch through 2000 ft. of 3-in. pipe. A 50-hp. gasoline engine pumping plant will be installed on the bank of the creek.

Mono County

PITTSBURG-LIBERTY (Masonic)—Initial operation of the new tube mill and cyanide plant is reported to have proved that $10 ore can be profitably mined and treated. Development of orebodies shows sufficient ore blocked out to run the mill for two years.

Nevada County

CHAMPION (Grass Valley)—Reported that $300,000 produced in the past year has been expended in mining and development. A large amount went into new machinery, buildings and the opening up of large areas of underground work.

GOLDEN CENTER (Grass Valley)—Reported that contract has been let for 110 ft. steel headframe for the vertical shaft. Shaft will be deepened to 1000 ft. Pump will be installed at that point with a capacity of 300 gal. per minute. Crosscut at 1000-ft. point contemplated to cut the Peabody vein.

Santa Clara County

J. MORENO VS. NEW GUADALUPE QUICKSILVER MINING CO. (San Jose)—Plaintiff awarded $8000 damage by Superior Court for death of husband who was killed in an ore-car accident.

Shasta County

GLADSTONE (French Gulch)—Force of 120 men employed at this gold mine; 40-stamp mill running steadily. Sinking 200-ft. winze from lowest or 1200-ft. level underway.

SPREAD EAGLE (Kennett)—Considerable lateral development being done, sinking also under way. Property seven miles west of Coram and owned by Mammoth Copper Mining Co.

UNCLE SAM (Coram)—Operations resumed at this gold mine six miles west of Coram, on Squaw Creek. Ten-stamp mill put in operation. Property has made large gold production in past.

STOWELL (Kennett)—This copper property under option to Mammoth Copper Mining Co. which is doing considerable development work upon it. New 2-compartment shaft being sunk. Fair tonnage good-grade copper ore assaying a little in gold and silver blocked out; this ore discovered by diamond drilling. Compressor installed recently.

Trinity County

ASBESTOS MILLING PLANT—Installation is reported to be contemplated at Oakland by L. V. Stevens, mining engineer with interests in California and Mexico. The purpose is to handle asbestos mined in this county.

Tuolumne County

BLACK OAK (Soulsbyville)—Thomas Ayoob, a Syrian miner, 36 years old, was found dead on July 1, in a water sump just below a loading platform at the delivery end of a chute where he had been working. Body was cut by the falling rock but direct cause of death believed to be drowning.

COLORADO

Boulder County

GOLD FARM (Magnolia)—Exploratory work done on this property last season will be resumed and systematic development will be performed under direction of Col. W. H. Moore, representing group of Lincoln, Neb., men.

BOULDER TUNGSTEN (Boulder)—Promising orebody is being developed in east heading from Forest Home shaft. This level recently broke into old workings of Cold Spring No. 2 mine of Wolf Tongue Co., which is considered encouraging in view of fact that Cold Spring vein has produced high-grade ore in past.

Lake County

WESTERN ZINC OXIDE (Leadville)—Smeltery operating full capacity treating nonsulphide zinc ores of this region.

MOUNT CHAMPION (Leadville))—Four teams are kept busy handling high-grade gold ore from mine in Half Moon gulch on Mt. Massive to railroad at Malta.

NEW MONARCH (Leadville)—Leases all doing well, several averaging carload of ore each per day. Company is developing new deeper ground.

BIG FOUR (Leadville)—Mine is again active after its long shutdown following destruction by fire of its surface plant. Is shipping steady tonnage of $20 ore.

IBEX (Leadville)—Jacketts lease ships regular tonnage of high-grade smithsonite averaging 40% zinc. Tonnage pro-

duced in these properties during June was greatest monthly production in 5 years, while average grade was also highest.

PENROSE (Leadville)—Water having been lowered below 470-ft. point in shaft, first to projected pumping stations is being excavated. Shaft pumps will merely hold water below this level until station pump is ready to operate when they will resume heavy pumping and lower water to second pump station.

Teller County

VICTOR (Altman)—Schultz, et al, ship carload lot per week. Winston lease has made its first shipment to Golden Cycle mill, Colorado City.

VOLCANO (Cripple Creek)—In 60-ft. prospect shaft on Gold Hill, leasers struck vein of highgrade ore. They are preparing to ship.

ELLA B. (Cripple Creek)—Johnson and McQuarrie, in new prospect hole on Tenderfoot hill, have struck large body of ore and have begun shipments.

GRANITE (Victor)—Stock now listed on Colorado Springs Mining Stock Exchange. Company owns Granite, Gold Coin, Monument, Dillon and Dead Pine mines, all close to Victor.

DEAD PINE (Victor)—On 400 level, McIntosh-Ingram leasers have drifted through cave-in that occurred years ago and are reclaiming an old stope said to have produced 1.5-oz. ore.

HONDO (Victor)—Sinking of main shaft continues. Body of milling ore was struck and is being mined and dumped on surface until contemplated mill may be erected. Some shipping ore is being marketed.

GOLDEN CYCLE M. & R. CO. (Colorado Springs)—Mill treated 36,000 tons of Cripple Creek ore during June, earning profit of nearly $60,000. It is still handling Cresson high-grade ore. Company is also producing ores from its own mines.

BLUE BIRD (Altman)—E. S. Johnson, sole owner and operator of this mine until few months ago, has granted option to purchase to Nelson Franklin who has been leasing since last December. Plans are being made to erect cyanide mill at mine. Property covers only 13 acres but its vein is remarkably strong and in many places very rich. Years ago, it produced many carload shipments of ore worth several dollars per pound. The shaft is 1865 ft. deep or 450 ft. above level of Roosevelt tunnel. Several sets of sub-leasers are operating on sliding-royalty scale.

IDAHO

Shoshone County

LITTLE PITTSBURG GROUP (Murray)—This silver-lead property, owned by G. A. Smith, is attracting considerable attention. Early in June the miners tapped the vein, which they crosscut for 11 ft. without reaching the hanging wall. Drift along vein shows 14 in. of high-grade zinc ore and 6 ft. of milling ore.

SUCCESS (Wallace)—June report shows that shipments of zinc ore brought $168,803 and shipments of lead ore $12,066. Operating and other expenses totaled $37,500, leaving net balance of $143,000. Report showed $179,531 on hand, with $85,069 worth of ore stored in mill and in transit to smelters, giving total of $264,600. The output is gradually being increased to 2000 tons per month.

HANDSPIKE (Wallace)—Handspike group owned by Little North Fork Mining & Mill Co., will be put on shipping basis, according to plans of management. Property lies above Horst-Powell mine and road is now being built from Handspike to that mine to provide outlet for ore. Driving is under way in mine and considerable ore taken out during development is on dump. Nearby Hamburg-American and Riverside properties are also being actively developed.

HYPOTHEEK (Wallace)—At a meeting of stockholders July 2 and 3 it was decided to use part of funds derived from sale of bonds to develop mine. Also decided to increase capital stock from 1,500,000 shares, par value 10c., to 2,000,000 shares. Drift on 900 level has been continued through mountain and three-compartment raise has been put up to surface on east fork of French Gulch. Raise now used as main working shaft in sinking to 1100-ft. level. W. W. Davidson, president, and J. H. Kern, general manager.

MICHIGAN

Copper

ONONDAGA (Houghton)—Has one diamond drill in operation and the second will be put into service as soon as the first strikes the ledge.

ALLOUEZ (Kearsarge) — Rock shipments are increasing and will continue to be maintained at the highest point in the history of the mine.

MASS (Mass City)—Will be back to 1300 tons daily this week. For the past week or ten days the shipments have been limited to 900 tons, due to difficulties with the hoisting plant.

LAKE (Houghton)—Shipped 15 cars of copper rock from mine to the Copper Range stamp mill at Beacon hill. Shipments will not be maintained at this high point for the present as this represents an accumulation of the first few days of rock hoisting. It is planned to maintain the shipments at the rate of 10 cars, 400 tons daily, for the present. In getting the Lake unwatered and in running condition Manager Walker has achieved quite as much of a success as he did with Mass.

CALUMET & HECLA (Calumet)—The dredge, recrushing plant, classifier and turbine that furnishes the power for their operation are all out of commission and may be for a month or longer. A pile driver drove into a live wire which created a short circuit. This put the generator for the turbine out of commission. This turbine furnishes the power that actuates the dredge and recrushers and classifiers. There is plenty of spare power but it is not applicable to the plants in question. Officials do not now know just how much time will be required to repair the damage and get the turbine generator into commission again. In the meantime the men employed in this auxiliary to the milling plant at Lake Linden are on vacation.

MONTANA

Hill County

HAVRE NATURAL GAS CO. (Havre)—Encouraged by recent strike of natural gas in well sunk by this company near Havre, it was decided to drill several more at once. Great Northern Ry. is said to contemplate erection of shops, using gas for power, and a number of capitalists are on the ground looking to the placing of other industries.

Silver Bow County

ANACONDA COPPER MINING CO. (Butte)—In spite of accident to concentrator of Washoe plant at Anaconda, which caused temportary curtailment in output in the latter part of June, the output for that month exceeded that of any month since last summer and was close to output for June a year ago. 22,100,000 lb. copper produced.

PARROT MINING CO. (Butte)—Work has begun on the removal of the steel headframe of the Parrot mine to the Never Sweat, where it will replace the old timber frame. The Parrot shaft was abandoned long ago as an operating shaft when mine was taken over by the Anaconda and exploited through the adjoining mines of that company. The removal of the frame marks final disappearance of evidences of activity at one of the famous Butte mines which was discovered in 1864 and became famous as a producer of exceedingly rich silver ore. The Parrot was taken over by the Amalgamated company in 1900.

NEVADA

Esmeralda County

JUMBO EXTENSION (Goldfield)—With exception of few days at beginning of month, daily shipments for June averaged 100 tons per day.

GOLDFIELD CONSOLIDATED (Goldfield)—Final official figures for May show production was 32,380 tons of ore from which $161,653 was realized.

ROUND MT. SPHINX (Round Mountain)—After legal battle lasting several years, Sphinx company, about year ago, adjusted its apex controversy with Round Mt. Mining Co. by turning over property to latter and receiving therefore cash and stock, which are now being liquidated to stockholders. Corporation will then be dissolved.

NEW GOLDFIELD SIMMERONE (Goldfield)—A round into what has been regarded footwall, after passing through seam of hard material, exposed 18 in. of ore which averages from $50 to $100 per ton. This is within 2½ ft. of old workings from which high-grade ore was extracted in early days of Goldfield.

Nye County

TONOPAH ORE PRODUCTION for week ended July 10 amounted to 8264 tons valued at $174,712 compared with 10,100 tons week previous. Decrease due to 4th of July holiday. Producers were: Tonopah Belmont, 2458; Tonopah Mining, 2400; Tonopah Extension, 1580; West End, 864; Jim Butler, 850; and miscellaneous leasers 112 tons.

TONOPAH-BELMONT (Tonopah)—H. P. Henderson, mining engineer, has been sent by Belmont company to make examination of Potosi mine, and he and his assistants recently arrived in Nicaragua. Steady progress being made at both Surf Inlet and Hart properties, but no information is at hand as to the results obtained recently.

Storey County

MEXICAN (Virginia City)—Mill crushed 140 tons of ore, assaying $11.09 per ton.

UNION CONSOLIDATED (Virginia City)—At 275-ft. point in north drift 2500 level, 5 to 7 ft. of quartz assayed $4 to $14 per ton.

SIERRA NEVADA AND UNION (Virginia City) — West crosscut on 2500 level opened to 274-ft. point in Comstock country.

COMSTOCK PUMPING ASSOCIATION (Virginia City)—Flumes and dam installed on 2700 level to divert water to Ophir-Mexican winze pumps.

JACKET-CROWN POINT-BELCHER (Gold Hill)—Mill received 1090 tons dump rock and 280 tons mine rock. One bar bullion shipped to smeltery.

OPHIR (Virginia City)—At central tunnel development was started on 6-ft. streak of quartz in parallel drift nearer the foot wall. Saved 232 cars of ore, and milled 175 tons.

OPHIR AND CONSOLIDATED VIRGINIA (Virginia City)—The 210-ft. level has been reached in reopening the east crosscut on the 2500 level boundary line, leading to the 2700 winze.

NEW MEXICO

Grant County

LESSEES IN THE TYRONE DISTRICT are taking out encouraging lots of copper ore. Dumps are being worked and many prospects are being developed. Shipments are being made over El Paso & Southwestern siding.

WORK ON THE SPUR connecting the Arizona & New Mexico Railway with the 85 Mine and other properties in the Virginia mining district, was begun July 13 by the A. & N. M. R.R. Co. No contracts were let. Company employing about 400 men on grading. Spur is expected to be in operation by Sept. 1.

SOUTHWESTERN NEW MEXICO MINES CO. (Hachita)—Has filed articles of incorporation. Will operate mines near Hachita.

MODOC (Fierro)—Mine under operation by J. W. Bible from Brockman estate. Shipments averaging a car-load daily. High in copper and iron.

WALDO (Lordsburg)—The Waldo lead concentrator will begin operations about July 18. Machinery in place and everything in readiness.

EMPIRE ZINC CO. (Hanover)—Grading to soon begin for a new powerhouse here. Lateral work under way on Thunderbolt mine. Carbonate shipments from Nason tunnel continue regularly.

CHINO (Santa Rita)—Company has increased wages of employees 10% as long as selling price of copper is at 17c. or above. Notices to employees state: "This new scale is put into effect in appreciation of the friendly assistance of our employees in the past, and with a desire that they may share in the increased prosperity which has come so unexpectedly. No one can anticipate how long the present condition in the copper market may continue, but you can be assured that these rates will not be changed for every fluctuation that may occur below the price named."

Santa Fe County

SANTA FE GOLD & COPPER CO. (San Pedro)—It is understood that earnings in June were slightly over $20,000. Company has under consideration the erection of plant equipped with flotation machinery for treatment of its low-grade ores.

Socorro County

ERNESTINE (Mogollon)—Has declared first dividend in two years. Present dividend 2%, aggregating $50,000. Development work interrupted dividend payments.

MOGOLLON GOLD & COPPER CO. (Mogollon)—Property will be sold at Socorro, N. M., July 26 to satisfy judgment for $416,626 given the Equitable Trust Co., of New York. Milton J. Helmick, Socorro, N. M., trustee.

NEW YORK

St. Lawrence County

NORTHERN ORE CO. (Edwards)—This zinc company of Pilling & Crane, is speeding up production at its new mill recently erected to replace former mill destroyed by fire. Justice Grugan is manager. Another zinc property several miles from Edwards is being developed by A. J. Moore who preceeded Mr. Grugan as manager for Northern Ore Co.

ALUMINUM CO. OF AMERICA (Massena)—The Massena plant of this company near the St. Lawrence River has been undergoing extensive additions. Large force of men employed on new work has boomed village of Massena. Electrical current, necessary in large quantity for reduction purposes is obtained from power installations on tributaries to St. Lawrence River.

UNIFORM FIBROUS TALC CO. (Talcville)—This company and St. Lawrence Talc Co., of Natural Bridge have materially increased their grinding capacity by addition of more cylinders and operating economies. International Pulp Co. and Ontario Talc Co. continue their usual productions. Operating power from Oswegatchic River which determines summer work has been good due to recent rains.

PENNSYLVANIA

Delaware County

BENZOL PRODUCTS CO. (Marcus Hook)—Plant now under construction expected to be completed within month or two. Product of plant said to be intended mostly for aniline dyes, on which problem General Chemical Co. is working in connection with American Coal Products Co. and Semet-Solvay Co.

Northampton County

LEHIGH COKE CO. (So. Bethlehem)—Contract has been let for new benzol plant to manufacture benzol from gas from present coke ovens, which treat 3000 tons of coal per day. Installation will be so laid out that it can be readily duplicated to handle gas from 212 additional ovens now under construction. Production of benzol expected to begin in less than four months.

SOUTH DAKOTA

Lawrence County

WASP NO. 2 (Flatiron)—Plant operating full capacity of 500 tons. Shipments of high-grade tungsten ore being made.

RATTLE SNAKE JACK (Galena)—Mill nearly completed and will be put into operation during present month. Trent system of cyanidation installed. Plant will treat 50 tons daily.

GOLDEN REWARD (Terry)—Roaster at Astoria mine will be put into commission about middle of month and kept in continuous operation. Mill at present is operating at capacity on oxidized ores from Bald Mountain mines.

HOMESTAKE EXTENSION (Deadwood)—Engineers are unwatering property, preparatory to thorough sampling of mine. Expected that this work will take several months. Jackhamer drills will be used to facilitate work.

NORTH HOMESTAKE (Maitland)—Shaft has been unwatered below 400 level by means of skips. It is expected that within week entire mine will be unwatered. Machinery is being put into shape and work will commence soon.

HOMESTAKE (Lead)—Company will enter first-aid team in contests at San Francisco Fair this fall. Work has been resumed on 1850 level of mine and it is probable that sinking will be commenced as soon as this level is opened up for active work. New boiler plant is nearing completion, one of 210-ft. smokestacks has been set up and work on second has commenced.

TEXAS

Potter County

WILL A. MILLER AND ASSOCIATES are promoting development of potash deposits near Amarillo. It is planned to install machinery and equipment for extracting mineral product from deep wells.

UTAH

Salt Lake County

COLUMBUS EXTENSION (Alta)—Drifting to southwest is being done under old Toledo fissure. Henry Barney is new superintendent.

ALTA CONSOLIDATED (Alta)—Development work is progressing more rapidly, since installation of machine drills. Six inches of ore has been opened in No. 2 drift, east from main tunnel.

WASATCH-UTAH (Salt Lake)—This company, which has instailed Koering mill and is cyaniding low-grade gold-silver ore, is reported to be making good extraction. Property is at mouth of Little Cottonwood.

SELLS (Alta)—From three to eight inches of sulphide ore has been opened on quartzite-limestone contact, along which 110 ft. of drifting has been done. Objective point is intersection with Skipper fissure, which carries ore in shallow surface workings. Operations are being carried on through main South Hecla tunnel.

CARDIFF (Salt Lake)—Recent visitors to this property report orebody to be opening up larger than ever, with extent undetermined. It has been opened 250 ft. on strike; and crosscuts show width up to 100 ft. On dip ore has been followed for more than 200 ft. above tunnel by raising, while winze has been sunk 90 ft. in ore below it. Shipments of about 90 tons daily are being made, these being limited by number of ore wagons obtainable. Hauling costs about $4 per ton.

Summit County

SILVER KING COALITION (Park City)—Work on new flotation section is in progress. Capacity will be 60 tons per eight-hour shift.

THREE KINGS (Park City)—Shaft sinking continues at this property in Nigger Hollow, with depth of 500 ft. to be attained. W. M. O'Brien has sold out to his associates.

Tooele County

SIMMS GROUP (Gandy)—These claims in Deep Creek district, on which tungsten ore has been opened are reported sold to Colorado company. Mill may be built.

Utah County

CONSIDERABLE ACTIVITY IN AMERICAN FORK CAÑON at present. Camp it attracting outside attention. Roads are in good shape for more than 20 miles.

MILLER HILL (American Fork)—First car of ore to be brought down cañon since melting of snow has been shipped by Wadley lease on this property.

BELLEROPHON (American Fork)—Strike of silver-lead ore has been made in tunnel on Live Yankee claim. Road will be put in condition for shipping.

MINERAL FLAT (American Fork)—Ore hauling has been started from this property, operated under lease. Several cars running well in lead and silver, with some gold, are ready for shipment.

ETTA MAY (American Fork)—Work has been started on vein, which appears promising at outcrop. Property was recently inspected by Salt Lake mining men. George Paramore is general manager.

CANADA

Ontario

ORE SHIPMENTS OVER THE T. & N. O. RY. for month of June were from Cobalt Proper: Beaver, 36 tons; Chambers Ferland, 52; Cobalt Comet, 76; Coniagas, 108, Crown Reserve, 118; Kerr Lake, 98; La Rose, 150; McKinley-Darragh, 247; Mining Corp of Canada, Ltd. Cobalt Lake Mine, 84.68; Townsite City, 283.98; O'Brien, 56; Penn Canadian, 143; Peterson Lake—Seneca Superior ore, 62; Temiskaming, 106. From New Liskeard: Casey Cobalt, 32. From Elk Lake: Miller Lake O'Brien, 25; total silver ore shipments, 1665 tons. From Porquis Junction: Alexo Mine (Nickel), 989 tons.

TECK-HUGHES (Kirkland Lake)—Mine has been unwatered and is being re-sampled in view of prospective sale.

POWERFUL (Calcite Lake, near Gowganda)—Operation on this property, which have been suspended for about year, have been resumed.

GIBSON CLAIMS (Goodfish Lake)—In sump below 100 level two more streaks of high-grade ore have been cut. One vein has full 12 in. of ore.

HOLLINGER RESERVE (Porcupine)—Dominion Reduction Co., is now engaged in sampling this property, to decide whether they will take up or drop option.

LAKE SHORE (Kirkland Lake)—Main vein has been cut with diamond drill 100 ft. from shaft on 100-ft. level. Sludge from drill hole averaged $48 per ton for width of 3 ft.

BEAVER CONSTRUCTION (Cobalt)—Is increasing capacity of concentrating mill to 150 tons per day. New installation to be completed in six weeks. Company has 259,480 oz. bullion in storage in New York.

HAITI

HAITIAN MINING CONCESSION—A concession just granted by the Haitian Government to the local representative of a British company carries with it the right to prospect for minerals of all kinds within that island Republic. The indemnities to be paid the owners of the land prospected over and the obligations which the company incurs are set out in full in the text of the concession.

NICARAGUA

RAILWAY CONCESSION FOR MINING DISTRICT — The Republic of Nicaragua has made a contract with the Tunky Transportation & Power Co. for the construction of a railway, and of a plant or plants for the manufacture and transmission of power, in the mining district of Pis Pis. The contract has been approved by both branches of the National Congress and duly signed by President Diaz. The National Congress gave a great deal of attention to the provisions of the contract, which appears equable to all parties concerned and it is expected to operate to the advantage of Nicaragua.

AFRICA

Transvaal

GOLD PRODUCTION IN JUNE was 755,280 oz., which is 8268 oz. less than in May, but 37,354 oz. more than in June, 1914. For the six months ended June 30 the total production was 4,086,847 oz. in 1914, and 4,408,048 oz. in 1915; an increase of 321,201 oz., or 7.9%, this year.

The Market Report

Metal Markets

NEW YORK—July 21

The prices for all of the principal metals exhibited drooping tendencies during the last week. The recessions in the prices for copper and spelter were rather sharp owing to the efforts of the producers to find a basis on which they could sell liberally.

Copper, Tin, Lead and Zinc

Copper—This market, which had been dull and reactionary for fully a month, declined rather sharply during the last week. Previously the market had been to a considerable extent in the hands of traders and dealers, the producers (who had generally sold well ahead) being content to stand aloof. Certain of the larger producers continue to maintain that position, but lately some of the smaller producers have been manifesting a desire to sell copper, and in order to do so they cut prices sharply last week. Sales were made to domestic manufacturers. There was relatively little business done for export, the London market having passed temporarily into the hands of the Japanese and Australian producers of electrolytic, who were willing to sell on lower terms than the American producers were disposed to accept. Business in Japanese electrolytic was reported done at £88, equivalent to about 18.60c. At the close there were sellers in the New York market at 18⅞@19c., regular terms, for domestic business, and at 18.70@18.75, New York, for export.

Although it is considered likely that copper may experience a further decline, there is no pessimism in evidence among the producers, and a turn of the tide is expected shortly. Domestic manufacturers are believed to be not very well covered, while the settlement of the strikes at Bridgeport and in Wales are favorable factors. Even more important as an index is the increasingly strong position of the iron and steel industry, which is regarded as marking a revival in domestic business generally. Another important factor is the probability that the British Government will within a few days make an arrangement for the release of standard copper to foreign refiners, with suitable guarantees, of course, including the assurance that raw copper taken out of England will be replaced by an equivalent quantity of electroylytic. An arrangement of this sort will tend immediately to bring standard copper back to the normal parity with refined, and will remove the bad sentimental effect that the relatively low price for standard has had in distant and uninformed quarters.

Copper Sheets have brought 25@26c. per lb. The principal manufacturer makes no base quotations. Wire is quoted at 21½@22c. per lb. at mill.

Tin—The price declined owing to dull demand and anticipation of bad effects of the strike of coal miners in Wales. Following the receipt of news of the settlement of that strike, the market rallied.

Arrivals of tin and tin concentrates at Liverpool in June, reduced to their equivalents in metallic tin, were: Bolivia, 2085; Nigeria, 235; South Africa, 28; total, 2348 long tons.

Lead—But relatively little business in this metal was reported. Some extraordinary features in the quotations are explained by the narrowness of the market. Producers generally adhere to the price of the A. S. & R. Co. and report the realization of it. On the other hand, lead has been obtained from dealers and traders at much lower figures. If somebody wanted to buy lead he was apt to have to pay the producer's price, while, if somebody wanted to sell, he was apt to have to accept a considerably lower price. It will be remarked that the St. Louis market has not gone off to the same extent as the New York market.

Spelter—There was a steady decline right through the week on relatively small business. About all of the producers were sellers, and some of them appeared to be rather urgent. The trouble with the market was that there were not enough buyers. Certain consumers made liberal offers of prompt spelter for resale and put some pressure on the market. There appears to be an increased supply of spelter available, both for the earlier and the later deliveries.

According to a U. S. Consular report another zinc smeltery is to be erected in Japan, especially to reduce Siberian ore, which previous to the war was exported to Germany.

Zinc Sheets are strong, base price $27 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Usual extras charged. The demand is steady and business is good.

Other Metals

NEW YORK—July 21

Aluminum—The market continues firm, with good demand. Prices are unchanged at 32@33c. per lb. for No. 1 ingots, New York.

The latest London quotation is £140@150 per long ton—average, 31.5c. per lb.—for No. 1 ingots.

Antimony—The market has been rather quiet, with trading limited to actual necessities. There is no material change in prices. Chinese and other ordinary brands bring 37½@40c. per lb. The special brands are nominal, 50@52½c. per lb. being asked for Cooksons.

DAILY PRICES OF METALS IN NEW YORK

July	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc
			Electrolytic, Cts. per Lb.	Spot, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	St. Louis, Cts. per Lb.
15	4.7650	47½	19.05 @19.25	37¾	5.60 @5.75	5.50 @5.60	19.00 @20.50
16	4.7638	47¾	18.90 @19.10	37½	5.60 @5.75	5.50 @5.60	18.50 @20.00
17	4.7650	47½	18.80 @19.00	37½	5.60 @5.75	5.50 @5.60	18.00 @19.50
19	4.7631	47½	18.75 @18.85	37	5.55 @5.75	5.50 @5.55	18.00 @19.00
20	4.7638	47¾	18.70 @18.80	36¾	5.55 @5.75	5.50 @5.55	17.50 @19.00
21	4.7638	47¾	18.70 @18.80	36¼	5.55 @5.75	5.50 @5.55	17.00 @19.00

The quotations herein are our appraisal of the average markets for copper, lead, spelter and tin based on wholesale contracts for the ordinary deliveries of the trade as made by producers and agencies; and represent, to the best of our judgment, the prevailing values of the metals, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The price quoted for copper on "regular terms" is the gross price including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.20c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Prime Western brands. Only the St. Louis price is herein quoted, St. Louis being the basing market. We quote the New York price at 17c. per 100 lb. above the St. Louis price.

Silver quotations are in cents per troy ounce of fine silver.

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

LONDON

July	Silver	Copper				Tin		Lead		Zinc	
		Standard		Electrolytic							
		Spot	3 Mos.	£ per Ton	Cts. per Lb.	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
15	22 9/16	76½	77¾	92½	19.70	170	163¾	25 1/16	5.35	100	21.73
16	22 9/16	75¾	77	91½	19.48	170	163	24 13/16	5.31	96	20.46
17	22 9/16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19	22 9/16	74½	75¾	91	19.37	167¾	162	24 11/16	5.26	96	20.46
20	22 9/16	74½	76	90½	19.27	164½	160½	24⅞	5.29	96	20.46
21	22 9/16	75¾	77⅛	90½	19.27	165¾	161¾	24 11/16	5.26	96	20.46

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 electrolytic, 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, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21½c.

Nickel is steady and unchanged at 40@45c. per lb. for ordinary forms, according to size of order. Electrolytic 3c. per lb. higher.

Quicksilver is strong and in good demand, with prices well held and showing little change. New York price is $92@94 per flask of 75 lb. for large orders. For smaller lots $95@100 is paid. San Francisco quotations are reported by telegraph at $92.50@95 per flask, on a quiet market. London prices is £18 5s. per flask, with £18 2s. 6d. quoted by jobbers.

Gold, Silver and Platinum

NEW YORK—July 21

Gold—No important arrivals of gold are reported during the week. Sterling Exchange continues at a low level, with a tendency to lower points yet.

Platinum—The market continues quiet, but with some gain in demand, and no material change in prices can be reported. Dealers name $37@39 per oz. for refined platinum and $41@44 per oz. for hard metal.

Our Russian correspondent writes under date of June 27 the market and the prices are without change. In Petrograd for the last fortnight no transactions have taken place. Government permission to export the platinum can be secured on condition that security will be given that the metal will not be diverted to Germany. The quotations are: at Ekaterinburg, 8.20@8.30 rubles per zolotnik; in Petrograd, 33,000 rubles per pood—equal to $31.02 and $32.34 per oz., respectively, for crude metal, 83% platinum.

Silver—The market has been pegged at 22 9/16d. for several days. The latest advices are that the Indian bazaars have not been active buyers and the daily transactions are limited. In the judgment of many holders of silver the price is too low and selling at current rates is not insistent.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—July 17

The base price paid this week for 60% zinc ore was $110@115 per ton. The base price paid for 80% lead ore was $70 per ton.

SHIPMENTS WEEK ENDED JULY 17

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	4,067,290	124,990	500,900
Year	102,040,720	3,993,460	14,762,170

Shipped during week to separating plants, 5,365,690 lbs. zinc ore.

JOPLIN, MO.—July 17

Blende, high price $123; base per ton of 60% zinc, premium ore $120@115; medium $105@95; and for low down to $70. Calamine base per ton of 40% zinc, $52@60; average price, all grades of zinc, $102.20 per ton. Lead, high price $61; base $60 per ton of 80% metal content; average all grades of lead $57.67 per ton.

SHIPMENTS WEEK ENDED JULY 17

	Blende	Calamine	Lead	Values
Totals this week..	6,939,860	941,310	1,106,520	$435,670
Totals this year...	310,910,260	27,085,390	47,208,190	$13,102,940

Blende value, the week, $376,630; 29 weeks, $11,282,610.

Calamine value, the week, $27,160; 29 weeks, $577,470.

Lead value, the week, $31,880; 29 weeks, $1,242,860.

The strikers all returned to work Monday and the strike leader has left the district, asserting he was going to Wisconsin to run a mine. Mine owners expect to compute a wage scale based on the average assay base price per month, the wages of the succeeding month to be governed thereby. It is intended to make it just to miner and mine owner alike. The first and only strike this district ever experienced ended as it begun peacably, and while the men will maintain a union it will be for their advancement along reasonable lines.

Iron Trade Review

NEW YORK—July 21

The expansion of the steel trade continues and steel makers are beginning to look forward with confidence to an active and prosperous second half.

June pig iron output in Alabama was 122,309 tons of foundry and 36,451 of basic, a total of 158,760. The June output was the largest of the year by 12,000 tons and that of July will show as great a gain, it is expected.

The Russian order for rails, recently referred to, was divided, 100,000 tons going to the Cambria Steel Co., while the Lackawanna Steel Co. took the remaining 60,000 tons.

PITTSBURGH—July 20.

Very nearly 90% of the steel productive capacity of the United States is now in operation, this including practically all the openhearth capacity and 70 to 75% of the bessemer, production of bessemer steel having been augmented by the starting yesterday of the Riverside plant, in the Wheeling district, of the National Tube Co. One of the Riverside blast furnaces was blown in last week, while the other goes in today, putting all the 11 stacks of the Tube company in blast. The Riverside plant was started chiefly to furnish billets and skelp, the latter for export, and will make only a limited tonnage of tubular goods, the demand for which is below normal on account of the lack of oil development work.

The demand for finished steel has been augmented in the past two or three weeks by the fact that in many steel products the mills are unable to make the almost instant shipment that characterizes dull periods, thus causing buyers to attempt to lay in stocks, which have been at record low levels. This buying gives such an impetus to demand that the future of the steel market will take care of itself, and full mill operations, with advancing prices, are regarded as certain, the only question being whether the movement will cover a period of months or of years.

The entire export business in iron and steel, direct and indirect, and including war material, probably amounts now to nearly 25% of the total production, but it certainly falls far short of accounting for all the improvement the steel trade has experienced in the past seven months.

Pig Iron—Offerings of Lake front iron in the general Valley-Pittsburgh territory appear to have been discontinued, and the Valley furnaces are firm at $14 for bessemer, $13 for basic, $12.75@13 for malleable, $12.75 for No. 2 foundry and $12.50 for gray forge, while the Pittsburgh market is quotable at 95c. higher. The Republic Iron & Steel Co. has bought 20,000 tons of bessemer at $14, Valley furnaces, for delivery in the next three or four months. The whole pig iron situation is greatly improved.

Ferromanganese—The market seems rather quiet and steel makers appear less disturbed about the future than might be supposed, considering the light supplies of manganese ore reaching England and the United States. The market remains at $100, Baltimore, on contract, and $100@105 on small spot lots.

Steel—Openhearth steel has become very scarce, with prices advancing sharply. Subsidiaries of the Steel Corporation are believed to have bought in the past three weeks about 150,000 tons of openhearth billets and sheet bars, cleaning up all the offerings at former prices. We quote prices $1 a ton higher than a week ago: Bessemer billets, $21; bessemer sheet bars, $21.50; openhearth billets, $22; openhearth sheet bars, $22.50, f.o.b. maker's mill, Youngstown, and $1 higher delivered Pittsburgh. Rods are $25.50@26, with light offerings.

IRON ORE

Of the ore shipped from the Lake Superior district in June 4,941,672 tons, or 82% of the total, were for Lake Erie ports.

New York and New Jersey ores are reported to have been sold to eastern Pennsylvania furnaces at prices which work out from 6¾ to 7c. per unit, delivered.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 340,742 short tons; shipments, 330,073 tons. Production in the Greensburg and Upper Connellsville districts, 39,086 tons.

Austrian Coal Production three months ended Mar. 31, in metric tons:

	1913	1914	Changes	
Coal	4,248,164	4,021,354	D.	226,810
Brown coal	4,582,203	3,702,631	D.	879,372
Coke made	641,383	441,335	D.	200,048
Briquettes made	109,497	123,788	I.	14,291

Of the briquettes reported this year 66,405 tons were made from brown coal or lignite.

Chemicals

NEW YORK—July 21

The general market remains quiet and is still rather uneven. The present tendency of business is to improvement.

Arsenic—Business remains about as usual, with moderate demand. Prices are unchanged at about $4 per 100 lb. for both spot and futures.

Copper Sulphate—Business is steady and shows little change. Prices are about the same at $7.25 per 100 lb. for carload lots and $7.50 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is steady, with a good demand and prices are unchanged. Quotations are 2.35c. per lb. for spot, and for all positions this year.

Pyrites—Imports at Baltimore for the week included 6482 tons pyrites from Huelva, Spain.

Assessments

Company	Delinqe	Sale	Amt.
American, Ida	Aug. 7	Sept. 2	$0.001
Blue Bell, Ida	July 5	Aug. 4	0.003
Carbonate, Ida	June 23	July 23	0.001
Challenge Con., Nev	July 12	Aug. 4	0.05
Con. Virginia, Nev	July 19	Aug. 10	0.05
Contact Copper, Mich	May 15		0.50
East Hercules, Wash	Aug. 10	Sept. 10	0.0015
Eastern Star, Ida		Aug. 24	0.002
Four Timbers, Ida	July 28	Aug. 28	0.001
Hancock Cons., Mich	Sept. 1		1.00
Hancock Cons., Mich	Jan. 3		1.00
Houghton, Mich	May 25		1.00
Idaho-Nevada, Ida	July 14	Aug. 6	0.001
Iron Mask, Ida	July 1	Aug. 10	0.002
Ivanhoe, Ida	July 12	Aug. 12	0.002
Majestic-Idol, Nev	Dec. 15	July 20	0.005
Mayflower, Ida	June 15	July 17	0.005
Michigan Copper, Mich	July 19		1.00
Mineral Range, Utah	May 24		0.003
Monarch Pitts., Nev	June 14	July 14	0.01
Moonlight, Ida	June 5	July 8	0.005
Nabob, Ida	July 5	Aug. 2	0.005
New Arcadian, Mich	June 1		0.50
New Arcadian, Mich	Dec. 1		0.50
New Baltic, Mich	July 15		0.50
New Baltic, Mich	Jan. 15		0.50
New Yerrington Cop., Nev	July 9	July 27	0.01
Nevada Douglas, Nev	July 21	Aug. 18	0.10
North Bunker Hill, Ida	June 12	July 17	0.002
Old Veteran, Ida	July 5	July 31	0.002
Oreano, Ida	Aug. 2	Sept. 2	0.0015
Rainhow, Ida	July 7	Aug. 7	0.002
Rescue-Eula, Nev	July 14	Aug. 19	0.01
Revelator, Utah	Aug. 17	Sept. 3	0.00½
Revelator, Utah	Oct. 4	Oct. 25	0.00½
Rhode Island, Ida	June 24	July 24	0.001
Sierra Nevada, Nev	July 27	Aug. 16	0.05
Sonora, Ida	July 23	Aug. 31	0.004
Springfield, Ida	July 30	Aug. 30	0.002
Sunrise, Ida	July 17	Aug. 17	0.002
Sunset Dev., Ida	June 30	July 24	0.0025
Tarhox, Ida	July 17	Aug. 7	0.0025
Umatilla Tonopah, Nev	July 12	Aug. 16	0.01
Virginia, Ida., (post.)		July 29	0.02
West Tonopah Con., Nev	July 10	Aug. 10	0.01
Wyandot, Mich	July 28		1.00

Stock Quotations

Only a few of the mining stocks moved upward last week; among these were Mason Valley, Nevada-Douglas, Lake, Tamarack, Timiskaming & Hudson Bay and Dome Mines. A number of the Tonopahs declined slightly, as did also Alaska Gold, Juneau, Hollinger, Caledonia, Majestic, American Zinc and Granby Consolidated.

COLO. SPRINGS July 20		SALT LAKE July 20	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.02½	Beck Tunnel	.04
Cripple Cr'k Con	.009	Black Jack	.10½
C. K. & N.	.03	Colorado Mining	.10
Doctor Jack Pot	.10	Crown Point	.01½
Elkton Con	.38	Daly-Judge	7.25
El Paso	.04	Gold Chain	.20
Findlay	.03½	Grand Central	.61
Gold Dollar	.02	Iron Blossom	.69
Gold Sovereign	.03	Little Bell	.12
Golden Cycle	1.79	Lower Mammoth	.03½
Isabella	.17	Mason Valley	2.50
Jack Pot	.05½	May Day	.21½
Jennie Sample	‡.02	Opohongo	‡.00½
Jerry Johnson	.05	Prince Con	.78
Lexington	.005	Seven Troughs	.01½
Mary McKinney	.37	Silver King Coal'n	3.52½
Pharmacist	‡.005	Silver King Con	2.10
Portland	1.40	Sioux Con	.01½
Raven B. H.	.02	Uncle Sam	.03
Vindicator	1.71	Yankee	‡.03½

TORONTO July 20			
Bailey	.02	Dome Exten	.25
Coniagas	4.75	Foley O'Brien	.25
Peterson Lake	.21	Hollinger	25.00
Right of Way	.03	Imperial	.06
Seneca Superior	.90	Jupiter	.12
Silver Queen	.01	McIntyre	.54
T. & Hudson Bay	18.00	Pearl Lake	.00½
Timiskaming	.35	Porcu. Crown	.75
Wettlaufer-Lor	.03	Preston E. D.	.03
Dome Mines	22.75	Rea	.10

SAN FRANCISCO July 20			
Comstock Stocks		Misc. Nev. & Ca	
Alta	.05	Belmont	3.85
Andes	.06	Jim Butler	.79
Belcher	.30	Lone Star	.05
Best & Belcher	.06	MacNamara	.02
Caledonia	.20	Midway	.14
Challenge Con	.07	Mont.-Tonopah	.32
Confidence	.10	North Star	.14
Con. Virginia	.10	Rescue Eula	.08
Gould & Curry	.03	West End Con	.75
Hale & Norcross	.05	Atlanta	.32
Julia	.01	Booth	.51
Mexican	.36	C.O.D. Con	.03
Occidental	.79	Comb. Frac	.08
Ophir	.14	Jumbo Extension	1.52½
Overman	.07	Pitts.-Silver Peak	.10
Potosi	.02	Round Mountain	.50
Savage	.03	Sandstorm Kendall	.06
Sierra Nevada	.05	Silver Pick	.10
Union Con	.17	Central Eureka	.15
Yellow Jacket	.30	So. Eureka	‡1.50

N. Y. EXCH. July 20	
Name of Comp.	Clg.
Amalgamated	73⅛
Am.Sm.&Ref.,com	78⅛
Am. Sm. & Ref., pf.	107
Am. Sm. Sec., pf. B.	80
Anaconda	34⅛
Batopilas Min	1⅛
Bethlehem Steel	198
Bethlehem Steel, pf.	121
Chino	45⅛
Colo. Fuel & Iron	34⅛
Federal M. & S., pf.	50
Great Nor., ore., ctf.	36⅛
Guggen. Exp.	61⅛
Homestake	118
Inspiration Con	31
Mex. Petroleum	71⅛
Miami Copper	27⅛
Nat'l Lead, com	61⅛
National Lead, pf.	107⅛
Nev. Consol.	14⅛
Ontario Min	2⅛
Quicksilver, pf.	4
Ray Con	23
Republic I.&S, com.	34
Republic I.&S, pf.	91
SlossSheffi'd, com	37
Tennessee Copper	37½
Utah Copper	66½
U. S. Steel, com	63⅛
U. S. Steel, pf.	111

N. Y. CURB July 20	
Alaska Juneau	12½
Alta Con	.82
Beaver Con	.30
Big Four	.05
Blue Bell	.02
Braden Copper	6⅛
Buffalo Mines	⅛
Can. Cop. Corpn	1
Can. G. & S.	‡.05
Caribou	‡.50
Cashboy	.05½
Chambers Ferland	.15
Chile Cop.	19⅛
Con. Ariz. Sm.	13/16
Con. Coppermines	‡2⅛
Con. Nev.-Utah	31/32
Davis-Daly	1⅛
Diam'field-Daisy	.04
Dia. Black B.	.02½
Florence	.50½
Goldfield Con	1 1/16
Goldfield Merger	.24
Greene Cananea	40
Kennecott Cop.	33½
Kerr Lake	4⅛
La Rose	.50
McKinley-Dar-Sa	.21
Majestic	.75
Mines of Am.	‡2½
Nevada Hills	.22
New Utah Bingham	3
Nipissing Mines	5⅛
Ohio Copper	.25
Oro	.08
South Utah	‡.25
Stand'd Oil of N.J.	400⅛
Standard S. L.	1 3/16
Stewart	2
Tonopah	6⅞
Tonopah Ex.	2 3/16
Tonopah Merger	.38
Tribuilion	⅞
Tularosa	‡.9/16
Yukon Gold	2⅛

LONDON July 9			
Alaska Tre'dwell	£7	7s	6d
Cam & Motor	0	13	9
Camp Bird	0	4	6
El Oro	0	7	6
Esperanza	0	8	0
Mexico Mines	3	7	6
Oroville	0	14	6
Santa Gert'dis	0	7	6
Tomboy	1	1	10½
Tough Oakes	0	7	6

BOSTON EXCH July 20	
Name of Comp.	Clg.
Adventure	2
Ahmeek	396
Alaska Gold M.	34⅛
Algomah	2⅛
Allouez	53
Am. Zinc	56
Ariz. Com., ctfs.	6⅛
Bonanza	.40
Butte-Balaklava	3
Butte & Superior	70⅛
Calumet & Ariz.	64⅛
Calumet & Hecla	560
Centennial	19
Cliff	‡1⅛
Copper Range	55⅛
Daly West	2⅛
East Butte	13
Franklin	9⅛
Granby	85
Hancock	18
Hedley	29
Helvetia	.50
Indiana	5⅛
Island Cr'k, com	49
Island Cr'k, pfd	89⅛
Isle Royale	28
Keweenaw	2⅛
Lake	15
La Salle	6⅛
Mass	11⅛
Mayflower	4
Michigan	2⅛
Mohawk	72
New Arcadian	10⅛
North Butte	30⅛
North Lake	2
Ojibway	2
Old Colony	3⅛
Old Dominion	53
Osceola	82⅛
Quincy	85
Santa Fe	3
Shannon	8⅛
Shattuck-Ariz	26⅛
Superior	27⅛
Superior & Bost	2⅛
Tamarack	39
Trinity	4⅛
Tuolumne	.45
U. S. Smelting	41⅛
U. S. Smelt'g, pf.	46⅛
Utah Apex	4⅛
Utah Con	13⅛
Victoria	2⅛
Winona	3⅛
Wolverine	61⅛
Wyandot	.75

BOSTON CURB July 20	
Name of Comp.	Bid.
Alvarado	.70
Bingham Mines	9⅛
Boston Ely	.29
Butte & Lon'n Dev.	.27
Calaveras	1⅛
Calumet-Corbin	.04
Chief Con	1 1/16
Corbin	‡.50
Cortez	.40
Crown Reserve	.50
Eagle & Blue Bell	1 1/16
First Nat. Cop	2⅛
Houghton Copper	3⅛
Iron Cap Cop., pf.	4⅛
Majestic	.70
Mexican Metals	.22
Nevada-Douglas	.60
New Baltic	3⅛
Oneco	1⅛
Raven Copper	.11
Smokey Dev.	.15
So. Lake	‡0⅛
Tonopah Victor	.32
Trethewey	‡.10
United Verde Ext.	5⅛

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067	50.241	26.669	26.788	23.708
April	59.490	58.519	50.250	27.416	26.958	23.709
May	60.361	58.175	49.915	27.825	26.704	23.570
June	58.990	56.471	49.034	27.199	25.948	23.267
July	58.721	54.678	.....	27.074	25.219	.....
August	59.293	54.344	.....	27.335	25.979	.....
September	60.640	53.290	.....	27.986	24.260	.....
October	60.793	50.654	.....	28.083	23.199	.....
November	58.995	49.082	.....	27.263	22.703	.....
December	57.760	49.375	.....	26.720	22.900	.....
Year	59.791	54.811	.....	27.576	25.314	.....

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

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.49	14.394	65.259	63.494	70.188	*
March	14.131	14.787	64.276	66.152	69.170	*
April	14.211	16.811	64.747	75.069	69.313	*
May	13.99	18.506	63.182	77.600	67.786	*
June	13.603	19.477	61.336	82.574	66.274	95.333
July	13.223	.....	60.540	.....	64.955	.....
August	*	.....	‡	.....	‡	.....
September	*	.....	‡	.....	‡	.....
October	*	.....	‡	.....	‡	.....
November	11.739	.....	53.227	.....	*	.....
December	12.801	.....	56.841	.....	*	.....
Year	.....	.....	.....	.....	.....	.....

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038	48.426	173.619	180.141
April	36.154	47.884	163.963	166.225
May	33.360	38.790	150.702	162.675
June	30.577	40.288	138.321	167.636
July	31.707	.....	142.517	.....
August	*	.....	‡	.....
September	32.675	.....	‡	.....
October	30.284	.....	‡	.....
November	33.304	.....	139.391	.....
December	33.601	.....	147.102	.....
Av. year	34.301	.....	.....	.....

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3.937	3.718	19.606	19.122
March	3.970	4.053	3.850	3.997	19.651	21.883
April	3.810	4.221	.688	4.142	18.225	21.094
May	3.900	4.274	3.808	4.182	18.503	20.347
June	3.900	5.932	3.810	5.836	19.411	25.170
July	3.891	.....	3.738	.....	19.051	.....
August	3.875	.....	3.715	.....	‡	.....
September	3.828	.....	3.658	.....	‡	.....
October	3.528	.....	3.384	.....	‡	.....
November	3.683	.....	3.585	.....	18.500	.....
December	3.800	.....	3.662	.....	19.097	.....
Year	3.862	.....	3.737	.....	.....	.....

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250	8.541	5.100	8.366	21.460	44.141
April	5.113	10.012	4.962	9.837	21.569	49.888
May	5.074	14.781	4.924	14.610	21.393	68.100
June	5.000	21.208	4.850	21.038	21.345	100.614
July	4.920	.....	4.770	.....	21.568	.....
August	5.568	.....	5.418	.....	‡	.....
September	5.380	.....	5.230	.....	‡	.....
October	4.909	.....	4.750	.....	‡	.....
November	5.112	.....	4.962	.....	25.016	.....
December	5.592	.....	5.430	.....	27.369	.....
Year	5.213	.....	5.061	.....	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15.07	14.55	13.94	13.45	14.10	13.95
April	14.90	14.55	13.90	13.45	14.12	13.95
May	14.90	14.61	13.90	13.60	14.27	13.83
June	14.90	14.70	13.90	13.67	13.96	13.77
July	14.90	.....	13.90	.....	13.90	.....
August	14.90	.....	13.90	.....	14.08	.....
September	14.90	.....	13.90	.....	14.03	.....
October	14.84	.....	13.75	.....	13.97	.....
November	14.59	.....	13.43	.....	13.83	.....
December	14.70	.....	13.45	.....	13.83	.....
Year	$14.88	.....	$13.78	.....	$14.01	.....