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A Journey to Lassen Peak

BY W. H. WRIGHT.*

SYNOPSIS—W. H. Wright visited Lassen Peak during the recent disturbance and made a number of interesting photographs, some taken within close range of the fissure or crater. The opening formed by the eruptions was, on June 16, about 400 ft. long and 100 to 150 ft. wide. The material thrown out by the eruptions had the appearance of debris from the walls of the old crater. The elevation of Lassen Peak is 10,437 ft. It appears to be the only active volcano in the continental United States outside of Alaska.

An eruption on Lassen Peak, California, occurring at 10 a.m. Sunday, June 14, had just ceased when I arrived

intimated that, while he wished us good luck, he had grave doubts of our returning.

We visited the peak on June 16, under guidance of Harry Kaul, who had spent the winter at Drake's Springs as caretaker. Kaul stated that on Thursday night, May 28, he heard a rumbling like that of thunder. Upon going out of doors he found the stars shining brightly. Also that on Friday afternoon, at 2:30, a slight earthquake caused the poorly fastened roof of the barn to slide to the ground. This shock was felt in Westwood, 29 miles, and Susanville, 51 miles, distant. At this time Kaul was probably the nearest to the mountain of any person in that region. On Saturday, May 30, the first

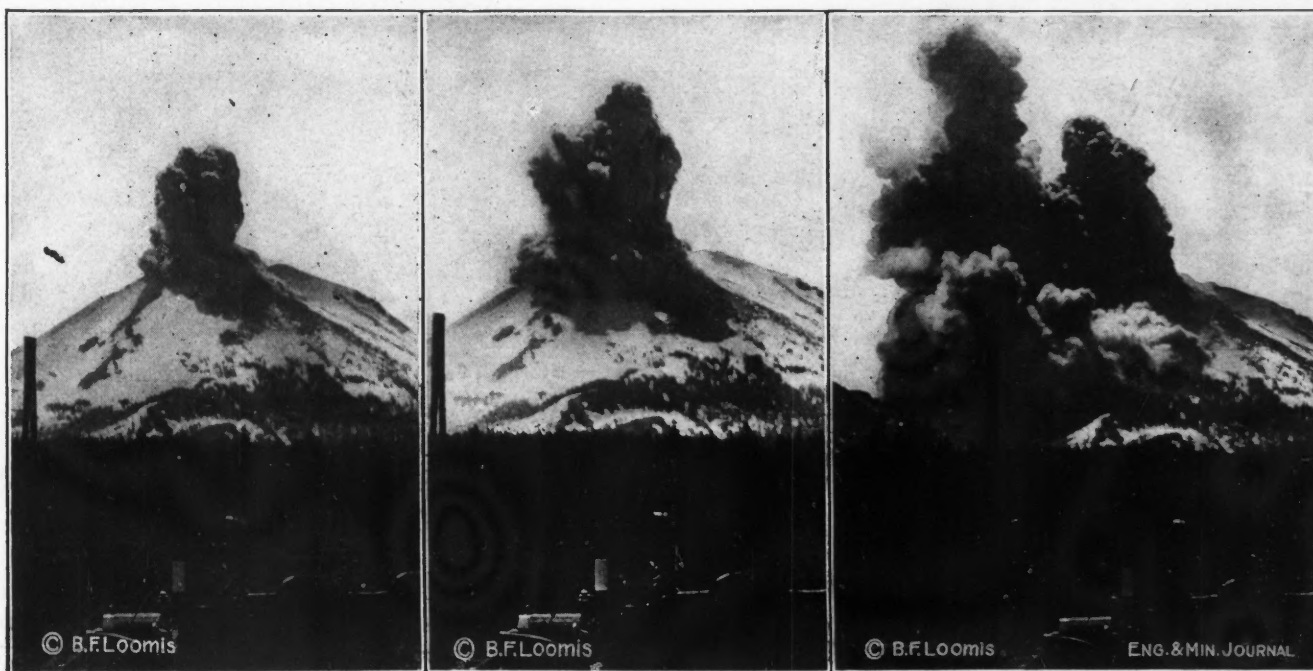


FIG. 1. THE ERUPTION OF MT. LASSEN

Showing successive stages of the smoke column, June 14, 1914.

at Prattville, on the way to Drake's Springs, in company with J. M. Howell and W. H. Spaulding, of San Francisco. The dust-cloud still hung over the mountain. A resident of Prattville stated that this had been the largest of all outbreaks and earnestly sought to dissuade us from going on to what he seemed to consider certain death. His parting words were rather doleful, and he

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eruption occurred, although a stage driver reports seeing a vapor rising from the mountain on Friday. Two days after the eruption, Kaul accompanied a party to the peak. The crater or fissure was then about half its present size, but general conditions were the same. There was not so much debris scattered about, and a small pool occupied a depression in the old crater. Since that time numerous eruptions have taken place, and have all been

of the same character. Tin cans left by the party on Kaul's first visit to the peak were picked up by our party. They were badly mashed and dented by falling stones.

Leaving the Western Pacific R.R. at Keddie, we traveled by automobile to Big Meadows, a distance of 26 miles, to secure saddle horses. Then a horseback ride of 35 miles brought us to Drake's Springs, where the night was spent. This point is 7 miles from the summit of the peak. O. L. Caddle, deputy sheriff of Plumas County, preceded the party with a light wagon, which carried a camp outfit and supplies.

SECOND SUNDAY ERUPTION LIGHTED BY SUNSET

About 15 miles from the mountain, in a direct line, the first sign of volcanic dust was seen. A slight film covered the ground. This seemed to lie in a narrow belt, as we soon passed through it when our course was changed. At various times during the ride glimpses of the mountain were caught, and a column of steam was always seen rising high above the summit. At Lee's ranch, in Warner Valley, 10 miles from the peak, we witnessed the second eruption of the day. This happened at 7 p.m. and was an impressive spectacle. The

from these has a decided odor of hydrogen sulphide. The area of this pool is approximately an acre. One large spring at the south end is almost a true geyser in its intense bubbling and spouting of steam. Two and one-half miles southeast of this lake is Geyser, a large boiling spring, which formerly spouted to a considerable height, but is now quite feeble in its action.

Two miles northwest of Tartarus Lake, and in the direction of Lassen Peak, is situated the Devil's Kitchen. This consists of a large number of solfataras and hot springs that are on both sides of a ravine, through which runs a good-sized mountain stream. Some of the springs actually bubble up through the water of the creek. The action of these springs varies from the sluggish mud-pots to the violently boiling springs that are, in fact, small geysers. The springs after a time apparently become choked with a deposit from the water and form other vents in new places. In the same general line, but a trifle more to the west, Bumpas Springs are situated. This is a group of springs similar to those of the Devil's Kitchen, but on a much larger scale. Many other hot springs, as well as mineral springs, exist in other localities in this region. The steam from all of these springs has the same characteristic odor of hydrogen sulphide,

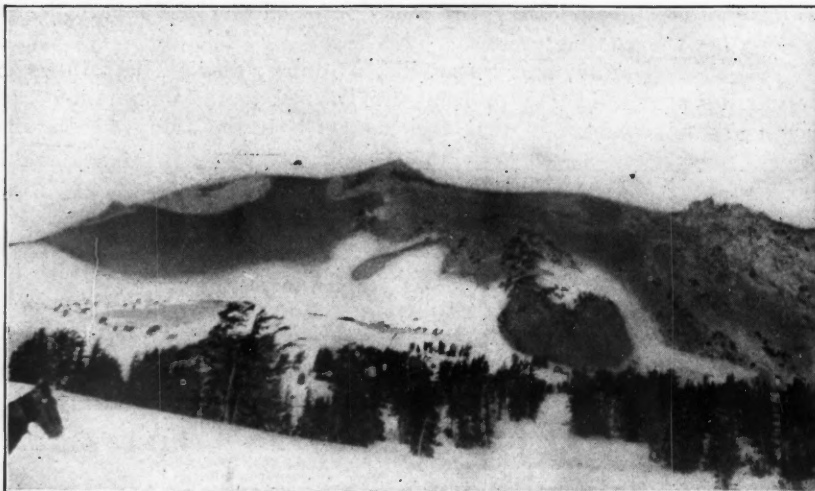


FIG. 2. LASSEN PEAK FROM 8600-FT. ELEVATION

The dark shading shows where the ash fell on snow; the lighter, ash on shale.



FIG. 3. THE CRATER

Track of guide who paced length of crater, at right.

setting sun was level with the top of the peak and a little to the left. A column of steam and dust rose to a height of at least 1500 ft. above the mountain top. In appearance it much resembled the dirty white exhaust of a coal-burning locomotive. Although witnesses to this eruption, situated on the west and northwest side of the mountain, reported that flames were visible, none could be seen from the southeast side. It is more than likely that the swift-rising column of steam reflected the red rays of the setting sun, giving an appearance of fire.

BOILING SPRINGS AND MUD POTS IN THE VALLEY

That evening, after reaching Drake's Springs, it was decided that the next day could be well spent in recuperating and visiting the wonderful hot springs that occur at many points in this little valley. The next morning, Monday, June 15, the party visited Tartarus Lake. This is a pool occupying a crater-like depression, completely surrounded by boiling springs and mud pots. The steam

and possibly of the dioxide, although this could not be definitely ascertained by the sense of smell alone.

All day June 15 one of the party stood guard at a vantage point, looking across Tartarus Lake, with a camera ready to take a picture of an outburst from the mountain. The old saying that a watched pot never boils proved true in this case.

TRAVELING OVER DUST-COVERED SNOW

Tuesday morning, June 16, guided by Harry Kaul, the party left Drake's Springs for the summit of Lassen Peak. Kaul had made two trips to the top of the peak since the first eruption on May 30. The trail leads through a magnificent growth of timber. Above 6000 ft. altitude the traveling was done over hard snow, which as we neared the top became very deep. It easily supported the horses and made the ascent much easier than at other seasons. Even close to the peak only a slight amount of dust covered the snow. Illustrations No. 1

and No. 2, taken at the elevations of 7250 ft. and 8600 ft., respectively, show this clearly. In picture No. 2 the shadowy area covering the top of the mountain is dust-covered snow and plainly marks the distance any great amount of dust fell.

The lighter-colored portions of this area are bare rock covered with cement-colored dust; the dust upon the snow, being wet, is dark colored. A short distance above the place shown in Fig. 2 the horses were tied. From there on it was a strenuous climb of a vertical distance of 1800 ft.

FISSURE ALONG MAIN AXIS OF OVAL PIT

At 12:30 the ridge at the top was gained and our first view of the crater obtained. The party then descended the slope into the cup-shaped depression that marks the site of the ancient crater. The new crater has broken out on the northwest side of this, and seemingly has been formed by steam escaping under high pressure from a fissure which lies along the main axis of the oval-shaped pit. Figs. 3, 4 and 5 all show this fissure distinctly. The steam forced its way through the fissure and formed a narrow crater, the sides of which had begun to cave,



FIG. 4. FIRST VIEW OF CRATER LOOKING NORTH
Note large ejected rocks in left foreground.

rapidly widening it. These pictures were taken at great risk. Aside from the danger of an outbreak of the crater, the danger from the caving sides was great. In order to get good views of the pit it was necessary to go close to the edge. Huge cracks extended back 25 and 30 ft. Every few minutes great masses would fall from the sides. A short time after one of the pictures was obtained, the place from which it was taken suddenly fell into the hole, sending up a cloud of dust and making a spectacular display, which, unfortunately, was over too soon to be photographed, as the party was busily engaged in eating lunch. The volume of escaping steam varies from moment to moment. Fig. 5 shows a large block of hard snow lying on the caved material covering the fissure at the bottom of the pit. In appearance and odor the steam resembles that escaping from the boiling springs previously mentioned; in fact, it was impossible to detect any difference. That the vapor is steam is evidenced by the fact that it condenses and disappears after rising into the air for a short distance. The hole is about 100 ft. in width and 500 ft. in length, and large quantities of huge rocks were thrown out. The one in the foreground weighed at least two tons. The deep snow, on the north slope of the south side of the old crater, which was covered with dust, sand and rocks, contained several hundred holes which had been caused

by falling rocks. These must have been hot, as they were deep in the snow, which is as hard as ice; also, the sides of the holes are perfectly smooth, and there are many large stones lying on top of the snow beside these holes. Of course, it is possible that the unburied ones did not fall from as great a height as those that are buried. A stone lying 1000 ft. from the crater measured 30x54 in. As it was deeply buried, the thickness could not be measured.

DEBRIS THREE AND FOUR FEET DEEP ON THE SNOW

Small heaps of crumbled rock lying on the snow showed that some of the stones crumbled upon being suddenly cooled by it. The lookout station of the forest service, situated on the highest pinnacle of the mountain and about a thousand feet from the crater, resembled a large salt-shaker, the roof having been perforated



FIG. 5. CRATER SHOWING BLOCK OF SNOW IN FOREGROUND

in many places by falling rock. The largest hole was 12 in. in diameter and clean-cut. At the edge of the crater, debris from the different explosions lay on the snow to a depth of three or four feet. This gradually diminished to a depth of 6 in. at the top of the ridge surrounding the cup of the crater. The deposit has been classified as descending from a great height. Upon the snow were stones of various sizes. Next is a deposit of coarse sand, upon which is a layer of very fine dust that closely resembles portland cement. There was no lava or cinders. The only indications of heat were the hot stones and steam. The mountain is composed of dacite, which has the appearance of gray granite. If one could collect the debris from a blast in this rock, he would have exactly the same material that has been cast up by the present eruptions.

The edges of the fissure are covered with a yellow deposit that appears to be sulphur. This could not be verified, as it was impossible to reach the fissure. The presence of sulphur is not unexpected, as deposits of sulphur are found at many of the hot springs. An

odor of sulphur was noticed in the dust, but it was so faint that it could not be determined whether it was the hydride or dioxide.

DEBRIS FROM THE WALLS OF AN OLD CRATER

The evidences on the ground bear out the belief that the material thrown out by the outbursts consisted of débris from the walls of the ancient crater broken and forced from the fissure by steam under great pressure. Much of this material fell directly back into the new crater or caved from the side, closing the vent and making other explosions necessary to clear the outlet. Lassen Peak is 10,437 ft. high and is the southern terminus of the Cascade range. Like many other mountains in this range, it is an extinct crater. In the Lassen lava field, which lies to the northeast and north of Lassen Peak, is situated Cinder Cone, the latest active volcano in the United States. History does not record this last eruption, which appears to have occurred in the neighborhood of 200 years ago. This eruption was so quiet that it would not attract attention in a sparsely settled country.

Gypsum Production in 1913

Gypsum, of which plaster of paris is made, was mined in the United States in 1913 to the extent of 2,599,508 tons, an increase of 98,751 tons over 1912, according to the U. S. Geological Survey. Gypsum sold crude without calcining and used principally as an ingredient in portland cement and paint and as land plaster amounted to 463,136 short tons, which is a good increase over the business of 1912. About 85% of the gypsum sold crude in 1913 was used for portland cement at an average value of \$1.49 a ton. The quantity sold for this purpose is steadily increasing.

There was an increase of 42,175 tons in the amount of calcined gypsum sold in 1913. A total of 1,680,157 short tons was calcined for wall plaster, Keenes cement, plaster of paris, etc. About 1,250,000 tons of this amount was used for mixed wall plaster, the so called cement plaster and hard wall plasters of the building trade. A marked advance in the quantity and value of gypsum imports was made in 1913, the total importation of unground gypsum in 1913 being 447,383 tons.

British Steel Production

The British Iron Trade Association has completed its report of steel production in Great Britain for 1913. According to its statement the total make of steel in that year—not including crucible and electric steel—was, in long tons:

	—Acid—		—Basic—		—Total—	
	Tons	Per Cent.	Tons	Per Cent.	Tons	Per Cent.
Converter steel.	1,048,772	13.7	551,929	7.2	1,600,701	20.9
Openhearth	3,811,382	49.7	2,251,793	29.4	6,063,175	79.1
Total	4,860,154	63.4	2,803,722	36.6	7,663,876	100.0

The total make of steel in 1913 was the largest ever reported, it was 867,732 tons, or 12.8%, more than in 1912. The gain last year was, as it has been for several years past, in openhearth steel, the advance in converter steel being comparatively small. Great Britain adheres to the acid process, however, and the increase in acid steel last year was much greater than in basic metal.

The production of wrought or puddled iron, on the other hand, showed a decrease of 119,272 tons from 1912, though it was greater than for several years previous. The make of steel and of wrought iron for five years past has been, in long tons:

	Converter	Steel		Total	Wrought Iron
		Openhearth	Total		
1909	1,733,220	4,148,408	5,881,628	1,129,412	
1910	1,779,115	4,595,366	6,374,481	1,118,893	
1911	1,461,140	5,000,472	6,461,612	1,191,499	
1912	1,522,487	5,273,657	6,796,144	1,326,017	
1913	1,600,701	6,063,175	7,663,876	1,206,745	

In the five years the proportion of bessemer, or converter, steel has dropped from 29.5 to 20.9%, while that of openhearth has increased from 70.5 to 79.1% of the total. The steel total has gained over 30% in the five years, while there have been no great changes in wrought iron.

The total production of finished iron in bars, shapes and other forms in 1913 was 1,121,132 tons. There is no complete report of the output of finished steel.

Argonaut Company Gets Decision

The Argonaut apex suit, an action brought by the Kennedy Extension Gold Mining Co. against the Argonaut Mining Co. for the recovery of the value of ores extracted and for other damages, aggregating about \$1,000,000, was decided in favor of the defendant by Judge Fred V. Wood, in the Superior Court of Amador County, Calif., on June 29, 1914. The trial was begun in September, 1913; the arguments were submitted in January, 1914. Following is the decision rendered by the court, reprinted in part and condensed:

There are vexatious and embarrassing questions involved in this case, some of which seem to be impossible of an entire and satisfactory solution by the human mind, looking at them from an impartial standpoint; but this court is largely influenced in its decision by the preponderance of the testimony of practical mining men familiar with its history, and is disinclined upon the evidence produced to take from the possession of the Argonaut company the property which it has obtained by its discovery and labor upon what it had every reason to believe and was generally supposed to be the Argonaut vein.

This court is of the opinion and decides that the continuity and identity of the Argonaut vein is sufficiently shown to meet the requirements of the law; that the evidence does not satisfactorily establish the course of the apex of the Jackson vein; that the defendant Argonaut Mining Co. is entitled to retain the proceeds of the ores and minerals extracted from the segment of the vein in dispute and to a judgment for its costs.

All the work that plaintiff has ever done since its acquisition of the property has been to clean out the old workings and perform such other work as it deemed important to establish its claim in this action, and all of the property was idle for many years prior to plaintiff's ownership.

In the regular and customary course of mining the defendant extended its shaft, opening and developing various levels, and mining and milling the ore and minerals until at the time of the trial the shaft had been sunk to the 3900-ft. level on the incline. In developing the mine below the 1240-ft. level and in following what

is claimed to be its vein or lode, the defendant company extended its levels, drifts and openings and extracted therefrom and removed ore and minerals of the value of many thousands of dollars, much of it underneath the placer lands owned by plaintiff and its predecessors in interest. The damage caused by the removal of these ores and minerals is the subject of this litigation.

On the part of the plaintiff it is claimed that the lode or vein from which these ores and minerals were taken formed no part of the so called Argonaut vein or lode, and that plaintiff is entitled to recover the value of all the ore and mineral mentioned upon either one of two grounds:

(1) Its common-law right to the ownership of all minerals lying underneath the surface of its property when not extracted from a vein having its apex within the exterior boundaries of land belonging to other persons.

(2) The plea that the ores were extracted from veins having their apices within the Muldoon quartz and Jackson quartz mines, extended downward within vertical planes of the end lines of such claims.

The defendant asserts in its defense that the orebodies mentioned were all obtained from and formed a part of the so-called Argonaut vein having its apex within the surface boundaries of the Pioneer quartz mining claim.

As to plaintiff's claim under the common-law right to ownership of the ores, the same may be eliminated from discussion, for it can be sustained only by disregarding practically all the oral testimony of the witnesses and the opinion of the experts. The real controversy in the action is waged over the location of the apex of the vein from which the minerals were extracted, that is, whether the ores were taken from veins having their apex within the surface of plaintiff's or of defendant's land.

Plaintiff's claim, under such apex right, to the ownership of the ores and minerals mentioned is based upon what it terms the Jackson vein by virtue of a union with the Muldoon gouge vein below the 950-ft. level of its mine. No continuous development of the vein has been made. It is not the discovery vein upon which the patent to the claim was issued, but developed exposures have been made upon which plaintiff has founded an interesting theory of geological movements causing the formation of the great Mother Lode, namely, that the Mother Lode fissure is a normal fault with a displacement of some 700 ft. and not an overthrust fault, as described by Ransome in the Mother Lode folio of the U. S. Geological Survey; that instead of there being one vein with branches, as claimed by defendant, and heretofore generally supposed to exist, there are a number of veins, formed at different periods of time, which by their faulting must have prevented any connection between the Pioneer vein and the vein from which the ores and minerals in controversy were extracted.

It can serve no useful purpose to enter into a discussion of the testimony of many hundred pages given by experts in support and refutation of this theory. Upon trial, the impression was strong in the mind of the court that there was great probability of the correctness of this theory. Before this court, however, will say that these men are all mistaken, upon a speculative theory as to the convulsions and workings of nature countless ages before the time of man, it will

require something more than a strong opinion as to the plausibility of a theory.

The mining laws of the United States are framed upon the ideas of the practical miner as to what constitutes a lode or vein, rather than upon those of the geologist. In this case the testimony of practical miners, familiar with the conditions upon this part of the Mother Lode, is overwhelming that the Argonaut vein is continuous from the apex to the lowest level. Needless to state, all the expert witnesses for defendant concur in that testimony.

While the plaintiff in this case relies upon developed exposures only to substantiate its theory and its claim to extra-lateral rights by virtue of its apex location, it contends that continuous development by defendant in its workings has disclosed interruptions or breaks in the so called Argonaut vein which demonstrate that there is no continuity of the vein shown as required by law. This to my mind seems to be the most serious objection to the adoption by the court of the inference of these experienced and qualified mining men.

If a vein were always an ore-bearing filling of a single fissure, the difficulties encountered in this case and the wide divergence of experts' opinions would not exist. However, when it is tested by the opinions of the courts and of geologists, it does not seem that the inference drawn by the witnesses who are experienced in mining development in this district is unwarranted by the evidence, when they say that the so called Argonaut vein is continuous in its downward course through the placer lands of plaintiff, even though admittedly short interruptions in the vein are shown to exist.

It is claimed that the apex of the Jackson vein comes to the surface and is not what is known as a blind apex. A series of cuts or trenches was made, which it is claimed show the course of this apex. Every witness for defendant, practical miners and experts, is positive that nothing is disclosed in these cuts which can be called a vein. As to the witnesses for plaintiff, Mr. Perry stated that a fissure was shown in each one; that there were numerous stringers of quartz east of the fissure, irregular and running in different directions. Mr. Devereux, who has had more experience in mining upon the Mother Lode than any of the other witnesses for the plaintiff, in giving his testimony as a witness for plaintiff said that these stringers of quartz are a common occurrence in a slate country, whether near a large vein or not, and as to some he did not consider them a part of the Jackson vein.

All the witnesses for plaintiff, however, are positive that the Jackson apex is sufficiently disclosed. To me it seems difficult to understand how this vein, with its apex at the surface, should remain undiscovered until the commencement of this action, after so many years of mining activity in this county.

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The Output of Ontario Mines for the first three months of 1914 shows a total value of \$9,484,299 as compared with \$9,469,938 for the corresponding period of 1913. The reason for this small increase is the falling off of the silver production from Cobalt, which decreased 680,198 oz. valued at approximately \$560,000. This decrease in silver was offset by the increased production of gold, copper and nickel. The following shows the value of the different minerals for the first three months of the year: Gold, \$1,202,502; silver, \$3,549,556; copper, \$591,988; nickel, \$1,446,012; iron ore, \$12,923; pig iron, \$2,503,450; cobalt, \$8,898; oxides, \$168,965; total, \$9,484,299. During the period 112,826 tons of gold ore were crushed and of this amount 104,880 tons were treated in the mills at Porcupine.

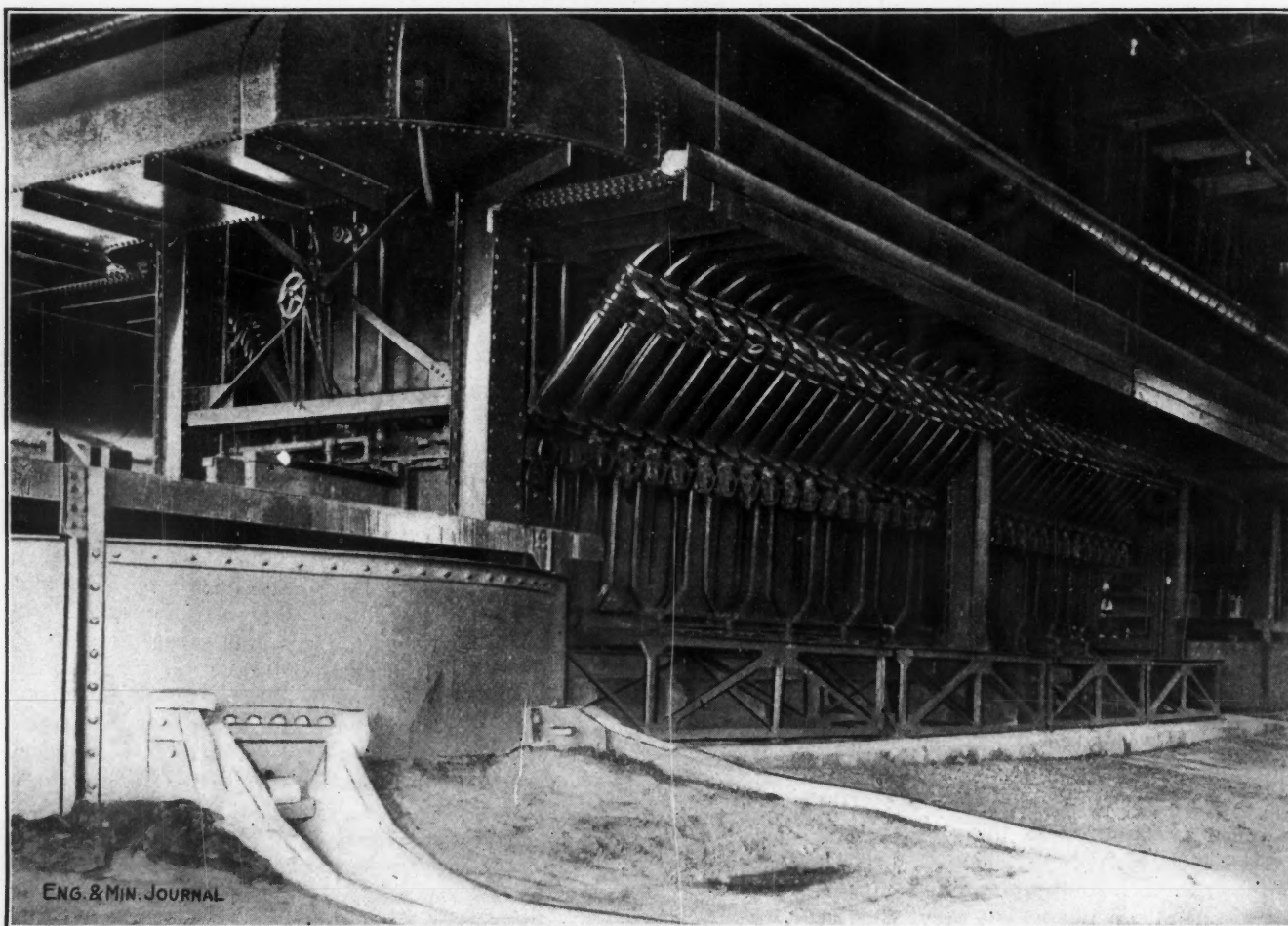
Calumet and Arizona's New Smelting Works at Douglas, Ariz.

BY RICHARD H. VAIL

SYNOPSIS—Description of one of the new Arizona smelting works that replaces this company's old blast-furnace plant built in 1902. Four reverberatory furnaces now supplement two large blast furnaces. Some of the power equipment and the receiving bins of the old plant have been retained but a new bedding system, new roasting department, basic-lined converters and other modern equipment have been installed, thus making the smelting plant entirely new and up-to-date.

When the management of the Calumet & Arizona Mining Co. decided in 1910 that it would be necessary to

for the various structures, approximately 500,000 tons of slag were used. By this method the roaster plant is on an elevation that permits the calcines to be hauled on a level track and charged into the reverberatory furnaces. The reverberatory furnaces are on an elevation that allows the matte to be tapped directly into large ladles resting upon the converter floor. The reverberatory-furnace floor is 14 ft. above the converter floor, and the calcine track 15 ft. above the reverberatory floor. The site for the bedding system, which has the same elevation as the converter-plant floor, is also a slag fill, the slag on portions of it being 16 ft. deep. The foundations for the

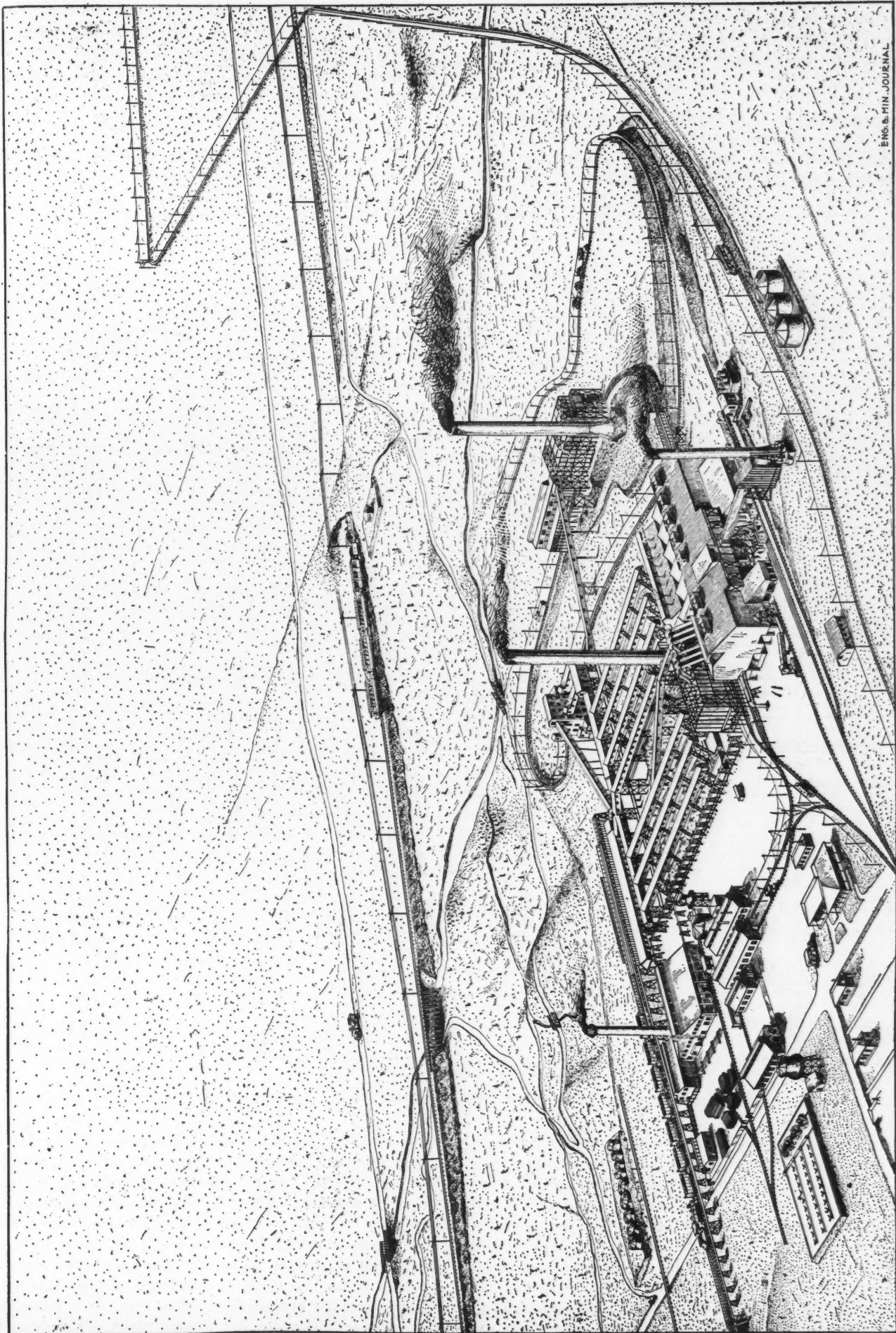


CALUMET & ARIZONA'S 40-FT. COPPER BLAST FURNACE, DURING CONSTRUCTION

build a new copper-smelting plant, a careful study was made of the several possible sites for the plant. It was finally decided to build near the site of the old plant at Douglas, Ariz., as the water development, shops, receiving bins, yard tracks and power plant were all well adapted for use in the new plant. The topography of the proposed site was not desirable, but it was made ideal in this respect by building up benches with molten slag, which was obtained from the old plant at the rate of approximately 1500 tons per day. In order to get desirable elevations

chimneys were made of slag, the foundation bolts being held down by rails imbedded in the slag 12 ft. below the top of the foundation. Only a comparatively thin layer of concrete was used on the top of the foundation in order to make a proper surface for supporting the base rings of the stacks.

The receiving bins belonging to the old plant were utilized in the new plant and were equipped with new chutes for feeding ore into the hoppers of the conveyor feeders. The bins have been equipped on both sides with



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NEW CALUMET & ARIZONA SMELTING WORKS AT DOUGLAS, ARIZ.

30-in. conveyors that deliver the ore into two 36x24-in. Blake-type crushers at the end of the bins. New coke-receiving bins have been installed.

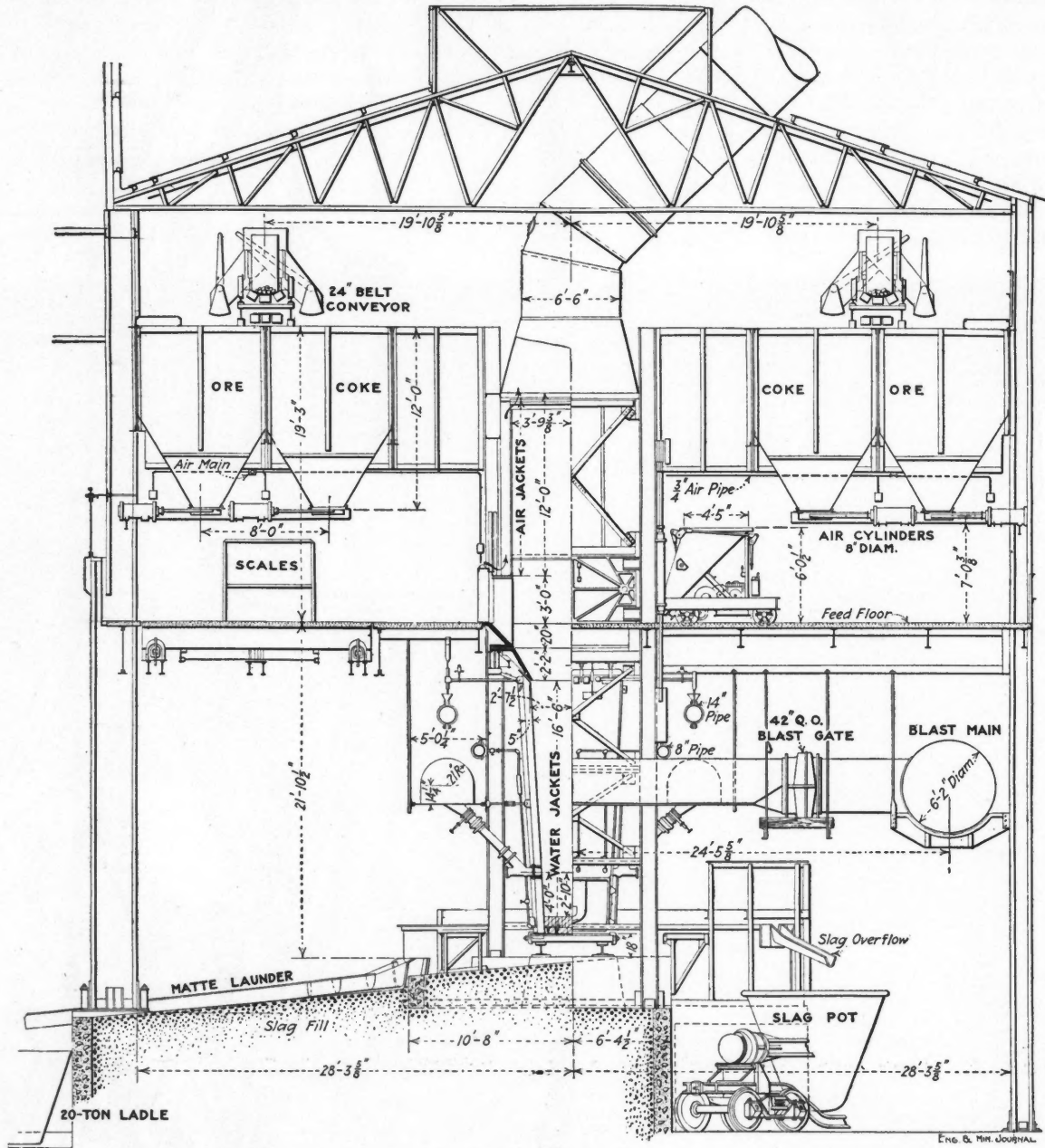
STEEL SAMPLING MILL

From the crushers at the end of the bins, the ore is conveyed up two inclined conveyors to the crushing and sampling plant, which has a capacity of 200 tons per hour when screening out the large sizes for the blast

54x24-in. Blake crusher, two 20x10-in. crushers, one 54x24-in. rolls, and two 14-ft. trommels. Each section of the sampling department has one 20x10-in. Blake crusher, one 36x12-in. roll, one 24x12-in. roll, one 60-in., one 42-in. and two 27-in. Snyder samplers.

BEDDING AND CONVEYING SYSTEM

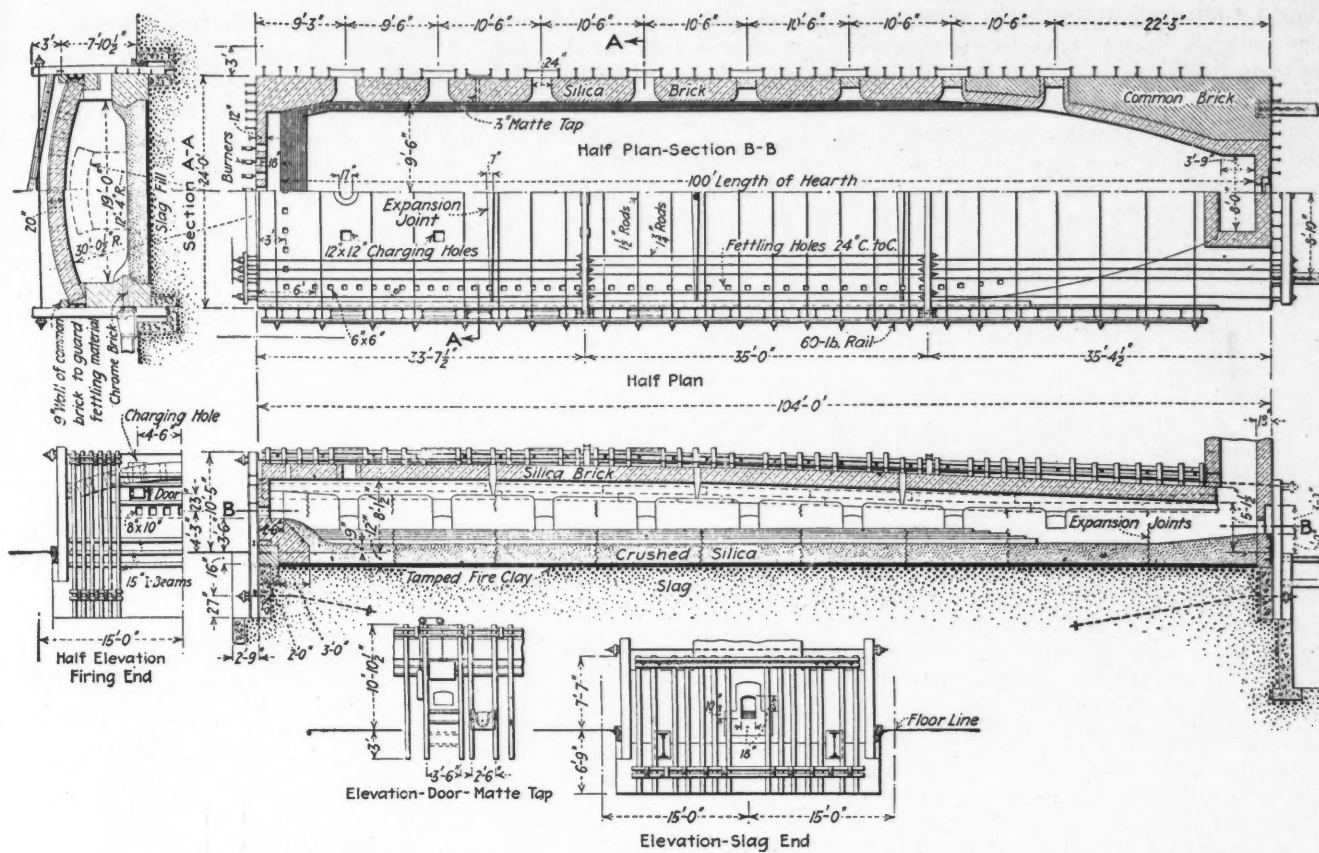
From the sampling and crushing plant the fine material passes to the fine beds and coarse material to the



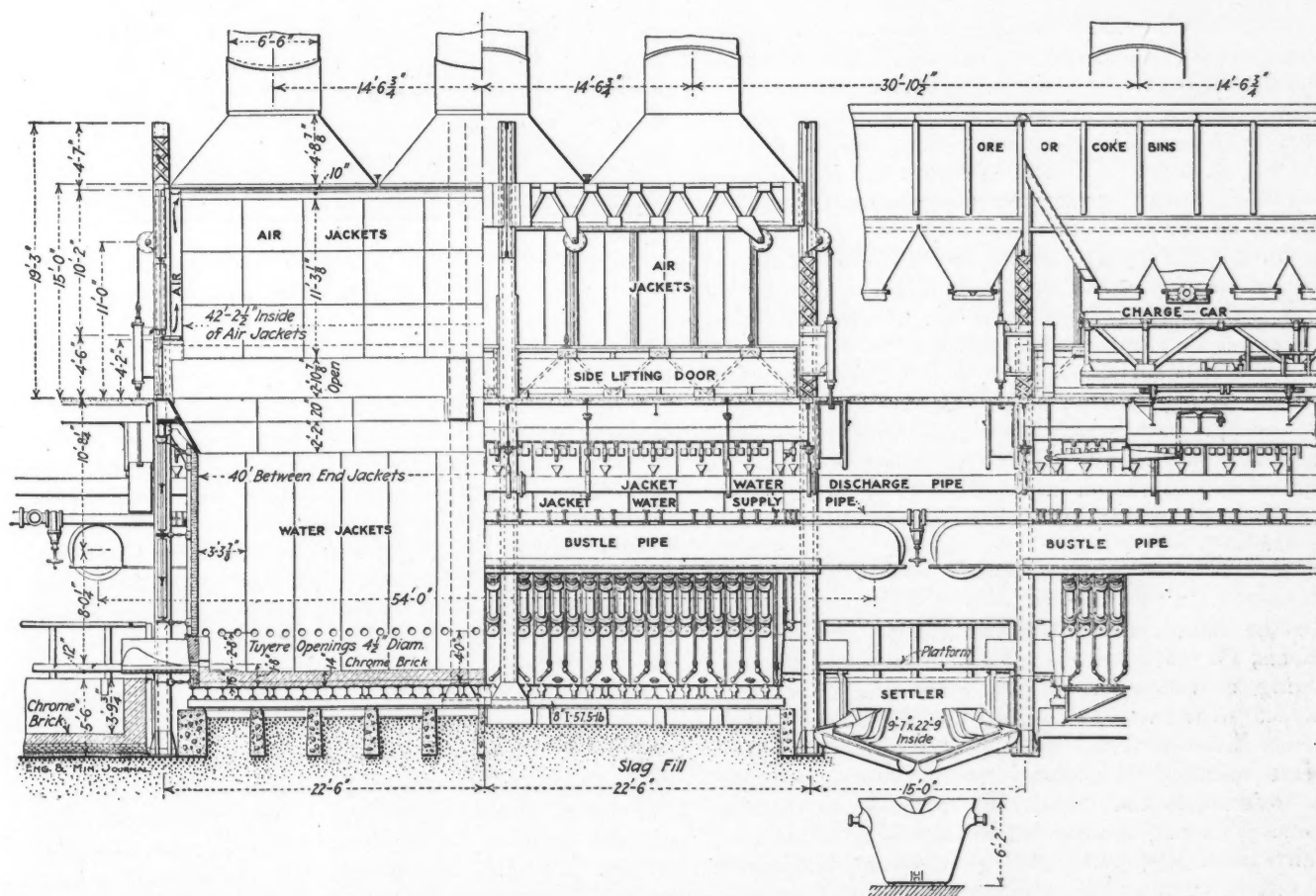
END SECTIONAL ELEVATION OF CALUMET & ARIZONA 40-FT. COPPER BLAST FURNACE

furnaces. The building is of steel and concrete through-cut. It is 40x84 ft. in plan, and is five stories high. The mill is divided into two sections, which are run independently of each other. Each section has a crushing and sampling department. In the sampling department the ore is cut four times by Snyder automatic samplers, and a sample, weighing 1.6 or 3.2 lb., as desired, is obtained per ton of ore passing through. The plant is flexible, and ore may be crushed and screened and discharged at any desired size. Each section of the crushing plant has

coarse beds. The bedding scheme is practically a duplicate of the Cananea system. Three beds for coarse and three beds for fine ore are provided, each having a capacity of 10,000 tons. A bed for coke, having a capacity of 5000 tons is also provided. Messiter reclaimers will transfer the material from the fine and coarse beds to Robins belt conveyors. The coarse ore and coke is conveyed up an incline to the ore-and-coke charge floor of the blast-furnace charge floor. The fine ore is conveyed up a similar incline to the roaster plant. The coke is



THE 19x100-FT. REVERBERATORY FURNACE OF THE CALUMET & ARIZONA MINING CO., DOUGLAS, ARIZ.



SIDE ELEVATION SECTION OF 4x40-FT. COPPER BLAST FURNACE

dumped from the cars into the coke-receiving bins, and from there it is conveyed to the blast-furnace charge bins or to the coke-storage bed by a belt conveyor.

The roaster plant contains twelve 21 ft. 6 in. Hersheoff air-cooled roasters, each having a capacity of approximately 80 tons of fine ore per day. The furnaces have six regular hearths, besides a top or drying hearth. A storage bin of 70 tons capacity is provided for each furnace. The roaster plant has a tile-and-steel dust chamber, 60x140x70 ft. high, equipped inside with baffles and wires. The gases from the dust chamber pass into a brick-lined steel chimney, 20 ft. inside diameter by 279 ft. high.

The main building of the new works is 222x460 ft. in plan, and it contains two blast furnaces, four reverberatory furnaces, six converters, copper-casting department, skullbreaker and other accessory equipment.

TWO 40-FT. BLAST FURNACES

The blast-furnace department contains two 40-ft. furnaces, 48 in. at the tuyeres, giving a hearth area of 160 sq.ft. for each furnace. Among the features of the blast-furnace department are the method of feeding and of obtaining an accurate weight of the charge; also the design of the bustle pipe which has been combined with the girder that takes the horizontal thrust from the furnace jackets. The furnaces have an air-jacketed superstructure and three uptakes 6 ft. 6 in. in diameter; there are but two charge doors on each side operated by compressed air. Belt conveyors deliver the ore and coke to bins over the charge floor and air-operated gates discharge these materials into charge cars that rest upon platform scales. The charge cars always remain on the feed-floor level and are propelled the short distance from the scales to the furnace doors by electricity; no hand work is done in connection with the feeding, except occasional barring.

The blast furnaces have single-tier water jackets, of which there are 12 used on each side; each jacket has three 4½-in. tuyeres. The furnaces are tapped through a brick-lined trough spout, the blast being trapped by building up the front with clay. Chrome brick is used for lining the furnace bottoms and settlers. The furnace bottoms are made up on ½-in. bridge plates on which was spread a ⅝-in. layer of chrome sand; then two courses of chrome brick, one laid on the side and the other on end. A steel dust chamber, 60x100x70 ft. high, having suitable baffles and wires, receives the blast-furnace gases which then pass through an overhead flue into a brick-lined steel chimney, having a height of 305 ft. and an inside diameter of 25 ft. Gases from the reverberatory waste-heat boilers also pass into this stack.

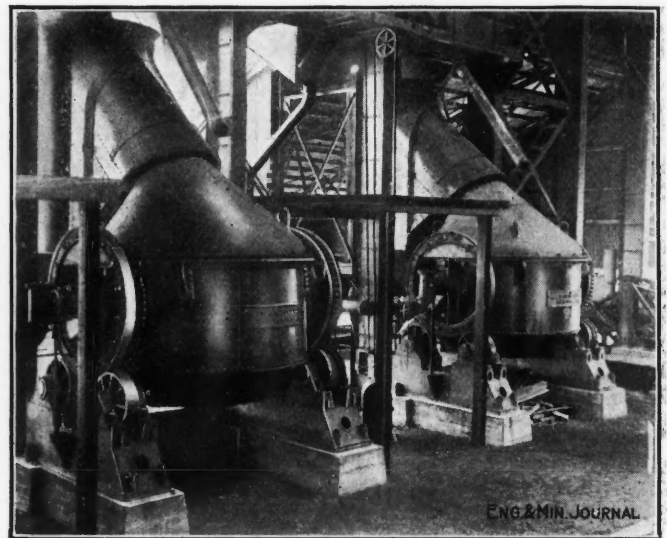
REVERBERATORY DEPARTMENT

In the reverberatory department four reverberatory furnaces, 19x100 ft., are installed and the foundation and building for a fifth furnace is in place. Each furnace is equipped with two 712-hp. Stirling waste-heat boilers. Calcines are delivered to the reverberatory hoppers by cars running on overhead tracks. Matte is tapped into 20-ton pots and transferred by cranes to the converters. The slag is skimmed directly into 25-ton electrically tilted slag pots running on tracks underneath and just in front of the skimming end of the furnaces. The reverberatory furnaces are built on a slag block on

which a 4-in. layer of fireclay was first put down, then 21 in. of silica. The details of the reverberatory-furnace construction are shown in an accompanying engraving. One of the newer features is the 9-in. wall of common brick along the top of the furnace side walls to prevent fettling material from dropping off the roof. At the skimming end of the furnaces, care has been taken to make the skimming operation as comfortable for the skimmer as possible by placing the header flue well above his head and setting the boilers back from the furnace. One of the features in the boiler settings of this department consists in reversing the usual baffling for Stirling boilers and allowing the gases to pass in at the top of the boiler instead of at the bottom as has been done heretofore.

CRANES NOT REQUIRED FOR FEEDING CONVERTER FLUX

The main converter aisle is 55 ft. wide and two 40-ton electric traveling cranes are installed. Stands for six 12-ft. Great Falls type converters, built by the Allis-



C. & A. CONVERTERS WITH OVERHEAD SILICA BINS AND FEEDING ARRANGEMENT

Chalmers Manufacturing Co., are installed. An independent flue, dust chamber and chimney are provided for the converter department. The dust chamber is 40x60x50 ft. high, and the stack is 16 ft. in diameter by 200 ft. high. The balloon flue connecting the header flue just back of the converters with the dust chamber is 15 ft. in diameter. It serves to collect most of the dust. The molten converter slag is poured back into the reverberatory furnaces by the cranes. The slag skulls are broken in the McGregor skull-breaking equipment, described in the JOURNAL of Apr. 11. The converter copper is poured into two straight-line copper-casting machines.

One of the features of the converter plant is the method of charging the siliceous material into the converters. Bins have been provided over the converter smoke boxes, which are equipped with weighing hoppers and chutes, permitting weighed or measured quantities of siliceous material to be charged directly into the converters. The bins are charged with the siliceous ore by means of conveyors leading from the blast-furnace inclined conveyor, across the converter aisle.

WATER AND OIL SYSTEM

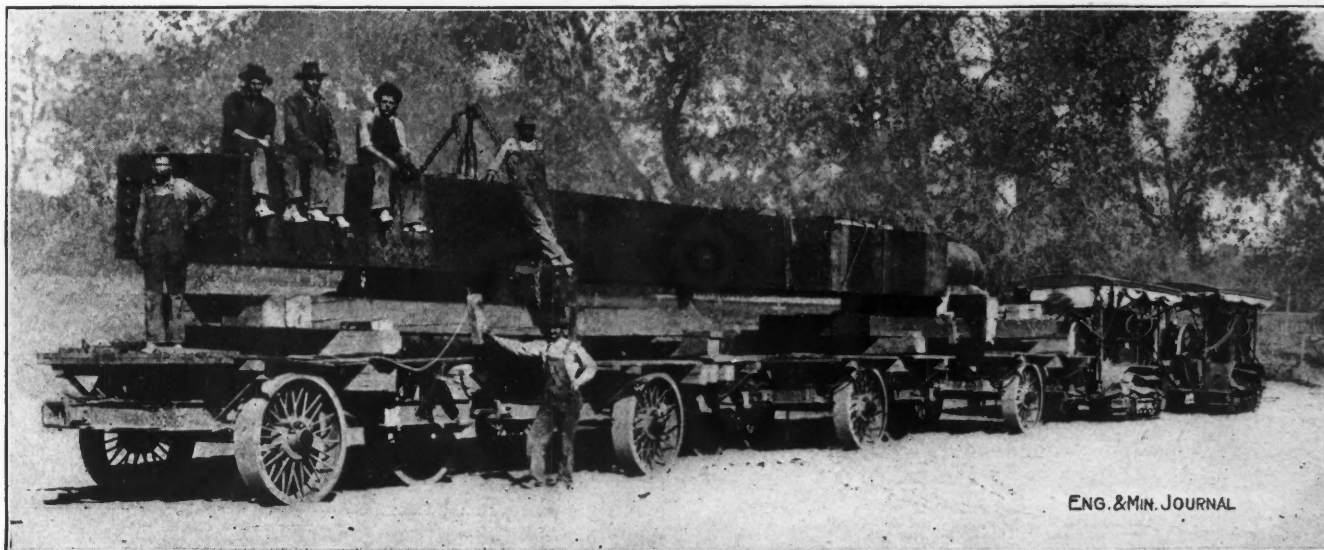
A new water tank having a capacity of 200,000 gal. has been installed for the blast-furnace water-jacket supply. Approximately 2000 gal. of jacket water are circulated per minute for the two blast furnaces. Two spray cooling systems are installed, one for the powerhouse condenser water and the other for the blast-furnace jacket water. Three 10,000-bbl. steel oil tanks and eight 111-bbl. auxiliary oil tanks with the necessary pumps, heaters, etc., have been installed for furnishing the reverberatory oil supply.

The works is equipped with weighers and scales throughout, so that accurate metallurgical records can be made, and the results carefully watched. Dr. L. D. Ricketts was consulting engineer for the new plant, which was designed by Repath & McGregor, of Douglas. The smelting works is under the general direction of John C. Greenway, general manager of the Calumet & Arizona

Caterpillar Engines for Hauling Heavy Machinery

BY LEWIS H. EDDY*

The economy and efficiency of caterpillar-type engines for hauling heavy machinery was satisfactorily demonstrated during the construction of Yuba No. 14 dredge in 1913 at Hammonton, Calif. For the largest and heaviest pieces used in the construction of the dredge, two caterpillar-type engines of the Holt manufacture were employed, as shown by the accompanying illustration, which shows the hauling of a steel spud. These spuds weigh 80,000 lb. each, and are 62 ft. long. It required the use of four 3-wheel trucks, hitched tandem to carry each spud. The illustration gives an idea of the method of building up timber beds on the trucks carrying the spuds, so that the train of two caterpillars and four wagons loaded with one piece of great length, may be driven,



TANDEM CATERPILLAR ENGINES HAULING DREDGING SPUD

Mining Co.; J. Owen Ambler is metallurgist and H. A. Clark is smelter superintendent.

COPPER ROOFING FOR DUST CHAMBERS AND FLUES

For some years a number of men prominent in smelting work have held the opinion that copper would make a lasting covering for dust chambers, flues, converter buildings, etc. It will be of interest to many to know that in the Calumet & Arizona Mining Co.'s plant, copper was used for covering the roaster dust chamber, the blast-furnace dust chamber and the reverberatory flue. The copper covering, contrary to expectations, has been rapidly corroded on the underside, and is now being replaced in the dust chambers and flues at this plant. At this writing the cause is not definitely known. At one works where copper roofing was tried, the corroded copper upon examination showed the presence of soluble iron sulphates; these probably brought about the destruction of the copper sheets through well known reactions for which the necessary elements are contained in the flue dust and gases.

❧

A rich deposit of phosphate has been discovered in the valley of the Huasco River, about 300 miles from Valparaiso, Chile. Government engineers are preparing to report thereon.

when necessary, as in this case, around short turns of the road.

For the hauling of ordinary pieces the larger of the two caterpillars was used alone, and two wagons or trucks were commonly used. For hauling a number of small pieces, from four to eight wagons were used. The caterpillar engine is 65 hp. with a speed of $2\frac{1}{4}$ miles per hour loaded and $4\frac{1}{4}$ miles per hour empty. The general dimensions of this caterpillar are: Length over all, 18 ft.; width, 9 ft.; height, 11 ft. The machine is built with two caterpillar tracks and a single forward steering wheel. The tracks are made up each of 22 links, 10 in. long and 20 in. wide. These tracks measure 220 in. around the inside. They are provided with 22-in. sprockets, 10-in. rolls and manganese pins, 2 in. in diameter. In this machine an exact sprocket was not used; the projections were too far apart, which caused a flat wear on the pin rolls. The exact sprocket would act on the pins to a gradual contact that would greatly lessen the wear and increase the efficiency. The error in sprocket construction, which has been positively demonstrated by this character of hauling, may be easily remedied. This was one

*Associate editor. "Engineering and Mining Journal," San Francisco, Calif.

of the earlier engines of this type and much improvement has been made in many respects in the later manufacture.

The wagons or trucks are two lengths, 12 ft. and 14 ft., and each has 3 wheels, the two hind wheels carrying the greater part of the load, the forward wheel carrying a share of the load and being used for steering. The wheels are 50 in. high. The rim or tire of the wheel is made of bent-channel iron, 1-in. thick. The wheel spokes are of $\frac{7}{8}$ -in. steel rods countersunk through the rim and bolted to the hub. The wheels are held in place by a 2-in. pin through the axle at the hub. The hind axle is 4 in. in diameter; the front axle is 7 in. in diameter at the center, tapering to 4 in. at the outer ends; the center pin is 7 in. long, $2\frac{1}{2}$ in. in diameter. There is a 12-in. bearing inside the hub of the forward wheel, this bearing acting as a turntable for the hub.

The body of the wagon is a wooden platform of eight planks, $1\frac{1}{2} \times 10$ in. by 13 ft., laid on a frame supported by steel brackets. For the heavier pieces of machinery like those shown in the photographs, a bed consisting of timbers is constructed. Two pieces of 4x7-in. timbers are set lengthwise of the wagon on top of the platform, one on either side. Two pieces of 7x7-in. timber are laid close together across the center of the wagon and resting on the lengthwise timbers. When two wagons are coupled together a bed of six timbers 12x12-in. by 24-ft., and clamped together, is laid lengthwise on the two wagons. This timber bed rests on two bolsters made of 14x16-in. by 10-ft. timbers. One of these bolsters is placed across the center of each wagon. The king-bolt, $1\frac{1}{2}$ -in. diameter, passes through the timber bed and bolster and on through the joint of the two cross timbers. Thus two of the double wagons may be coupled together and a long heavy piece of steel material loaded so as to rest on two cross timbers, one under either end, as shown in the photographs of the loaded spuds.

The materials hauled were delivered by the Western Pacific Ry. on a spur track, two miles south of Marysville, and were transferred from the cars to the wagons by the use of two hand-derricks. In handling the spuds the use of the derricks was largely dispensed with. The spuds were turned over chiefly by hand and skidded on to the wagons. The unloading of the spuds at the construction camp was done with derricks operated by electric motors. Timber cribbing was built to nearly the height of the wagons and the wagons driven alongside. Then the spud was lifted with the derricks, one end at a time, from the wagons to the cribbing in such position as to be readily placed on the dredge.

This hauling was done under contract by R. N. Anderson, of Oroville, using his own caterpillar engine and eight wagons for most of the hauling and using an extra engine belonging to the Yuba Consolidated Gold Fields when necessary for handling the larger pieces. Since this hauling was done, the Yuba Construction Co. at Marysville, has established the manufacture of the caterpillar-engine.

Fluorspar in 1913

The fluorspar production of the United States in 1913 was the second largest in the history of the industry, the year 1912 having been a record-breaker. The quantity of domestic fluorspar reported to the U. S. Geological Survey as marketed in 1913, was 115,580 tons, compared with 116,545 short tons in 1912. Fluorspar was pro-

duced in 1913 in six states—Illinois, Kentucky, New Mexico, Colorado, New Hampshire, and Arizona—in the order named.

About 80% of the domestic output of fluorspar is consumed as a flux in basic open hearth steel furnaces. It is used also as a flux in blast furnaces, iron foundries, and silver, copper and lead smelters; in the manufacture of fluorides of iron and manganese for steel fluxing; in the manufacture of glass, enameled and sanitary ware and of hydrofluoric acid; in the production of aluminum; and for many other purposes.

The Old-Metal Association

BY SALI B. MOERS*

The enormous strides made in the old-metal trade parallel, if not surpass, those of many other large industries within the last 25 years, and that once despised pigmy has now become a giant. During these years of development the old-metal trade was left to take care of itself. There was no harmony, no union, no established system of practice, of rules and regulation. If the metal dealer had a grievance he had to fight it out by himself and for himself. There was no association to appeal to, to take it up and fight it out. With all this handicap, the business thrived and prospered and enlarged by leaps and bounds, until today it has become a recognized power. It is, therefore, not to be wondered at, that an association should have been organized, for the systematizing of the business by adopting standards, and a classification of old metals that will have to become recognized all over the country, also to uplift the business, with a view to more correct methods of trade, to correct abuses and to consider grievances of any character relating to the metal trade, and to organize in the near future an Old-Metal Exchange, where dealers from all over the country, on becoming members of the association, may do business and make acquaintances, both business and social. To carry out the foregoing there was organized an association, as a section of the National Association of Waste Material Dealers, relating exclusively to metals, and known as the Metal Section. This section was organized at the Hotel Astor several months ago, and has had since two successful meetings. Its officers are those of the paternal organization, most of whose members are more or less interested in the metal trade, but the specific business of the Section is in the hands of committees appointed from the membership of the Metal Section. The association is on lines now existent in Germany, where 86 of the largest metal dealers have joined the association, and it has become so influential that we understand their laws, rules, etc., after being in practice two years, became part of the law of the Empire, in matters of dispute pertaining to this business. The association was honored at its last meeting at the Hotel Astor by the presence of N. Levy, the president and organizer of the Old Metal Association of Berlin, Germany, who favored the association with an address. All signs bespeak a splendid progress for the organization.

A Cement Factory with a Capacity of 150,000 bbl. Yearly is under construction at Binangonan, in the province of Laguna, in the Philippines. Limestone and other materials will be delivered by cableway into the bins at the plant. The machinery will be driven by electricity furnished from a central power plant. The cement can be shipped to Manila by water. It is expected that the plant will be completed by December next.

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Retorting Cyanide Precipitate

BY G. HOWELL CLEVINGER*

SYNOPSIS—To recover zinc from precipitate in a form suitable for further use as precipitant, the apparatus must be air tight, and products of combustion must not come into contact with precipitate. The scheme is feasible and economical when properly designed apparatus is properly used. To be profitable, only those precipitates containing much zinc can be so handled. Faber du Faur furnace with de Saulles-Convers condenser is recommended.

Mr. Megraw's¹ proposal to remove zinc from cyanide precipitate by distillation and recover it in a form available for use again in precipitation, is of particular interest to me as I had occasion some time ago thoroughly to investigate this possibility.

It would not be feasible to use any furnace in which the products of combustion come in contact with the charge for this purpose, for the reason that it would be impossible to prevent oxidation of the zinc vapor. Under this condition the losses of gold and silver would be high, and this could not be ignored, for the zinc dust would be largely zinc oxide and could not be used as a precipitant.

This system of eliminating zinc has been proved feasible when the precipitate is contained in a closed graphite retort or crucible, connected with a suitable condenser. In this connection it is well to bear in mind that the zinc metallurgists have pretty thoroughly threshed out the problem of recovering zinc, and as a result, they still adhere to the retort furnace in which the ore undergoing reduction is heated in small, closed retorts out of contact with the products of combustion.

The removal of zinc by distillation from cyanide precipitate was first proposed by Sulman and Teed², and actually applied by them prior to 1897, in connection with their bromo-cyanide process as practiced at Deloro, Canada. In this connection Pickard determined that the loss of gold when heated in the presence of zinc is largely due to oxidation. He pointed out that when zinc and gold are heated together in a muffle furnace or a retort with air freely passing through, the loss of gold is serious. In retorting, he states that the loss of gold appears to be largely a function of the amount of oxygen which enters the retort. However, when the retort is closed and carbon is present, and there is a continuous flow of zinc vapor without the formation of zinc oxide, the loss of gold is small. In retorting precipitate, he found that even after this chemical cause for the loss of gold was eliminated, there was still a mechanical loss, due to the formation of miniature geysers and explosions throughout the finely divided precipitate by reason of the rapid evolution of zinc vapor, which projected particles of precipitate out of the retort. It was found that mechanical loss could be overcome by mixing the precipitate with a soluble carbonaceous substance as gum, flour, starch, sugar or molasses. In the work which is recorded, sugar with a small amount of borax was used as a binding agent and

a source of carbon. The sugar and borax were added to and mixed with the wet precipitate and after drying, the bone-dry cake was broken into pieces about the size of a walnut and charged into a large graphite retort heated in a Faber du Faur furnace. Upon heating the mixture, there resulted an open, spongy mass, which served to hold the precipitate together, but was sufficiently porous to provide a free passage for the zinc vapor.

The following is an example of the charge retorted at Deloro: Precipitate, 55 lb. (containing 70 oz. of gold); sugar, 12½ lb., and borax, 1 lb. The coal required for retorting a charge was about 300 lb., and the total time of the operation about 10 hr. The ingot cast directly from the retort contained 64 oz. of the 70 oz. of gold originally present in the precipitate; the remaining 6 oz. of gold being in the slag produced. One melt in a No. 33 crucible recovered this remaining 6 oz. of gold. The condensed vapor from the retort contained constantly

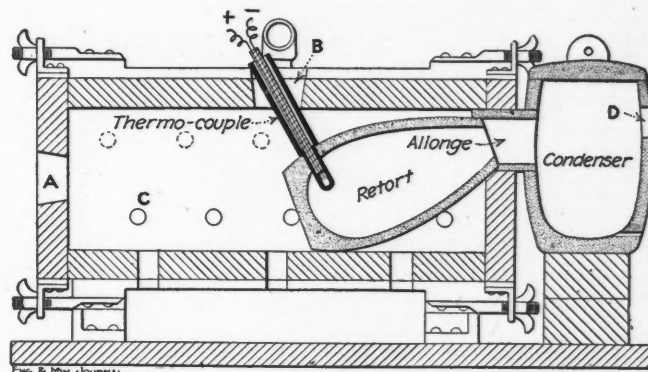


FIG. 1. TRANSVERSE SECTION OF FURNACE AND EQUIPMENT USED FOR DISTILLATION EXPERIMENT

about 1 oz. of gold per ton, regardless of the grade of precipitate retorted. The fineness of the bullion in this case ranged from 750 to 820. No mention is made of the proportion of zinc remaining in the bullion at the end of the operation. Apparently no attempt was made to recover it in a form which could be used again in precipitation.

Magenau³ gives an account of an attempt which was made at Mercur, Utah, prior to 1900, to remove zinc by mixing the precipitate with charcoal and lead and retorting in a Faber du Faur furnace. It was proposed to recover the gold and silver from the lead by cupellation. The reasons given for the failure of this experiment were the impossibility of reducing the large proportion of zinc oxide present with the temperature it was possible to attain with the equipment used, and the persistent retention of combined water by the precipitate, which caused explosions in the retort. There were also said to be minor mechanical difficulties which arose.

In 1902 I carried on a series of experiments in the metallurgical laboratory of Columbia University

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¹"The Treatment of Cyanide Precipitates." Herbert A. Megraw. "Eng. and Min. Journ.," Vol. 97, p. 612.

²"The Sulman-Teed (Bromo-Cyanide) Process of Gold Extraction." H. Livingstone Sulman and Frank L. Teed. "Jour. Soc. of Chem. Ind.," Vol. 16, pp. 966, 967.

³"Some Observations on Practice of the Cyanide Process at Mercur, Utah." Wm. Magenau. "Min. and Sci. Press," Vol. 80, 492.

⁴"The Refining of the Precipitates Obtained by Means of Zinc in the Cyanide Process of Gold and Silver Extraction." G. Howell Clevenger. "Trans." Amer. Inst. Min. Eng., Vol. 33, pp. 908, 917.

with a view of ascertaining whether it was feasible to remove zinc from cyanide precipitate and condense it in a form available for reuse in precipitation by distillation. Careful consideration seemed to indicate that the difficulties encountered in the Mercur experiments were due to insufficient heat. The incomplete reduction of zinc oxide was doubtless largely due to the fact that there was not sufficient carbon present. The explosions attributed to combined water were most probably due to the formation of a crust on top of the charge, due to lack of heat, as it has been pointed out in connection with the retorting of the zinc crusts in the Parkes process that it is necessary to maintain the temperature well above the boiling point of zinc until distillation is completed, otherwise crusts form and explosions occur.⁵

The precipitate used in making these experiments was the result of zinc shaving precipitation and showed the following composition:

ANALYSIS OF PRECIPITATE		
Element	Per Cent.	Remarks
Gold	16.639	
Silver	23.166	
Iron	0.170	
Aluminum	0.800	
Calcium	6.680	
Magnesium	0.070	
Zinc (as metal).....	14.510	Determined by $\text{Fe}_2(\text{SO}_4)_3$ method; likely high
Zinc (as oxide).....	18.060	
Lead	0.730	
Arsenic .....	.....
Antimony .....	.....
Mercury .....	.....
Cadmium	Trace	
Copper	0.870	
Manganese	0.100	
Silica	1.760	
Sulphur	0.210	
Carbon dioxide.....	3.770	
Moisture .....	.....
By difference cyanide, oxygen alkalies and matter not determined	12.465	
Total	100.000	

The distillations were made in a small graphite retort, the counterpart upon a small scale of those used for retorting the zinc crusts in the Parkes process. The retort was heated in a cylindrical gas-fired furnace. A No. 100 graphite crucible connected to the retort by a section sawed from a small crucible, which acted as an allonge, served as a condenser. A section of the apparatus is shown in Fig. 1.

A mixture of 300 grams of precipitate with 500 grams of test lead and 50 grams of charcoal was placed in the graphite retort, and heated slowly in the gas furnace for 1 hr., until all moisture was expelled. The temperature was then raised and the heating continued for 5 hr. The weight of zinc recovered from the condenser was 74 grams, or 85% of the zinc present. The condensed zinc contained, by assay, 7.2 oz. of silver and 0.8 oz. of gold per ton. This experiment established the fact that zinc could be expelled by distillation without explosions, and in fact more completely than by acid treatment. It also established the fact that volatilization losses were small, and in view of the fact that it was proposed to condense the zinc in the form of a dust available for use again in precipitation, they would be of no moment.

Another mixture of 400 grams of precipitate, 100 grams of charcoal, and 100 grams of granulated lead was retorted as before. In this experiment a thermo-couple was introduced into the retort as shown in Fig. 1. Temperature measurements were taken at 15-min. intervals, as noted in Table I. In this experiment there was a

smaller loss of gold and silver by volatilization than was noted in experiment I.

TABLE I. TEMPERATURE RECORD

Time	Temperature, Degrees C.	Remarks
10:30	22	Time of starting
10:45	159	
11:00	450	
11:15	671	First signs of zinc
11:30	874	
11:45	1011	
12:00	1100	
12:15	1125	
12:30	1206	
12:45	1269	
1:00	1287	
1:15	1310	
1:30	1310	
1:45	1362	
2:00	1382	
2:15	1400	
2:30	1414	
2:45	1420	
3:00	1382	
3:15	1400	
4:00	1414	
4:15	.....	No temperature taken at the last two points
4:30	.....

A third 200-gram sample of precipitate was mixed with 200 grams of test lead, and 50 grams of charcoal and retorted. Temperature readings were taken as before at 15-min. intervals. A sample of the contents of the retort was removed every half-hour, and zinc determined. The record of this test is given in Table II:

TABLE II. RECORD OF RETORTING

Time	Temp. Degrees C.	Per Cent. of Zinc in Charge	Per Cent. of Zinc Expelled	Remarks
11:15	20	11.58	0.0	First zinc appeared at 671° C.
11:30	498	.....	.....
11:45	866	10.51	9.2	
12:00	1055	.....	.....
12:15	1055	9.72	16.1	
12:30	1119	.....	.....
12:45	1166	6.95	40.0	
1:00	1185	.....	.....
1:15	1197	4.41	61.9	
1:30	1204	.....	.....
1:45	1206	1.48	87.2	
2:00	1210	.....	.....
2:15	1210	1.82	84.2	
2:30	1250	.....	.....
2:45	1225	0.53	95.4	
3:00	1265	.....	.....
3:15	1275	0.38	96.7	
3:30	1284	.....	.....
3:45	1284	0.19	98.3	
4:00	1281	.....	.....
4:15	1281	0.10	99.1	

Another 150-gram sample of precipitate was mixed with 40 grams of charcoal. No lead was added. In this experiment temperature measurements were made and a sample for the determination of zinc was removed at 15-min. intervals. The record of this test is given in Table III:

TABLE III. RETORTING RECORD

Time	Temp. Degrees C.	Per Cent. of Zinc in Charge	Per Cent. of Zinc Expelled	Remarks
1:00	22	24.50	0.0	
1:15	820	24.28	1.0	First zinc appeared at 750° C.
1:30	1015	23.90	2.4	
1:45	1134	28.67	3.1	
2:00	1163	17.77	27.4	
2:15	1194	5.41	77.9	
2:30	1194	4.98	79.6	
2:45	1209	4.50	81.6	
3:00	1214	2.40	90.2	
3:15	1209	1.72	92.9	
3:30	1204	1.92	92.2	
3:45	1221	2.40	90.2	
4:00	1229	1.00	95.9	
4:15	1239	0.68	97.2	
4:30	1264	0.68	97.2	
4:45	1274	0.62	97.4	
5:00	1264	0.43	98.2	
5:15	1290	0.38	98.4	
5:30	1274	0.38	98.4	
1:45	1280	0.19	99.2	
6:00	1296	0.10	99.6	

A fifth mixture was of 95 grams of precipitate with 95 grams of borax glass, 25 grams of soda, 30 grams of silica, and 400 grams of test lead. It was retorted under the same conditions as obtained in the previous experiments. Temperature measurements were not taken in this experiment on account of the difficulty of protect-

⁵"Metallurgy of Lead." 6th Ed., p. 490. H. O. Hofman.

ing the thermo-couple. The object of the experiment was to determine whether a fusible slag could be formed from which the lead would completely separate, but although there was a large excess of fluxes used, the material came out of the retort as a sintered mass. This was probably due to the large excess of charcoal in the charge. The residues after distillation showed 0.14% of zinc. The condensed zinc contained 3.86 oz. of gold, and 35.8 oz. of silver per ton. About the same temperature was maintained as in the fourth experiment. Apparently the presence of the fluxes caused a higher volatilization of gold and silver.

The retorting of cyanide precipitate, while resembling the practice of retorting the gold-silver-zinc alloys obtained in the Parkes process is different in that a larger proportion of charcoal is necessary by reason of the higher percentage of zinc oxide and carbon dioxide generally occurring in precipitate. In both cases the best results are obtained by raising the heat to the proper temperature at once and maintaining it at this point throughout the distillation. The time required for almost total expulsion of zinc upon a small scale was found to be four to

97.1% of metallic zinc. Later, as the zinc vapor became less diluted with carbon-monoxide, and the condenser became hotter, a portion of the zinc condensed as a liquid bath and the remainder as zinc dust, which in its highly heated condition rapidly oxidized to zinc oxide through the admission of air to the condenser. It might be mentioned that the condenser used was not air tight.

The proper conditions for the formation of zinc dust seem to be that the vapor be diluted with some inert gas, such as carbon monoxide, which, of course, is always present if the proper amount of carbon has been used, and that condensation take place below the melting point of zinc, without access of air.

Shortly after the publication of the account of this work, A. B. de Saulles,⁶ of the New Jersey Zinc Co., called my attention to U. S. Patent No. 695,376, which had been granted to G. G. Convers and himself, Mar. 11, 1902, for a condenser to be used in connection with the ordinary zinc-distillation furnace which was designed to condense the whole of the zinc vapor as zinc dust.⁷

It is apparent that this type of condenser could be readily used in conjunction with the Faber du Faur re-

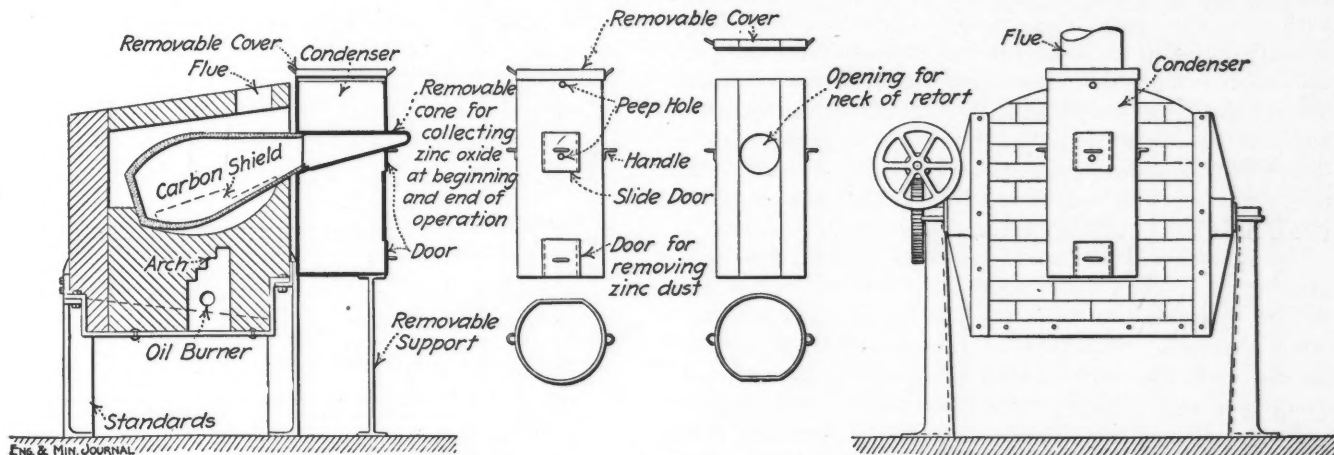


FIG. 2. PROPOSED ARRANGEMENT OF OIL-FIRED FABER DU FAUR FURNACE AND CONDENSER

five hours. About 90% of the zinc was removed in the first 2½ hours, and at a temperature not much exceeding 1200° C. To remove the remaining zinc required from 1½ to 2½ hours, and a somewhat higher temperature. It seems desirable to heat the material at the last to about 1300° C. in order to remove the last zinc. This operation seems to be somewhat analogous to the removal of mercury from amalgams by retorting; thus the most of the mercury is removed at a comparatively low temperature while the last requires a high temperature; in fact, so high that mercury is not entirely eliminated, even when the retort sponge is melted. It will be noted that the volatilization of gold and silver is not excessive, and in view of the fact that the zinc can be reused in precipitation it is of no moment. Indeed, it would appear that the presence of a small proportion of gold and silver in the zinc dust would tend to render it more active as a precipitant. In the course of these experiments it was not possible to determine the exact conditions required to cause the zinc vapor to condense as zinc dust free from oxide. It was, however, noted that when the condenser was cool and the zinc vapor was largely diluted with carbon monoxide, it readily condensed as dust fairly free from the oxide. A sample of this zinc dust showed

tort furnace for retorting precipitate and practically the whole of the zinc vapor condensed in the form of zinc dust, which would be suitable for use as a precipitant. In Fig. 2, I have shown this form of condenser attached to an oil-fired Faber du Faur furnace, such as are used at Perth Amboy.⁸

Convers and de Saulles⁹ give the following conditions as being necessary for the condensation of the whole of the zinc vapor as zinc dust: The zinc vapor should pass at once into a collecting chamber sufficiently large to receive it, and care should be taken that the pipe or connection through which the vapor is discharged into the condenser shall be always above the boiling point of zinc.

⁶Personal communication in 1903.

⁷Generally, in retorting of zinc ores, the aim is to condense as high a percentage of the zinc as possible in the molten condition, which, when cast into slabs, is known on the market as spelter. Zinc dust, which is now largely used for precipitating cyanide solutions, is a byproduct, which results from the condensation of zinc vapor, which escapes from the spelter condensers, or is not in proper physical condition for condensation to spelter, in flue chambers beyond the spelter condensers. It appears that this source of supply has generally satisfied the market, although a more regular grade of zinc dust would result if more attention were paid to its special production.

⁸"Drawing of Oil-Fired Faber du Faur Furnace." "Eng. and Min. Journ.," Vol. 83, p. 84. Drawing U. S. Patent 695,376.

⁹Specification U. S. Patent 695,376.

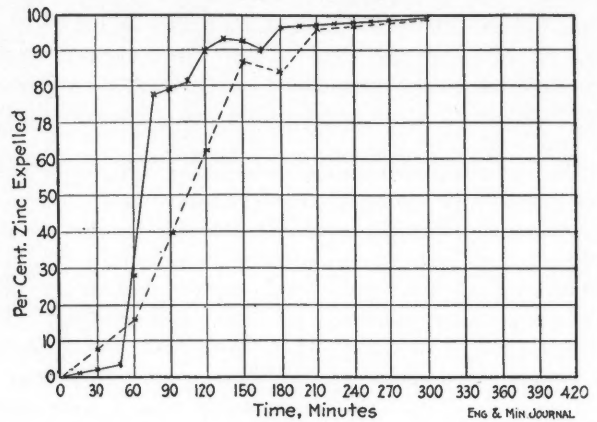
At the beginning of the operation when the retort contains a quantity of air, and at the end of the operation when the charge contains a small proportion of zinc, more or less zinc oxide is produced. This is taken off separately by means of the removable cone indicated in the drawing of the condenser. When the zinc oxide ceases to deposit, this cone is removed through a door on the side of the condenser, and the zinc dust allowed to collect in the main body of the condenser. Toward the end of the operation, when the zinc oxide again begins to form, the cone is introduced a second time. In this way the zinc oxide is kept separate from the unoxidized zinc dust collected in the main body of the condenser. This condenser, due to simplicity, and apparent effectiveness, should leave little to be desired in this direction. Doubtless careful experimentation would be necessary in the beginning in order to determine the size of condenser and other minor details of equipment necessary for any particular case.

The particular sample of precipitate upon which my experiments were made presented the same general appearance at the end of retorting that the mixture did at the beginning, but upon close examination it was found that the gold and silver had taken the form of fine shot, with generally several large masses of bullion, especially if lead was used, as it considerably increased the bulk of the metal. When hot, this mass could be poured from the retort like so much sand, there being no tendency to stick. It was found that the retort could be easily washed or cleaned by adding metallic lead while it was still hot, and shaking. This lead was added to the main mass of precipitate before cupeling.

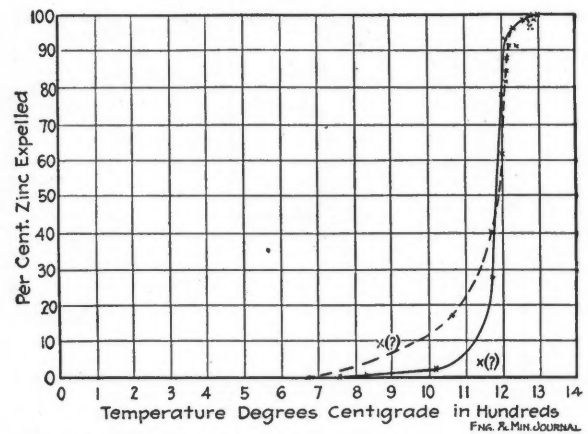
The practice at Deloro of retorting without lead and pouring the bullion direct from the retort would not appeal to be feasible in cases where it was necessary to add much charcoal. Regardless of the proportion of carbon or lead used, the residues after addition of copper fluxes could be readily melted in the blast furnace or cupeling furnace. Briquetting would doubtless be desirable, but on account of the change in the physical condition of the gold and silver, perhaps not so essential as where retorting was not practiced. Retorts would have a longer life if fluxes were not added at this stage.

As a result of my investigation I was convinced that this method of eliminating zinc and converting it into a form available for precipitation was entirely feasible and could be readily applied by using the ordinary Faber du Faur furnace fitted with the Convers and de Saulles condenser. I have never had the opportunity of trying this method upon a large scale, and so far as I know, no one else has given it a trial with proper equipment. Retorting appears to be more attractive since the general introduction of crude oil as a fuel, as the intense heat necessary for successful operation can be more readily obtained with an oil burner than with coal. The amount of attention necessary with oil would be a minimum. In my opinion retorting would not be advantageous, in fact, unnecessary, except in cases where successful precipitation necessitates the use of a considerable excess of zinc, and as a consequence the formation of a precipitate containing a high percentage of zinc. In the case of precipitate resulting from the treatment of silver ores, or from silver-gold ores, in which silver predominates, it has been found possible with proper manipulation to obtain precipitate containing a surprisingly small proportion of zinc, and upon which the practice of any method for the removal

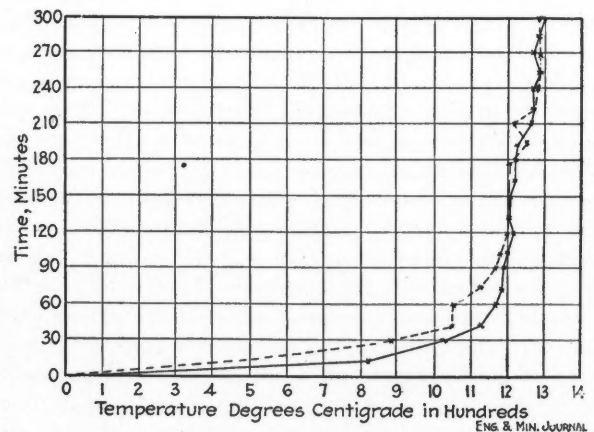
of zinc would be superfluous. On the other hand, in precipitating low-grade gold solutions a considerable excess of zinc is essential, and as a result the precipitate contains much zinc, which should be removed before melting. In present practice the zinc is dissolved by acid; at best a disagreeable operation, and one in which the zinc is



EFFECT OF TIME ON ZINC EXPULSION. WITH LEAD, DOTTED LINE; WITHOUT, FULL LINE



EFFECT OF TEMPERATURE ON ZINC EXPULSION. WITH LEAD, DOTTED LINE; WITHOUT, FULL LINE



RATE OF HEATING

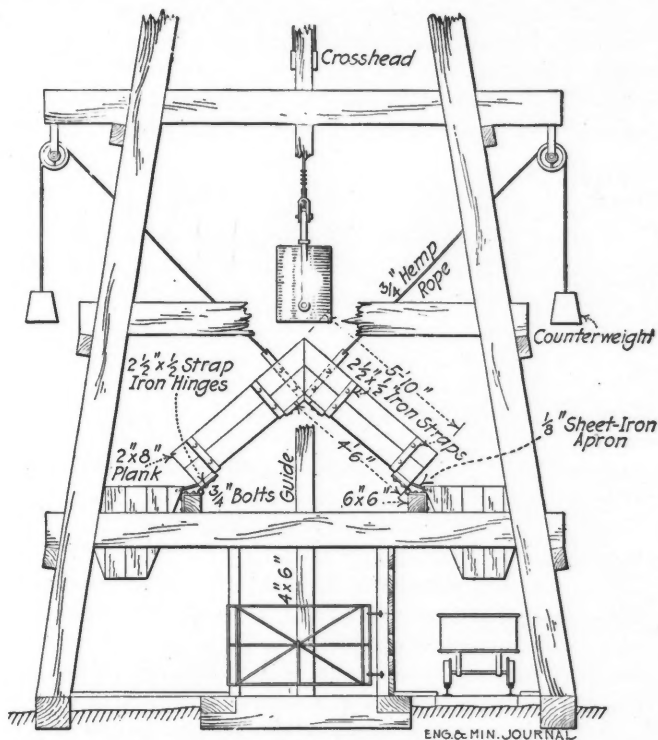
lost. In such cases retorting seems to be a promising possibility. Retorting should not be attempted unless the proper equipment is provided. Makeshift experiments in crucibles, without provision for obtaining the high temperature necessary, are certain to be disappointing.

Details of Practical Mining

Shaft Cover and Chute for Sinking

By W. H. JOBE*

The arrangement here illustrated, taken from my annual report for 1912-13, is one devised for the Armenia mine, near Crystal Falls. A cover over the hoisting compartment consists of two chutes opening outward; it resembles a roof when in position. The bucket is hoisted above the cover, which is then closed by pulling the counterweight rope; the bucket is dumped to one side or the



COMBINATION COVER TO CATCH CONTENTS OF BUCKET

other and the contents slide down in the chute cover to a hopper over a waiting car. The covers are opened by pulling the counterweight rope in the opposite direction and the bucket is lowered. The details of construction are shown in the drawing. The cover is made of 2-in. plank and lined with 1/8-in. sheet iron.

Reversal of Air Current in Mine Fires†

Reversal of air current during a mine fire will cause the smoke and gases to seek escape through the opening that was previously the downcast. If men are escaping through such an opening, they may be overcome by the gases. If we assume that there is a fire in one of two or

*Inspector of mines for Iron County, Crystal Falls, Mich.
†From U. S. Bureau of Mines Technical Paper 59, by Edwin Higgins.

more shafts, all connected underground, the shaft in which the fire exists will upcast. Water played upon the fire, or into the shaft, will likely cause the current to reverse. Obviously, then, it is not safe to throw water on the fire until it is certain that all of the men are out of the mine. If, however, tight ventilation doors or fire doors are provided, they may be closed as the men leave the fire zone and the men will then be in no danger from smoke or gas. The doors will serve the further purpose of shutting off the supply of air from the fire and thus aid in extinguishing it. The danger from this source is a fact; witness the Belmont and Giroux fires a few years ago.

Gopher-Hole Blast at Chino*

At the Chino mine in New Mexico, the benches are usually blasted by a combination of vertical churn-drill bores and approximately horizontal machine-drill lifters or "toe holes." At one cut, because of trouble encountered in chambering the churn-drill holes and because of danger to the steam shovel, it was decided to try a mammoth blast using gopher holes, largely as an experiment. The bench was 300 to 400 ft. long with an abrupt rise of 75 to 100 ft.

Three adits were driven as shown in Fig. 1, 3 ft. wide

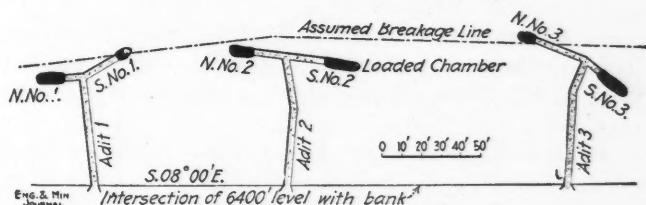


FIG. 1. PLAN OF EXCAVATIONS

by 5 ft. high, both machine and hand drilling being used. From the ends of these, crosscuts were run to each side and the ends chambered to receive the powder. The muck from the main adits was dumped around the entrances. That from the crosscuts was thrown back and leveled over the bottom so as to half fill the crosscuts to the adit, leaving only a 2x3-ft. space to permit the passage of a man. The amount of chambering was determined by the amount of powder necessary to break the calculated yardage. This yardage was estimated on the assumption that the blast would break to a line 10 ft. back of the breasts of the main adits, and run to the surface on a 1:1 slope.

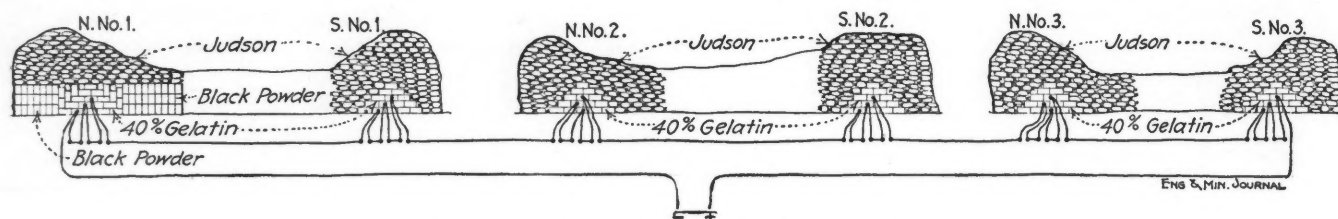
The total footage of the openings was 352; the work was carried on at first in two 9-hr. shifts and later in three 8-hr. shifts. With the latter system, two men were employed in each face, 18 men altogether per 24 hr. The laborers were Mexican, the miners being paid \$2.75, the muckers, \$2 per day. The work took 31 days to com-

*An abstract of an article by R. I. Kirchman in the "Colorado School of Mines Magazine," May, 1914.

plete. Loading was begun at once after the excavation was completed and required three days, using four powdermen and 10 laborers in 10-hr. shifts only. A path was made on the bottom of the workings consisting of boards laid loose, end to end, in a single row without rails. The powder boxes were slid along the board path to the loading chambers. Pocket electric flash lamps were used for illumination, the batteries giving a fair light for about 24 hours.

Chamber	Pounds of Powder Loaded			Ratio of Explosive Charge to Ignition	Total Powder
	Black	Judson	Gelatin 40%		
N. No. 1.....	7725	2,400	800	12.65	10,925
S. No. 1.....	.....	5,500	500	11.00	6,000
N. No. 2.....	.....	5,250	600	8.75	5,850
S. No. 2.....	.....	9,250	800	11.56	10,050
N. No. 3.....	.....	7,050	500	14.10	7,550
S. No. 3.....	.....	9,050	900	10.05	9,950
Total ...	7725	38,500	4,100	11.27	50,325

Gelatine, black powder and Judson powder were used for charging. Chamber No. 1 was loaded first. The ends of the gelatine boxes were broken open and the boxes placed end to end in the form of a pyramid down the center of the chamber. Three electric fuses were placed in each chamber in the middle boxes of three tiers. Extreme care was necessary not to injure the electric fuse



.FIG. 2. DIAGRAM OF THE MANNER IN WHICH THE CHAMBERS WERE LOADED

wires and to avoid undue pressure on fuses or gelatin. The Gelatin was du Pont 40% Repauno; the fuses, Victor No. 7 in 10-ft. lengths with a resistance of 1.2 ohms each.

Around the gelatin was placed black powder in 25-lb. cans. About three-quarters of this black-powder charge was loaded from the breast to the front of the chamber and half-way up to the back. Judson powder in 12½-lb. paper bags was placed upon the powder cans, as compactly as possible and filled the pocket clear to the back. The opening to the chamber was sealed with the remaining one-quarter of the powder cans, to avoid any danger of damage to the gelatin and Judson powder when tamping.

The different chambers were connected in series with No. 14 lead wire. All electric fuses were carefully tested with a du Pont galvanometer. This instrument shows the presence of a circuit, as well as the resistance contained therein. All completed circuits in the different chambered pockets were tested before sealing with muck. The lead wires from each chamber were laid on top of the muck and in one corner of the passage and were protected by pieces of wood broken from the powder boxes and placed at an angle above them. These lead wires were uncoiled as fast as the tamping proceeded.

The tamping was a slow and laborious process. The muck had to be carried in powder boxes and slid along planks. These were then dumped into the receding filled faces. At intervals of about 3 ft., the circuits were tested in all the drifts to detect any wires broken by tamping.

During the loading, the men suffered from powder headaches which were sharp and annoying, but soon passed away in most cases. The tamping progressed more rapidly after the main adits were reached. The fill was carried to the entrances of all the adits. An unusual source of danger existed for a few days, namely, the presence of electrical storms; and the precaution of keeping all lead wires well within the adit entrances was observed.

The lead wires from the several entrances were connected in series. A pair of main lead wires was laid a distance of 1500 ft. north from the entrance of adit No. 1. These main leads were not connected to the adit leads until the time for blasting arrived. The blasting machine, a du Pont 1-75 fuse, was cleaned by holding a piece of paper between the armature and the brushes and rapidly rotating the former. The platinum contact point was also cleansed with paper. A du Pont rheostat was used to test the machine.

For blasting the adit, lead wires were connected to the main lead wires outside. A guard was stationed over the terminals, until the moment of blasting. The final circuit was tested with the galvanometer, a resistance of about 24 ohms being found, which was about right. The

eighteen 10-ft. fuses used should have had a total resistance of 21.2 ohms; the remaining 2.8 ohms was due no doubt to imperfect connections. The resistance of the main leads was practically nothing.

The warning signal for blasting, a series of short toots, was given by a steam shovel. After a lapse of three minutes, the battery was sprung. The blast threw some boulders a distance of from 400 to 600 ft. The main mass of the material was not thrown over 200 ft.

Broken material equal to 60,000 cu.yd. (solid) was removed and a rough estimate of the remaining material would be about 40,000 cu.yd. The load was a trifle too heavy for this class of overburden. A load of one pound of powder per 3 or 3½ solid cubic yards would have yielded better results. But as an experiment for future reference, this was a successful blast. The engineers' figures of volume to be broken gave 118,660 cu.yd., representing a loading ratio of 0.425 lb. of powder per cu.yd. of material to be broken.

❧

Injury to Miner in Drilling

Under the rule that although a miner is required by law to exercise a reasonable degree of care for his own safety, he does not assume the risk of a hidden danger over which he has no control; a miner engaged in drilling holes as a preliminary to blasting does not assume the risk of being injured by drilling into an unexploded charge left by another shift of miners, if he had no knowl-

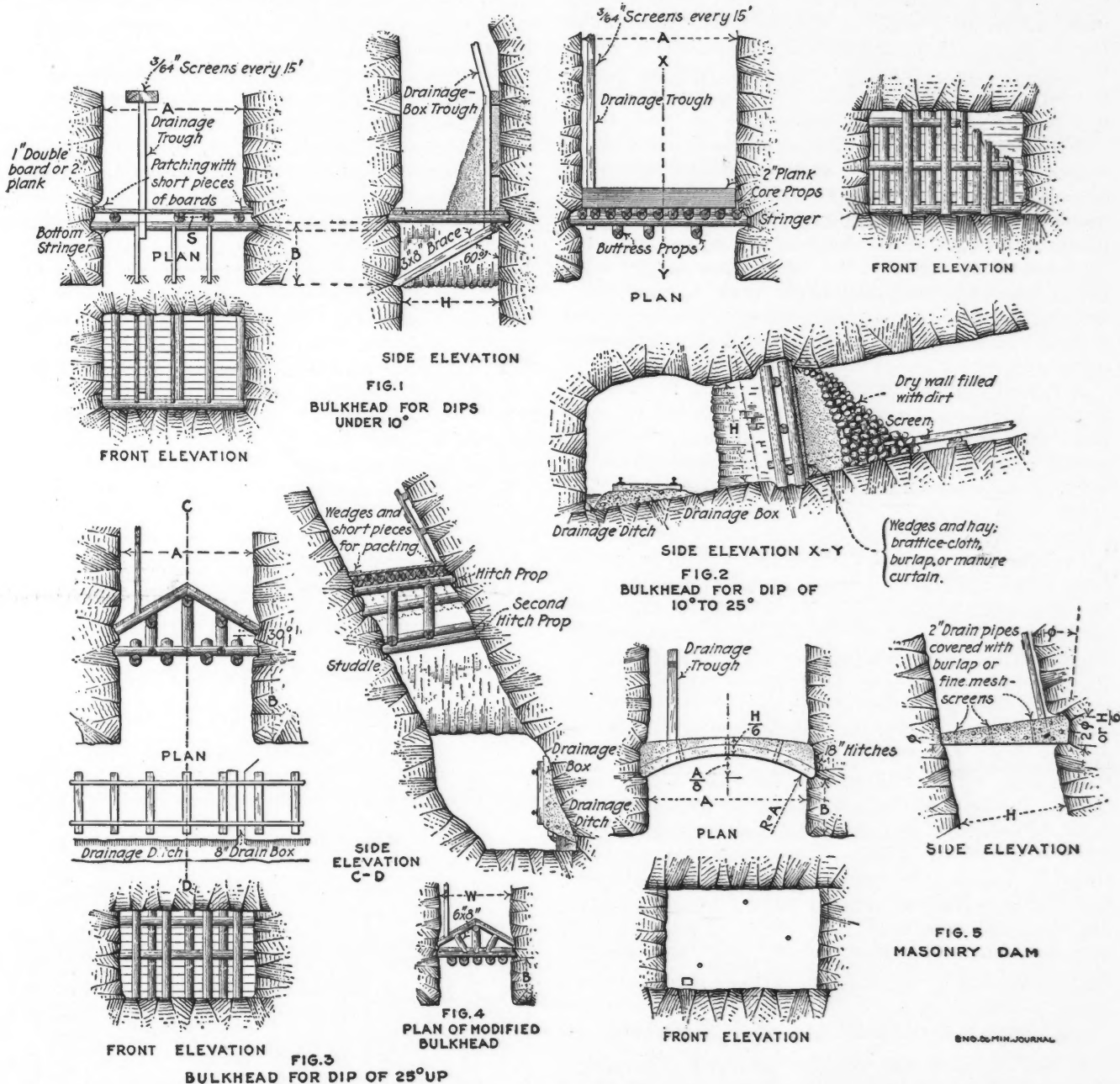
edge as to its presence. (Nevada Supreme Court, Peterson vs. Pittsburgh-Silver Peak Gold Mining Co., 140 Pacific Reporter, 519.)

Bulkheads for Hydraulic Filling*

In the anthracite regions of Pennsylvania, where hydraulic filling for the underground workings is extensively practiced, certain types of bulkheads have become

Certain rules for proportioning the various dimensions are as follows:

The haunch distance *B* should be one-half the width of the opening for flat workings or workings dipping up to 10°; two-thirds the width of the opening for chute workings, those dipping between 10° and 25°; and the same for pitch workings, those dipping more than 25°. The width of opening is designated by *A* in the illustrations. The props should have a diameter in inches equal to their length in feet for flat workings, one-half greater for



TIMBER AND MASONRY DAMS USED IN ANTHRACITE MINE WORKINGS OF VARIOUS DIPS TO CATCH FLUSHED FILLING

standard for confining the filling to its proper resting place. The design of these will vary chiefly with the steepness of the working; that is, the dip of the coal bed. The particular functions of such a bulkhead are to retain the solid material and permit the passage of water.

*Note—An abstract from Bull. 60, "Hydraulic Mine Filling," U. S. Bureau of Mines.

chute workings, and three-quarters greater for pitch workings. The spacing of the props across the opening

is determined as follows: For flat workings, $S = \frac{A}{H}$;

for chute workings, $S = \frac{2A}{3H}$; for pitch workings, $S =$

$\frac{4A}{7H}$, it being understood that A = the width of the opening in feet, H = the height of the opening in feet, S = the distance from center to center of props in feet.

For flat workings, the method of construction is shown in Fig. 1. The props are securely wedged at the top, and manure or dirt is firmly packed around the bottom after the bottom plank has been attached, to prevent leakage. The inside of the line of props is lined with 1½-in. planks or double 1-in. planks, the bottom, sides and tops being carefully joined or patched by short pieces of board nailed to the main boarding and the solid coal or pillar. For the steeper of the flat workings, a hay, straw, burlap or brattice-cloth packing is used, or a drainage trough is inserted, as shown, the object of either method being to avoid excessive hydraulic head.

The method of constructing a bulkhead for a chute working is shown in Fig. 2. In some cases buttress props are advantageous. Drainage should be effected by the use of a trough, as illustrated. The chief advantage of this trough method is the fact that the water is rendered available for use again in the shortest possible period of time. Where the inclination of the work is 18° or more, manure, straw or hay is placed between the two courses of boards as a screener, and in many places a dry wall is constructed to act somewhat as a filter.

A typical bulkhead for a pitch working is shown in Fig. 3. The spacing rule in such cases may call for more props than can be inserted in one row, and therefore a second row becomes necessary. The V-form shown in Fig. 3 is one intended to resist the highest pressures. The construction shown in Fig. 2 is also applicable, using horizontal timbers hitched into the side of the working for reinforcing purposes. Where the V-form is used, a layer of fine manure and dirt is placed as a bedding for the first layer of timbers in the bottom hitches. The planking is placed vertical, with as few nails as possible. Fig. 4 shows an alternative method of arranging the timbers. The use of a screener and a dry-wall filter is important with pitch workings.

Masonry is frequently desirable instead of timber, the most common form of bulkhead being that of a full-struck arch, with radius equal to the width of the opening, the thickness of the bulkhead at the haunches being equal to one-third of the height, and the crown equal to one-sixth of the height. These conditions are illustrated in Fig. 5. Dry walls are also used for bulkheads, and offer the advantage of being both a filter and a retaining wall at the same time. Concrete bulkheads have been tried and found advantageous where great pressures are encountered and timber is expensive.

Titanite--A New Explosive

A new explosive has been invented and patented by Norbert Ceipek, of Vienna (Brit. pat. 9743 and 13,549 of 1911). It is essentially an ammonium-nitrate explosive to which turmeric powder is added, for which many advantages are claimed. The turmeric or curcuma root is nitrated by boiling in water to extract coloring substances, drying, grinding, treating with a mixture of sulphuric and nitric acids, washing and drying the product of the reaction. Carbonized turmeric powder may be similarly nitrated. Ammonium-nitrate explosives usually contain carbonaceous material, and carbonized tur-

meric powder and carbonized sandalwood are recommended as excellent for this purpose, the sandalwood hastening the speed of combustion. As a formula for an explosive compounded along these lines, the following is suggested: Ammonium nitrate, 88%; carbonized turmeric powder, 1.05%; carbonized sandalwood, 0.95%; nitrated turmeric powder, 10%.

It has been found, however, that the carbonized material is unnecessary when the nitrated turmeric powder is used and a simpler formula offered is: 80 to 90 parts of ammonium nitrate and 20 to 10 parts of the nitrated turmeric powder, carefully dried, intimately mixed and finely ground.

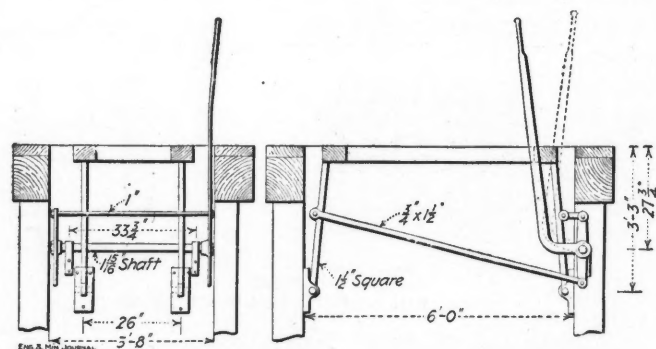
The addition of trinitrotoluene and gelatin, the latter consisting of collodion cotton and dinitrotoluene, results in an explosive of greater strength. A formula for such a compound would be: Ammonium nitrate, 82 parts; nitrated turmeric powder, 4 parts; trinitrotoluene, 10 parts; gelatin, 4 parts; (the latter to consist of 0.17 part of collodion cotton and 3.83 parts of dinitrotoluene.)

It is claimed that these explosives are stable when stored, the hygroscopic quality of the ammonium nitrate being overcome; that they are entirely safe, being insensitive to blows, shocks and fire, and exploding only from an initial explosion as by a powerful detonator; that they are powerful in their effect, and that they yield only a small amount of noxious gas. As a matter of fact, these claims have been pretty well borne out by trial at one of the largest mines in this country. The difficulty in the way of the general introduction of the explosive, which is called titanite, seems to be that ammonium nitrate cannot now be obtained quite cheap enough to enable the titanite to compete in price with the other high explosives in common use.

Simple Cage Chairs

BY PERCY E. BARBOUR*

A simple type of landing dog or cage chair is giving satisfactory service on various stations in the Uwarra shaft at Candor, N. C. The dogs were made in Charlotte,



ARRANGEMENT OF CAGE CHAIRS IN THE SHAFT

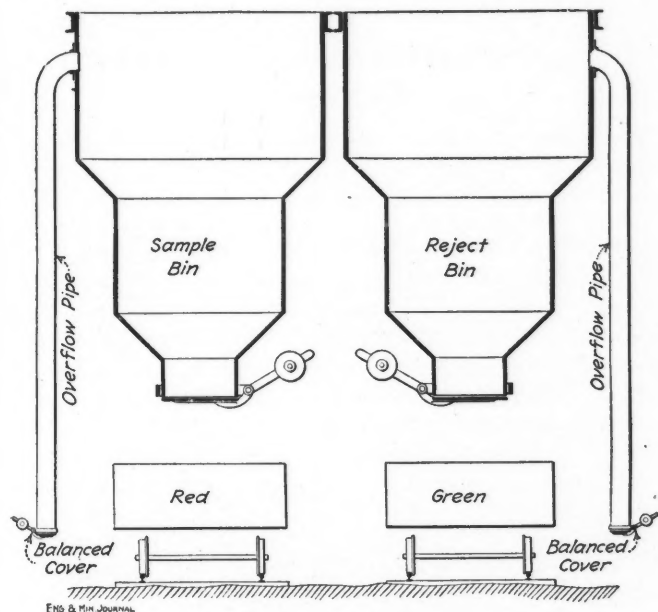
weighed, complete, 465 lb., and cost the mining company \$60. This is nearly 13c. per lb. and is too high, although there is a good deal of forging in the set. The drawing shows the details of construction.

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

Details of Milling and Smelting

Overflow Indicator for Sample Bin

In the Snyder sampling plant at the works of the Deloro Mining & Reduction Co., at Deloro, Ont., the sample and reject bins are steel receptacles placed alongside each other. Trouble was experienced in having the sample bin fill up and overflow into the reject bin, or vice versa. To avoid this, a slot was cut in each bin near the top, and a pipe fixed to it, leading down to the operating floor. The ends of these pipes were covered with automatically closing covers so balanced that a stream of material would open them, while at other times they remained closed. When the bins fill up to the danger point the material flows out of the slot before overflowing into the adjoining bin. Falling through the pipe to the oper-



OVERFLOW FOR FINE-ORE BINS

ating floor, the attendant is at once notified that the bin is full and the contents must be removed.

These sample bins are emptied into cars which run beneath them. In order to insure the same car being used for the sample at all times, the sample bin and car are painted red, while the reject bin and its car are painted green. The accompanying sketch shows the arrangement.

Lime Grinding at the Dome Mill

In order to secure a constant and uniform stream of lime water for mill use, the Dome mill has installed a two-stamp Hendy battery for the purpose. Lime will be fed through an automatic feeder into the mortar, where it will be ground and put into the pulp circuit where

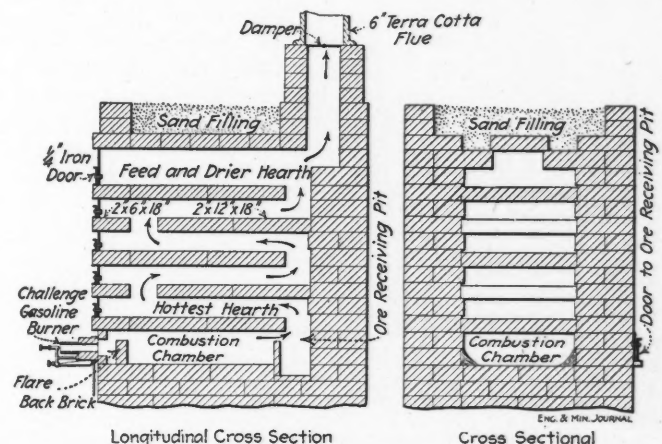
required. This installation is similar to the one at the Homestake plant, Lead, S. D., where a one-stamp mill has been grinding lime for a number of years.

Zinc Extraction from Complex Ores

BY S. E. BRETHERTON† AND FRANK L. WILSON*

The smelting of zinc-bearing ores, especially in the blast furnace, has been a problem of much importance. Ores containing up to 30% zinc have been successfully smelted in an ordinary blast furnace¹, although the zinc was lost under this form of treatment. Approximately 41% of this loss was in the slag, 11% into the matte, and 48% was volatilized.

Treating the ore to recover the zinc before smelting is now being tried at the Afterthought mines of Shasta County, Calif.² A 50-lb. testing plant has been installed



ROASTER AT AFTERTHOUGHT MINE, INGOT, CALIF.

and the results have so far been exceedingly encouraging, checking the smaller laboratory tests in a satisfactory manner.

The ore of the Afterthought mines is peculiarly adapted to the process; it consists of a complex mixture of blende, chalcopyrite, a trace of galena and silver sulphide, pyrites, barytes, calcite, silica, and alumina. The average is from 20 to 25%, and some of the ore blocked out runs 30 to 40% zinc. It is not susceptible to ordinary separation, such as concentration, flotation, magnetic separation, etc., on account of its complexity.

The recovery of the zinc then lies between direct smelting, electric smelting, acid treatment or alkali treatment. The last named method has, up to this time, proved superior to any of the others, in respect of initial

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*Metallurgical chemist for the Afterthought Copper Co., Ingot, Shasta Co., Calif.

¹"Matte Smelting at Ingot," W. B. Bretherton, "Eng. and Min. Journ.," Feb. 29, 1908.

²"Preparation of Ore Containing Zinc for the Recovery of the Other Metals," by S. E. Bretherton, "Trans." A. I. M. E., Vol. XLVI.

cost of plant, treatment cost and recovery of the zinc, copper, lead, gold and silver.

The alkali process, known more familiarly as the ammonium-carbon dioxide process, consists of grinding the ore to a maximum of 30 mesh, sulphatizing roasting, re-grinding wet to —150 mesh, leaching, and recovering the metals. In leaching, the slimes are mixed with a solution (4 slimes: 1 solution) containing approximately 9% ammonia (NH_3) and 9% carbon dioxide (CO_2) in the ratio of 4 of solution to 1 of ore and hydraulically agitated under 30-lb. pressure. After sufficient agitation the charge is filtered, and the solution containing salts of zinc and some copper is sent to a tank where it comes in contact with scrap zinc or zinc dust. In this tank the copper is precipitated as a cement and the solution is again filtered to remove this cement. The clear solution containing the zinc is sent to a battery of stills where steam is used to boil out the ammonia and excess carbon dioxide. The zinc is precipitated as a white basic carbonate and recovered in a filter press. The pulp in the filter press is given first a wash with a strong solution to recover any undissolved zinc salts and finally with hot water to remove traces of ammonia. This residue is amenable to cyanidation or to direct smelting in the matting furnace. The cement copper can be either smelted with the residue or sold as a pigment. The zinc basic carbonate when calcined gives a pure white powder that is extremely light and different from the oxides produced by an acid process. It is of suitable quality for pigments.

The plant, with the exception of the stills, resembles a standard cyanide works, although the tanks are necessarily gas tight. All of the important features of the process and apparatus are covered by patents controlled by S. E. Bretherton.

As worked out at the Afterthought mine, the roasting was given particular study. It was found that with a prolonged sulphatizing roast the copper extraction averaged only about 55%, while the extraction of the zinc was 79.7% on an 18.6% zinc ore, 84.9 on a 20.72% ore, and from 87 to 95% on a 30% zinc ore. A different roast and longer leaching is necessary for proper copper extraction.

Copper dissolved was not ascertained, as this copper is later reprecipitated and remains with the residue. Silver extraction is negligible.

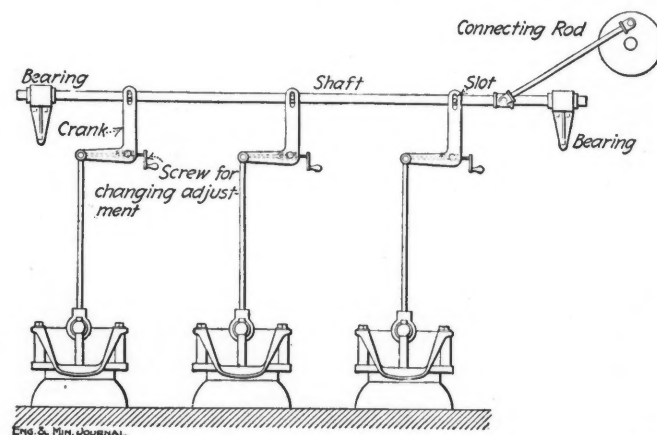
To obtain roasting results that would conform to those obtained in the use of a modern multiple-hearth roaster, a laboratory roaster was designed. The first one built by the writers had a capacity of 3 lb. per shelf. For the experimental plant at Ingot a larger one of similar design was built. It is made entirely of fire brick and tile. Heat is generated by a "Challenge" gasoline burner. Distillate works well, but gasoline is more satisfactory and is apparently as cheap in the long run. The "flare back" brick is placed about 3 in. in front of the burner face and not only keeps the generator face of the burner hot, but spreads the flame and causes a more uniform heat on the under surface of the bottom hearth. An ordinary toothed rabbling iron is used to stir the ore on the different shelves. Frequent rabbling of the ore is necessary, especially on the three lower shelves. The ore is fed in at the top door and spread out on the upper hearth to dry. The charge is shoved back and falls through the opening to the second hearth and again spreads out. As it is worked down from shelf to

shelf it finally falls into a pit in the rear of the furnace from which it is drawn through a side door. The ore commences to roast on the second shelf and on each succeeding shelf becomes hotter until the fifth shelf is reached. Here the last of the unnecessary sulphur is removed and the ore given the proper roasting temperature. The ore is allowed to remain on each shelf from one to two hours, each shelf having a capacity of 9 to 12 lb. of ore.

Ammonia losses were 4.44% during the run (not counting the first four tests). Of this amount 0.28% was unaccounted for numerically, but due to intermittent leaks in the system, 17% of the total ammonia was tied up as fixed ammonia. No lime was used to free this in the run. Compressed air was used to drive the charge through the filters and the air remaining in the agitator and copper precipitator was released through a scrubber. In like manner the absorbers and separator were connected with scrubbers. Washing the residue first by hot solution from the first still and then with steam brought the residual ammonia down to from 1.3 lb. to 3 lb. per ton of ore. The zinc precipitate held some as salt.

Gang Motion for Diaphragm Pumps

A convenient means of operating a gang of diaphragm pumps has been designed and installed at the Hollinger mill, Timmins, Ont. The accompanying drawing shows



GANG MOTION FOR DIAPHRAGM PUMPS

clearly the idea, which consists, of connecting the pump rods, by means of a bell crank, to a reciprocally moving shaft. A screw is placed so that the pump rod may be moved back or forward in the fork of the bell crank, thus changing the stroke of the pump. The adjustment may be made while the machine is in operation. The stroke of these pumps is short, and slight changes of position will cover all necessary adjustments.

The Importation of Flint Pebbles into the United States is a subject of interest to cyanide operators and others using grinding mills requiring these pebbles. The value of the imports, but not the quantities, is reported by the U. S. Geological Survey, for 1913 as follows: Denmark, \$134,625; France, \$121,854; Belgium, \$40,947; Newfoundland, \$10,800; Canada, \$8599; England, \$2626; Sweden, \$56; Germany, \$2. The tonnage represented by this total, \$319,509, is not given, but assuming an average value of \$14 per long ton delivered at U. S. ports, would give a total of 22,822 tons as an approximation of the importations in 1913. It should be borne in mind, however, that many mills are using ore in conjunction with the imported pebbles.

Company Reports

British Columbia Copper Co.

According to the 1913 report of the British Columbia Copper Co., Greenwood, B. C., 612,907 tons of ore were smelted, of which 353,422 tons came from the company's mines and 259,485 tons from purchases of custom ores. The total production of metals was: 8,296,902 lb. of copper, 137,051 oz. of silver and 26,640.63 oz. of gold. Apparently the net balance of receipts above all expenditures was \$58,325 and the company paid a dividend of \$88,756, thereby decreasing its quick assets \$30,431. These figures were obtained in the following manner:

Balance of quick assets at end of 1912.....	\$152,836.99
Balance of quick assets at end of 1913.....	122,405.68
Decrease in quick assets during 1913.....	\$30,431.31
Dividends paid in 1913.....	88,756.35
Apparent balance of receipts over expenditures.....	\$58,325.04
Receipts and expenditures:	
Receipts from metal production.....	\$1,881,171.89
Receipts from miscellaneous earnings.....	23,522.63
Total receipts.....	\$1,904,694.52
Expended for operations, etc....	\$1,424,298.09
Custom ores purchased.....	368,499.94
Total expenditure shown in report.....	1,792,798.03
Profit as shown in report.....	\$111,896.49
Other expenditures apparent from decrease in quick assets but not given in report.....	53,571.45
Net balance of receipts over expenditures as indicated by decrease in quick assets..	\$58,325.04

Owing to shortage of ore, the smelting plant was unable to operate at more than 82% of capacity. The individual furnace efficiency was the highest ever attained at the plant. The slag showed lower metal losses than for any previous year. Costs were higher for several reasons; shortage of ore; extra labor on coke stockpile, occasioned by periods of coke shortage; many expensive renewals and repairs to plant and machinery, which were taken up in operating expenses; and same overhead expenses as when running full capacity. A summary of operating results for last five years as compiled from an analysis of annual reports follows:

Year	Tons of Ore Smelted		Metals Produced		
	Company Ore	Total Tons	Lb. Copper	Oz. Gold	Oz. Silver
1909.....	362,423	373,336	6,325,000	18,244	64,234
1910.....	399,353	441,672	7,143,456	24,962	84,180
1911.....	385,829	608,945	9,944,987	31,144	134,266
1912.....	443,022	740,539	11,146,311	25,862	142,025
1913.....	353,422	612,907	8,296,902	26,640	137,052

SUMMARY OF RESULTS

Year	Net Balance		Dividends Paid	Balance of Quick Assets	
	Receipts Over All Expenditures	Increased		Decreased	
1909.....	\$92,172.69	\$92,172.69	.....	.....
1910.....	56,324.07	56,324.07	.....	.....
1911.....	40,925.63	\$147,930.83	.....	\$107,005.20
1912.....	81,441.94	177,512.70	.....	96,070.76
1913.....	58,325.04	88,756.35	.....	30,431.31

Considerable expenditures have been made for new property during the last few years. It is estimated that an additional \$1,000,000 will be needed to provide for payment of properties now under option and installation of a concentrating plant. It was found desirable to provide for the organization of a new company for the purpose of financing these requirements and when all or nearly all of the company's shareholders have exchanged

their stock the new company will for all practical purposes become identical or be merged with the British Columbia Copper Co.

U. S. Smelting, Refining & Mining Co.

The 1913 report of the United States Smelting, Refining & Mining Co., shows earnings from all companies to have been \$4,555,122, and after charging off \$969,536 depreciation, to have been \$3,585,586. Of this amount, \$1,702,144 was paid in dividends on the preferred stock and \$1,053,322 on the common stock. The following table shows the production for 1913:

Metal	Amount	% in Value	Average Price Received
Copper	20,239,973 lb.	18.8	\$0.15433
Lead	53,116,504 lb.	15.3	0.04396
Silver	13,089,708 oz.	47.3	0.60503
Gold	148,372 oz.	18.6	.....

The charges to capital accounts for construction and other additions to property and investment were: \$19,250 invested in stocks and bonds of coal and allied companies in Utah, \$99,668 invested in stocks of other mining companies, \$310,596 for additions to plants in the United States and Mexico and \$218,217 for mine properties and other charges; total, \$647,731, from which credits amounting to \$296,665 are deducted, leaving a net charge of \$351,066. Current assets amount to \$10,507,118 over current liabilities. The total number of preferred stockholders in the company was 8702 and common stockholders 2674. The coal properties in Utah produced 869,522 tons of coal, an increase of 40% over 1912 production. The company has \$4,000,000 5% gold coupon notes, maturing on Aug. 1, 1914, which are not included in current liabilities. [These have since been refunded by an equal amount, maturing June 1, 1918, which were placed with the public at 98¼.—EDITOR.]

Tri-Bullion

According to the report of the Tri-Bullion Smelting & Development Co., Kelly, N. M., for year ended Oct. 31, 1913, the company was apparently as unsuccessful as ever in its efforts to realize some profits from operations. Owing to the decline in the price of zinc in June, the company found itself in debt approximately \$45,000. To relieve the financial strain, five directors signed notes to raise funds to pay off the debts. It was then decided to sell the Kelly group of claims and a sale was consummated at \$87,500. This has relieved the financial troubles somewhat. Since the sale of this property the company now owns about 112 acres of copper-zinc claims at Kelly, and copper claims aggregating 150 acres in Arizona. Apparently all work was stopped at the time the report was issued, but the management contemplated operating the New Mexico properties as soon as conditions would permit. The Starlight mines in Arizona have been closed since about 1907, but a force of men is now

cleaning out the old workings; after this is completed it will be decided just what steps to take to develop the property.

The production during the period covered by the report amounted to 2572 tons of zinc concentrates, 1467 tons of lead concentrates, 2096 tons of iron middlings, 1505 tons of copper ore, 417 tons of zinc carbonates, 137 tons of zinc sulphides, and 45 tons of lead carbonates. The value of this product by smelter settlements was \$153,861, but after payment of operating charges, there was a net loss of \$21,678. Development charges at Kelly, amounting to \$28,208, increased the charges to \$49,886 above income. The current assets, as shown in the balance sheet, amount to \$95,290, and current liabilities, \$55,800, leaving a balance of \$39,490 in current assets. Of this balance \$203 was in cash and \$6302 in ores in transit, the remainder was made up of bills and accounts receivable.

Chino Copper

The 1913 report of the Chino Copper Co., Hurley, N. M., shows a production of 50,511,661 lb. of copper and dividend payments amounting to \$1,919,070. An analysis of the financial statements shows the source of these dividends to have been as follows:

From balance of operating receipts over all expenditures	\$1,849,926.68
By decreasing quick assets.....	60,963.32
From balance received through profit accrued from conversion of bonds and investments....	8,180.00
Amount of dividends.....	\$1,919,070.00

To check this statement and to make figures in the report clear, the following summary of statements is given:

Operating receipts:	
From 50,511,661 lb. of copper at 15.0884c.....	\$7,621,419.35
From dividends, rentals, royalties, etc.....	137,533.40
Total operating receipts.....	\$7,758,952.75
Expenditures for operations, plants, etc.:	
Charged to 1913 operations..	\$4,431,126.28
Interest and income taxes.....	93,792.96
Total	\$4,524,919.24
Net profit for the year shown in report....	\$3,234,033.51
Expenditures for property, plants, and deferred charges to operations:	
Property purchase.....	\$2,739.23
Construction and equipment...	786,667.18
Development	146,628.73
Deferred stripping	448,071.69
Total expenditures not charged to operations	1,384,106.83
Net balance from operations above all expenditures	\$1,849,926.68
Stock, bonds and investment transactions:	
Receipts from increase in capital stock.....	\$415,600.00
Profits accrued, bond conversion.....	1,662,400.00
Profits accrued from investments.....	80,000.00
Total	\$2,158,000.00
Less: Bonds redeemed.....	\$2,078,000.00
Increase in investments.....	71,820.00
Total	2,149,820.00
Net balance from stock, bonds and investment transactions	\$8,180.00
Add balance from operations.....	1,849,926.68
Balance of all receipts over all expenditures	\$1,858,106.68
Dividends paid	1,919,070.00
Decrease in quick assets as shown in report	\$60,963.32

The only increase in mining property was through the location of some fractional areas. The company now owns 147 mining claims, comprising 2645 acres; of this acreage, 2412 are patented. It also owns 160 acres of agricultural lands. Other lands for mill site and water rights comprise 16,700 acres, of which 10,660 are pat-

ented. The only drilling done during the year consisted of 19 holes aggregating 10,593 ft. This work was done more to prevent depositing waste over ore-bearing areas than for development purposes. A general summary of operations and expenditures worked out per pound of refined copper follows:

Tons of ore milled.....	1,942,700	
Average contents of ore treated.....	2.033% Cu.	
Production of concentrates.....	183,166.5 tons	
Ratio of ore to concentrates.....	10.61 to 1	
Copper contained in concentrates.....	53,170,145 lb.	
Average assay of concentrates.....	14.518% Cu.	
Copper in concentrates per ton ore treated....	27.37 lb.	
Percentage of mill extraction.....	67.31%	
Refined copper produced.....	50,511,661 lb.	
Net recovery in refined copper per ton ore.....	26 lb.	

Expenditures:		Per Lb. Copper, Cents
Mining and milling.....	\$1,635,915.17	3.24
Treatment, refining, freight...	2,135,453.68	4.23
Selling commissions	76,947.43	0.15
Stripping	582,810.00	1.15
Interest and Federal tax.....	93,792.96	0.19
Total charge to operations..	\$4,524,919.24	8.96
Less miscellaneous income.....	137,533.40	0.28
Net total charged to operating	\$4,387,385.84	8.68
Additions to mining property..	2,739.23	
Construction and equipment...	786,667.18	1.56
Development	146,628.73	0.29
Deferred stripping.....	448,071.69	0.89
Total net expenditure for 1913	\$5,771,492.67	11.42

The total amount of ore and waste moved by steam shovels was 4,033,832 cu.yd. of material in place. Of this amount, 3,082,174 cu.yd. was stripping and the remainder, equivalent to 1,976,572 tons, was ore. Since the beginning of steam-shovel operations, there has been removed a total of 8,822,000 cu.yd. of material; 7,000,000 yd. of this was waste and the remainder, equivalent to 3,655,000 tons, was ore. Of this ore mined, 535,000 tons has been stored in stockpiles at the time. The average cost of steam shoveling and removing all classes of material during the year was 36.87c. per cu.yd. The cost of handling waste alone was 33.43c. per cu.yd. in place. The average cost of milling for the year was 61.08c. per ton.

Owing to the limited amount of development work done during the year no recalculation of ore reserves was made. It is stated, however, that the small amount of work done added more ore to the known reserve than was mined. The 1912 report estimated 90,000,000 tons of 1.8% copper ore in reserve. The company's equipment for shovel operations was increased by three shovels and four locomotives, making a total of 10 shovels and 19 locomotives. Tracks for steam-shovel work and the delivery of ore to the railroad increased 5.92 miles, making a total of 20.315 miles. Mining operations were hampered because of the limited areas in which ore shovels could work and at the same time avoid interference with stripping operations. On this account, to provide capacity for the mill, it was necessary to mine large quantities of partially oxidized ores upon which the mill could make only a partial saving. This condition was improving by the end of the year, and hereafter the mine is expected to produce ore of a more uniform grade.

The total issue of capital stock at the end of the year amounted to 860,540 shares. Bonds outstanding amounted to \$236,500, all these bonds have been called for redemption on July 1, 1914, and the right to convert these bonds will expire on this date. With these bonds converted the total outstanding stock will amount to 870,000 shares. It is stated that an increase of 30% in copper output may be expected.

Kimberley Diamonds and De Beers

BY FRANK CONLY*

SYNOPSIS—First discovery of diamonds and early operations. Formation of De Beers Consolidated. Methods of treatment, by weathering and by direct reduction. Rigid control of native labor and drastic laws to prevent stealing. Arbitrary rule of De Beers results in practical slavery for Kafirs and hostile feeling in the community.

Africa has a fascination all its own. The visitor is immediately conscious of it whether his first view be of Cairo in the north or of Cape Town in the south. Granted, these cities have a distinct individuality of their own; but they have both the mysterious charm common to the "dark" continent.

The journey to Kimberley from Cape Town occupies about 24 hr., and the train accommodation is not so up-to-date as it might be. For instance, in the compartment sleeping cars you have to pay extra for bedding. There is no charge, though, for the ministrations of battalions of fleas.

Kimberley is not exactly what one would describe as

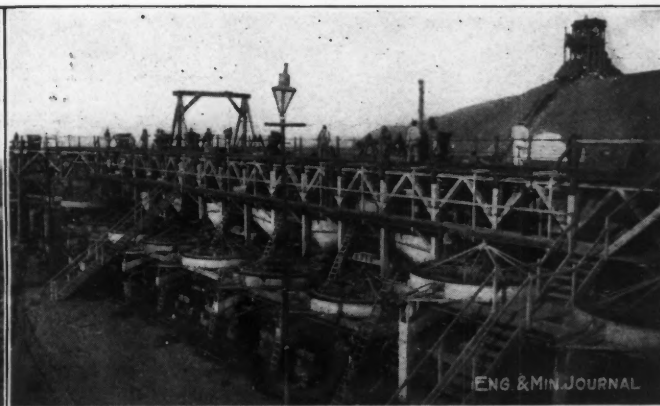
on the Vaal River, in Cape Colony, brought in a bright pebble, which they were subsequently allowed to play with as a marble. Eventually this came into the hands of an expert, and the next year was exhibited in Paris at the Universal Exhibition, as the "First African Diamond." It weighed $21\frac{3}{16}$ carats and was bought by Sir Phillip Woodhouse, then governor of Cape Colony, for \$2500.

Some little excitement was caused by this incident, but as there were no other immediate finds, it soon died down. In 1869, however, a magnificent stone of 83.5 carats was found in the possession of a witch doctor. It was bought by Earl Dudley for \$125,000, and this started the first rush.

As a curious instance of the mistakes even a specialist is liable to make, it is interesting to record that an expert sent out from England to go over the ground, reported that the formation of the country was such that no large deposits need be expected, and that any stones found had probably been carried a long distance by ostriches.



DE BEERS FLOORS, PULSATOR AND MILL



WASHING APPARATUS FOR BLUEGROUND

an inspiring town. It is very primitive, most of the houses being of corrugated iron, sheet iron—any old thing. A few of the better class residences, and also the business houses, are of sun-dried brick. The city boasts two hotels, which are almost unspeakable. There is one fine building, however, and that is the monument erected to commemorate the siege during the late war.

De Beers is the ruler of Kimberley, and to a large extent of the town's 25,000 inhabitants, directly or indirectly dependent upon the mines.

De Beers controls five "pipes" in the immediate vicinity of the town, and all within six miles of each other. These are the Dutoitspan with an area of 1440 claims, Wessleton with 1162, Bultfontein with 1667, De Beers with 622 and Kimberley with 470. The Premier mine at Pretoria, which produced the famous Cullinan diamond, has about 3570 claims. It takes 45.3 claims to make an acre.

Of all the histories of discoveries of vast mineral wealth, hardly can there be one more romantic than that of De Beers Consolidated. In 1867, the children of Daniel Jacobs, a Boer who had his farm near Hopetown,

The finding of another fine diamond, "The Star of Africa," protruding from the mud wall of a farmer's house led to the discovery of the Dutoitspan pipe in 1870, and the following year a hunter resting under a tree on the farm of another Boer, named De Beers, absent-mindedly kicked up a valuable stone. Thus was found the De Beers pipe, and the Kimberley was opened the same year.

But before these later discoveries, there had been a rush to the Orange River, where a party of prospectors from Natal had found diamonds in the gravels of that stream, at Berkly West. The rush has been compared to the early days in the California gold diggings, and many of the stampedeers actually came from the mines of California and Australia. They lined the river banks in their thousands, washing the gravel in rockers, with two or three sieves arranged so as to grade the material passed into the feed-box. As is the way with gold and diamond seekers, the very men who had been crazy to take up claims on the Orange River, now abandoned them and made for the new diggings.

Kimberley soon proved to be the richest pipe, and its 470 claims were so split up that at one time there were as many as 1500 owners, some holding no more than 5

*352 West 122d St., New York.

sq.yd. The men broke up the yellow ground with their shovels and, by passing it through sieves, extracted the diamonds.

Meantime, Barney Barnato—whose real name, by the way, was Isaacs—had hurried from London. On the steamer he was known as a sleight-of-hand expert and mountebank entertainer; but, arrived at Kimberley, he shrewdly bought up as many options as he could lay hands on.

IMPOSSIBLE METHODS OF WORKING

While at first no digger was allowed more than two claims of 31x31 ft., this principle came ultimately to be abandoned. All the ground was taken up with these claims except the roads, which, by the regulations, were 15 ft. wide and 47 ft. apart. In about one year's time the workings had become so deep that already the roads were becoming unsafe.

Picture over 10,000 whites and natives in one mine, digging and wheeling and hauling up in tubs and buckets, or carrying on hand up inclined planes, the comparatively loose earth. The result was chaos. There were frequent cave-ins, despite roughly constructed wood-staging and



INSIDE OF THE KIMBERLEY COMPOUND

other attempts at supporting the ground; and the deeper the diggings went, the more serious the situation became, until 25% of the claims were covered and 10 lots of waste had to be handled for every three of the famous "blue-ground" which was found about 50 ft. below the surface.

FORMATION OF DE BEERS CONSOLIDATED

Under such conditions it was impossible to go on for long, and in 1883 Cecil Rhodes, having paved the way by getting legislation passed allowing the ownership of multiple claims by one man, got control, with I. Rudd, of the De Beers pipe and later backed by the Rothschilds and Alfred Beit, bought the Kimberley pipe from Barney Barnato. The De Beers Consolidated Mines Co. was formed in 1888; though the Wesselson mine was not discovered till 1890.

Americans have played important rôles in the history of Kimberley. It was largely due to the influence of Gardner F. Williams, of Los Angeles, that the consolidation was brought about; it was another American engineer that consummated the difficult feat of supplying the mines with water from the Vaal River, and much of the machinery now used is American.

With the exception of Wesselson, all the mines are now worked by underground methods with uptodate equipment.

METHODS OF TREATMENT

Some years ago it was discovered that the blue ground crumbled and decomposed if exposed to the air for a considerable time. This led to the establishing of huge floors, several miles in extent, where the rock is taken and spread out, guarded night and day for months, raked over from time to time by huge steam ploughs or harrows, drawn by cable haulage, and finally sent to the treatment works.

But at the newer mines, direct treatment has been introduced, to save time and cost. The rock is gradually reduced by crushers and rolls. Then centrifugal pans, up to 18 ft. in diameter, are used to concentrate the material, the lighter substances and slime flowing away at the center.

The diamond-bearing concentrates, about 1% of the mass treated, are further concentrated by pulsators, and eventually the residue is passed over a series of vaseline-coated vanners to which the diamonds stick, while the other materials pass off.

The comparatively recent discovery that diamonds adhere to vaseline meant a great deal to the industry. The



THE DUTOITSPAN COMPOUND

concentrates are washed over the vanners by a flow of water strong enough to carry the waste matter away, while only the diamonds adhere. Perhaps 1% escape the plates, but these are caught in the little drains at the bottom, where a certain residue collects that has to be picked over later. The grease is scraped from the plates, melted in a cauldron and run off, leaving the gems at the bottom.

Finally the diamonds are gone over by an expert who knows the grade of a stone at a glance.

TREATMENT OF THE NATIVES

The bulk of the rough work of the mines is done by the Kafirs, some Zulus and convicts—these last distinguished by their white duck suits with a black arrow by way of adornment.

Of course, slavery is impossible under the British flag, but there are those who hold that a system not far short of slavery obtains in the diamond mines of Kimberley. It is said that for a certain sum, a chief will contract to supply so many men for labor in the mines. And once a native is inside the compound, he is a prisoner there for the six months of his contract.

True, he draws wages, from \$0.75 to \$1.20 per day; but, despite the rosy pictures drawn for the outside public of the happy Kafir who after six months' work, buys himself wives and oxen and settles down as a prosperous

farmer, it is a fact that little of this money goes out of the compound with him. Within the walls of corrugated iron, the company maintains its stores, where all supplies have to be purchased.

The wives of natives are not allowed within the compound, but quarters are maintained for them outside, and on pay days, they may come to the gate and, through an official, obtain a portion of their husband's wages.

The compound is simply a large open space surrounded by a high wall and low sheds wherein the men sleep. Much of the life is lived outside.

DIAMOND STEALING

Where there is no building against the wall, it is roofed in such a way that nothing can be thrown over. Before this was done smuggled diamonds were at times thrown over, in tin cans, to be picked up by the watching wives without.

The laws aimed to check illicit diamond buying cause a great deal of feeling in and about Kimberley. The rigorous searching of natives leaving the mines for the compound does not worry the white people much; but the atmosphere of suspicion with which even the company's officers regard each other is trying to the least sensitive disposition. De Beers detectives are everywhere. An official of the company under suspicion may find that his best friend of a year's standing is a spy watching his every movement.

And if you, in walking along the street in Kimberley, should see a diamond lying in the roadway, you will be well advised to leave it alone, and at most, to report it to the authorities. If it is found in your possession, you will be lucky if you escape seven years or so of penal servitude. De Beers is supreme in Kimberley and rules with a rod of iron. Nevertheless, despite every precaution, illicit diamonds to the value of three quarters of a million of dollars or so are annually sold in Europe.

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Bureau of Mines Oil Department

SAN FRANCISCO CORRESPONDENCE

An oil department has been formed by the U. S. Bureau of Mines. The Secretary of the Interior has appointed W. A. Williams, of San Francisco, chief of this department, with headquarters at Washington, D. C. The work of the department will embrace all of the oil-producing states.

The government, it is expected, will control a large amount of oil lands through the proposed leasing system, in which case the new department in the Bureau of Mines will have a large amount of work to do, particularly in California and Oklahoma.

The importance of the position to which Williams has been appointed is great. The government has had no method of obtaining technical information such as will be necessary properly to conduct a leasing system. It has been compelled to depend upon chance and the departments of statistics. There has been some misconception regarding the attitude of the Bureau of Mines in recent litigation brought by the Government for the recovery of oil lands.

The Bureau of Mines is not engaged in gathering evidence for prosecuting these suits. Its purpose and duty are to aid these industries, rather than fight

them. The establishment of the department of oils in the bureau will add to its efficiency. Williams has been geologist and engineer for some of the large California oil companies for several years. He graduated from the Stanford University department of geology in 1903. For several years he was chief geologist of the Associated Oil Co. and was recently with the General Petroleum Co. and has appraised their property, as well as that of the Union Oil Co., which was under option to the General Petroleum. Williams will probably proceed to organize his department immediately, and will have the cooperation of the State Mining Bureau, whose work respecting the oil industry will be in harmony with the Bureau of Mines.

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Calumet & Hecla Efficiency Work*

About the time the Calumet & Hecla began to experiment with the "one-man" drill, it also undertook some "efficiency work," that is, investigations to determine how the time was used in machine drilling. For this work the services of a large number of mining-school students and young graduates were engaged. It was desired to ascertain the amount of time occupied in setting up and tearing down machines, in changing steel and in extracting stuck steel, etc., which is regarded as unproductive time. In order to get fair averages, the tests were made to extend over a long period of time under different conditions and with different men.

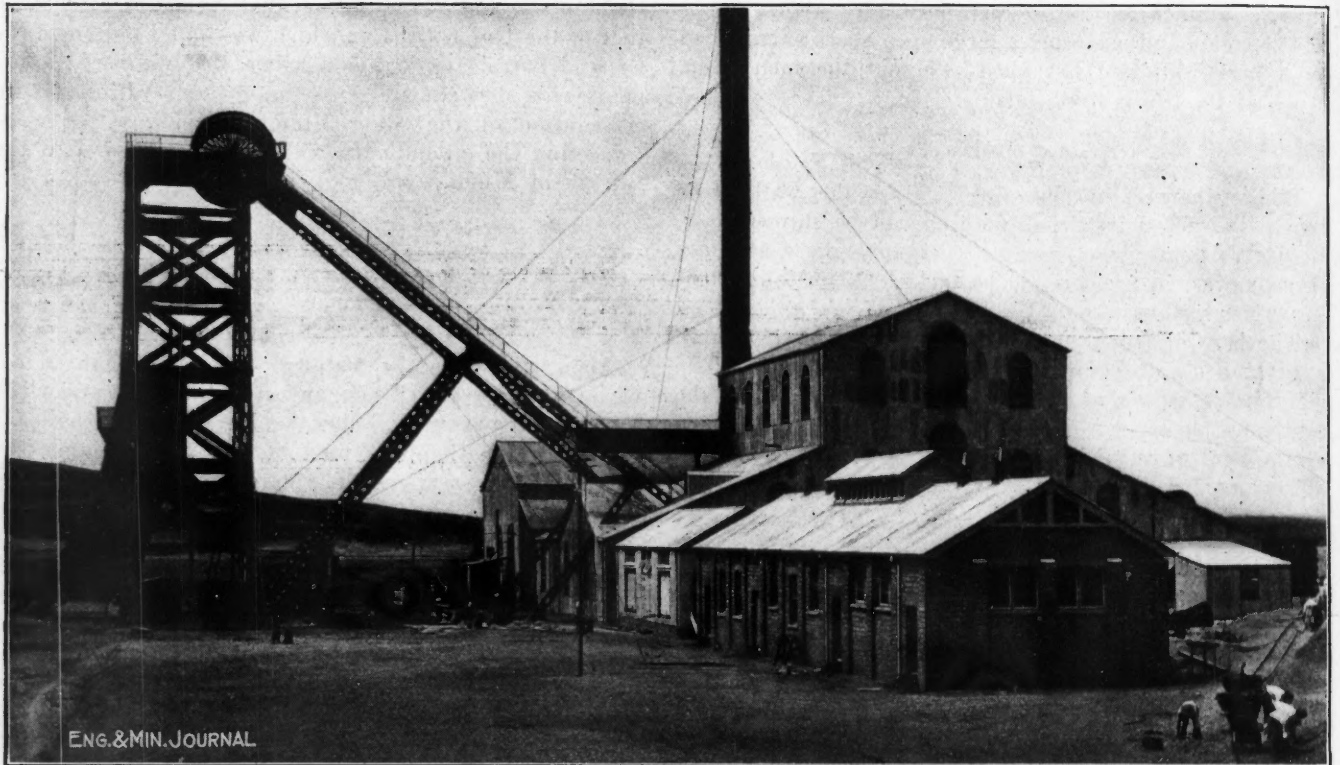
As a consequence, unproductive work in drilling was largely reduced, with resulting profit to both men and company. The compilation of the valuable data obtained was the means of introducing improvements and economies in many ways.

As a concrete instance, it was found that a large amount of time was lost in changing steel, this for the reason that the miner got his drills mixed. When sharp steel was brought to him in the morning, it was thrown down behind his machine, and when he took out his dull steel he threw it down with the rest, and then had to paw over all the dull and sharp steel when he wanted the next size. This consumed both time and energy, and it was soon demonstrated to be better to set the steel up in order at the side of the drift near the machine, where it was easily visible and accessible.

As might be expected, the work of these "efficiency men" was resented by the union and was the subject of complaint before the Congressional Committee. The miners called the men "school boys." Apparently, the "school boys" were somewhat to blame for this attitude, inasmuch as on their own initiative and without authority by the company they sometimes undertook to stimulate rivalry among the men. They would, for instance, hold stop-watches on two men and tell the slower one how much better the other was. The men considered this an attempt to speed them up and resented it, whereas the company desired only to obtain data that would eliminate useless work and result in benefit to both parties.

*From testimony given by James MacNaughton, manager of the Calumet & Hecla, before the Congressional Committee investigating the recent strike in the copper country.

The De Beers Diamond Mines



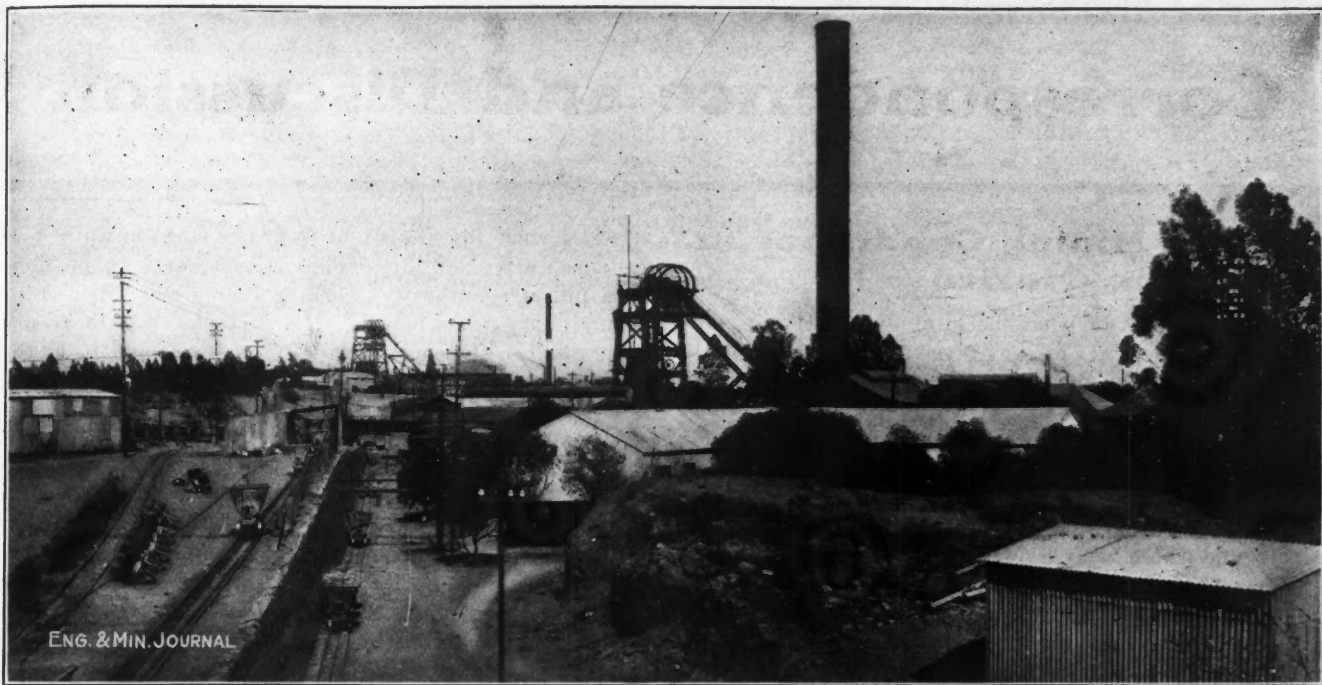
HEADFRAME AT THE DUTOITSPAN MINE

One of the properties of the De Beers Consolidated Mines, at Kimberley, South Africa.



THE GREAT PIT AT THE KIMBERLEY MINE

The total depth from the surface is 840 ft.



HEADFRAMES AND HAULAGE AT THE DE BEERS MINE
Cable haulage has been highly developed in the diamond mines.



HAULAGE SYSTEM AT THE WESSELTON MINE
The company owns five diamond "pipe" deposits, the Kimberley, De Beers, Bultfontein, Dutoitspan and Wesselton.

Correspondence and Discussion

Present Mining Conditions in Mexico

To form an idea of what the mining industry in revolutionary Mexico at present urgently requires, it is necessary to look at the matter from different points of view. The situation is much involved, and the various interests concerned in the industry are often antagonistic.

In many, in fact in most, districts work has been stopped or has been much curtailed. Large numbers of miners and those who live by the miners are without employment. To this are added the facts that in the mountain regions of the western Sierra crops were poor last year, that prices are high now, and that in many places there is actual distress and want.

Many of the mining districts are in isolated places and in desolate country. No other work is to be had; the working people have no reserve funds, and the distances by trail are generally so far that it would be impossible for them to shift their families to some other place, even if work could be obtained there.

The local authorities therefore have on their hands a lot of people clamoring for work, who, if they cannot find occupation, have either to steal or to starve. Among these are many of the best and most useful workmen, who have not allowed themselves to be carried away by promising prospects opened up by the revolution, but have remained to take care of their families. These workmen are to be pitied greatly, as they and their families have often suffered great hardships. These people also include the scamps of the neighborhood, who have been down to the mining camps during the last years of lawlessness and loot; the small merchants from whom the miners borrow their daily or weekly food supply; the parasites, the agitators, those who have been lately converted and have surrendered to the revolutionary cause, and all those who expect to derive benefit through being friendly to the revolution.

The local military government has to satisfy these people as well as the rabble. All, of course, expect to receive impossible benefits from the revolution. It also has to see that funds are provided for current municipal and military expenses. To bring this about, a number of profit-paying mines, especially those belonging to native refugees, are being worked by the government, and promises of protection are being made to foreign companies to re-establish confidence.

If, as a general rule, mines in Mexico could be worked offhand at a profit, either by day's wages or on a royalty basis, the local government, under present conditions of war, could probably oblige all owners to work their mines for an indefinite time. In most districts, however, especially in the bonanza mines, this, unfortunately, is not the case. Rich ores and profits do not occur constantly. Generally it takes much capital and years of exploration and development to put mines in a producing condition, and profitable production will not con-

tinue if such investment of funds is not carefully and systematically kept up. This is not likely to be done by a military authority, working temporarily in a mine belonging to other people. His first object is to keep a large number of people profitably occupied, and if, at the same time, an "honest penny" can be made, the chance is not often neglected. The result of such work is that sooner or later the good ores are gouged out, that the working of the mine no longer leaves a profit, that the systematic work of years is destroyed, and that operations to produce future results stop indefinitely.

Most of the principal mining companies have lost considerable amounts of money, during the revolutions of the last three years, in assessments, forced loans and contributions collected by various factions or by looting bands. The mines of native silver and gold have moreover lost large amounts by direct robbery. For instance, in the mines of Batopilas, Chihuahua, hundreds of thousands of pesos have been stolen from the mines by thieves. Against these thefts, there was no protection, and there has been no redress. Only in April last, looting bands were carrying off the products from the mills.

No company, and especially no company working bonanza mines, can invest capital unless there is a certainty of permanent protection, not only now, but for years to come. This protection necessarily includes: The guarantee that the mines can be worked exclusively according to the companies' systems and plans, without outside interference; full assurance that only such workmen and people shall enter the mines as the companies may choose to employ or permit; proper protection against thieves and their operations, and proper punishment of culpable parties.

No company can invest money, start new work or develop new property when other people are allowed to take the benefit of their years of labor. It would be ridiculous to do work under such conditions. It is, of course, necessary that these and other local conditions be thoroughly explained to the new general and local governments. The true inwardness of mining conditions is different in each locality and therefore not generally understood. Even with the best intentions, a business which it has taken years to build up can be broken up in a short time through want of practical knowledge.

To explain matters in a clear and effective manner, plain talk is absolutely necessary, and, under present conditions in Mexico, plain talk is not always appreciated. People are sensitive and complaints are apt to be locally resented and to be laid to antagonism to "the cause," or to personal enmity. Still, present conditions and requirements will have to be thoroughly understood by the Constitutional Government before protection, such as foreign companies need, can be expected to be granted. It is, however, hardly possible at this present moment for every single mine operator to explain to the new government, and for the forever-changing officials to study out all the difficulties that have arisen or are

coming up from day to day. A single mine often may not be important enough to influence administration changes, even if it were inclined to weigh all suggestions presented and to favor all requests of foreign operators.

The best and most effective way would be to present suggestions and complaints through an association or bureau of foreign operators. This would eliminate the personal equation and local resentment, and would give every suggestion, indication or complaint far more weight. It would also, in any future operations, avoid the personality of separate agreements which might bind the operator without insuring him the fulfillment of promises locally made. There is no doubt but that the general and state governments of the Constitutionalists would welcome any suggestions made through such a channel. It would give a more general view of conditions than could be obtained in any other way; conditions which have to receive due consideration if mining is to be resumed with the aid of foreign capital on the scale of former years.

I present this suggestion to foreign operators as an aid toward a better and fuller understanding between foreign mining companies and the Constitutionalist Government, believing that it may help to bring about a mutual understanding, without which, in Northern Mexico, mining is not likely to flourish for some time to come.

WALTER M. BRODIE.

Brielle, N. J., June 24, 1914.

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What Becomes of All the Mining Engineers?

Any misguided notion of wholesale competition with libraries and bibliographers has long since vanished from my mind. I am perfectly willing to contribute my mite toward the demand which enables their livelihood, confining direct attention to one periodical, and imposing on it the obligation of keeping me informed as to significant events in mining. All unwittingly the JOURNAL has borne this responsibility for years, and done so most admirably.

Nor do I wish in the present allusion to imply any essential shortcomings. I wish simply to ask a question and to import true significance to it in the importance of its setting. Why publish such piffle as that appearing in a recent issue under caption of "What Becomes of All the Mining Engineers?" If the writer had prefaced his remarks with an accurate, comprehensive definition of the species for purposes of identification when encountered, some enlightening observations might have been recorded from time to time. Possibly an answer might have occurred even to the writer himself before the completion of his preface.

It is most gravely unfortunate for the best interests of educational institutions that their limitations are not fully appreciated popularly. Fertilizing and tilling the soil will not produce peaches on a pumpkin vine. In fact the pumpkinny element will only be increasingly emphasized thereby. Naturally this is no argument against cultivation, however strongly the disgusted experimenter with cultivated pumpkins may have been led to feel. Experience as instructor in a mining school will shortly convince anyone, if conviction be necessary, that the laws of nature are common to farm and college alike—

namely, that the best to be hoped for from cultivation is a better crop of peaches on a *peach* tree. Moreover, it matters not by what terms you designate the cultivated product of farm or college; the consumer will recognize the true quality shortly, once it comes into his hands.

What becomes of all the mining engineers? Glancing over an alumni list, a round hundred familiar names of one-time seedlings appear. Of these, some 15% the cut worms got after shortly, among them a certain name which stands out conspicuously in the present connection. Another 25% early developed runners and other unmistakable signs. Despite unmistakable signs, however, after a four-year period of cultivation and grafting, an "E.M." label was attached to the 25 as a matter of formality along with the 60 more or less well formed saplings, and all were shipped off variously for planting and development as fruit bearers. With about a third of the 60, it appears from subsequent events, the grafting did not take, and they went entirely to wood. Some eight or 10 others seem to have been totally unable to withstand the rigors of the climate, and another 10 or 12 have apparently been incapable of marked headway against it. Of the 100 about 20 have become active producers.

"By their fruits ye shall know them," applies to mining engineers quite as well as in its original context, and furnishes the sole truly selective identification for the species. By their fruits you may go further also and keep track of what becomes of them. Out of the 100 entries then there are 20 actual mining engineers, all of whom may be accounted for pretty much any time. Of the rest, some have doubtless been recognized in their misnomer characteristics and cleared out, leaving no record save a lasting one of discredit to their Alma Mater and to the profession at large; and others have been left neglected where first planted out to accumulate dead wood, and finally die off completely. But the fate of such is not properly involved in the question since they were never mining engineers despite shipping labels. And as to the demand for mining engineers, there is and always will be demand for the real stuff. If the aspirant will concentrate not on external conditions of demand, but on internal ones of fitness, and if institutions of learning will exercise a full measure of discrimination in choice of materials, eventualities may safely be left to care for themselves. Among candidates I have seen men who have afterward become mining engineers in fact, and who at the time gave every assurance, cut off because they could not meet some inconsequential arbitrary requirement. Meanwhile, others whose real qualifications for the future were utterly hopeless were held simply because they managed to fulfill or dodge those same arbitrary requirements, and at length were foisted on the no longer unsuspecting public. The roll call shows up as well for the mining profession as for any other, but there is food for contemplation in other directions.

C. G. GILBERT.

Washington, D. C., July 5, 1914.

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Cultivating the Safety-First Idea

Few movements in recent years have attracted so widely the attention of the people or have been so enthusiastically carried forward as has the propaganda for

"Safety First." Nevertheless, the adoption of safety precautions runs against difficulties. No desultory, spasmodic efforts, for instance, succeed. Your independent working man (and Heaven knows how independent he can be!) regards such as little less than periodic aberrations on the part of the management, and resents them as personal interferences. Nothing excites more contempt among his kind than a half-hearted attempt at carrying out a policy so important as the regulation or correction of his methods of working.

The way to lead the workman to think of safety first and to act accordingly, is to compel him to obey sensible and practical rules, and to penalize disobedience. It is an axiom that behind law shall stand force. In no other way can a wholesome respect for the laws of safety be inculcated. Without such enforcement, the most beautifully printed set of rules becomes a toothless futility, and the mild expostulation of his foreman, an insufferable impertinence.

J. FRED OLDER.

Angels, Calaveras County, California, May 28, 1914.

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The Flotation Decision

Few of your readers will agree with the sentiments editorially expressed in the JOURNAL of May 23, on "The Flotation Process."

It may be true that, "The whole spirit of the American mining industry is one of freedom in the application of processes, the exchange of information for the benefit of everybody, and an abhorrence of royalties and objection to monopolies," but why should the metallurgist, or patentee of a process or apparatus, be the special object of comment, when he, above all others, has less of governmental protection for his efforts and expenditures than any other class of citizen?

Both the patentee of a metallurgical process and the patentee of mining property get their monopoly from the government, and probably of the two, the patentee of a metallurgical process has the better claim. It would seem eminently fair that the mine owner should be given the same monopolistic privileges enjoyed by the patentee of a metallurgical process, and have his patented lands revert to the government at the end of 17 years.

Why should it be any more abhorrent for the mine owner to pay a royalty for the use of a patented process, than for the patentee of the process to be deprived of that part of the public domain patented by the mine owner? If an average legal decision might benefit the patentee of a metallurgical process, as the article suggests, might it not also benefit the mine owner if his patented lands were to be thrown open to the public by court proceedings or legislative action? Is it not just as abhorrent for a lessee to pay a royalty on the ore extracted from a patented mine as for the mine owner to pay a royalty on a patented process to extract the metal from the ore? If one might be benefited by the loss of his monopolistic privileges, should not the other be benefited also?

It would be extremely interesting to many of your readers if the writer of the editorial would show just why patented lands should not be given the same monopolistic privileges as is now possessed by the patentees of metallurgical processes and apparatus, and at the end of 17 years become public property. When the essay has been finished, he will no doubt conclude that the patentee of

a process or apparatus is not fairly dealt with as compared with the beneficiaries of other governmental privileges. It usually takes as much time, patience and money to develop a metallurgical process as it does to develop a mining property. There is no argument in favor of one that is not just as applicable to the other. Monopoly, it is true, is distasteful, but let us at least be consistent, for consistency, as someone has said, is a fair jewel.

W. E. GREENAWALT.

Denver, Colo., May 28, 1914.

[Respecting the number of our readers who agree or disagree with the sentiments of our editorial we shall not argue. The patentee was the special object of comment, in view of patentees' proneness to claim (often in good faith) that to which they are not entitled, the U. S. Patent Office conniving, innocently, we will admit. Mr. Greenawalt's analogy of the patented lands is so imperfect as not to be an analogy at all. In our remarks regarding royalties on processes, we may have failed to convey our meaning. We did not mean that a real inventor is not entitled to a royalty on his invention, but we did mean that persons engaged in the mining and metallurgical industry are averse to paying a royalty per ton of ore. We merely stated a fact. Why it should be we shall not attempt to pronounce. It may be that the patentees are considered to be exorbitant; it may be that there is an aversion to the exhibition of private books. The Thomas-Gilchrist basic bessemer patent is the only major metallurgical patent successfully exploited in the United States on a royalty-per-ton basis. The Huntington-Heberlein patents were sold outright. Patented machines are usually sold at a price which includes royalty.

We have been speaking of things that are real inventions. These are rare. What often concerns the public are the alleged inventions, the quasi-inventor and actual patentee being only a developer of some old idea, although he may be quite sincere in his belief of his originality. In its attitude toward these the public is favorable rather than adverse. There are important processes in use today and recognized financially by the users, which probably would be rejected by the courts if the users were induced by unreasonableness to contest them. In paying for these the users really recognize engineering services, not patent rights. The particular patent plague that is annoying, however, is the combination of some well known steps that would naturally occur to almost anybody versed in the art and the attempt to hold up somebody because an ignoramus in the Patent Office has allowed a patent.

We often marvel why people spend so much money in taking out patents on anticipated or inconsequential things. Some reasons are known to us. Many persons who think they have made an invention lose all sense of perspective. Some like to put their ideas officially on record and consider a Patent-Office fee to be well spent for that purpose. Some think there may be enough in their ideas to induce someone else to buy their patent to get it out of the way. Some may be contemplating the organization of a company and need papers to turn in, whether or not they really be worth anything. Another reckons on getting his profits while the going is good and figures that a worthless patent may be a certain protection in the meanwhile. After all, it is only the great patents, like the cyanide patents, the roasting-furnace patents, the filter patents and the flotation patents that are fully tested in the courts.—EDITOR.]

Editorials

The American Mining Congress

A committee, comprising Hennen Jennings, James Douglas, D. W. Brunton, Samuel A. Taylor, M. S. Kemmerer, Harry L. Day and Carl Scholz, the list of which comprises some distinguished names, lately issued a report respecting the affairs of the American Mining Congress, and for the first time there is published, so far as we are aware, a financial statement of this organization for a long series of years. From this it appears that during the period 1905-13, both years inclusive, this organization has run behind to the amount of \$11,100, which deficit is owed to the secretary, James F. Callbreath, for arrears of salary. The committee says: "The original agreement with the secretary in 1905, was that for three-fifths of his time, he was to receive \$300 per month. In 1912, the directors, in consideration of his devoting his whole time to the Congress' affairs, considered he was thoroughly entitled to \$500 per month. Since starting the work he has conducted the financial end of it on the principle that the Congress' indebtedness should be limited to himself."

Means for improving the financial situation of the organization are now being considered. It has been proposed to create a corporation class of membership and a canvass among the corporations is to be inaugurated. The committee says: "Should no encouragement be given to the project by these representative men, it would then be well to face the fact and drop our political program and office at Washington at once."

The accounts submitted with the report of this committee are carelessly compiled and will be distressing to the expert accountant. However, it is not worth while to enter upon minor or technical criticisms. The most important thing is an examination of the income. This rose to \$14,949 in 1908, fell to \$8666 in 1910, rose again to \$12,916 in 1912 and fell to \$8465 in 1913. This shows an absence of steady interest in the organization. The direct income from memberships and dues reflects a similar condition. Life memberships, at \$100, yielded \$1500 in 1907, in 1911 but \$100, and in 1912 and 1913 nothing at all. Memberships (\$15 initiation) yielded \$3315 in 1908 and only \$405 in 1913. The income from these sources is hardly to be expected to increase from year to year. Indeed, such compounded, anticipatory payments ought not to be treated as income at all, but only the amortization of them during the life-expectancy of the payer should be so regarded. Most important is the membership dues of \$10 per annum. These rose to \$4743 in 1908, dropped to \$2843 in 1909, rose to \$5859 in 1912 and declined to \$4763 in 1913. The membership fee being \$10 per annum, we may assume that the American Mining Congress had a membership of 525 to 550 in 1913, this after 15 years of existence and after nine years of rejuvenescence, which began in 1905-6, progressed well up to 1908 and then halted. Even in the more prosperous days the largest item of revenue was the contributions from towns where the annual con-

vention was to be held. In several years there have been "contributions for special work," these amounting to \$2124 in 1912.

The American Mining Congress previous to about 1905 was not an altogether reputable organization. About that time a sincere effort was made by Hon. J. W. Richards, of Boise, Idaho, for many years its president, and J. F. Callbreath, of Denver, Colo., long its secretary, to elevate the organization to a healthy and useful plane. They had high ideals and as we conceive them, those ideals were meritorious. They were nothing less than the creation of an organization which might speak for the mining industry. The conception was bold and theoretically it was appealing. What could be more useful than an annual convention of representative mining men assembled to discuss the problems affecting them and exerting pressure upon legislators to secure what the industry needed? In fact this kind of work did secure the creation of the U. S. Bureau of Mines, the one great accomplishment of the A. M. C.

However, as an exponent of the mining industry, the American Mining Congress signally failed, as is manifest from its membership record. An organization which cannot maintain the interest of a considerable membership to the extent of payment of dues lacks the elements of success, and, of course, the 500 or 600 dues-paying members that the American Mining Congress has numbered out of the whole mining industry of the United States is ridiculously few. Yet the officers of the Congress have been earnest and sincere, while Mr. Callbreath, the secretary, has been almost quixotic in his self-sacrificing devotion.

With its establishment of a Washington headquarters a few years ago, the Congress began to tread the dangerous path of lobbying. When any organization of this kind begins to express its opinion as an organization and urge that opinion, there is likely to be scattered the seeds of dissension. Such may be done by a small and homogeneous organizations like the Mining & Metallurgical Society and the American Institute of Consulting Engineers, wherein the procedure is very formal and deliberate, with an opportunity for every member to vote and a stern avoidance of political controversies, but not in a large, loose and heterogeneous association. For this reason the American Institute of Mining Engineers has heretofore refrained wisely from expressing any opinion, and so certain is our conviction of the wisdom of its traditional policy that it is with alarm that we have lately observed some yielding of its management to temptation. A trouble of the American Mining Congress in this respect has been that it has not been representative. Even if it had been, it could seldom have hoped to be unanimous. There is no question about the unanimity of the brewers and distillers in lobbying against the prohibition movement, but upon what question will the miners, with their diverse and far greater interests, stand alike? Suppose we were back in the days of the silver

question, would the iron miners of the north have stood with the silver miners of the West? Probably there was never a resolution adopted by the American Mining Congress that represented undivided opinion. If there is going to be lobbying, what are the members of the other view going to do? Quit the organization, of course. Nobody is going to pay dues to an organization that is opposing his own interests. Upon the next question there will be a new division and subtraction. The history of such an organization would be like that of the ten little injuns. Indeed, the American Mining Congress appears to have abandoned this course.

Its latest prospectus is to constitute itself a Washington bureau of information, undertaking to keep its members informed respecting pending legislation, to bring to the attention of the respective bureaus in Washington and the congressional committees matters that interest persons engaged in the mining industry, the conception being that a communication from the organization will have more weight than from an individual. For example, a group of Cunningham claimants might become involved in the red tape of the Land Office, which a miners' agency in Washington, versed in red-tape tangles, might aid in solving. In other words, the American Mining Congress might become an intermediary between official Washington and the mining people. The committee mentioned at the beginning of this article sees something in this program, but announces bluntly that it must be dropped if sufficient financial support be not offered.

There is one thing certain, namely, that Mr. Callbreath should be paid the \$11,100 that was owed him on Oct. 1, 1913. As the committee says, "The sanguine, self-sacrificing work of the secretary has kept the organization in existence." Whatever be its future, the organization ought promptly to square its debt to him.

Feeding Blast Furnaces

The method of feeding blast furnaces is a subject of almost perennial discussion, because the conditions prevailing at different works usually impose a solution having special reference to local requirements. The feeding of lead blast furnaces, however, has become more standardized than is the case in copper smelting, although mechanical charging was earlier introduced into copper-smelting practice.

At most lead works the present practice is to drop the charges from large cars that are run directly over the furnace; these cars, which approximate the length of the furnace, are usually charged with the furnace stock from small barrows, and then proceed under their own power to the furnace-feed floor; when the latter is on a higher level, the charge car is raised on an incline by an electric hoist, or vertically, by a platform elevator, after which it proceeds under its own power to a position directly over the furnaces, the gases of which are drawn off below the feed-floor level. This general scheme is followed even in lead plants that are using mainly a sintered charge.

At copper plants, on the other hand, the charging arrangements are more varied, although nearly all copper works employ mechanical charging in some form. The method of charging the new 40-ft. furnaces at the Calumet & Arizona smelting plant, illustrated on page 104, is interesting. The charge cars in this instance operate in connection with a bedding and belt-conveyor system

that delivers the furnace stock into bins at the sides of the furnaces. The charge cars operate under their own power, but merely run a few feet from the charge bins to the furnace doors. As the cars do not leave the feed floor, the system eliminates the danger and confusion caused by charge trains running through a furnace building at high speed.

The Diamond Trade

Slack times, both in Europe and America, have seriously affected the diamond market, and sales in the past year have fallen off materially, as those of luxuries are apt to do when money is scarce. The control of the diamond trade for years has rested between the London Syndicate and Amsterdam, but recently a third interest has come in in the shape of the Antwerp dealers, who have built up an important trade in precious stones. This has been large enough to make their influence felt in the trade, and has put the Belgians almost on a par with the Amsterdam dealers. The control of the London syndicate is with the DeBeers company, which is the foremost producer and likely to remain so. The threat that the Premier Diamond Co. as an independent seller of diamonds would flood the market and break the established control has never been carried out. That and other outside companies seem to have realized that any break would be more disastrous to them than to their competitors, and they have been content to let the old syndicate regulate prices.

The Antwerp dealers have handled most of the diamonds from German East Africa, the quantity of which has come to be of some importance. They are generally possessed of large capital and may be able to tide over the present period of decreased demand and increased production, which does not look altogether propitious for the trade.

Diamonds, as we all know, have only a very limited use in the arts, which would be satisfied with a very small production. Nevertheless they have retained their hold on men's imaginations for centuries and this has been enough to give them a value in trade which has made the mining of them one of the most profitable of mineral industries.

Southern Iron Rates

The recent decisions of the Interstate Commerce Commission on pig-iron rates from Alabama and Virginia furnaces should be of much importance to those producers. In both cases the Commission holds that the old rates have been unreasonable and have tended to discrimination, and orders that they be reduced. The difference in the new rates is apparently not large—from 10 to 15%—but it is sufficient to put the Southern iron makers on a much better competitive basis with the Pittsburgh district and the Mahoning Valley in the West, and with the Buffalo and Lehigh Valley stacks in the East.

As is well known, the Alabama furnaces, outside of the Tennessee Coal & Iron group, are chiefly merchant furnaces, supplying foundry iron to the East and also to the Northwest, while the Virginia makers are also merchant furnaces sending foundry and basic iron into the seaboard territory. The quality of their product is not questioned, and their sales at seasons when trade is inclined to be slack depend almost entirely on the rates

they can make to purchasers. The new rates will enable them to meet Northern competition on equal terms, and still maintain a fair price at furnace, which has not always been possible. Whatever the railroads may think, the furnacemen should certainly be satisfied with this decision.

Oil booms seem to be in fashion now all over the world. The latest is in Japan, where the Japan Petroleum Co. recently completed a well at Kurokawa, Akita district, which proved to be a gusher, yielding 400,000 gal. a day. The news caused extraordinary excitement on the Tokyo Stock Exchange, and the company's shares rose from 86 to 200 yen in a very short time; and would have gone further, but the Exchange officials ordered dealings suspended. Prospecting and drilling in Akita have been greatly stimulated.

The index to Vol. XCVII of the ENGINEERING AND MINING JOURNAL is mailed with this issue. Any subscriber not receiving same should notify the subscription department at once.

BY THE WAY

A London dispatch to the *New York Times* says that the final valuation of the estate of Sir Julius Wernher, which is now being concluded, will occasion great surprise. It was provisionally valued at \$25,000,000, but it is understood that the revised estimate will set the value at more than \$57,500,000. As the estate of Alfred Beit was finally proved at about \$42,500,000, the two chief partners of Wernher, Beit & Co. made during their lifetime \$100,000,000 between them. The Wernher fortune is easily the record for a South African magnate. It is unlikely that its total will ever be equaled by any other fortune taken from the Transvaal mines.

American industry is threatened in a new quarter. It appears that out in Bingham the canny Italians are getting tips for their acetylene mine lamps direct from Sunny Italy, and the local stores cannot obtain them at a competing price. The explanation is probably that thrifty cousins in Italy of the thrifty Italians here send over tips in letters, thus escaping the payment of duty; and it is also possible that some Italian mines may distribute tips to their men without charge and that a proportion of these find their way to America. Against such competition, the American acetylene-mine-lamp-tip industry would seem to stand small chance.

Entomology and metallurgy appear to be as unrelated as two branches of science can be, yet such is not the case. Heretofore, the bee industry has been a profitable one in Mason and Smith Valleys, Nevada. This spring, for some unaccountable reason, the bees died in such numbers as to entirely destroy whole stands. Of course, the farmers immediately blamed the "smoke" from the Thompson, Nev., smelting plant, but bees died at such a distance from the smelting works that its fumes could not possibly have been the cause. An investigation of probable causes of the bee trouble, writes an engineer, has led to the discovery that the blossoms of all the wild

flowers, sage brush and alfalfa, were filled with small insects known as thrips. The thrips have also been found on the bees, hence a clue. Entomologists from the University of Nevada are making an investigation, and their report is awaited with interest.

In the Senate's hearing of the Gold Hill case, the following letter from W. G. Newman to the Comptroller of the Currency was produced:

Jan. 14, 1914.

My Dear Mr. Williams: You will see by the enclosed that I have made my trade that I was so anxious to make with you, but not without you, because I admire you and with a man like you, with the properties I control with Mr. Phillips, we can make millions upon millions, because I am in nothing but what is beyond question. Our holdings in Nevada to-day are enormous and just becoming dividend payers.

The property Mr. Phillips and myself control in Alaska is greater than that controlled by the Guggenheims and Morgan and the Standard Oil Co. all combined. My Gold Hill mine is a wonder, truly.

When the clouds roll by and you have a quiet moment I will show you where we can make the City Bank crowd look green with envy. Tennessee Copper will pay \$4 in 1914 and \$1 extra, \$5 sure. This is private. At 50 the stock is a 10 per cent. dividend payer. So get a few of your friends to buy some and let you vote their stock.

I am in a position to promise you everything you want in the company in the way of officers, excepting the presidency. This must be strictly private. You know I don't know what failure means, never having made one at anything I ever undertook.

Please name your time and place and I will be at your service with the facts.

I congratulate you now on your new office, as it's yours, I know.

Yours very respectfully,

W. G. NEWMAN.

Now we wonder what those holdings in Nevada are? Also, is the tip on Tennessee Copper still good?

In the investigation of the recent miners' strike in Michigan, the question of socialism came up. Congressman Casey asked Mr. MacNaughton whether the companies were going to make it a condition of re-employment that the men give up their membership in the Socialist party. Mr. MacNaughton said they were not. The chairman wanted to know about "red socialism," asking why, if the miners were going to have to give up their Western Federation cards, they should not have to give up their affiliations with red socialism. Mr. MacNaughton said the companies might like to make them, if they could distinguish between the different shades of socialism. He said he prided himself on being something of a socialist, but did not think he was a red one. He assumed that red socialism was militant socialism, the enforcing of its doctrine by violent means. He didn't think he would fight for the socialism he believed in, although he might consider that.

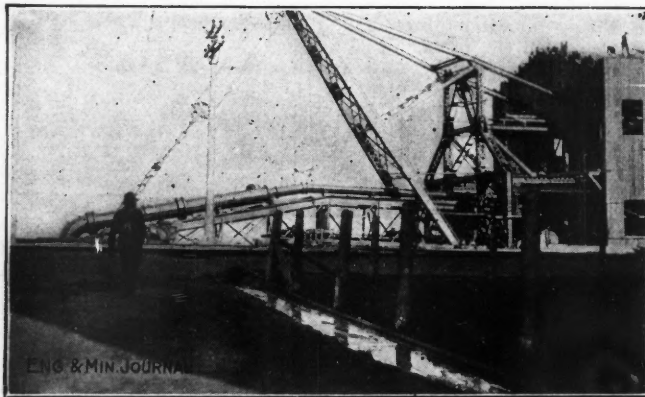
Later on an attorney for the strikers cross-examined Mr. MacNaughton on his socialism. He asked him whether the adjective "red" might not be taken to signify the red blood of brotherhood, rather than that of war. Mr. MacNaughton said he hadn't heard that meaning attributed to the word, and very much doubted whether that was the sense in which it was used.

We are inclined to agree with Mr. MacNaughton that it is beyond the power of ordinary intelligence to distinguish the different colors of socialist doctrines. It is enough to keep an ordinary brain busy distinguishing between the I. W. W., socialists, the Western Federation of Miners, and the Butte Mine Workers' Union.

Calumet & Hecla to Leach Tailings

HOUGHTON CORRESPONDENCE

By far the most interesting and perhaps the most important development that has occurred in the Lake Superior copper district in several years, at least, is the leaching process of the Calumet & Hecla company. Full details are not available now and will not be for some time, but enough is known to foreshadow its importance. A short résumé of its growth may be of interest. In the early days of mining at the Lake, mill methods were decidedly crude as compared to present day practice. The mill tailings of those and even later days carried what would now be considered very low-grade rock—from 6 to 8 lb. of copper per ton, and upward. Simply for comparison, it has been stated that if the Franklin mine last year had averaged 12½ lb. copper per ton of rock, the results would have made both ends meet. To go back—the Calumet & Hecla was one of the mines whose lode was rich—and also the tailings—and these tailings have lain for years at the doors of the mills on Torch Lake. The first step in the recovery of their contents was the original regrinding plant built by this company, adjacent



BUCYRUS SUCTION DREDGE AT LAKE LINDEN

to the mills. This plant was designed to handle the tailings as they came from the mills, every day, and has proved entirely successful. The second regrinding plant was designed to handle the tailings which had lain in the lake all these years. The problem of getting these sands from the lake to the plant on shore is expected to be solved by the use of a large suction dredge which has been furnished by the Bucyrus company and is now being erected at Lake Linden. The accompanying photograph shows the outrigger end of this, containing the suction pipe which leads to the large Morris centrifugal pump on the dredge. The steelwork is exceptionally heavy—in fact, looks more like very heavy bridge work than dredge construction. This is possibly accounted for in the fact that the dredge is expected to do duty for 30 years.

But even with the regrinding plants, the tailings would still contain enough copper to make its recovery worth working for and the leaching process is intended to accomplish this. About all that can be said of it at present, is, that it has proved successful on a small scale, and is now being installed on a large scale. The process itself is said to be extremely simple. A number of sheet-steel tanks, 54 ft. diameter and 20 ft. deep, with re-

movable covers are to form a portion of the equipment and it is said that the chemical employed is an ammonia solution which has no effect on anything except the copper; also that it can treat profitably any sands containing 6 lb. or more of copper per ton, at a treatment cost of about 35c. per ton.

If the final results of this process, working on a large scale, are what are expected, the effects are bound to extend beyond the Calumet & Hecla. For instance, the Franklin mine, it is conservatively estimated, has about 4,000,000 tons of such sands, running from 6 to 8 lb. of copper per ton. Of course, this process may not be the last word in Lake Superior mill practice, but a final tailings content of two pounds of copper per ton would seem to be about as fine as the process of recovering copper from these low-grade ores could be carried.

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Geological Survey Appropriation

WASHINGTON CORRESPONDENCE

The Government appropriation for the Geological Survey, covering the coming fiscal year, has been enacted into law. The total is \$1,355,520.

The salaries for the director's office are: Director, \$6000; chief clerk, \$2500; chief disbursing clerk, \$2500; librarian, \$2000; photographer, \$2000; increased by salaries of assistant photographers, clerks, copyists, watchmen, janitor and messenger boys to a total of \$35,340. The salaries of scientific assistants are: \$4000 each for two geologists, \$3000 for one, \$2700 for one; \$2000 each for two paleontologists; \$3000 for a chemist; \$2700 for one geographer, \$2500 for one; and \$2000 each for two topographers.

The purchase of not more than four motor vehicles at a total cost not exceeding \$2800 is authorized and the purchase of 16 horse-drawn vehicles at a total cost not exceeding \$2400.

The appropriation for skilled laborers and temporary employees is \$20,000; for topographic surveys, \$350,000; for geologic surveys, \$400,000; for chemical and physical researches, including investigation of conditions favoring deposition of potash salts, \$40,000; for preparation of illustrations, \$18,280; for preparation of mineral-resources report, \$75,000; for water-supply investigations, \$300,000, \$100,000 of this to be used for well-boring tests in arid regions; for the library, \$2000; for engraving and printing geologic maps, \$110,000; and \$75,000 for topographic survey of forest lands.

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Rio Tinto Labor Troubles

According to a Spanish correspondent of the *London Mining Journal*, the "labor conflict at Rio Tinto is getting dangerous again. The relationship between the company and the workmen, which for so long has not been a hearty one, has reached a difficult point. He says: "It is not so much a question now of wages or of the precise claims made by the workmen as of the general atmosphere, and that will continue until the politico-economic system, maintained by the company, suffers a complete transformation."

"The strike committee recently took a very grave step.

They called on the workmen to employ *sabotage*, in order to reduce production from 6000 to 1000 tons a day. The company answered by announcing a lockout. The Government has sent to Rio Tinto a member of the Institute de Reformas Sociales, who, after studying on the spot all the circumstances, claims and rights, will propose a final solution. I may say that this commissioner has a modern spirit and training, and is familiarized with the Socialist movement and carries great authority on the subject. The lockout of the company is no doubt an efficacious solution, as the workmen have suffered badly; but it is at the same time a dangerous system of a doubtful social morality, and as the causes are not removed, trouble may arise again at any moment. The present time is precarious, and the solution adopted will decide the future of these wealthy fields which an erroneous management is threatening to make barren."

Salt Lake Meeting of the A. I. M. E.

The annual summer meeting of the American Institute of Mining Engineers is to be held in Salt Lake City, Aug. 10 to 14, inclusive. The Hotel Utah will be headquarters and reservations may be made through Duncan MacVichie, Newhouse Building, Salt Lake City.

In addition to the technical sessions and sight-seeing trips around the city, trips are planned to the mines at Bingham, the Magna and Arthur concentrators, the Garfield smelting plant, the A. S. & R. smelting plant at Murray, the United States Smelting plant at Midvale, the plant of the International at Tooele, the mines at Park City and the Tintic mining district. Other pleasure trips are outlined, particularly for the visiting ladies, and there will be a banquet on Friday evening, Aug. 14. The papers to be read at the various technical sessions are as follows:

Monday, Aug. 10, 8:30 p.m.: F. W. Bacorn, "An Amendment to Sales' Theory of Ore Deposition;" C. W. Goodale, "Drumlummon Mine, Marysville, Mont.;" I. B. Joralemon, "The Ajo Copper - Mining District;" Stuart Croasdale, "Leaching Experiments on the Ajo Ore;" Frank R. Van Horn, "The Occurrence of Bournonite, Jamesonite and Calamine at Park City;" Howland Bancroft, "Dip Chart;" M. N. Alling, "Ancient Auriferous Gravel Channels of Sierra County, California;" B. S. Butler and H. D. McCaskey, "Copper Ores of the New London Mine;" George A. Packard, "Rope Idlers for an Incline Shaft;" Arthur Crowfoot, "Development of the Round Table at Great Falls;" Frederick Laist and A. E. Wiggins, "The Slime Concentrating Plant at Anaconda;" H. A. Wentworth, "Electrostatic Separation at Midvale."

Tuesday, Aug. 11, 8:30 p.m.: R. D. Divine, "Separation of Lead, Zinc and Antimony Oxides;" W. H. Howard, "Electrical Fume Precipitation at Garfield;" H. H. Alexander, "The Bag House in Lead Smelting;" L. D. Anderson, "Effects of the Bag House on the Metallurgy of Lead;" Lawrence Addicks, "Nodulizing Blast - Furnace Flue Dust;" E. L. Newhouse, "Lead Smelting at East Helena, Mont.;" W. W. Norton, "A Comparison of the Huntington-Heberlein and Dwight-Lloyd Processes;" G. P. Hulst, "The International Lead Refining Plant;" Irving A. Palmer, "Smelting Lead Ores in the Blast Furnace;" Dorsey A. Lyon and S. S. Arentz, "Losses of Zinc in Mining, Milling and Smelting;" S. E. Bretherton, "Treatment of Complex Ores."

Wednesday, Aug. 12, 8:30 p.m.: Earl S. Bardwell, "The Effect of Annealing upon Refined Copper;" C. D. Demond, "Economy and Efficiency in Reverberatory Smelting;" E. Horton Jones, "Unit Construction Costs for the New Arizona Copper Co. Smelting Plant;" Frederick Laist and Harold W. Aldrich, "Experimental Leaching at Anaconda;" Frederick Laist and F. F. Frick, "Precipitation of Copper from Solutions at Anaconda;" Dorsey A. Lyon and Robert M. Keeney,

"Melting of Cathode Copper in the Electric Furnace;" C. R. Kuzell and I. H. Wigton, "Curves for the Sensible Heat Capacity of Furnace Gases;" L. O. Howard, "Basic-Lined Converter Practice at Old Dominion Plant;" O. Kuchs, "Lead Matte Converting at Tooele."

Thursday, Aug. 13, 9:30 a.m.: T. P. Holt, "Chloridizing-Leaching at Park City;" A. W. Allen, "Descriptive Technology of Gold and Silver Metallurgy;" W. F. Ward, "Playa Panning on the Cauca River;" J. V. N. Dorr, "The Dorr Hydrometallurgical Apparatus;" G. H. Clevenger, "Discussion of James Johnston's Paper, 'Mill and Metallurgical Practice of Nipissing Mining Company, Ltd., Cobalt, Ont., Canada.;" Robert S. Lewis, "The Book Cliffs Coal Field, Utah;" J. P. Hodgson, "Mining Methods at the Copper Queen Mines;" R. H. Bedford and William Hague, "Tests of Rock Drills at North Star Mine;" Robert Livermore, "Draining Kerr Lake;" Sidney L. Wise and Walter Strache, "The Design, Construction and Cost of Two Mine Bulkheads;" Carl Allen, "Methods and Economics in Mining;" H. M. Chance, "The Appraisal of Coal Land for Taxation;" E. D. Gardner, "Mining Claims Within the National Forests;" R. W. Raymond, "Biographical Notice of Louis Janin."

The chairmen of the various committees at Salt Lake City are as follows: General, R. C. Gemmell; transportation and accommodation, Duncan MacVichie; program, Alfred Frank; entertainment, C. W. Whitley; press, Ernest Gayford; ladies' entertainment, G. B. Wilson. The chairman of the Bingham committee is J. D. Shilling; of the Garfield, W. H. Howard; of the Park City, James Humes; of the Tintic, Walter Fitch.

Bituminous Shales in Utah

The oil shales of northwestern Colorado and northeastern Utah, whose existence have been known for some time, have been examined by the U. S. Geological Survey and are described in Bulletin 581-A. It seems not unlikely that these shales may before long be of economic importance. They occur in the Uinta Basin, the outcrop having a total length of something more than 125 miles. The actual amount of shales is not estimated. In field distillation tests, the amount of oil obtained per ton of rock was found to vary from 10½ to 61 gal., the average being about 30½ gal.

It is stated that in one place along the outcrop of the shales the cliffs are strewn with slag, produced by the burning of the bituminous matter in the rock; this burning seems not to have penetrated more than about 300 ft. in depth. Where the rock was not actually fused to a slag its color was changed to pink, red or yellow, whereas the normal color of the unaltered shales is brown.

Copper Consumption in North America

In their "Statistical Compilations on Copper," Messrs. Aron Hirsch & Sohn estimate the consumption of copper in North America for three years past as below, in pounds:

	1911		1912		1913	
	Lb.	%	Lb.	%	Lb.	%
Electrical industry.....	350,000,000	49.4	400,000,000	48.8	400,000,000	52.1
Brass mills.....	225,000,000	31.7	265,000,000	32.4	220,000,000	28.7
Copper sheets.....	100,000,000	14.1	115,000,000	14.1	105,000,000	13.7
Miscellaneous.....	34,000,000	4.8	39,000,000	4.7	42,000,000	5.5
Total.....	709,000,000	100.0	819,000,000	100.0	767,000,000	100.0

Copper wire is included under the electrical industry. The miscellaneous is made up chiefly of castings and alloys

Close Work in Estimating

BY DWIGHT E. WOODBRIDGE*

In the years that have passed since the first development of the Mesabi iron district, methods of operation have been subjected to great changes and have become increasingly scientific. Doubtless there is room for much and continued improvement in many details of work, but it seems as though in one department, at least, theoretic scientific accuracy was already approximated. I refer to that most difficult operation, the calculation of ore in the ground before its actual development by shafts, cross-cuts, drifts and raises. At the outset one must admit that the calculation of Mesabi range orebodies is a more simple affair than that of smaller deposits in lenses or in irregular veins, but even the estimation of Mesabi flat-lying bodies is beset with difficulties. The estimator must study ore channels, shore-line areas, completeness of drill information, the relation that depths bear to areas; he must take into consideration the method of drilling, whether it be churn or diamond, in connection with the relative silica analyses, so as to know if he is including rock or ore; he must study the rock inclusions in the ore deposits of that particular part of the range which he is considering, in order to make fair estimates of rock inclusions or deductions; and he must have a general understanding of all practical mining conditions, so that he may know what and how much nonmerchantable ore will naturally be mined with the good, while still not reducing the latter to a grade where it becomes unsalable.

To show to what close approximation engineers have come in their calculations of Mesabi range tonnages, the

TABLE OF COMPARATIVE CALCULATIONS OF MESABI ORE

Estimator	Area No. 1		
	No. 1 Ore	Low-Grade Ore	Total
No. 1	4,752,361	1,041,376	5,793,737
No. 2	4,725,530	855,357	5,580,887
No. 3	4,773,465	544,602	5,318,067
No. 4	.....	.....	5,305,000
		Average.....	5,499,423
Area No. 2			
No. 1	171,207	1,122,473	1,293,680
No. 2	170,790	1,076,600	1,267,390
No. 3	126,639	1,187,903	1,314,542
No. 4	.....	.....	907,000
		Average.....	1,195,653
Area No. 3			
No. 1	2,699,000	699,931	3,398,931
No. 2	2,671,387	775,152	3,446,539
No. 3	2,480,601	573,974	3,054,575
No. 4	.....	.....	3,791,000
		Average.....	3,422,761
Area No. 4			
No. 1	452,682	279,792	732,474
No. 2	464,122	309,152	773,274
No. 3	365,534	212,242	577,776
No. 4	.....	.....	1,114,000
		Average.....	799,373
Area No. 5			
No. 1	12,467,176	415,755	12,882,931
No. 2	12,420,748	551,700	12,972,448
No. 3	12,484,736	1,098,795	13,583,531
No. 4	.....	.....	13,020,000
		Average.....	13,114,730

These figures make account of the rock deductions from No. 1 ore, and the additions to low grade thereupon, which in the case of No. 1 engineer were 1,141,998 tons and in that of No. 2, 607,906 tons.

various results reached by several engineers who worked independently and for opposing clients in connection with a recent lawsuit at Duluth, are tabulated herewith.

*Mining engineer, Duluth, Minn.

In this table are the estimates of four engineers; No. 1 is a man who has estimated almost every ore deposit on the range to a total of perhaps 1,500,000,000 tons; I myself am No. 2; No. 3 is the engineer of a purchasing company whose purchase price was fixed at a certain figure per ton shown; No. 4 is the manager of a company whose annual shipments exceed 1,500,000 tons. Nos. 1 and 2 worked for the defendant in the suit referred to, and No. 4 for the plaintiff. The figures of No. 1 were checked almost precisely by a fifth engineer who accepted the areas and depths calculated by No. 1; a fifth set of figures was prepared by another engineer, but is not included, as I do not possess the figures in detail; however, they were in gross, only about 2% greater than the average of those given.

Some Anthracite Statistics

The report for 1913 of Edward W. Parker, statistician of the United States Geological Survey, gives some interesting particulars of the anthracite trade. The total mined in 1913 was the largest ever reported in one year, and its disposition was as follows:

ANTHRACITE MINED IN 1913

	Tons	%
Shipped from mines to market.....	71,343,172	87.3
Sold to employees and local trade.....	1,793,814	2.2
Consumed at mines.....	8,581,694	10.5
Total.....	81,718,680	100.0

The average number of men employed in 1913 was 175,145 and the average number of days worked was 257. Both the number of men and the number of days were the highest ever reported. The average output per man for the year was 466 tons, or 32 tons more than in 1912; but the average per man per day decreased from 1.88 tons in 1912 to 1.81 last year.

The coal marketed was as follows in 1913, by sizes:

Grade	Collieries	Washeries	Total	%
Lump.....	362,084	630	362,714	0.5
Broken.....	3,501,211	2,284	3,503,495	4.9
Egg.....	8,957,166	20,941	8,978,107	12.6
Stove.....	13,900,576	21,210	13,921,786	19.5
Chestnut.....	17,060,899	107,918	17,168,817	24.1
Total prepared sizes.....	43,781,936	152,983	43,934,919	61.6
Pea.....	8,056,919	151,762	8,208,681	11.5
Buckwheat.....	9,135,587	368,574	9,504,161	13.3
Buckwheat No. 2, or rice.....	5,081,314	552,723	5,634,037	7.9
Barley.....	2,836,147	852,410	3,688,557	5.2
Culm (screenings).....	313,643	11,718	325,361	0.5
Total steam sizes.....	25,423,610	1,937,187	27,360,797	38.4
Total.....	69,205,546	2,090,170	71,295,716	100.00

Pea coal is coming to be more used for domestic purposes each year, and it is probable that before long it will be included in the prepared or domestic sizes. Washery coal is decreasing each year as the old culm banks are worked out. The maximum shipments of washery coal were 4,301,082 tons in 1907; since then they have decreased steadily, and last year were less than half those of six years ago.

The records of anthracite shipment have been kept with some approach to closeness ever since the first shipment in 1807. While there are gaps in the earlier years, there is no doubt that for at least 60 years they are very nearly correct. According to the tables published in the report the total shipments to market up to the close of 1913 were 1,952,030,891 long tons. Allowing for sales at mines and coal consumed in operating, this means that practically 2,250,000,000 tons have been mined in the anthracite region in the last century.

PERSONALS

Henry H. Armstead sailed, July 10, from New York for Mexico.

L. Vogelstein, of New York, sails July 18 for Europe, to be gone about two months.

A. L. Frank, consulting engineer of the Ohio Copper Co., has resigned his position.

William S. Mann is making an examination of the Trinidad Mine in Placer County, California.

Col. J. A. Wood, general manager of the Santa Fé Dredging Co., operating at Golden, N. M., has gone East on a short business trip.

H. J. Stewart, assistant manager of Crown Reserve Mining Company, Ltd., Cobalt, Ont., is on a two months trip of inspection to the principal mining camps in the West.

Bernard MacDonald has changed his office from 1005 Fair Oaks Ave., South Pasadena, Calif., to 533-A, I. W. Hellman Building, Los Angeles, where he continues designing the Parral tank system.

H. M. Kingsbury has left the Conrey Placer Mining Co. to accept a position with the Kyshtim Corporation at its copper mines in Russia. He sailed from New York for London July 7, on his way to his new post.

K. A. Strand, engineer of the Empire Zinc Co., has been made superintendent of mines at Hanover, N. M., taking charge July 1. William Swancoat, former superintendent, will remain with the company at Hanover in a consulting position.

Robert Sticht, general manager of the Mt. Lyell Mining & Ry. Co., Tasmania, was in Denver last week. He was entertained by the Colorado Scientific Society on July 8, and made an interesting address on mining methods and pyritic smelting in Tasmania.

OBITUARY

James McChristian, the last of the pioneers who raised the Bear Flag in California in 1846, died at Sonoma, near the place of the original flag raising, on June 15. He was 87 years old. His illness was caused by overtaxing himself at the celebration of the 68th anniversary of the flag raising, June 13 last.

William Bleeker Potter died at his home in St. Louis, July 13, aged 68 years. He was born in Schenectady, N. Y., being a son of the late Bishop Potter of New York. He graduated from the Columbia School of Mines in 1869 and for two years was assistant in the department of geology there, at the same time serving as assistant on the Ohio Geological Survey. In 1871 he was appointed professor of geology at Washington University, St. Louis and retained his connection with the university for 22 years, until 1893. While holding his professorship he also served for two years as assistant on the Geological Survey of Missouri; as mining engineer of the Pilot Knob Iron Co.; as metallurgist of Vulcan Iron & Steel Works, St. Louis; as mining engineer of the Iron Mountain Co.; and as a member of the board of Managers of the Missouri Geological Survey. In 1893 he resigned from his professorship and since then has been consulting engineer and metallurgist. He founded the St. Louis Sampling & Testing Works, and was manager of those works up to the time of his death. Dr. Potter served as president of the St. Louis Engineers' Club in 1887 and as president of the American Institute of Mining Engineers in 1888; he was also a member of the Mining & Metallurgical Society of America. He was one of the best known mining engineers and metallurgists in the country, and his service as consulting engineer were often in request. In 1888 Dr. Potter married Agnes Kennett Farrar, of St. Louis, who survives him. He leaves also two daughters and two sons.

SOCIETIES

Northwestern University—In the Department of Geology of this University, at Evanston, Ill., the following appointments have been made, to take effect on Sept. 1, next:

Joseph E. Pogue, U. S. Geological Survey, associate professor of Geology and Mineralogy. William H. Haas, University of Chicago, instructor in Geology and Geography. Henry R. Aldrich, Massachusetts Institute of Technology, to be instructor in Mining and Metallurgy. John R. Ball, Northwestern University, assistant in Geology.

University of Utah—Work continues at the metallurgical research department of the School of Mines, supported in part by state and in part by Federal appropriation and operated under the joint direction of the Bureau of Mines and of the University of Utah. The names of the holders of fellowships—five in number, granted to graduates in metallurgy and chemistry—during the coming collegiate year have been announced. They are as follows: Robert M. Isham, Nebraska Wesleyan and Columbia University; Clarence L. Larson, University of Minnesota; Harry T. Morgan, Stanford; Orville H. Pierce, University of Nebraska; Wallace G. Woolf, University of Utah. In all there were 41 applicants, from 25 American colleges. Dorsey A. Lyon, metallurgist of the Bureau, is at Salt Lake, personally supervising the work. The object of the department is to aid in the advancement of metallurgical practice by the improvement of old processes and the invention of new, so that more low-grade ores may be made commercially available.

NEW PATENTS

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

ALLOY of Platinum, Gold, Silver and Copper. Robert R. Graf, Highlandtown, Md., assignor of one-half to Frank E. Welsh, Jr., Baltimore, Md. (U. S. No. 1,101,534; June 30, 1914.)

AMALGAMATOR. Erastus B. Bennett, Denver, Colo. (U. S. No. 1,101,244; June 23, 1914.)

BLAST FURNACES—Stack Cooler for Blast Furnaces. Luther L. Knox, Niles, Ohio, assignor to Keystone Bronze Co., Pittsburgh, Penn. (U. S. No. 1,101,701; June 30, 1914.)

CONCENTRATION—Improvements in or Relating to Ore-Concentrating Tables. J. M. and J. H. Holman, Camborne, Cornwall. (Brit. No. 11,775 of 1913.)

CONCENTRATOR—Ore Concentrator. Paul H. Darrah, Goodyears Bar, Calif. (U. S. No. 1,101,415; June 23, 1914.)

CRUSHER—Gyratory Crusher. Josiah E. Symons, Chicago, Ill. (U. S. No. 1,101,668; June 30, 1914.)

CYANIDING—Apparatus for Filtering Slimes. William Armor Stedman, Wonder, Nev., assignor to Butters Patent Vacuum Filter Co., Inc. (U. S. No. 1,100,267; June 16, 1914.)

CYANIDING—Apparatus for Thickening Pulp. John Edward Rothwell, Butte, Mont., assignor to Colorado Iron Works Co., Denver, Colo. (U. S. No. 1,099,396; June 9, 1914.)

CYANIDING—Method of Cleaning Filter Leaves. Paul Foster Leach, Wollaston, Mass., assignor to Moore Filter Co., New York, N. Y. (U. S. No. 1,101,639; June 30, 1914.)

CYANIDING—Pulp-Distributing Machine. Vyvyan C. Bennett and Grey Drummond, El Oro, Mex. (U. S. No. 1,100,649; June 16, 1914.)

DRILL—Rock Drill. James H. Baldwin, New York, N. Y., and Frederic P. Darte, Ridgefield Park, N. J., assignors to Dulles-Baldwin Electric Drill Co., New York, N. Y. (U. S. No. 1,101,387; June 23, 1914.)

DRILL—Rock Drill. John Thomas Curnow, Palatka, Mich., assignor of one-half to Arnold Giesen, Palatka, Mich. (U. S. No. 1,102,012; June 30, 1914.)

ELECTRIC FURNACE. Frederick T. Snyder, Oak Park, Ill. (U. S. No. 1,100,995; June 23, 1914.)

ELECTRIC FURNACES, Door for. Frederick T. Snyder, Oak Park, Ill. (U. S. No. 1,100,994; June 23, 1914.)

FERROMANGANESE—Melting Ferromanganese. Ernest Humbert, Chicago, Ill. (U. S. No. 1,101,551; June 30, 1914.)

GRADING—Method of and Apparatus for Grading Finely Divided Materials. Halbert K. Hitchcock, Tarentum, Penn. (U. S. No. 1,100,302; June 16, 1914.)

MINE-DOOR CLOSER. Thomas Ramsay, Roslyn, Wash. (U. S. No. 1,100,690; June 16, 1914.)

MINER'S LAMP. Frederic E. Baldwin, New York, N. Y. (U. S. No. 1,101,982; June 30, 1914.)

MINING SHAFT. Charlie B. Rowley, Brainerd, Minn. (U. S. No. 1,100,622; June 16, 1914.)

WIRE ROPE. Thomas Gore, New York, N. Y. (U. S. No. 1,099,644; June 9, 1914.)

ZINC—Improvements in and Relating to Apparatus for the Manufacture of Zinc. P. Ferrere, Paris, France. (Brit. No. 3965 of 1913.)

ZINC—Process for the Recovery of Zinc from Its Ores. Alex Roitzheim, Düren, Germany. (U. S. No. 1,100,390; June 16, 1914.)

ZINC—Process of and Apparatus for Producing Zinc and Other Similar Metals. Heinrich Specketer, Griesheim-on-the-Main, Germany. (U. S. No. 1,099,211; June 9, 1914.)

ZINC OXIDE—Improvements in and Relating to Apparatus for the Manufacture of Zinc Oxide. P. Ferrere, Paris, France. (Brit. No. 9368 of 1914.)

Editorial Correspondence

SAN FRANCISCO—July 8

Comstock Mining Situation, since the settlement of the differences in the north end companies and the renewal of pumping arrangements with the Mexican, is more encouraging than it has been for a number of years past. It is reported that there is a marked change in sentiment in Virginia City regarding the situation there, and improvements in general conditions along the lode are expected. There is a stronger spirit of confidence that mining will be carried on steadily and without friction in the future. The physical condition of the mines is such as to give good basis for the belief that opportunities for discovering new ore, which have not been taken advantage of lately, will now be improved. The mines are in good shape and the water under control.

Old Drift Mines in Magalia District in Butte County, which in the early days of California mining were rated among the largest producers, are proving attractive for re-opening and development. Recently two companies have undertaken the reopening of the old Indian Springs channel mines. One of these is the Union Construction Co., of San Francisco, engaged in dredge mining in Trinity County and in Alaska, of which W. W. Johnson is president and manager. The other company, recently organized, is the Nugget Gravel Mining Co., of which John D. Hubbard is president and James Spiers secretary. The head office of the company is in San Francisco. Hubbard is also mine manager and personally directs operations. Indian Springs channel has a record which probably approximates \$4,000,000 production from drift mining in the early days. The Union Construction Co. has taken over the old mine and 560 acres of the Hupp ranch. The Nugget Gravel Mining Co. has taken over adjoining land and is driving a tunnel toward the old Indian Springs mine. Each operator believes he is on the old Indian Springs channel. Which may be right, is not so much a matter of interest as the fact that both companies are developing pay gravel. The Nugget mine is fully equipped with electric power for all purposes, including hoist, pumps, cars and lighting underground. The mine is also provided with telephones. The gravel is washed in sluices and the company is prepared to handle 100 cars per day. The floor of the tunnel is 120 ft. below the surface and the gravel is hoisted through an incline of 30°. The Union Construction Co. is preparing for development on a similar scale. There are other drift enterprises in operation or preparing to operate in the Magalia district, pointing to a renewal of old time mining activity.

Reports from Guadalajara, sent here by the British vice-consul at Guadalajara, Mexico, state that all the mines in the State of Jalisco, without exception, are closed. The mine managers have no thought of resuming operations until peace is assured and there is absolute security for the lives of foreigners engaged in mine and mill direction. It will be remembered that El Favor camp, in the Hostotipaquillo district of Jalisco, was the scene of the only killing of foreign mining men that resulted in Mexico during the anti-American rioting following the American occupation of Vera Cruz, C. B. Hoadley and G. E. Williams losing their lives at the hands of a Mexican mob. Hoadley, an American, was assistant mill superintendent, and Williams, an Englishman, was accountant. The mob included many of the miners employed at El Favor. Hoadley and Williams were stabbed to death, and later Hoadley's head and face were horribly mutilated to secure several gold-filled teeth. Walter Neal, manager at El Favor, who was stabbed in the back, has entirely recovered from his injuries since reaching the States, and he is now acting as consulting engineer for the Makeever interests, owners of El Favor, who also have properties in Montana and Arizona. The last of the Jalisco properties to shut down was that of the Espada Mines Co., owned by San Antonio, Texas, men. At the time work was stopped several bars of bullion were stolen by Mexicans. It is understood here that R. H. Ramsdell, the American owner of the Mirador mine in the Mascota district of Jalisco, and three Americans with him there have remained at Mirador, but have made no attempt to continue operations. Late advices from Guadalajara are to the effect that Ramsdell and his companions have not been molested. Private

advices from Guadalajara tell of the temporary confiscation by Mexicans of the Casados mine in the Hostotipaquillo district. They operated it as long as the dynamite and other supplies found at the mine held out, and it is stated that high-grade ore to the value of 20,000 pesos was taken out and sold to Mexican ore buyers. Many former employees were concerned in the confiscation. The federal troops in the district either were powerless to drive the mob away from the mine or made no effort to do so. The Casados mine is the property of the Consolidated Mining Co., an American concern. A. F. Flynt, owner of the Purisima mine in Tepic, has just arrived here from Mexico, and reports that all mining operations are at a standstill in that territory. Flynt remained concealed at his mine after the American occupation of Vera Cruz, and did not venture into the Tepic capital until its capture by the Constitutionalists under Gen. Obregon. He had just completed a 20-ton cyanide plant at the Purisima. He also had the Zopilote mine, the property of a German company, under lease, and was milling there. Flynt states that after the Vera Cruz occupation the federal forces confiscated the property of the Grant Bros. Construction Co., the American concern that built the Southern Pacific railroad through Sonora and Sinaloa and into the Tepic capital. This property included over 500 horses and mules and 100 carts. All the supplies of the Waters-Pierce Oil Co. also were confiscated by the federals.

BUTTE—July 9

Minerals Separation, Ltd., has been denied a motion for a rehearing on the injunction suit against Hyde, involving the Butte & Superior oil flotation process, by the U. S. Circuit Court of Appeals at San Francisco.

Electrification of the Milwaukee Ry. from Three Forks to Deer Lodge, Mont., was but fairly started when the company and its contractors ran into trouble from the Butte labor unions. The electrical workers extended their jurisdiction to embrace all the work on the Chicago, Milwaukee & St. Paul Ry. and called out the electrical workers because they were not getting the prevailing rate of wages of Butte, \$5 for an 8-hr. day. The railroad company declined to treat with the Butte labor union and suspended work.

Construction of the Southern Montana R.R., from Butte to Jackson, which will open the Big Hole Basin and the Elkhorn and French Gulch mining districts, has been delayed because the English syndicate which is to build the road, a subsidiary of the Boston & Montana Development Co., has asked that the railroad bonds be made convertible into Boston & Montana stock. This proposition has been agreed to by the latter company, and it is said that as soon as the formality of the change in the papers is made work will begin. The financiers and contractors for the road are Sir Robert W. Perks and the MacArthur Bros., of London, comprising the firm of MacArthur, Perks & Co.

Union Troubles at Butte are practically unchanged and it appears that there may be no change until the mining companies are drawn into the controversy, which to date has been confined to opposing factions of the Western Federation of Miners, with the I. W. W. in control of one faction and Charles H. Moyer and his associates in control of the other. Moyer says that as soon as the international unions are lined up in support of the Federation, the mining companies will be asked to live up to the contract with the Federation, which provides for the employment only of Western Federation miners. It is possible that the mining companies will agree to do that, as they have always been inclined to fulfill their contracts, and the rebels may then be told that they must show Federation cards. If they refuse to go back and get Moyer's permission to work, they will be locked out. Moyer says he will then bring other Federation men into Butte to take the places of the seceders. It is doubtful that he will be able to do that, and, failing, the Federation contract with the mining companies will be vitiated. Whether he fails or is successful, it looks as if serious trouble with the seceders cannot be avoided. The seceders, through their president, have served notice that they will not return to the Federation and that they will soon make a demand of their own that none but white-button men, their own members, be permitted to work in the Butte mines. Officers of the seceding union have also

stated that their organization will not be controlled by the I. W. W. and that sections of the constitution and by-laws, reported by a committee which is controlled by the I. W. W., will not be approved by the majority of the members of the new Butte Mine Workers Union.

SALT LAKE CITY—July 9

Experiments with the New Christensen Process at the Knight mill at Silver City are being kept up and the mill is operating the greater part of the time. By working three shifts it has been treating 60 tons daily of Dragon Consolidated ore worth \$5 per ton. A recovery of 85 to 95%, it is stated, has been made. Tests have been made on ore from the Iron Blossom, Black Jack, Colorado, Beck Tunnel and other properties.

HOUGHTON—July 18

Calumet & Hecla Conglomerate Production is usually looked upon as a thing of the past. This view is taken for the reason that each year the Calumet & Hecla shows a further decrease in the amount of copper in the conglomerate and a constantly increasing cost for the copper produced. Compared with the days of 60 and 70 lb. of copper per ton of rock, when the Calumet & Hecla conglomerate lode was opened, the explanation is reasonable. The conglomerate lode has, of course, seen its best days, but the fact remains that Calumet & Hecla will still be mining from the conglomerate 10 years from date, and will be taking out practically as much copper rock as it is getting out at present. The pillars and arches and stope cleanups alone would keep up the conglomerate tonnage for 10 years. Calumet & Hecla continues to have 10 operating shafts on the conglomerate lode, all sending up rock of average grade, and above average tonnage is being mined. Five of these producing shafts are at the Calumet and five at the Hecla. All of them are getting close to the boundary lines, all but the slope shaft. Rock around this is hoisted through the vertical Red Jacket shaft. It is the largest producer of the entire Calumet & Hecla plant at present. The shaft has attained a depth of 1600 ft. below the 57th level. Shafts Nos. 5 and 6 of the Calumet are double. They are down over 6200 ft. to the 60th level. No. 4 is the deepest shaft on the Calumet. It is now down over 8000 ft. No. 2 shaft continues to be one of the main producers and will be for some time to come, although sinking will be permanently discontinued when the 63d level is reached. The South Hecla or Blackhills end of the conglomerate lode has practically stopped producing except from the removal of pillars. This was, without question, the richest part of the conglomerate lode. When the Calumet mine first was opened by the late Alexander Agassiz the best rock was found in the upper levels. Compared with the Calumet in those days the Hecla and South Hecla property did not show up so well. In fact, when the deal first was proposed to get the Agassiz interests to invest in these two adjoining properties there was some hesitancy because of the apparent leanness of the formation. When the shafts reached a depth of 1000 ft. the Blackhills end of the property developed unusually high-grade rock. In fact, at no period in the mine's unusual history was there such uniformly rich rock as at this depth. During the last year the old No. 11 South Hecla shaft had its pillars taken down on the fifth, fourth and third levels, and in No. 8 the work of taking down pillars is well under way, practically up to the 54th level from the bottom of the mine. As yet no pillar removal is under way in the Calumet, although in two of the Hecla shafts, Nos. 2 and 3, three or four levels are cleaned up each year. The Hecla's deepest shaft is now No. 6, which is rapidly approaching 8000 ft. South Hecla Nos. 9 and 10 is a double shaft, similar in operation to Nos. 5 and 6 at the Calumet; it is under the 80th level. At No. 8, South Hecla, sinking has been discontinued, the boundary line being reached. Rock tonnage from the conglomerate lode during this year likely will exceed that of last year by a substantial amount. In fact, it would not be surprising if the conglomerate tonnage for this year ran considerably over 2,000,000 tons, and the mine costs will not be much over \$2.25 per ton, if operating conditions remain the same during the remainder of the year as they have the first six months. These figures are by no means authoritative. In fact, it is quite impossible to get company officials to commit themselves to any figures on the costs at present, but they are based on conservative estimates from persons reasonably well acquainted with the conditions at the property. In the past four years the conglomerate tonnage gradually has declined each year. In 1910 it totaled 1,950,040, and there was a pronounced slump in 1912 and 1913, in the latter year due to the strike and the year before to the shortage of labor due to the fear of the strike rather than to any difficulty in finding opening operations for the drills. In this connection it would, of

course, be unreasonable to expect to see the conglomerate rock again produce an average of 30 lb. of copper per ton of rock. Under existing circumstances and with the present efficiency in mining, and more particularly in milling, for the milling of the conglomerate rock always has been a difficult and serious problem for the Calumet & Hecla to solve satisfactorily in comparison with the milling of amygdaloidal rock. More of the foot wall is being treated satisfactorily now. The single-man drill working in the conglomerate is doing fairly good work, some 20 drills of this type operating in pillar removal.

NEGAUNEE—July 11

Townsite of Alpha on the Western Menominee range, is being improved. A park has been created in the center of the plat, with streets radiating from it like the spokes of a wheel. These streets are being graded and parked. Flowers and shrubbery will be planted. Eventually the streets will be paved with asphalt. Surface water pipes are being laid for use until the permanent system is installed. Electric lights are already available. The town will be given a village organization shortly. It is the prediction in the vicinity that within a few years Alpha will have a population of close to 10,000.

Work at the Athens Property is being done by the Cleveland-Ciffs company. A shaft is being sunk that will go down 2000 ft. before a deposit located by diamond drilling will be encountered. The Athens is within the corporate limits of Negaunee. It will be a model mine. The shaft will be lined with concrete from top to bottom, and its equipment, compartments and all, will be of steel. There will be two skipways, a ladder and a pipe-way and a counter-balance compartment for the cage. A steel headframe has been erected, also an engine house and other buildings. As far as possible, machinery will be operated by electricity. An air compressor and a hoisting engine are already installed and in operation. The mine will be fully equipped with electric motors and electric lamps, both above and below ground. The feed wires will extend below the surface through a 12-in. pipe line. It is considered unlikely that the Athens will be ready for permanent operation much before four years. The shaft is down but 80 ft. Fifteen men are employed under Capt. John Phillips. The shifts are of eight hours each and work is done every day except Sundays.

Contract for Two Additional Blast Furnaces has been awarded by Corrigan, McKinney & Co., of Cleveland. These furnaces will be built at the steel plant the company has under construction. This has been cheery news to the Crystal Falls district on the Menominee range. The Corrigan-McKinney interests are large holders of mining property in that field, and of late years only a minimum amount of ore has been produced and shipped. Most of the shafts are, in fact, inactive at present. It is believed that with the company using its ores in its own manufacturing operations the Crystal Falls country will be greatly benefited. The Corrigan-McKinney company holds in this field the Great Western, Tobin, Genesee, Columbia, Fairbanks and Lamont mines, all idle now, and the Dunn and other properties. A large amount of ore is in stock, much of such character that it is hard to sell in times like the present. The furnaces of the company will enable the utilization of all the raw material. Before the Great Western is again placed in commission, some improvement work will have been done. For a distance of 80 ft. the upper part of the shaft extends through quicksand. It has been necessary to keep a hydraulic pump in operation all during the time the mine has been idle. The timbering will be removed and the shaft concreted from the surface to the ore. The present shafthouse will be replaced with a modern and more substantial structure. In addition the ore-crushing plant will be removed from the shafthouse and installed in a separate structure. Work on these improvements will be commenced at once.

TORONTO—July 11

Calgary Oil Fields has been connected with Calgary by a wireless service, there being field stations at 12 of the leading properties, in charge of government licensed operators. It is hoped by this means to secure reliable news and prevent the dissemination of false reports as to sensational strikes. More oil is being produced at the Dingman well than can be saved, the 12,000-gal. tank being full to overflowing. A second tank will be installed as rapidly as possible. The Dingman well No. 2 is down to 700 ft. and is giving off 1,000,000 cu.ft. of wet gas daily. A strike of crude oil in the well of the Southern Alberta is reported. A sample brought to Calgary shows 45° Baumé.

The Mining News

ALABAMA

Blount County

TENNESSEE COAL, IRON & R.R. CO. (Birmingham)—Prospecting for brown ore near Chepultepec is in progress. **PIG IRON FREIGHT RATES** from Birmingham, according to Interstate Commerce Commission, are unreasonable, and it has ordered following rates: To Louisville, \$2.65; to St. Louis, \$3.40; to Chicago, \$4; to Boston, \$4.25.

ALASKA

KOYUKUK DISTRICT—This is one of the oldest placer mining regions in Alaska, and it will produce more gold during 1914 than has ever yet been taken out in a single year, according to reports. Production should therefore be \$300,000. Second largest nugget ever found in Alaska was picked up on No. 4 Above, Hammond River, by J. C. Kinney and partners last winter. It was worth \$2600; Alaska's largest nugget came from Nome and was worth \$3200.

NATIONAL RAILWAYS COMMISSION—Thomas Riggs, member of commission, arrived at Dawson, June 12, with a party of 40 men, including three assistant locating engineers. Party left at once by steamer for Tanana district. Some members of party will land in Nenana River district and others will proceed farther up the Tanana to Fairbanks with Riggs. Both parties will begin surveying immediately upon landing. Riggs will cover the field from Fairbanks 400 miles westward through Susitna Valley, where connections will be made with present road, extending 72 miles from Seward. Lieut. Mears will leave Seward for interior to make surveys from Susitna River to Broad Pass. After making a trip of inspection over Alaska Northern Ry. line, Mears stated that engineering difficulties in way of constructing a railroad from Seward to Knik Arm have been overestimated.

ALASKA MEXICAN (Douglas)—In May, 20,811 tons of ore crushed yielded \$29,927, or \$1.94 per ton; net profit, \$16,363.

ALASKA TREADWELL (Douglas)—In May, 83,706 tons of ore crushed yielded \$189,265, or \$2.28 per ton; net profit, \$100,866.

READY BULLION (Ketchikan)—Webber & McKenzie, owners, are contemplating installation of new machinery and building of a cyanide plant.

ALASKA UNITED (Douglas)—In May, Ready Bullion mill crushed 20,888 tons of ore, yielding \$51,740, or \$2.50 per ton; net profit, \$21,227. In same month 700 Claim mill crushed 19,903 tons of ore that yielded \$32,351, or \$1.64 per ton; net profit, \$7428.

READY BULLION (Fairbanks)—Isaacson & Hendrickson, lessees on old Hess claim at mouth of Ready Bullion Creek, report discovery of pay running \$1.25 per sq. ft. of bedrock. Many holes sunk by former workers missed pay by a narrow margin. Ground is 86 ft. deep.

ERCEG (Fairbanks)—M. Erceg has taken a contract to sink Keystone drill holes on Allen Creek, a tributary of Goldstream. A large amount of prospecting has been done on creek in past, both by drilling and by shaft-sinking, but no workable ground has yet been found.

TOKIO CREEK (Fairbanks)—With opening of navigation, many stamperers are returning from Chisana and other parts of upper Tanana country, most of them drifting down river to Fairbanks in poling-boats or on rafts. In vicinity of Tokio Creek, which is near Tanana Crossing, where old Eagle telegraph line crosses the Tanana, over 100 holes were sunk to bedrock without result, although Van Bibber found some good prospects at one place.

ARIZONA

Cochise County

CALUMET & ARIZONA (Warren)—A large shoot of sulphide ore has been found in Cole shaft. So far drifting has gone for 40 ft. and has not run out of the ore. This ore came as a surprise. While some work had been done in limestone, shoot as a whole is in unexplored territory. It may have a bearing of considerable importance upon future of Warren district.

SHATTUCK (Bisbee)—Superintendent states that during last two weeks good ore has been encountered on 400 level in crosscuts 35 and 20, which gives evidence of bringing in some important ore-bearing territory. New finds in intermediate A87 raise on 600 level have been made, about which more will be known in next 30 days. New ore zone developed in crosscut 22 on 700 level is one of the most encouraging finds made in last five months, ore carrying 15% copper. No. 9 crosscut on 700 level also has shown good ore streaks from 32 crosscut to present face. Stopping ground in older orebodies is looking well. New ore is being found there daily. Shipments continue at rate of 50 eight-ton cars daily. Development of high-grade ore on 700 level is especially important, taken in connection with encouraging conditions on 800 and 900 levels.

Gila County

INTERNATIONAL SMELTING CO. (Miami)—Slag foundations for two reverberatories are being poured. The third will be erected after first two are in operation, making it possible to use slag from those furnaces for pouring foundation of third. Concrete base for blowing engines, containing 400 cu. yds., is now being poured. Erection of bedding bins is nearly completed, riveting being well under way.

INSPIRATION CONSOLIDATED (Miami)—The most important construction work now in progress at mine is lining

of main shafts, as buildings have been completed so far as actual construction is concerned. Floors must yet be laid and not much machinery is yet in place, but contract work, largest item of the undertaking, has been finished. All machinery for crushing plant is on the ground, as well as that for compressor and hoist house. Feeder and conveyor machinery for storage bins and crushing plant is ready for installation, and if it were necessary whole upper plant could be made ready to go into commission in a short time. There is, however, considerable work yet to be done such as building underground bins and completing shaft lining. Main east shaft will be finished to collar by another week and main west shaft a few days later. Because of large amount of excavation necessary for 3000-ton underground bins on 600 level concreting of shafts could not be started at bottom, so that 200 ft. in bottom of each shaft is yet to be lined. Work on bins will begin soon. Work on concentrator building continues, carpenters and corrugators being well started on inclosing structure. Railroad trestle is being hastened to completion that it may be placed in commission. As soon as this approach to concentrator is completed it is purposed to finish west end of bins, where ore will be stored for test mill. Steel shelving for warehouse has been assembled and is practically ready to be put in place. A large shipment of electrical supplies has been received and work on transformer and distributing stations will now proceed without delay. Pouring of walls and piers for station at Inspiration is already well under way.

Greenlee County

ARIZONA COPPER CO., LTD. (Clifton)—Results for half year ended Mar. 31 show that free profits, subject to final adjustments, and including \$13,394 brought forward from Sept. 30, 1913, amount to \$151,117. Dividends for half year on "A" preference shares are at the rate of 7%. Preference dividend amounts to \$12,266, leaving a sum of \$138,851. Out of this sum directors have resolved to pay, July 27, an interim dividend of 1s. per share, free of tax, on ordinary shares. This will absorb \$75,995 and leave a balance of \$62,856 to be carried forward, subject to deduction of an amount to be set aside at close of financial year to meet redemption of debt, capital expenditure and contingencies. Price received for copper was \$5 9s. 8d. per ton less than that for corresponding period of last year.

Mohave County

FAY (Hancock)—Three cars of machinery for Lusk mill, to be built at these mines, has been received. Treatment will consist of amalgamating and cyaniding 25 tons of ore daily. Water is piped in from Granite Springs.

COPPER CANON (Copperville)—Compressor and engine have reached camp after a long trip through rough country where there are no roads. Adit is now in over 200-ft., giving a back that high. Some shipping ore has been developed but not enough to justify road building.

Pinal County

MAGMA (Superior)—All machinery for concentrator has been on the ground for some time and concentrator should soon be ready for operation. Electric power from Roosevelt has been available some time and tram between mine and concentrator is in operation. Management has not yet given out decision as to which route will be chosen for proposed aerial tram over which concentrates will be shipped for disposal. Direct line to smelting plant at Miami is thought by mining men in this region as route that will be selected.

Yuma County

D & W (Parker)—Slow Speed mill has proved a failure. Concentrates carried \$175 gold, while only \$6 was recovered on plates. Mine and mill are closed pending investigations as to advisability of remodeling mill or building a new one.

CALIFORNIA

Amador County

HARDENBERG (Jackson)—It was reported that mine would be sold, but this is now denied. Present owners will continue operations.

KEYSTONE (Sutter Creek)—Twenty stamps of old mill have been overhauled and four vanners have been installed. Mill will be run on ore from 900- to 1200-ft. levels. A large tonnage is being blocked out on 2600-ft. level.

PLYMOUTH CONSOLIDATED (Plymouth)—Construction of new mill is progressing as fast as machinery can arrive. It is reported that 110,000 tons of ore have been blocked out. On 2000-ft. level, which is lowest, orebody is said to be 21 ft. wide. Grade runs from \$5 to \$6.50 per ton.

SOUTH EUREKA (Sutter Creek)—Repairs to shaft are about completed and 40 stamps of 80-stamp mill will be started crushing ore. During a part of time repairs were in progress ore was mined, but it was found more expedient to stop taking out ore and hasten shaft work.

Butte County

DIVING APPARATUS FOR RECOVERY OF GOLD from crevices in bedrock is used in Feather River near Belden. Depth of water is 10 to 15 ft. and each of two divers remains on bottom half an hour. It is reported that these men are making good wages. Diving suits have frequently been used for this kind of work in California, but not extensively, owing chiefly to swiftness of current in most streams in which gold is found.

UNDINE MINING CO. (Chico, president, G. F. Dyer)—Mining machinery and equipment recently purchased of Forbestown Mining Co. will be installed at this mine on Butte Creek.

San Bernardino County

TRINIDAD (Westville)—A cyanide plant is being built. This mine is known as Old Salvation Army mine, and is said to have been a producer.

AMERICAN TRONA CO. (Trona)—A daily railroad service will be started from Mojave on Southern Pacific to Searles Lake, connecting with new railroad of American Trona Co., at Searles or Garden station. Trona R.R. will be used largely for hauling material for construction of new plant.

Plumas County

BELLEVUE (La Porte)—A new tunnel will be driven 2500 ft. on bedrock to tap gravel further up than present tunnel now extends. Last summer yield from this mine is reported to have averaged higher than usual.

CLAYBANK (La Porte)—This gravel mine is to be reopened under new management and ownership. Great difficulty was encountered under old management in maintaining a drainage tunnel. It is now planned to install steel pipe in tunnel and allow the rough to cave in.

Sierra County

KATE HARDY (Forest)—Electric pumps are being installed and sinking will be resumed to a depth of 100 ft. below tunnel level. Shaft is on a shoot of milling quartz 6 ft. wide, of more than average value. A rich strike was recently made, but its extent has not been announced by those in charge.

SWASTIKA (Sierra City)—This old property, from which pockets and rich bunches of ore were taken in early days, is to be developed by a deep shaft to be sunk on shoot of high-grade ore which was encountered two years ago when systematic development was begun. Mine is now owned by New England men.

COLORADO-YELLOW JACKET (Alleghany)—After having been practically abandoned by C. C. Crary, this mine has suddenly become one of the most promising in district. Caretaker left in charge, an experienced prospector, has uncovered a large shoot of gold-bearing quartz, and owner has returned from South Dakota to develop mine. An electrically operated air compressor will be installed and ore will be opened by drifts. This mine is on Kanaka ridge and is a south extension of El Dorado.

EL DORADO (Alleghany)—After two months idleness pending blocking out of ore, mill is again in operation, and with an abundant water supply, will be kept running indefinitely. An interest has been secured by Armstrong Bros., retiring merchants of Alleghany, who will join with Tessler Bros. in management of enterprise. During last six months mine has produced \$30,000 in coarse gold with but four men working underground, and is believed capable of doing proportionately well with a larger force.

Siskiyou County

GREAT NORTHERN (Yreka)—Large amount of pay ore has been mined. It is being sampled, and if grade of ore warrants it McCook mill will be removed to this mine on middle fork of the Humbug.

Trinity County

NASH (Carrville)—Hydraulic mining has been resumed at this mine, on Coffee Creek. Sawmill will be put in commission and a large amount of new flume built. This is one of the largest hydraulic producers in the state.

Tuolumne County

RAND—A 10-stamp mill is being built. This mine was formerly known as Poor Man. It was a producer, but poorly managed.

HOPE (Sonora)—New 5-stamp mill has made a test run. It is driven by 25-hp. gasoline engine. Ore is blocked out and stoping will begin immediately.

SPRINGFIELD TUNNEL (Springfield)—Mill is being moved to mouth of big tunnel on Stanislaus River slope. development is progressing actively.

EAGLE SHAWMUT (Shawmut)—Thirty-five stamps are dropping. Electric cars have been installed in tunnel for hauling ore from underground hoist to mill.

COLORADO**San Juan Region**

GERTRUDE (Gold King Basin)—This property is being developed by August Anderson and J. H. Brink. Ore, which is similar to that from Alta vein and requires concentration, will be treated in custom mills.

BALLARD (Telluride)—Ore from this property, which is operated by Weller Gold Mining Co., is treated in company's mill in Bear Creek. Mill has recently been remodeled and one Wilfley table has been added to equipment.

SUFFOLK (Ophir)—A cyanide plant is to be erected by D. C. and D. W. Reinohl, of Detroit, for treatment of old Suffolk mill tailing and Suffolk dumps. Machinery, which is manufactured by American Rapid Cyaniding Co., of Detroit, is on ground.

MAMMOTH (Telluride)—This property, in Bear Creek Gulch, two miles south of Telluride, is being reopened and placed in condition for operation by Colorado Milling & Mines Product Co. Ground is being broken for a small mill, construction of which will begin Aug. 1.

Teller County

A RAILROAD STRIKE broke out at midnight July 3, all train crews running into Cripple Creek district going out on strike because of refusal of operating company to reinstate a conductor who had been discharged. Samplers and a number of the larger mines are either shut down, on account of shortage of coal or of bin-room for storing ore. No settlement of strike is yet in sight.

BLUE-FLAG (Victor)—A contract has been let for sinking this shaft.

VINDICATOR (Independence)—The steel frame-work for

the new concentrating plant is completed, and some of the machinery installed.

DRAINAGE TUNNEL—Work of laying tracks and pipe lines and digging trench is almost completed up to breast, and work of driving tunnel will commence soon.

PORTLAND (Victor)—A Davis-Calyx drill is boring a 6½-in. hole, for ventilation, between 1600 and 1700 levels. A storage battery locomotive has been ordered for tramping on 17th level.

IDAHO**Cœur d'Alene District**

COPPER AT ADAIR, on Chicago, Milwaukee & St. Paul Ry. may make that place an important camp. Well known mines heretofore have been reached by way of Saltese. Monitor, Richmond, St. Lawrence and others, some of which lie on Idaho side of divide, eventually will find an outlet for their products at Adair. Much ore has been shipped from these properties, all of it being hauled to railroad at Saltese, and all have been developed to an extent that indicates persistence of ore. Plans are now being worked out for deep development of Monitor through a long tunnel to start near Adair and this will afford means for exploring other properties at great depth. Near railroad at Adair, so close that it is almost possible to shoot ore from dump to car, is the Big Elk. Ore was found practically at grass roots and several cars have been shipped to smelters from which large returns were received. Recent work has been concentrated in raising 90 ft. from lower to upper tunnel. Upper drift seems to have passed through top of an ore shoot, and it is expected that a drift of 50 ft. from raise in lower level will strike it. Well up on divide between Idaho and Montana, and connected with Saltese by wagon road, is the Monitor. Property has been developed through a shaft, and ore has been shipped. Mine was well equipped with hoisting plant, compressor and buildings, but these were all swept away by forest fire in 1910. As it was not intention to operate mine through this shaft, company did nothing toward restoring property, but immediately took up a plan to drive a long tunnel from a point on a branch of Milwaukee railroad on Idaho side of divide. This enterprise contemplates opening Monitor orebodies at a depth of 1300 ft. Work of financing project is now under way and tunnel has actually been started. Tunnel will develop not only Monitor, but will make it possible to explore Richmond and St. Lawrence at depth. Richmond is situated in Idaho, just over Idaho-Montana divide. It is developed through a shaft, from which high-grade ore has been taken. A crosscut tunnel has been driven to vein giving an additional depth of 600 ft. and which will be future outlet for mine.

RAY-JEFFERSON (Wallace)—Washington Water Power Co. of Spokane has completed its power line to this mine in Sunset district, and everything is now in readiness to start new compressor with electric power.

COPPER KING (Mullan)—Company has filed a protest against Missoula Copper Mining Co. for patenting Wisconsin fraction claim. Copper King Co. alleges that Missoula company's survey embraces five acres of its Blue Streak claim, and contends that it has a right to ground in controversy because of fact that Blue Streak was located in 1901, while Wisconsin fraction was not located until 1907. Ground in controversy is along strike of vein not far distant from where Missoula is getting some of its best ore showings.

MICHIGAN**Copper**

INDIANA (Houghton)—Lately, exploratory work on 1100-ft. level was resumed. Results have been satisfactory to say the least. Operations for some time past have been confined principally to 600-ft. level.

HOUGHTON COPPER CO. (Houghton)—A campaign of exploratory development work is being carried on. Two drifts are being driven from bottom of winze and each is in a good grade rock, presumably the Superior lode. While these openings are limited in extent as yet, they are encouraging.

SOUTH LAKE (Houghton)—Shaft is down 613 ft., but no sinking is going on at present and there is no intention to resume sinking in the immediate future. All efforts are directed to extending 600-ft. level to rich zones which were shown by drill cores. This will mean a total drifting of 1200 ft. Unusual interest is taken in this work because of the showing made in drill cores.

NORTH LAKE (Houghton)—Crosscut on 300-ft. level is 350 ft. long and has 300 ft. more to go to get into zones opened in South Lake and showing such satisfactory results. These three zones are commonly supposed to be the Evergreen series. This North Lake crosscut went through 125 ft. of conglomerate as it left the shaft, and since that time it has been in trap all the way.

MINNESOTA**Duluth**

ESTIMATED IRON ORE OUTPUT FOR 1914—John H. McLean, general manager for Oliver Iron Mining Co., estimates that Lake Superior districts will send forward from 38,000,000 to 40,000,000 tons this season, comparing with 50,000,000 last year. This is most optimistic estimate that has appeared to date.

GRAND MARAIS & NORTHERN RY.—Contract has been awarded to John Bergman, Duluth, for construction of first 20 miles of this line, being from Grand Marais, Minn., to intersection with Duluth & Northern Minnesota Ry. This leaves 55 miles to complete line to Ely, Minn., on Vermilion range. Road opens up a country rich in mineral possibilities.

DELL DEVELOPMENT CO. (Duluth)—Company has awarded to Mesaba Boiler Works a contract for erection at Duluth of a furnace designed to treat manganiferous iron ores, in manufacture of spiegel and ferro-manganese. Plant is to be ready by September. Company will purchase ores in open market. Some months ago this company began erection of a larger plant of same character at Aitkin, Minn., on eastern end of Cuyuna range, but for some reason work was abandoned and all company's mineral lease options were dropped.

Cuyuna Range

ROWE (Riverton)—Shipments are now being made at rate of 80 cars daily. This pit is unique in that only English-speaking workmen are employed. Efforts are being made to conduct a model operation.

INTERSTATE IRON CO. (Ironton)—This subsidiary of Jones & Laughlin Steel Co. has taken a three-months' option of lease on holdings of Cuyuna Iron & Manganese Ore Co., adjoining Pennington pit on north. New lease, if taken, provides for a substantial increase in royalty rate over 40c. lease held by Cuyuna Iron & Manganese Ore Co. Latter company began explorations over a year ago, property having before that time been abandoned as worthless by an operating company. Recent developments have shown several million tons of nonbessemer ore of good grade, besides a considerable tonnage of manganese iron ore. Jones & Laughlin company already controls Hill Lumber Co. property, adjoining on southwest. Operations on all properties will be by open-pit method.

Mesabi Range

MINNEWAS (Virginia)—Oliver Iron Mining Co. is erecting a concrete shaft house at this new property, between Eveleth and Virginia.

OLIVER IRON MINING CO (Hibbing)—Butler-Coons Contracting Co. has completed work on Carson Lake project, and Oliver company now has two 10-in. centrifugal pumps draining lake, water being forced into ditches which convey it to Kelly Lake.

MILLER (Aurora)—Pitt Iron Mining Co. will try out a gasoline motor for underground tramping. Motor is similar in form to those used in coal mines and is said to be first of kind to be installed in a Minnesota iron mine. Mine has heretofore employed 14 mules, work of which will in future be done by three motors if test proves satisfactory.

Vermilion Range

CHANDLER (Ely)—Ore is being hoisted daily from this once-abandoned mine, and a considerable stockpile has been accumulated. A relatively large tonnage has been developed by new operators, new buildings have been erected and operation put on a substantial basis. Mine had been practically abandoned for a number of years prior to resumption of activities last September.

MONTANA**Broadwater County**

OHIO-KEATING (Radersburg)—Owing to high cost of transportation and smelting mines of company which have been operating at a loss for last year, have been shut down. A meeting will be held Aug. 5 to consider following propositions: To change stock from non-assessable to assessable; to consider issue of a mortgage bond to replace outstanding bonds and to discuss plans for erection of a mill which can treat ore profitably. Management favors an assessment of 15c. per share, payable in three installments of 5c. each during a period of nine months. This will liquidate pressing floating debt of \$113,925 and provide funds for erection of a cyanide plant which, it is estimated, can treat ore at a cost of \$1.50 per ton while present cost of transportation and smelting is \$3.35 per ton. Value of ore blocked out and on dumps is estimated at \$206,000.

Deer Lodge County

WASHOE WORKS (Anaconda)—One of eight reverberatory furnaces which have been fitted up for new pulverized coal feeding system, was fired up for first time June 30 and worked without a hitch. Greatest item of cost is plant for crushing and drying coal. Run-of-mine coal is broken in a Jeffrey coal crusher from a maximum of 24 in. to 1 in. and finer. After iron has been removed by an electro-magnetic pulley, coal is dried in a Ruggles-Cole drier in which it remains for 20 min. It is then pulverized in a Raymond 5-roll mill so that 85% of it will pass through a 200-mesh sieve. From Raymond mill coal is taken up by a vacuum separator and carried to furnace by screw conveyors. A No. 11 Buffalo fan with 9-oz. air pressure blows pulverized coal into furnace where it catches fire practically as a flaming gas. "Safety-first" policy has cost \$10,000 at Washoe works for rearrangements that will make for greater safety to employees. Guards have been placed over gears and pulleys, railings constructed on platforms, doors have been changed to avoid opening on tracks and everywhere signs have been posted to remind men to take all necessary precautions against accidents.

Granite County

ROYAL BASIN MINING CO (Maxville)—Company has contracted with Allis-Chalmers Mfg. Co., of Milwaukee, for construction of a hydro-electric station on Boulder Creek, a distance of four miles from mine. Contract calls for generation of 1000 hp. alternating-current generator to operate at a potential of 6600 volts and a speed of 360 rev. per min. About 200 cu.ft. of water per min will be conveyed to turbine in power station from forebay on Boulder Creek by a wood-stave pipe line 2000 ft. long. Water enters a spiral casing in turbine, which will be of reaction type, and passes out to draft tube through vanes of the runner. Runner will be cast in one piece and connected directly to extended shaft of generator. Speed of waterwheel, as load comes off and on, will be controlled by an oil pressure governor. Power will be used in connection with new electrolytic flotation method of treating carbonate and sulphide ores.

Silver Bow County

BUTTE & SUPERIOR (Butte)—June output was smallest in tonnage for many months, resulting in 8600 tons of concentrates, assaying 54.7% zinc. Decrease is partly ascribed to labor disturbances.

BUTTE-ALEX SCOTT (Butte)—A meeting of directors was called for July 14 to consider question of declaring a dividend. President Hugo states that there are funds in

treasury to pay a dividend and that money has been earned by operation of company's property. The question to be decided is whether a dividend is warranted at present time, considering condition of copper market and outlook for continuance of operations in near future, in light of recent labor disturbances.

NETTIE (Butte)—Unwatering of this mine, a property of Anaconda company, in old silver district, three miles west of Anaconda hill, has progressed down to 350 level. Shaft is 540 ft. deep and within next three months it is expected that entire mine will be clear of water. Upon completion of this work, sinking will be started at once, followed by extensive exploration work. Enough ore running from 20 to 60 oz. silver is known to have been blocked out when mine was shut down in 1897 to pay for present work of unwatering and for contemplated development. Indications are strong that these western silver mines may develop commercial bodies of zinc ore at depth as in similar veins in Butte & Superior and Elm Orlu mines in eastern portion of Butte district. Both Davis-Daly and Butte & Superior companies own ground in vicinity of Nettie mine and development in it will have an important bearing on these mines.

NEVADA**Clark County**

FREDRICKSON (Goodsprings)—A new gasoline hoist has been installed, and sinking in main shaft will be resumed.

BULLION (Goodsprings)—No ore is being shipped, owing to low lead market, but men are at work on development, and a considerable tonnage of high-grade lead ore has been accumulated on dumps.

MOUNTAIN TOP (Goodsprings)—Men are at work on this property, which is under lease to M. G. Wade, and a considerable tonnage of lead and zinc ore has been mined. It is reported that a new road will be built to property, and an aerial tramway constructed.

BOSS (Goodsprings)—New aerial tramway is completed and copper ore is being hauled to railroad at Jean for shipment to Salt Lake smelters. A strike of rich gold ore was made in a winze from the upper tunnel, during the latter part of June. A small shipment of this ore, forwarded by express to smelter, assayed \$2500 per ton, and a car of ore is now being sacked, which assays indicate will carry \$300 per ton in gold. Ore occurs in talc gouge along a fracture in limestone and ranges in thickness from a few inches to several feet. There has been considerable excitement over rich find, and claims have been staked for several miles from the Boss.

YELLOW PINE (Goodsprings)—New two-compartment shaft has reached a depth equal to lowest of old workings, and connections are being made with seventh level. Several stations and ore pockets will be constructed before new shaft can handle entire output of mine. During June, 1200 tons of zinc concentrates and 250 tons of lead concentrates were shipped, a considerable increase over previous months. Mill operated at but two-thirds capacity, and it is expected that full capacity will be maintained as soon as shaft-work is complete. Company paid regular monthly dividend of 1c. per share in June, but announced intention of paying dividends quarterly instead of monthly, hereafter.

Churchill County

NEVADA HILLS (Fairview)—Report for May, 1914, is as follows: Ore treated, 5300 tons; gross value, \$42,350; net costs, \$32,812; loss in tailings, \$4267; net profit, \$5271. Total extraction of 89.9% was made, 19.1% by concentration and 70.8% by cyanidation.

Esmeralda County

LOU DILLON-SILVER PICK (Goldfield)—A consolidation of these two properties will be effected. New company will be called Lou Dillon-Silver Pick Extension Consolidated Co.

JUMBO EXTENSION (Goldfield)—Extraction in 10-stamp section of Goldfield Consolidated mill has been increased from 75 to 83%. Lower portion of big stone above 921-ft. level has caved, necessitating suspension of work in east drift on 850-ft. level until a crosscut can be driven around cave. Mine production is not curtailed.

Humboldt County

DONNELLY MOUNTAIN MINES CO. (Gerlach)—Articles of incorporation have been filed. Development work will be done on six claims on Donnelly mountain in northwestern part of county.

NATIONAL MINES CO. (National)—It is reported that a cache of 20 sacks of high-grade ore has been found in an old abandoned drift. Good-grade oreshoot was struck recently in deepest workings. Mill is running steadily.

Lander County

AUSTIN-DAKOTA (Austin)—Main vein is being developed by a tunnel 300 ft. to northeast of incline shaft. Bottom of shaft is in ore containing native silver. Drifting from shaft and driving of tunnel are being done under contract. Mine is equipped with hoisting plant and pumps.

Lincoln County

AMALGAMATED PIOCHE (Pioche)—Crosscut on 1400-ft. level has cut shoot of silver-lead ore 7 ft. wide. Discovery was unexpected, and further development is necessary to determine extent of shoot.

YUBA (Pioche)—Shoot of good-grade silver-lead ore has been opened west of shaft on 800-ft. level. This ore contains both lead carbonate and steel galena. It is planned to drive from old Boston-Pioche shaft to Yuba workings, and deal for use of this shaft and equipment is now under way. Compressor will be installed at No. 3 shaft.

Lyon County

ACTIVITY IN MOUNT GRANT DISTRICT is considerable. A small mill is in operation on Burke property, and another mill has been moved from Aurora to Lewis property.

MOUND HOUSE GYPSUM CO. (Moundhouse)—Property is being examined for purchase by United States Asbestos Co.

NEVADA-DOUGLAS (Ludwig)—Following estimate of cost of mining, and treating ore by leaching is taken from statement of A. J. Orem, superintendent: Acid loss, \$0.35; acid regeneration, \$0.35; handling of solutions, \$0.50; electrolytic precipitation \$0.45; superintendence, \$0.52; mining, \$2; crushing and grinding, \$0.50; interest and depreciation, \$0.30; freight handling, etc., \$0.21; total, \$5.18.

MASON VALLEY MINES CO. (Thompson)—Ore receipts for June, 1914, were as follows: From Mason Valley mine, 7558 tons; from Nevada-Douglas, 3403 tons; from other mines, 9905 tons; total, 20,866, or a daily average of 696 tons. During same month 13 cars of blister copper were shipped. Exploratory work is being done in Bluestone mine, Mason Valley district. A large tonnage of ore is now being received from Balaklala company, of Kimberly, Calif.

Nye County

TONOPAH CASH BOY (Tonopah)—Shaft is now 1245 ft. deep and sinking will be continued to 1400-ft. level, where crosscut will be driven to cut extension of Murray vein from Tonopah Extension ground. Shaft is now in ore-bearing formation and indications are favorable.

WHITE CAPS (Manhattan)—Two shifts of miners are laying air lines for machine drills, removing debris left in mine from lease operations, putting down rails, catching up several incipient caves through fault plane. Soon mining operations on company account will be at full capacity. Next addition to surface plant is to be two large ore bins, which will be used immediately upon completion. It is understood that a shipment to renovated Associated mill will be made as soon as mill is in shape to receive it.

White Pine County

FIRST AID AND MINE RESCUE CONTEST was held in Ely on the Fourth as part of celebration. First aid contest was won by Copper Flat team and mine rescue by Veteran mine team.

WILLOW CREEK CONSOLIDATED (Ely)—It is planned to build a stamp mill this autumn.

WILLOW CREEK GOLD MINING CO. (Ely)—Good tonnage of milling-grade ore has been developed and mill may be built.

NEW MEXICO

Bernalillo County

SANTA FE DREDGING CO. (Golden)—Eighteen cars of machinery are en route and three cars are already on property. Company is employing 34 men and 18 teams in transportation; 360-hp. Corliss engine and 250-kw. generator supply electric power, supplanting steam. Dredge is being re-modeled. Company will work 570 acres proved placer ground. Work will commence with day and night shifts after Aug. 1.

Grant County

COLORADO FUEL & IRON CO. (Fierro)—Company continues to ship 10 carloads iron ore daily to Pueblo, Colo. from Brockman property. District in general rather dull at present time.

CHINO COPPER CO. (Santa Rita)—Steel structural work on crushing plant is nearing completion. Ore bins are latest addition to Santa Rita plant. Railroad construction to Northwest orebody is finished. Many road improvements and new business houses are adding to appearance of Chino camp.

Socorro County

MOGOLLON MINES CO. (Mogollon)—Incorporation papers have been filed with state corporation commission, paid up capital being given at \$1,655,015. Ex-Postmaster-General Frank H. Hitchcock is president of company. Company is incorporated under laws of Maine.

UTAH

Juab County

TINTIC SHIPMENTS FOR FIRST HALF OF 1914 have amounted to 3656 cars, ore coming from 39 mines and leases.

GRAND CENTRAL (Mammoth)—Conditions are stated to be such as to insure continuance of present dividend rate of 15c. to 20c. a share yearly.

EAGLE & BLUE BELL (Eureka)—Ore has been opened below 1600, and it is planned to sink main shaft from 1550 to 1700, where drifting will be started.

TINTIC ZINC (Eureka)—This company's tunnel is in 540 ft. at a vertical depth of 300 ft. Some mineralization is showing in the face, which is nearing a large iron blow out.

GEMINI (Eureka)—This company, capitalized at 5000 shares, has declared a dividend of \$10 per share, or \$50,000. This will make a total dividend record of \$2,280,000 since payments began in '80s. In 1912 there were produced approximately 14,000 tons; in 1913, 22,000 tons; and 12,000 tons thus far in 1914. Work carried on by lessees is being done from 200- to 1600-ft. levels.

SIoux CONSOLIDATED (Silver City)—This property has been leased and a small force is at work. It is expected that operating expenses will be met from small bunches of ore left in some old workings. Stringers of ore now exposed will be followed in hope of finding offshoots from Beck Tunnel-Colorado vein, which continues for several hundred feet in Sioux ground. A large dump will be sampled.

CHIEF CONSOLIDATED (Eureka)—Company has just declared a dividend of 5c. per share, or \$43,820, payable Aug. 25. This will bring total from this company thus far to \$263,030. In June 3850 tons of ore were marketed, and monthly output during last six months has ranged from 3250 in February, lowest month, to 5000 tons in May, highest; 24,000 tons has been produced thus far in 1914. Main working shaft is to be provided with heavier guides, which will be placed during the early part of July.

Summit County

MINES OPERATING CO (Park City)—This company's mill is treating stope fillings from Ontario at increased profit, owing to greater efficiency of recently installed new machinery.

DALY WEST (Park City)—Foundations for new mill are being laid, and work on mill building will begin shortly. Capacity will be 250 tons per day. In 1913 Daly West mill treated 59,233 tons of ore, which gave 8332 tons of lead and 1592 tons of zinc concentrates. New mill will be similar to old, but improvements are contemplated, by which greater efficiency is expected. Upper levels are being worked by lessees, who drop their ore to 1200 level tunnel, from which it is loaded. Shipments of crude ore from mine during 1913 amounted to 5038 tons.

Tooele County

BULLION COALITION (Stockton)—A station has been cut 1300 ft. vertically underground and 8500 ft. in from portal of Honorine tunnel. Work is in dolomite limestone. A shaft will be sunk 150 ft. and crosscutting started for an orebody, which has been found to continue downward from tunnel level. An engine is being installed. Mill is treating 50 tons of low-grade ore daily.

Utah County

PACIFIC (American Fork)—New lessees have a force of 10 men at work; shaft is being sunk and prospecting is being done in various places. A pump will be installed to take care of water which has interfered with shaft sinking. Gasoline engine will be used.

WASHINGTON

Ferry County

SAN POIL-REPUBLIC (Republic)—While a plan to consolidate these two companies is still under consideration, leaders in movement admit that prospects for success are not encouraging. At an adjourned meeting in Spokane, July 3, of Republic stockholders proposed plan was practically turned down, but another plan has been suggested, nature of which has not been made public. Consolidation plan, which originated with San Poil company, provides for organization of a new corporation, capitalized for 1,500,000 shares at \$1 each. San Poil stockholders to be apportioned half issue and Republic stockholders half. This means that San Poil company, now capitalized for 1,500,000 shares, will sacrifice half of its stock and Republic, capitalized for 1,000,000 shares, will suffer a loss of but 25%. This discrepancy is offset, however, by proportionate indebtedness, San Poil having outstanding obligations of \$150,000 and Republic but \$90,000.

Okanogan County

RATTLER (Chesaw)—New equipment is being installed and preparations are being made for enlarging the force.

WISCONSIN

Jackson County

DIAMOND DRILLING HAS BEEN STARTED at Iron Mound, near Black River Falls, to explore for iron ore, of which there are some indications. Locality is 75 miles northwest of recently abandoned Baraboo district, and is far removed from any other known iron region. University of Wisconsin is now having a geological survey made of southern Sawyer and northern Rusk counties, 50 miles north of Black River Falls. A total of 80 men are employed. Field work will be completed by Sept. 20.

Zinc-Lead District

THOMPSON—R. E. Davis and H. A. Roessler, of Platteville, have organized a company to develop J. J. Thompson land near Lead Mine, in Benton district.

ALDERSON—Charles Kistler, of Platteville, has begun shaft sinking on Alderson 80-acre tract, three miles south of Platteville; 50-ton mill and equipment of St. Rose Co. have been purchased and will be removed to the Alderson.

CANADA

Ontario

PORCUPINE LAKE (Porcupine)—This mine has been closed down owing to lack of funds. An attempt will be made to reorganize.

COCHRANE (Cobalt)—An oreshoot from 3 to 5 in. wide of 2000-oz. ore has been opened up on 100-ft. level. Same vein has been cut on level below, where it is of much lower grade.

TIMISKAMING & HUDSON BAY (Cobalt)—Mill of this company was closed down July 6 and mine will shortly be closed. Company is still operating its claim south of McKinley-Darragh.

DOVE LAKE (Porcupine)—No. 1 vein has been opened up for over 40 ft. on 300-ft. level, showing high-grade ore. Main shaft is now down to 400 ft. and crosscutting will be undertaken to tap veins proved up on upper levels.

MEXICO

Chihuahua

AMERICAN SMELTING & REFINING CO.—Company has blown in two of six furnaces at Chihuahua plant, and hopes to be able to do something in way of resumption of operations at Velardeña in near future. Difficulty of obtaining an operating force is chief obstacle company has to meet. Chihuahua plant requires 900 men to operate at capacity and mines at that place 2500 men.

TRANSVAAL

GOLD PRODUCTION IN JUNE is reported by cable at 717,926 oz., which is 2303 oz. less than in May and 29,151 oz. less than in June, 1912. The average daily output for June, however, improved, being 23,931 oz., against 23,233 in May. For the six months ended May 31 the total was 4,640,427 oz. in 1913, and 4,086,847 oz.—or \$84,475,127—in 1914, a decrease of 553,580 oz., or 11.9% this year.

The Market Report

METAL MARKETS

NEW YORK—July 18

The metal markets have been quieter this week, the activity reported recently having passed over. Price fluctuations have been small.

MONTHLY INDEX NUMBERS

Month	1912	1913	1914	Month	1912	1913	1914	Month	1912	1913	1914
Jan.	111	126	108	May	118	126	111	Sept.	127	118	...
Feb.	109	125	115	June	117	117	109	Oct.	133	114	...
March	111	125	110	July	114	110	...	Nov.	129	110	...
April	115	124	107	Aug.	120	116	...	Dec.	129	110	...

Average for year 1913, 118; year 1912, 119; year 1911, 112; year 1910, 115. Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Copper, Tin, Lead and Zinc

Copper—The activity in the market during the early part of July had petered out before the beginning of our last week. The publication of the June statistics threw a further wet blanket over the market. At the moment the world's production of copper is in excess of its consumption. The producers are averse to carrying more than their natural proportion of the increasing unsold accumulation, which is equivalent to saying that everybody wants to sell copper, but everyone is more or less circumspect in his way of going about it. In the early part of the week copper was offered freely by producers and second hands at 13½c., delivered, usual terms, and some domestic business was done at 13½c. During the latter part of the week 13½c. was the asking price openly named. The attitude of some of the producers toward customers seems to be, "We offer at this price, what will you give?" Certain of the large producers, however, have ostensibly maintained a higher asking price and have avoided putting any pressure on the market, although there have been indications that they have been fishing for the level at which worth-while business might be done. The total volume of the business done during the last week was small.

Prime Lake copper was sold by producers in round lots right through the week at 13½c., basis, cash, New York.

The average of quotations of electrolytic during the week is 13.49 cents.

The London standard market has been quiet and weakish, fluctuating around £61 for spot and £61 10s. for three months. It closes on July 15 at £61 2s. 6d. for spot and £61 11s. 3d. for three months.

Base price of copper sheets is now 19c. per lb. for hot rolled and 20c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14½¢ @ 15½¢. per lb., carload lots at mill.

Tin—The advance of last week did not increase the interest in the market. In fact, trading ceased almost entirely, and selling orders from this side which were placed on July 14 on the London Metal Exchange easily upset this market. It declined about £4 and failed to rally. The close is easy at £142 17s. 6d. for spot and £144 7s. 6d. for three months, and about 31½c. here.

Lead—This market also has been weaker. While some small lots of special lead have been sold at a cent or two above quotations, the larger business was done at 3.75c. and a trifle under. There appears to have been a distinct pressure to sell from several quarters, and the demand has not been good.

The London market is also lower, Spanish lead being quoted £19 2s. 6d.; English lead, £19 12s. 6d. per ton.

Exports from Baltimore for the past week included 846,676 lb. lead, to Hamburg and Bremen, Germany, and to Rotterdam, Holland.

Spelter—During the early part of the week certain important producing interests took the bull by the horns and sold largely at a reduced price, realizing about 4.75c., St. Louis. During the latter part of the week the metal was freely offered at that price without finding takers.

The London market is unchanged, good ordinaries being quoted £21 12s. 6d.; specials, £22 7s. 6d. per ton.

Base price of zinc sheets is \$7 per 100 lb., f.o.b. Peru, Ill., less 3% discount.

Other Metals

Aluminum—Business continues on a moderate scale, and prices are a little easier. Current quotations are 17.50 @ 17.75c. per lb. for No. 1 ingots, New York.

The Bremer-Waltz Corporation, 30 Church Street, New York, has been recently organized with W. S. Bremer, president; J. L. T. Waltz, secretary and treasurer, to handle aluminum in all its forms. Mr. Waltz has been engaged in importing aluminum for a number of years, having been manager for Guiterman, Rosenfeld & Co., of New York.

DAILY PRICES OF METALS

NEW YORK

July	Sterling Exchange	Silver, Cts. per Oz.	Copper		Tin		Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	
9	4.8765	56½	13.55 @13.65 13.47½	32½	3.87½ @3.90 3.87½	3.72½	4.87½ @4.92½ 4.87½	4.72½	@4.77½	4.72½
10	4.8750	55½	13.50 13.45	32½	3.87½ @3.90 3.87½	3.72½	4.87½ @4.92½ 4.87½	4.72½	@4.77½	4.72½
11	4.8750	55½	13.50 13.45	32½	3.87½ @3.90 3.87½	3.72½	4.87½ @4.92½ 4.87½	4.72½	@4.77½	4.72½
13	4.8750	55½	13.50 13.40	32½	3.87½ @3.90 3.87½	3.72½	4.87½ @4.90 4.87½	4.75	@4.75	4.72½
14	4.8740	55½	13.50 13.40	31½	3.87½ @3.90 3.87½	3.72½	4.87½ @4.90 4.87½	4.75	@4.75	4.72½
15	4.8710	54½	13.50	31½	@3.90	3.75	@4.90	4.75	@4.75	4.75

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

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. 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, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triests, 22c.

LONDON

July	Copper						Tin		Lead		Zinc	
	Silver	£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'd	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.	
												Spot	3 Mos.	£ per Ton	Cts. per Lb.
9	25½	61½	13.36	62	66	147½	148½	19½	4.24	21½	4.67	
10	25½	61½	13.31	61½	66	146½	148	19½	4.24	21½	4.67	
11	25½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13	25½	61½	13.36	62	66½	146½	147½	19½	4.21	21½	4.67	
14	25½	61	13.25	61½	65	143½	144½	19	4.13	21½	4.67	
15	25½	61½	13.28	61½	65	142½	144½	19½	4.16	21½	4.70	

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26½c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21½c.

Antimony—Business has a better tone and demand shows some improvement. Ordinary brands—Hungarian, Chinese, etc., are, however, a little easier at 5.60@5.75c. per lb. Cookson's holds at 7.10@7.30c., with 6.90@7.10c. for other special brands.

Quicksilver—While there is a fair demand prices are rather softer. New York quotation is \$36@37 per flask of 75 lb. with 53@54c. per lb. quoted for jobbing lots. San Francisco, \$36.50 per flask, with about \$2 less for export. London, £7 per flask, with £6 17s. 6d. quoted by second brands.

Nickel—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are \$1.80 per lb. for imported, \$1.72 for metal from native ores—**Cadmium**, 750 marks per 100 kg.—81c. per lb.—at works in Germany—**Magnesium**, \$1.50 per lb., New York—**Selenium**, \$3@3.25 per lb. for lots of 100 lb. or over, and \$5 per lb. for small quantities.

Gold, Silver and Platinum

Gold—While the European banks are carefully holding their gold, the special demand for arrivals in London was less keen, and no premium was paid, the price continuing at 77s. 9d. per oz. for bars.

Transvaal Gold Production in June is reported at \$14,839,530, showing decreases of 0.3% from May, and of 4.1% from May, 1913. For the five months ended May 31 the total gold reported was \$95,917,626 in 1913, and \$84,475,127 in 1914; a decrease of \$11,442,499, or 11.9%, this year.

Platinum—The market here is quiet and unchanged, dealers asking \$43@44 per oz. for refined platinum, and \$46@51 per oz. for hard metal. The foreign market is reported unsettled.

Silver—The market continued dull and quiet on small demand until July 14 and 15, when the price broke under selling pressure by the Chinese Banks. Indian demand continues light owing to heavy stocks on hand, unfavorable Monsoon reports and the probability that the India Mint will not buy-in the near future.

Shipments of silver from London to the East, Jan. 1 to July 2, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£4,012,000	£3,893,000	D. £119,000
China.....	417,000	40,000	D. 377,000
Total.....	£4,429,000	£3,933,000	D. £496,000

Stocks in London are reported as gradually decreasing, and there is little speculation in futures.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—July 11

There was a slight slump in the market this week, the base price paid for 60% zinc ore being \$37@38.50 per ton. For 80% lead ore the market price was \$46@47 per ton. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED JULY 17

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,463,520	.....	711,600
Year	80,103,920	2,862,610	21,419,930

Shipped during week to separating plants—3,087,350 lb. zinc ore.

JOPLIN, MO.—July 11

Zinc blende sold at \$42, though there is a drop of \$1 in the base price, which is \$37.50@39 assay, and \$36@37.50 metal base. Calamine is \$19@22 per ton of 40% zinc. The average selling price of all grades is \$35.80 per ton. Lead sold as high as \$48, the base remaining at \$46 per ton of 80% metal content, and the average of all grades is \$46.08 per ton.

The further decline in zinc ore prices is pressing some producers very hard, and a few cannot long continue with no margin of profit showing, unless an arrangement can be made with miners to accept a lower wage scale, and this is not probable yet.

SHIPMENTS WEEK ENDED JULY 11

	Blende	Calamine	Lead	Values
This week	8,539,290	565,830	1,264,390	\$199,930
28 weeks	287,477,960	20,728,810	49,353,280	\$7,047,515

Blende value, the week, \$164,620; 28 weeks, \$5,629,150.
Calamine value, the week, \$6180; 28 weeks, \$235,835.
Lead value, the week, \$29,130; 28 weeks, \$1,182,535.

MONTANA ZINC ORE

Butte & Superior in June produced 8600 tons of blende concentrates, averaging 54.7% zinc.

IRON TRADE REVIEW

NEW YORK—July 15

The iron and steel markets seem surely to have taken an upward turn, and the improvement is the more manifest since July is generally regarded as a dull month.

The pig iron market is more active for both foundry and basic, especially foundry iron. Orders are small generally, but more numerous than they have been.

A sale of low phosphorus pig for export to Wales is reported to have been made at 61s., or \$14.64 per ton. The analysis of the iron shows 2% silicon, 0.35 sulphur and phosphorus, 0.2 manganese and 0.5% copper.

The United States Steel Corporation reports unfilled orders on its books June 30 at 4,032,857 tons of material of all kinds. This is 34,697 tons more than on May 31 and is the first increase shown for a number of months. It is 249,251 tons less than on Dec. 31 last.

Pig Iron Rates from Virginia Furnaces will be reduced Aug. 15 by the decision of the Interstate Commerce Commission in the complaint of the Low Moor Iron Co. against the Chesapeake & Ohio and other roads. The Commission finds that the present rates are too high and discriminate against the Virginia furnaces in competition with those in Pennsylvania. The reduction ordered is 10%, the new rates being \$2.25 per gross ton to Baltimore; \$2.75 to Philadelphia; \$3 to New York; \$3.25 to Boston.

Pig Iron Production in June again showed a decrease. The reports of the furnaces, as collected and published by the "Iron Age" show a total of 193 coke and anthracite stacks in blast on July 1, having a total daily capacity of 63,700 tons; a decrease of 800 tons from July 1. Making allowance for the charcoal furnaces, the estimated total make of pig iron in the United States in June was 1,946,500 tons; for the six months ended June 30 it was 12,365,200 tons. Of this total 8,718,200 tons, or 70.5%, were made by the furnaces owned or operated by steel works.

PITTSBURGH—July 14

The improved rate of buying of steel products for prompt shipment which obtained in June has continued with scarcely any abatement since the first of this month, while buying on contract has increased, and on the whole the total bookings, in contracts and prompt orders, appear to be at a somewhat greater rate than in June. Prices have responded to the better buying to the extent that declines are entirely arrested in finished-steel products, though perhaps not in unfinished steel, and in some directions there is slightly more firmness.

Sentiment throughout the iron and steel trade has greatly improved in the past week, on the part of buyers as well as sellers, and there is a more general disposition to buy ahead, even to the extent, in many cases of paying a premium for far forward deliveries. Prices are expected to firm up or advance slightly, but no large advances are expected for material for delivery any time this year. The improvement is expected in tonnage rather than in prices.

An agreement on the wage scale to govern the operation of union iron mills was reached last Friday between the Western Bar Iron Association and the Amalgamated Association, whereby slight advances are given in rates in the sliding scale when bar iron ranges under 1.25c., there being no change in rates from the old scale when bar iron is 1.25c. or higher. On 1.00c. bar iron the puddling rate is 25c. higher, at \$5.50 per ton.

Pig Iron—There is a moderate movement in foundry iron, chiefly in small lots. Small lots only of bessemer iron are changing hands. One of the Allegheny river steel plants has purchased 6000 tons of basic iron, the price reported being \$13.90, delivered. Several other steel interests are expected to buy basic shortly. We quote: Bessemer, \$14; basic, foundry and malleable, \$13; gray forge, \$12.50 to \$12.75, at Valley furnaces, 90c. higher delivered Pittsburgh, except that one or two furnaces having 75c. freight to Pittsburgh would probably sell foundry at \$13 at furnace or \$13.75, Pittsburgh.

Ferromanganese—The price of \$37, Baltimore, on German ferromanganese seems to be made upon authority from the German producers, while English is still quoted at \$38. In some quarters it is believed that a part of the arrangement between the English and German producers is that the latter be allowed occasionally to undersell the former's price. The market is very quiet.

Steel—There are reports of lower prices quoted by some of the Youngstown mills on both billets and sheet bars. There are very few regular transactions, most of the consumers having contracts on which price adjustments are made from time to time. We quote prices, f.o.b. Youngstown mill at \$19 for billets and \$19.50 for sheet bars, or 50c. lower than formerly, and prices f.o.b. Pittsburgh mill at \$19.50 for billets and \$20 for sheet bars. Rods are \$24.50 to \$25, Pittsburgh.

IRON ORE

Shipments of iron ore from the Lake Superior region in June were 5,502,367 gross tons. For the season to July 1 the total shipments were:

Port	1913	1914	Changes
Escanaba.....	1,800,601	1,076,020	D. 724,581
Marquette.....	1,059,776	383,948	D. 675,828
Ashland.....	1,509,702	833,081	D. 626,621
Superior.....	4,677,349	3,733,502	D. 943,847
Duluth.....	3,995,948	1,779,876	D. 2,216,072
Two Harbors.....	3,081,666	1,767,680	D. 1,313,977
Total.....	16,125,042	9,624,116	D. 6,500,926

Out of the total shipments in June 4,383,045 tons, or 79.7%, went to Lake Erie ports.

COKE

Coke production in the Connellsville region for the week is reported by the 'Courier' at 259,252 short tons; shipments, 275,902 tons. Production of the Greensburg and Upper Connellsville districts, 35,826 tons.

The Otto Coking Co., New York, has been awarded the contract for the construction of the byproduct coke plant of the Niagara Coke Corporation near Buffalo. The company plans a plant to cost about \$1,000,000, to employ 700 men and capable of carbonizing 1700 tons a day.

Connellsville Coke—The market continues very quiet, but with a little interest shown, two consumers having inquired for furnace coke on contract for the second half of the year. One of these represents a furnace now in blast, with a contract just expired, the other being a furnace which may possibly go into blast. In general consumers are covered at least for the present month. A contract is reported for 13 cars weekly of foundry coke the next twelvemonth at the full market price for the best grade. We quote: Prompt furnace, \$1.75@1.80; contract furnace, \$1.90@2; prompt foundry, \$2.25@2.35; contract foundry, \$2.35@2.50, per net ton at ovens.

Anthracite Shipments in June were 6,130,196 long tons, an increase of 160,189 tons over June, 1913. For the six months ended June 30 the total shipments were 34,851,854 tons in 1913, and 32,945,789 in 1914; a decrease of 1,906,065 tons, or 5.5%, this year.

Coal Imports of Spain, four months ended Apr. 30 were 939,728 tons, a decrease of 9471 tons; coke imports, 126,501 tons, an increase of 1197 tons over last year.

Fuel Production in Germany five months ended May 31 is reported as below, in metric tons:

	1913	1914	Changes
Coal.....	77,648,129	79,131,777	I. 1,483,648
Brown coal.....	35,041,459	37,192,341	I. 2,150,882
Coke.....	13,333,419	13,309,963	D. 23,456
Briquettes.....	10,965,055	12,078,029	I. 1,112,974

Of the briquettes reported this year, 9,414,818 tons were made from brown coal, or lignite.

Arsenic—The market remains quiet and easy, but prices do not change. The current quotation is \$3 per 100 lb. for both spot and futures.

Copper Sulphate—Business is fair but not specially active. Prices are a little lower, \$4.50 per 100 lb. being quoted for carload lots and \$4.75 per 100 lb. for smaller parcels.

PETROLEUM

Announcement is made that the Valley Pipe Line Co. has awarded to Sanderson & Porter, of New York, a contract for the entire installation of a pipe line for transporting oil from the San Joaquin oil field in California to tidewater. The Valley Pipe Line Co. is one of the subsidiaries of the Royal Dutch-Shell combination, and the new line will be 175 miles in length. Surveys for the pipe line have been completed and contracts for the pipe have been placed with the Youngstown Sheet & Tube Co. Equipment for stations will be furnished by the Llewellyn Iron Works of Los Angeles.

COPPER SMELTER'S REPORTS

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

	February	March	April	May	June
Alaska shipments.....	1,803,579	2,060,960	1,279,537	585,387	1,114,758
Anconda.....	21,300,000	23,800,000	22,900,000	23,500,000	23,800,000
Arizona, Ltd.....	3,062,000	3,286,000	3,570,000	3,092,000	3,742,000
Copper Queen.....	6,987,366	7,637,042	7,562,723	8,388,203	7,613,719
Calumet & Ariz.....	5,596,850	5,875,000	5,450,000	5,495,000	4,630,000
Chino.....	5,642,426	5,399,814	5,926,591	5,496,875	.....
Detroit.....	1,814,214	1,973,725	1,790,926	2,105,034	2,129,100
East Butte.....	1,193,960	1,546,180	1,178,000	1,170,762	1,215,323
Giroux.....	90,017	287,980	45,948	429,553	.....
Masou Valley.....	1,254,000	1,250,000	862,000	916,000	.....
Manmoth.....	1,400,000	1,800,000	1,850,000	1,750,000	1,725,000
Nevada Con.....	4,588,243	5,218,257	4,880,043	4,959,589	.....
Ohio.....	582,000	797,520	610,518	625,000	.....
Old Dominion.....	3,066,000	2,997,000	2,779,000	3,302,000	2,937,000
Ray.....	5,432,000	6,036,908	6,089,362	6,300,847	.....
Shannon.....	903,761	1,082,000	1,012,000	1,056,000	.....
South Utah.....	333,874	406,381	247,641	55,394	.....
Tennessee.....	1,232,812	1,262,184	1,370,800	1,336,950	.....
United Verde.....	2,700,000	3,100,000	3,000,000	3,100,000	.....
Utah Copper Co.....	9,07,111	12,323,493	12,739,757	13,208,483	.....
Lake Superior*.....	8,500,000	11,000,000	13,000,000	12,500,000	16,000,000
Non-rep. mines*.....	7,600,000	8,200,000	8,000,000	8,200,000	.....
Scrap, etc.....	2,500,000	2,500,000	2,500,000	2,500,000	.....
Total prod.....	96,700,213	107,036,667	108,554,846	110,082,077	.....
Imp. bars, etc.....	19,918,448	22,676,605	17,043,191	.....	.....
Total blister.....	16,708,661	129,713,272	125,598,035	.....	.....
Imp. ore & matte.....	9,713,164	7,029,646	10,400,122	.....	.....
Total Amer.....	126,421,825	136,742,918	135,998,157	.....	.....
Miami.....	3,316,482	3,361,100	3,130,772	3,347,000	3,124,750
Shattuck-Arizona.....	1,134,480	1,136,458	1,386,594	1,353,043	.....
Brit. Col. Cos.....	.....	.....	.....	.....	.....
British Col. Cop.....	.....	.....	.....	.....	.....
Granby.....	1,661,212	1,775,852	1,692,102	1,669,334	.....
Mexican Cos.....	.....	.....	.....	.....	.....
Boleo.....	1,984,080	2,535,680	2,204,720	2,213,120	.....
Cananea.....	2,688,000	4,260,000	2,632,000	2,222,000	.....
Mocetzuma.....	2,642,543	2,887,884	2,654,926	2,834,616	3,370,800
Other Foreign.....	.....	.....	.....	.....	.....
Braden Chile.....	2,362,000	1,810,000	2,720,000	2,480,000	741,440
Cape Cop. S. Af.....	459,200	660,800	468,160	.....	.....
Kyshtim, Russia.....	1,534,400	.....	.....	.....	.....
Spassky, Russia.....	902,720	896,000	904,900	907,200	.....
Exports from.....	.....	.....	.....	.....	.....
Chile.....	6,720,000	6,944,000	9,072,000	7,616,000	.....
Australia.....	7,952,000	8,176,000	7,168,000	8,400,000	.....
Arrivals-Europe.....	18,354,560	17,572,800	17,299,520	13,558,720	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.
‡ Does not include the arrivals from the United States, Australia or Chile.

CHEMICALS

NEW YORK—July 15

Midsummer quiet seems to have settled over the general market, and business is quiet.

Nitrate of Soda—While there is no special activity at this season, there is some business doing. Prices are 2.10c. per lb. for spot and 2.07½c. for futures.

W. Montgomery & Co., Ltd., of London issue the following statement giving the movement of nitrate of soda for the year ended June 30, in long tons:

	1912-13	1913-14	Changes
Shipments from S. America...	2,647,000	2,631,000	D. 16,000
Estimated consumption.....	2,451,000	2,633,000	I. 182,000
Visible supply June 30.....	420,000	400,000	D. 20,000

Visible supply includes quantities afloat. The estimated consumption last year was: Europe, 1,990,000; United States, 553,000; other countries, 90,000; total, 2,633,000 tons.

Latest quotations at Chilean ports were \$1.81@1.92 per quintal. Freight to Europe or the United States, \$2.16 per ton by steamer.

COPPER STATISTICS

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
VII. '13	138,074,602	58,904,192	78,480,071	52,814,606	77,904,000	124,808,606
VIII. '13	131,632,362	73,649,801	73,263,469	53,594,947	66,420,480	120,015,385
IX. '13	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X. '13	139,070,481	68,173,720	68,123,477	29,793,094	53,025,600	83,418,692
XI. '13	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII. '13	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr. '13	1,622,450,829	767,261,760	869,062,784	.....	.....	.....
I. 1914.	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II. '14	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,405,485
III. '14	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV. '14	151,500,531	63,427,633	82,345,216	64,609,319	46,435,200	111,044,519
V. '14	142,308,287	55,592,170	72,710,477	70,337,001	52,371,200	122,708,201
VI. '14	141,345,571	46,227,353	73,350,196	84,342,641	61,062,400	145,405,041
VII. '14	.....	.....	.....	106,110,663	64,220,800	170,331,463

Note—Visible supplies in Europe do not include copper afloat.

Mining Companies—United States

Name of Company and Situation	Shares		Dividends		
	Issued	Par	Total	Latest	Amt.
Acacia, g.	1,438,989	\$ 1	122,004	Jan '11	\$0.01
Adams, s.l.c.	80,000	10	778,000	Dec. '09	0.04
Almeek, c.	50,000	25	2,030,000	Apr. '14	2.00
Alaska Mexican, g.	180,000	5	3,345,381	May '14	0.20
Alaska Treadwell, g.	200,000	25	14,335,000	June '14	1.00
Alaska United, g.	180,200	5	1,666,840	May '14	0.20
Am. Zinc, Lead & Sm.	165,360	25	1,071,420	Jan. '14	0.50
Anaconda, c.	4,662,507	25	87,916,875	Apr. '14	0.75
Argonaut, g.	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf.	1,426,120	1.20	1,950,242	Apr. '14	0.00
Arizona Copper, com.	1,519,896	1.20	16,446,145	Feb. '14	0.30
Bagdad-Chase, g. pf.	84,819	5	202,394	Jan. '08	0.10
Baltic, c.	100,000	25	7,950,000	Dec. '13	2.00
Bingham N. H., c.	228,690	5	385,695	Apr. '14	0.10
Bonanza Dev., g.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	200,000	1	841,000	June '14	0.05
Bunker Hill & Sul., l.s.	327,000	10	15,225,250	June '14	0.25
Butte-Alex Scott, c.	74,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	596,353	10	20,504,287	June '14	1.25
Calumet & Hecla, c.	100,000	25	124,250,000	June '14	5.00
Camp Bird, g.s.	1,100,051	5	9,761,377	Jan. '14	0.24
Centen'l-Eur., l.s.g.c.	100,000	5	4,050,000	Apr. '14	1.50
Center Creek, l.z.	100,000	10	500,000	Apr. '14	0.50
Champion, c.	100,000	25	8,400,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	876,453	1	218,138	Feb. '14	0.10
Cliff, g.	300,000	1	90,000	Jan. '13	0.10
Cliff, g.	100,000	1	210,000	Oct. '13	0.01
Colorado Gold Dredging.	100,000	10	550,000	Jan. '14	2.50
Colorado, l.s.g.	1,000,000	0.20	2,570,000	Dec. '12	0.50
Columbus Con., g.s.	285,540	5	226,832	Oct. '07	0.20
Commercial Gold.	1,750,000	1	43,750	Dec. '10	0.00
Con. Mercur, g.	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l.	22,000	25	308,000	Jan. '14	0.50
Copper Range Con., c.	393,445	100	13,986,746	Oct. '13	0.75
Daly Copper, s.l.	300,000	1	765,000	Apr. '14	0.15
Daly West, s.l.	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g.	3,000,000	0.10	45,000	Mar. '11	0.00
Doe Run, l.	65,782	100	3,550,969	Dec. '13	0.76
Eagle & Blue Bell, g.s.l.	893,146	1	223,286	Apr. '14	0.05
Elkton Con., g.	2,500,000	1	3,379,460	May '14	0.02
El Paso, g.	490,000	5	1,707,545	Feb. '14	0.10
Ernestine, g.s.	300,000	5	165,000	Mar. '13	0.05
Fed. M. & S., com.	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	120,000	100	8,567,434	Mar. '14	1.50
Florence, g.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	10,000	100	180,000	Dec. '09	1.00
Fronton Con., g.	200,000	2.50	236,000	June '14	0.02
Frontier, z.	1,250	100	146,202	Nov. '13	2.00
Gemini-Keyne, l.g.s.	5,000	100	2,280,000	June '14	10.00
Gold Chain, g.	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	2,500,000	0.10	100,000	Dec. '12	0.00
Gold King Con., g.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	1,500,000	5	2,865,000	June '14	0.03
Golden Star, g.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	3,558,367	10	27,398,214	Apr. '14	0.30
Grand Central, g.	500,000	1	1,595,750	May '14	0.05
Granite, g.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	900,000	1	971,000	Dec. '13	0.01
Hecla, l.s.	1,000,000	0.25	3,070,000	June '14	0.02
Hercules, l.s.	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	218,400	100	35,251,486	June '14	0.65
Horn Silver, l.s.z.	500,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	1,666,667	1	216,832	July '13	0.00
Iowa-Tiger Leasing g.s.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	1,000,000	7.10	1,970,000	Apr. '14	0.10
Iron Silver, s.l.g.	500,000	20	4,900,000	Apr. '14	0.10
Jamison, g.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	2,500,000	7.10	175,000	Aug. '12	0.01
Kendall, g.	500,000	5	1,475,000	Nov. '12	0.02
Kennedy, g.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	200,000	1	396,000	Aug. '09	0.12
Klar Piquette, z.l.	20,000	1	187,500	Apr. '13	0.50
Knob Hill, g.	1,000,000	1	45,000	May '12	0.00
Liberty Bell, g.	130,551	5	1,452,338	Sept. '12	0.00
Little Bell, l.s.	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g.	1,309,252	1	1,143,123	Apr. '14	0.02
May Day, g.s.l.	800,000	0.25	132,000	Feb. '13	0.03
Mexican, g.s.	201,600	2.50	161,910	June '14	0.75
Miami, c.	664,993	5	3,338,869	May '14	0.50
Modoc, g.s.	500,000	1	275,000	Dec. '11	0.01
Mohawk, c.	100,000	25	3,175,000	Aug. '13	2.00
Monarch-Mad'a, g.s.l.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	921,865	1	530,000	Dec. '12	0.10
Mountain, c.	250,000	25	4,216,250	May '08	0.44
National, g.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	1,999,524	5	16,226,911	June '14	0.37
New Century, z.l.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	100,000	5	1,740,000	Apr. '14	0.10
North Butte, c.	410,000	15	11,685,000	Apr. '14	0.50
North Star, g.	250,000	10	4,262,040	June '14	0.30
Old Domin'n, M. & Sm.	162,000	25	3,563,000	Jan. '14	1.25
Opbir, s.g.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging.	700,000	5	1,468,086	Mar. '14	0.12
Osceola, c.	96,150	25	12,083,525	Apr. '14	1.00
Parrot, c.	229,850	10	7,359,085	May '14	0.15
Pearl Con., g.	1,909,711	0.05	181,422	Feb. '10	0.02
Pharmacist, g.	1,500,000	1	87,500	Dec. '10	0.00
Pioneer, g.	5,000,000	1	2,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g	2,790,000	1	715,400	Mar. '14	0.02
Portland, g.	3,000,000	1	9,577,080	Apr. '14	0.02
Quilp, c.	1,500,000	1	67,500	Feb. '13	0.01
Quincy, c.	110,000	25	20,952,500	Dec. '13	1.25
Republic, g.	1,000,000	1	85,000	Dec. '10	0.01
Rochester, l.z.	4,900	100	188,396	Dec. '10	0.50

Mining Companies—United States—(Continued)

Name of Company and Situation	Shares		Dividends		
	Issued	Par	Total	Latest	Amt.
Round Mountain, g.	866,426	\$ 1	\$ 363,365	Aug. '13	\$0.04
Seven Troughs Coal, g.	1,500,000	1	37,500	July '12	0.02
St. Joseph, l.	1,000,000	10	9,279,180	June '14	0.05
Shannon, c.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	350,000	10	1,925,000	Apr. '14	0.50
Silver King Coal, l.s.	1,250,000	5	2,534,085	Apr. '14	0.15
Sioux Con., s.l.g.	745,389	10	872,097	July '11	0.04
Skidoo, g.	1,000,000	5	275,000	May '12	0.02
Snowstorm, c.g.	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	178,394	10	5,274,407	Nov. '13	0.25
Stratton's Ind., g.	1,000,000	0.60	425,250	May '13	0.06
Success, z.	1,500,000	1	925,000	May '13	0.02
Superior & Pitts., c.	1,499,793	10	7,179,028	June '14	0.38
Tamarack, c.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	200,000	25	4,156,250	June '14	0.75
Tomboy, g.s.	300,000	4.85	3,482,905	June '14	0.48
Tom Reed, g.	909,555	1	1,937,246	June '14	0.06
Tonopah Belmont, s.g.	1,500,000	1	6,133,000	May '14	0.25
Tonopah Ext., g.s.	943,433	1	473,709	Apr. '14	0.05
Tonopah of Nev., s.g.	1,000,000	1	11,600,000	Apr. '14	0.25
Tri-Mountain, c.	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l.	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	1,000,000	1	40,000	Nov. '12	0.01
United (Clop. Cl.) g.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	23,000	10	1,794,000	Apr. '14	4.00
United Verde, c.	300,000	10	34,372,000	June '14	0.75
Utah, s.l.	100,000	10	281,860	Dec. '10	0.02
Utah, c.	2,797,182	10	22,350,809	June '14	0.75
Utah Con., c.	300,000	5	8,250,000	Mar. '14	1.00
Valley View, g.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	1,500,000	1	2,902,000	June '14	0.03
Wasp No. 2, g.	500,000	1	441,965	June '14	0.01
Wellington Mines, g.	10,000,000	1	300,000	July '13	0.00
Wolverine, c.	60,000	25	7,740,000	Apr. '13	5.00
Work, g.	1,500,000	1	172,500	July '08	0.00
Yak, s.l.	1,000,000	1	1,757,685	Mar. '14	0.02
Yankee Con., g.s.	1,000,000	1	143,500	Jan. '13	0.01
Yellow Aster, g.	100,000	10	1,216,789	June '14	0.05
Yellow Pine, l.z.s.	1,000,000	1	423,008	June '14	0.02
Yukon Gold, g.	3,500,000	5	2,998,000	June '14	0.07

Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	\$100	\$85,893,067	May '14	\$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	26,333,333	June '14	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	48,208,333	June '14	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	8,640,000	Apr. '14	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	13,087,000	Apr. '14	1.25
Cambria Steel.	Penn.	900,000	50	20,035,000	May '14	0.62
Greene Cananea.	U. S.	486,302	100	4,363,646	June '14	1.00
Guggenheim Expl.	U. S.	831,732	25	19,665,933	Apr. '14	0.87
Inter'l Nickel, com.	U. S.	115,826	100	12,933,715	June '14	2.50
Inter'l Nickel, pfd.	U. S.	89,126	100	7,957,424	May '14	1.50
Inter'l Sm. & Ref.	U. S.	100,000	100	3,900,000	May '14	2.00
National Lead, com.	N. Y.	206,554	100	8,106,055	June '14	0.75
National Lead, pf.	N. Y.	243,676	100	28,963,779	June '14	1.75
Old Dominion, c.	Ariz.	293,245	25	5,340,344	Apr. '14	1.00
Phelps, Dodge & Co.	U. S.	450,000	100	33,971,527	June '14	4.00
U. S. Steel Corp., com.	U. S.	5,083,025	100	207,569,744	June '14	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	376,578,945	May '14	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,320	50	6,098,852	Apr. '14	0.75
U. S. S., R. & M., pf.	U.S.-Mex.	351,105	50	13,816,321	Apr. '14	0.87

Assessments

Company	Dellng.	Sale	Amt.
Atlas Wonder, Nev.	July 6	July 29	\$0.01
Aurora-Sampson, Ida.	July 18	Aug. 18	0.002
Caledonia, Nev.	July 3	July 24	0.05
Challenge Cons., Nev.	July 21	Aug. 11	0.05
Crown Point, Nev.	July 6	July 28	0.10
D. & M., Utah	July 11	July 31	0.05
Emerald, Utah	July 15	Aug. 18	0.0033
Enterprise, Ida.	July 31	Aug. 17	0.002
Evergreen, Utah	July 23	Aug. 22	0.01
Federal-Ely, Nev.	July 20	Aug. 21	0.005
Hamburg-American, Ida. post'd	July 7	Aug. 6	0.001
Holy Terror, Ida.	July 15	Aug. 15	0.0005
Idaho-Nevada, Ida.	July 7	Aug. 1	0.001
Jack Waite, Ida.	July 21	Aug. 18	0.01
Moonlight, Ida.	July 13	Aug. 20	0.005
Nabob, Ida.	July 20	Aug. 17	0.005
New Hope, Ida.	July 13	Aug. 13	0.002
North Star, Ida.	July 10	Aug. 8	0.0015
Overman, Nev.	July 8	Aug. 29	0.05
Paymaster, Ida.	July 15	Aug. 12	0.002
Saltese, Mont.	June 20	July 20	0.002
Santaquin King, Utah	July 11	July 27	0.0025
Silver Mt., Ida., postponed.	July 11	Aug. 11	0.003
Smilver Pick, Nev.	June 22	July 27	0.01
Smuggler, Utah	July 11	Aug. 11	0.005
Snowshoe, Ida. postponed.	July 21	Aug. 18	0.0025
Spider, Utah	July 6	Aug. 27	0.01
Sunset, Ida.	July 10	Aug. 1	0.002
Utah-United, Utah	July 6	Aug. 27	0.01
Wasatch-Utah, Utah	July 13	Aug. 17	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
	January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26.788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60.654	58.721	57.919	27.074	27.335	26.704
August	61.606	59.293	58.375	27.335	27.986	26.704
September	63.078	60.640	59.088	27.986	28.083	26.704
October	63.471	60.793	59.299	28.083	27.263	26.704
November	62.792	58.995	59.012	27.263	26.720	26.704
December	63.365	57.760	59.320	26.720	26.720	26.704
Year	60.835	59.791	58.042	27.576	27.576	26.704

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	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March	14.713	14.131	65.329	64.276	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.996	68.807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190	13.000	64.166	60.446	73.614	69.446
August	15.400	14.000	69.200	74.313	78.614	73.614
September	16.328	15.125	73.125	78.614	79.250	73.614
October	16.337	15.125	73.383	79.250	73.825	73.825
November	15.182	14.000	68.275	73.825	69.583	69.583
December	14.224	13.000	65.223	69.583	69.583	69.583
Year	15.269	14.000	68.335	73.740	73.740	69.583

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

TIN

Month	New York		London	
	1913	1914	1913	1914
	January	50.298	37.779	238.273	171.905
February	48.766	39.830	220.140	181.556
March	46.832	38.038	213.615	173.619
April	49.115	36.154	224.159	163.963
May	49.038	33.360	224.143	150.702
June	44.820	30.577	207.208	138.321
July	40.260	28.511	183.511	138.321
August	41.582	28.511	188.731	138.321
September	42.410	28.511	193.074	138.321
October	40.462	28.511	184.837	138.321
November	39.810	28.511	180.869	138.321
December	37.635	28.511	171.786	138.321
Av. year	44.252	33.000	206.279	138.321

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

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
	January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	16.550	19.606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.321	3.810	4.242	3.688	17.697	18.225
May	4.342	3.900	4.226	3.898	18.923	18.503
June	4.325	3.900	4.190	3.810	20.226	19.411
July	4.353	4.223	4.223	4.038	20.038	20.038
August	4.624	4.550	4.550	4.406	20.406	20.406
September	4.695	4.573	4.573	4.448	20.648	20.648
October	4.402	4.253	4.253	4.106	20.302	20.302
November	4.293	4.146	4.146	3.999	19.334	19.334
December	4.047	3.929	3.929	3.781	17.798	17.798
Year	4.370	4.233	4.233	4.095	18.743	18.743

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

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
	January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21.413
March	6.078	5.250	5.926	5.100	24.605	21.460
April	5.641	5.113	5.491	4.993	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278	5.128	5.128	5.000	20.592	20.592
August	5.658	5.508	5.508	5.381	21.148	21.148
September	5.694	5.444	5.444	5.317	20.614	20.614
October	5.340	5.188	5.188	5.061	20.581	20.581
November	5.229	5.077	5.077	4.950	20.514	20.514
December	5.156	5.004	5.004	4.877	21.214	21.214
Year	5.648	5.504	5.504	5.366	22.746	22.746

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

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
	January	\$18.15	\$14.94	\$17.35	\$13.23	\$18.59	$13.90
February	18.15	15.06	17.22	14.12	18.13	14.09
March	18.15	15.07	16.96	13.94	17.53	14.18
April	17.90	14.90	16.71	13.90	16.40	14.10
May	17.68	14.90	15.80	13.90	15.40	14.23
June	17.14	14.90	15.40	13.90	15.10	13.97
July	16.31	15.13	15.13	14.74	14.74	14.74
August	16.63	15.00	15.00	14.88	14.88	14.88
September	16.65	15.04	15.04	14.93	14.93	14.93
October	16.60	14.61	14.61	14.80	14.80	14.80
November	16.03	13.91	13.91	14.40	14.40	14.40
December	15.71	13.71	13.71	14.28	14.28	14.28
Year	\$17.09	\$15.57	\$15.57	\$15.77	\$15.77	\$15.77

STOCK QUOTATIONS

COLO. SPRINGS July 11		SALT LAKE July 14	
Name of Comp.	Bld.	Name of Comp.	Bld.
Acacia	.02	Beck Tunnel	.03
Cripple Crk Con.	.006	Black Jack	.03
C. K. & N.	.06	Cedar Tailman	.00
Doctor Jack Pot.	.05	Colorado Mining	.11
Elkton Con.	.46	Crown Point	.01
El Paso	1.40	Daly-Judge	4.95
Findlay	.008	Gold Chain	.08
Gold Dollar	.03	Grand Central	.67
Gold Sovereign	.01	Iron Blossom	1.42
Golden Cycle	1.00	Little Bell	.10
Isabella	.10	Lower Mammoth	.00
Jack Pot.	.05	Mason Valley	2.25
Jennie Sample	.03	May Day	.06
Jerry Johnson	.02	Ophongo	.01
Lexington	.04	Prince Con.	.18
Old Gold	.01	Silver King Coal'n.	2.82
Mary McKinney	.50	Silver King Cons.	1.77
Pharmacist	.009	Sioux Con.	.02
Portland	1.09	Uncle Sam	.04
Vindicator	1.08	Yankee	.01

TORONTO July 14

Name of Comp.	Bld.	Name of Comp.	Bld.
Balley	.00	Foley O'Brien	.25
Conlagas	7.00	Hoffinger	18.50
Peterson Lake	.33	Imperial	.01
Right of Way	.02	Jupiter	.05
T. & Hudson Bay	48.00	Pearl Lake	.03
Timiskaming	.14	Porcu. Gold.	.01
Wetlaufer-Lor.	.05	Preston E. D.	.01
Big Dome	9.15	Rea	.13
Crown Chartered	.00	Swastika	.01
Dome Exten.	.08	West Dome	.07

SAN FRANCISCO July 11

Name of Comp.	Bld.	Name of Comp.	Bld.
Comstock Stocks	.05	Misc. Nev. & Cal.	6.62
Alta	.30	Belmont	1.02
Belcher	.06	Jim Butler	.01
Best & Belcher	.45	MacNamara	.20
Caledonia	.03	Midway	.55
Challenge Con.	.02	Mont-Tonopah	.26
Chollar	.22	North Star	.68
Confidence	.13	West End Con.	.14
Con. Virginia	.30	Atlanta	.04
Crown Point (Nev.)	.03	Booth	.02
Gould & Curry	.06	C.O.D. Con.	.04
Hale & Norcross	.50	Comb. Frae.	.04
Mexican	.70	Jumbo Extension	.19
Occidental	.15	Pitts.-Silver Peak	.37
Ophir	.20	Round Mountain	.38
Overman	.11	Sandstorm Kendall	.06
Protos	.07	Silver Pick	.06
Savage	.06	Argonaut	\$3.00
Sierra Nevada	.11	Brunsrick Con.	1.50
Union Con.	.36	Central Eureka	.12
Yellow Jacket	.36	So. Eureka	1.40

N. Y. EXCH. July 14

Name of Comp.	Cig.
Amalgamated	69
Am.Sm.&Ref.com.	65
Am. Sm. & Ref. pf.	102
Am. Sm. Sec. pf. B.	82
Anacosta	31
Batopias Min.	75
Bethlehem Steel, pf.	84
Chino	40
Colo. Fuel & Iron	25
Federal M. & S. pf.	33
Great Nor. ore. ctf.	31
Guggen. Exp.	53
Homestake	113
Inspiration Con.	18
Mex. Petroleum	61
Miami Copper	22
Natl. Lead, com.	45
National Lead, pf.	107
Nev. Consol.	13
Ontario Min.	17
Phelps Dodge	17
Quicksilver, pf.	1
Ray Con.	21
Republic I&S, com.	22
Republic I&S, pf.	85
SlossSheff'd, com.	25
Sloss Sheff'd, pf.	84
Tennessee Copper	32
Utah Copper	57
U. S. Steel, com.	109
U. S. Steel, pf.	60

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Name of Comp.	Cig.
Beaver Con.	.24
Big Four	1.05
Boston Montana	.91
Braden Copper	.71
B. C. Copper	.11
Buffalo Mines	.1
Can. Cop. Corp.	2
Can. G. & S.	.08
Caribou	.66
Chambers Ferland	.17
Con. Ariz. Sm.	.50
Cons. Nev.-Utah	.1
Coppermines Cons.	1
Davis-Daly	.58
Diam'held-Daisy	1.05
Ely Con.	.06
Florence	.38
Gold Hill Con.	1.1
Goldfield Con.	1.1
Greene Cananea	29
Kerr Lake	.51
La Rose	.1
McKinley-Dar-Sa.	.54