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Natoma No. 7, a California All-Steel Dredge

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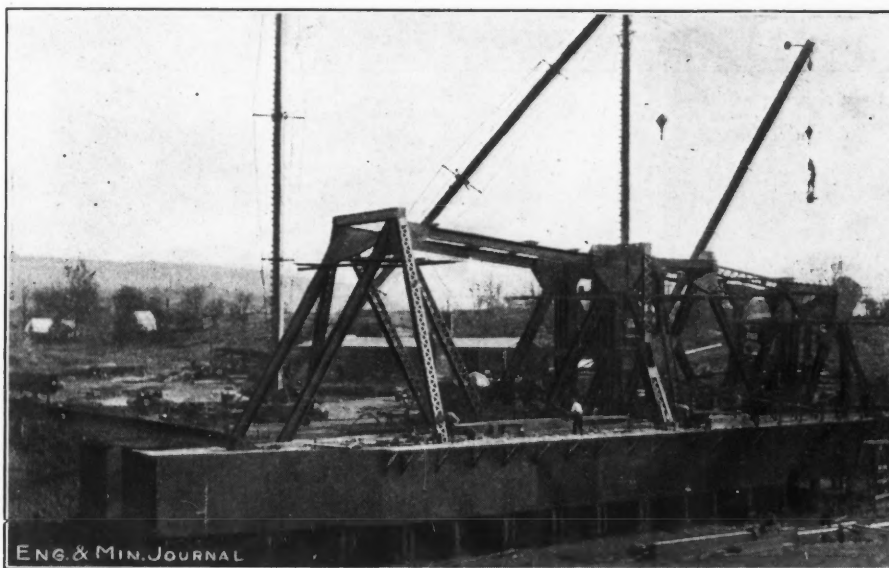
SYNOPSIS—Natoma No. 7 is the third all-steel California dredge. It is a reconstruction of Folsom No. 3, the largest dredge in America when built. In the first three months' working the only loss of time was due to the inability of the power company to supply electricity.

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Natoma No. 7 dredge, equipped with 9-cu.ft. close-connected buckets, put in commission by the Natomas Consolidated of California in Blue Ravine field of American River district in May, 1913, is the third all-steel bucket-elevator dredge designed by S. L. G. Knox, man-

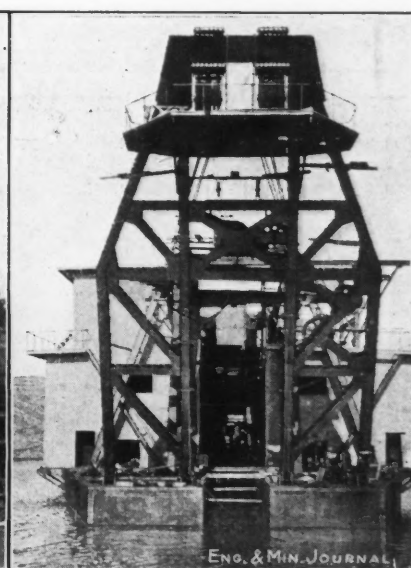
missioned in July, 1908. On Jan. 1, 1909, this dredge and four others of the Folsom Development Co. were taken over by the Natomas Consolidated of California. Folsom No. 3 was renamed Natoma No. 7, and continued digging until November, 1912, when it was taken out of commission and dismantled for reconstruction. The reconstruction was begun on Jan. 2, 1913, and completed on May 12, 1913; total time 130 days.

The original hull dimensions of Folsom No. 3 were: Length, 120 ft.; width, 46 ft.; depth, 10 ft. The digging ladder was equipped with eighty 7-cu.ft. buckets,



STEEL HULL COMPLETED

Installing some machinery prior to floating.



BOW GANTRY

Ready for digging ladder.

ager of Natomas Consolidated, and built by the Yuba Construction Co. for gold-placer digging in California.

This dredge was reconstructed from Natoma No. 7, a wooden-hull boat, which was originally Folsom No. 3, designed by George L. Holmes, of San Francisco, built in 1904 and reconstructed in 1908 by the Western Engineering & Construction Co. for the Folsom Development Co. The drawings for the original construction were started on Mar. 1, 1904, the hull was launched in August and the initial digging was begun on Dec. 13, 1904. No. 3 went into commission at Willow Hill on Jan. 1, 1905, and dug intermittently until May, 1908, when it was closed down and reconstructed, and recom-

cast by the Taylor Iron & Steel Co., and designed to dig 35 ft. below the water line. The buckets weighed 2650 lb. each. The bucket pins were made of 3% nickel-steel by the Midvale Steel Co. In the reconstruction a 13-ft. section was added to the digging ladder, extending the digging depth to 45 ft. below the water line. The old bucket line was discarded and displaced by eighty-seven 8½-cu.ft. Bucyrus buckets. The tumblers cast by the Taylor Iron & Steel Co. were displaced by Bucyrus tumblers. The original winches built by the Link Belt Machinery Co. were displaced by Bucyrus winches. The shaking screens were discarded and a revolving screen 36 ft. long, 7 ft. diameter was installed. The dredge was equipped with the Holmes type all-steel gold-

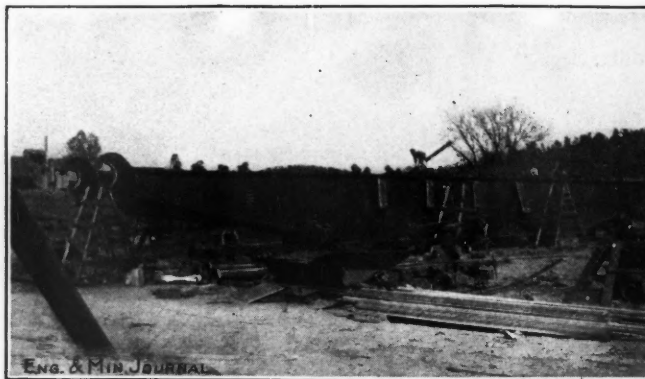
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saving tables, the second set of these tables built in California. The total power of the original No. 3 dredge was 320 hp. The total power of the reconstructed No. 3 dredge was 490 hp. The total power of the No. 7 all-steel dredge is 778 hp.

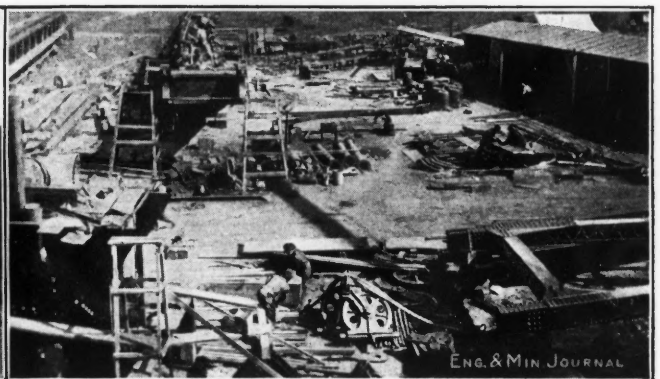
At the time of initial construction Folsom No. 3 was the largest gold dredge in North America. The total displacement was 1,178,000 lb., which was one-half the total displacement of "narrow-gage" Southern Pacific ferry boats running between San Francisco and Alameda. At that time the Western Engineering & Construction Co. and the Bucyrus Company of South Milwaukee would not guarantee a dredge to dig more than 90,000 cu.yd. per month. Prior to reconstruction, No. 3 dredge frequently dug 50,000 cu.yd. per week. In the reconstruction the rated efficiency was increased from 70,000 cu.yd. to 180,000 cu.yd. per month. In the first four years this dredge turned over 81 acres of ground and handled 3,600,000 cu.yd. of gravel, which is about 95,000 cu.yd. per month for actual digging time, digging an average depth of 30 ft. below the water line. The present yardage of the reconstructed No. 7 dredge is about 180,000 cu.yd. per month digging 55 ft. below the water line.

dredges. The bow gantry has four legs rounded at the foot and set up in cast-steel footings, permitting a forward and backward swing of the gantry conforming to the movement of a digging ladder. The successful operation of this design of gantry is demonstrated in the three all-steel dredges now digging in this district, and will be adopted in the construction of Yuba No. 14.

The digging ladder is 122 ft. long between centers, designed to dig 55 ft., but having actual capacity to dig 58 ft. below water line. The ladder is of plate-girder type, riveted with 1-in. rivets and weighs without the bucket line, about 12,500 lb. The bucket line is composed of 97 close-connected Bucyrus type California buckets of 9 cu.ft. capacity. The buckets are cast in three pieces, manganese lips, nickel-chrome steel base and pressed-steel hood. They are 43 in. wide, 42 in. high, 33 in. deep and weigh about 2600 lb. each. The bucket pins are of nickel-chrome steel 31 in. long, 6 in. diameter and weigh about 260 lb. each. The tumblers are Yuba Construction Co. type, each cast in two pieces; six-sided and provided with six manganese-steel tread plates $2\frac{1}{2}$ in. thick. The upper tumbler weighs 10 tons, the lower tumbler $8\frac{1}{2}$ tons. The stacking ladder is 150 ft. 6 in. long between centers and is provided with a



NATOMA No. 7, DIGGING LADDER



CONSTRUCTION CAMP

Natoma No. 7 all-steel dredge, compared to the original Folsom No. 3 wooden-hull dredge, is a fine example of the evolution in design and construction of gold dredges in California in the past 10 years. Compared to old No. 7 wooden-hull dredge the present yardage efficiency and extended digging depth are of engineering interest from the fact that a large proportion of the old machinery has been replaced in the present dredge, including the screen, winches, main-drive complete, screen-drive complete, tumblers, shafts and one 5-in. pump.

The new steel hull of Natoma No. 7 is 134 ft. 6 in. long, 9 ft. 6 in. deep. It is 46 ft. 6 in. wide on the water line, plus 3 ft. 3 in. overhang on each side, making a total width of deck of 53 ft. The sides and stern of the hull are built of $\frac{3}{8}$ -in. steel plates, double riveted with $\frac{3}{4}$ -in. rivets. The well hole is built of $\frac{1}{2}$ -in. steel plates, double riveted with 1-in. rivets. The well hole is 77 ft. long and 6 ft. $10\frac{1}{2}$ in. wide between chafing strips, which are made of $\frac{3}{4}$ -in. steel $1\frac{1}{2}$ and 2 ft. wide. The deck is built of 6x4-in. planking, calked with two strands of oakum.

The gantries are of the Yuba Construction Co. type, all-steel, the same as installed on No. 8 and No. 10

36-in. conveyor belt 312 ft. long traveling over two drums.

The situation of the spuds and stacker of No. 7 is similar to the plan of Natoma No. 10.¹ The digging spud of No. 7 is situated off the fore-and-aft center line 2 ft. 4 in. to port. The stacker is situated off the center line 2 ft. 9 in. to starboard. The stepping spud is situated off the center line 11 ft. 8 in. to starboard. The digging spud of No. 10 is situated directly on the center line, the stacker to port and the stepping spud to starboard. The digging spud of No. 7 is 70 ft. long, 34x54-in. section; the stepping spud is 60 ft. long, 34x54 in. section.

The revolving screen is 37 ft. 6 in. long, 7 ft. diameter; the perforations are $\frac{3}{8}$ in. and $\frac{1}{2}$ in. The gold-saving tables are double-bank Yuba Construction Co. type and have a surface area of 3600 sq.ft. The screen washer, hopper, saveall, grizzly, etc., are of the same design as installed in No. 10 dredge. The cleanup methods are the same as employed in No. 10 and other Natomas boats. No. 7 dredge is also equipped with an Ingersoll-Rand 8x8-in. class NE-1 air compressor for

¹"Eng. and Min. Journ.," May 31, 1913, p. 1079.

operating air hammer, drills, hoists, etc. This is the same type of compressor as used in Nos. 8, 9 and 10 dredges, but smaller. The housing, doors, windows, stairways, etc. are the same as in No. 10 dredge.

The dredge is electrically driven with Westinghouse machinery. The current is furnished by the Great Western Power Co. The wiring is all in conduit, in accordance with underwriters' specifications. The total power used is 778 hp., distributed as follows: Ladder hoist and main drive, 300 hp.; stacker, 50 hp.; high-pressure pump, 100 hp.; low-pressure pump, 50 hp.; monitors, 135 hp.; two-step pump, 30 hp.; screen drive, 50 hp.; starboard winch, 30 hp.; compressor, 30 hp.; shop tools, 3 horsepower.

The reconstruction of Natoma No. 7 dredge was under the supervision and direction of W. R. Bassick, of San Francisco, general manager of the Yuba Construction Co., and P. R. Parker, superintendent and engineer in charge of shops at Marysville. The construction work was begun on Jan. 2, 1913, under superintendence of O. B. Hart and completed under the superintendence of Paul E. Morse on May 12, 1913. The machinery was started at 4:30 p.m., May 12, and the actual yardage digging begun at 1 a.m., May 13. During the first 17 hours, to 5 p.m., May 13, the dredge dug $15\frac{3}{4}$ hours, a fine record for initial digging. In the first three months the only loss of time was due to the inability of the power company to supply electric power at the time of the strike of electricians.

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South Africa Mineral Output in 1912

The annual report of the South African Mines Department has just been issued and gives the following figures of production for 1912: Gold, 9,108,792 fine oz.; diamonds, 5,071,882 carats; coal, 8,117,078 tons; coke, 11,980 tons; copper (45.95% Cu), 18,570 tons; tin (66.64% Sn), 2932 tons; silver (contained in gold bullion and base-metal ores), 1,019,012 fine oz.; asbestos, 1220 tons; graphite, 40 tons; magnesite, 602 tons; lead, 2112 tons; mica, 5 tons; salt (including byproducts), 41,848 tons; lime, 78,114 tons; flint, 1404 tons; steatite, 7 tons; corundum, 111 tons.

The Transvaal produced 9,107,511 oz. of the total gold output, of which 8,731,969 oz. were from the Rand. The total gold production from South Africa represented 39% of the world's output, as compared with 37% for 1911.

In December, 1912, a total of 10,117 stamps and 288 tube mills were at work, as compared with 10,383 and 259, respectively, for December, 1911.

Of the diamonds, 4,887,053 carats came from mining, and 184,829 from alluvial washing. The Premier mine produced a total of 2,047,185 carats, or 40.4% of the output for the Union. The De Beers mine, which stopped actual mining work in June, produced 2,203,470 carats, or 43.4% of the total.

The Messina (Transvaal) Development Co. was the only copper producer in the Transvaal during the year. Its concentrating plant treated 15,391 tons of ore, from which was obtained a marketable product of 2075.8 tons, assaying 48.76% Cu. In Cape Colony, copper was produced by the Cape Copper Co. and the Namaqua Copper Co., these concerns having smelted 128,759 tons of ore

during the year, resulting in an output of 14,299 tons of copper matte, assaying 50.60% Cu. In addition, 2145 tons of picked ore, assaying 13.79%, and 135 tons of precipitates assaying 71.62% were obtained.

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Experiences at Shushanna

A recent issue of the *Wallace Miner* contains interesting accounts of the experiences of two men who have returned from the lately discovered Alaskan gold district. One of these men was from the Cœur d'Alene district in Idaho, the other from Dawson. M. J. Sinclair, of Kellogg, was visiting at Katalla when the news of the strike reached the coast towns. He immediately started for the diggings. From Cordova he went to McCarthy, on the Copper River R.R., and from there reached the new camp, 100 miles distant. He was delayed in getting in, first in getting a pack horse. Later the horse was killed on the trail, and still later he paid \$1 per lb. for packing his outfit into camp. He was on the road 12 days.

Asked as to the merits of the new camp, he said: "Discovery claim is yielding handsomely, but more work has been done on this than on other claims. Gold was first found there in the spring. Some months later, through grubstake connections in Dawson and the appearance there of some of the gold that had been taken out, the discovery leaked out, the news spread and the rush began from all parts of Alaska. It is high-grade placer gold, worth \$18.30 per ounce. So far no big nuggets have been found; some are worth perhaps \$18 or \$20. Those who have gone in so far have been up against the grub proposition." Mr. Sinclair will return to Alaska at once and he and his brother will go to the new camp prepared to spend the winter there. Before leaving, he and his associates built a comfortable cabin for occupancy this winter. There were about 200 men in the camp when he arrived. Many were coming in as he came out.

Game is abundant. Mr. Sinclair said he saw 150 caribou in one bunch. Ptarmigan, "the white grouse of the north," are to be caught almost without effort. Sugar, coffee, flour and such necessities were hardly obtainable at any price. He stated that he saw a man offer \$5 for a teacupful of flour.

J. B. Isams, better known as "Jimmy, the Barber," returned from Donjek on a raft, after having "mushed" out from Shushanna. He went up on the first trip of the "Nasutlin," and mushed into the strike. After spending seven days there and running out of food, he bought a few pounds from an arrival from Cordova and came back to Dawson. Jimmy says he could find only two claims producing gold, and that they were James' Discovery and an adjoining claim.

"The Discovery claim is in a very narrow gulch," said Jimmy, "and I do not think the camp extensive. I started my barber shop but since I could get only cash for pay and cash is no good in that land where there are no supplies for sale, it did me no good. I wanted grub for the pruning service, and when none was forthcoming I had to hurry back to Dawson. I am not going there again this winter. I simply closed my shop by putting my razor in my pocket. The shop comprised two pronged stakes with a stick across the top for a seat, and another pronged stick back of the customer's head for a

head rest. I started into the camp with six towels, but threw away five and had to do business with only one. I charged \$1 for a shave and \$2 for a haircut."

"Ptarmigan are so tame we killed them with clubs whenever we wanted them. For several days I lived on cariboo meat and salt. On my way to the camp I was accompanied by Raeco, Max, Sally and James. I do not know their other names. Two were Greeks and two Montenegrins. We fell in with each other and had a glad time. At one time 10 nationalities were represented on a rope, pulling a boat up the Snag. A woman called Brownie had hired a Japanese to take her supplies up. The Japanese and the woman fell out and he was left without supplies. I fed him for days and he got into the camp. Many were so near stranded in the diggings that they went around begging for enough to get out. One German fell on his knees and lifted his hands in petition, saying he had been without food 17 days."

"Five of us were lost in the Beaver valley on the way to the camp. The place is full of growth, and is not marked with posts, flags or otherwise. The Government trail blazers are working that way, and I hope they will put up posts or flags to indicate to the strangers which way to go. However, the trail is being defined gradually. On the way up we were lost one day on Ptarmigan Creek, one day on Lake Creek and one day on Horsefelt. We finally hired an Indian to pilot us to the boundary."

"We started back Aug. 20. The nights were beginning to get cold and there was ice in the sluice boxes in the morning. The pay on the creek where James is working is about a mile and a half long. Fellows are prospecting everywhere, but I know of none getting out pay."

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Johannesburg Notes

SPECIAL CORRESPONDENCE

The leaders of the Workers Federation of Trades having refused the government's challenge to call a general strike if they were prepared to face the consequences, industrial peace has been restored and I do not think another attempt at a general strike will ever be made. Owing to the shortage of labor, development work is nearly suspended and several developing shafts have been closed down, throwing numbers of workers out of employment. I have contended in these notes that 80% of the strike was due to fear and intimidation, and that there was no widespread feeling of dissatisfaction among the mine employees. One must remember that half the 20,000 workers are surface employees, who work under conditions of employment and remuneration that are not equaled anywhere in the world. The bulk of the underground workers had no grievances. It is true that the terrible harvest of phthical cases, the result of bad conditions in the past, is still being reaped; but the condition of the majority of the mines today is such that no careful man need fear to work in them.

Water is generally available, though I know of one case in a deep mine not now milling, where, to save the cost of water purchased, the water was turned off when the inspector's back was turned. The men themselves are the great obstacle, as I know from experience, in further improving conditions. One great and real grievance, however, the men had, was that in several mines, though their legal working hours were eight hours in the

face, they were kept below in the smoke and dust after blasting, while the mine captain used his skips to haul ore for the mill. The 8½-hr. bank-to-bank concession granted will remove this grievance. There are other minor grievances. It is notorious that the New Kleinfontein employees were willing to go on strike only because, owing to the reputation and conduct of the new management, everyone felt that his position was not worth a day's notice. Directorates have, however, learned a lesson over this incident. The bulk of the workers realize that the industry cannot bear further burdens and that the government will strictly preserve law and order in future. Renewed interest in electrical systems of blasting is evident in the hope that all blasting may be done when the mine is empty of men.

Mining developments are scarce. The Springs Mines No. 2 shaft intercepted the reef assaying 6 dwt. over 53 in.; another showing gave 10 dwt. over 36 in. in the vicinity, and prospects are good. The Rand requires, however, another £5,000,000 or more to press on the wide development of the Far East portion of the field and of the deep ground at Randfontein, which are almost the only promising areas remaining. The breakdowns in the share market and the labor supply have put off the hope of getting this sum, and made the position for keeping up the output some five years hence a doubtful one. The Cinderella Deep is suffering from shortage of labor and the new West shaft which should be rushed down, has been stopped; the Jupiter mine is stopping milling for the present, the natives being sent to the Knights Deep.

The two furnaces at work at the Star of the Congo mine, Katanga, last month produced 900 tons of copper. The Messina mine in the North Transvaal is smelting middlings from the mill, containing 10% copper, in two reverberatory furnaces 23x11½ ft. and is producing high-grade matte, so that the African copper output will show an increase for 1913.

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Subliming Points of Metals

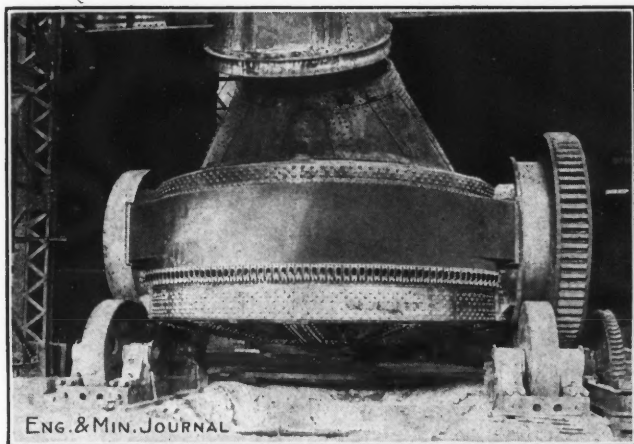
Experiments were made by G. W. C. Kaye and D. Ewen on the sublimation temperatures of the metals (Royal Soc. Proc., Vol. A89, p. 58). Experiments were made with iridium (in nitrogen at 20 mm. pressure), copper (in nitrogen at 1 mm.), iron and tungsten (in a high vacuum, about 0.004 mm. at the beginning), and sensible volatilization was observed in all cases at temperatures considerably below the melting points. In addition to volatilization as ordinarily understood, there was evidence of straight-line emission of particles of metal (see *Journ. Soc. Chem. Ind.*, p. 754, 1913). The data for a number of metals, for which information is available, are collected in the following table; the volatilization was detected mostly at low pressures.

Metal	Boiling point		Volatilization detectable at:	M.pt. at 1 atmos.
	At 1 atmos.	In vacuo		
	° C.	° C.	° C.	° C.
Mercury.....	357	160	-39	-39
Potassium.....	760	370	63	63
Sodium.....	880	420	97	97
Cadmium.....	778	450	160	321
Zinc.....	918	550	180	419
Bismuth.....	1420	1000	269	269
Lead.....	1525	1150	360	327
Silver.....	1955	1400?	680	961
Copper.....	2310	1600?	400	1084
Tin.....	2270	1700?	360	232
Gold.....	2530?	1800?	1370	1064
Iron.....	2450	....	950	1500
Platinum.....	2500?	....	1200	1750

The Great Falls Reduction Works

This article is based on a descriptive pamphlet prepared by the Anaconda management for the Montana meeting of the American Institute of Mining Engineers, but we have made additions from our own observations, and consequently we, not the Great Falls engineers and metallurgists, are responsible for many of the statements.

The reduction works of the Boston & Montana Reduction department, near the north end of the Black Eagle dam across the Missouri River, is one of the reduction plants belonging to the Anaconda Copper Mining Co., the other being at Anaconda. The Great Falls works



GREAT FALLS COPPER CONVERTER
(20 ft. in diameter.)

employs about 1100 men and has a capacity of about 3800 tons of crude ore per day. This plant is now being remodeled to embody results of experiments and investigations which have been made with a view to more economical treatment of ores. A brief description of the plant as it now and as it will be after the remodeling is as follows:

The concentrator department consists of six units or sections, each section treating from 550 to 600 tons of crude ore per day. This department is not being remodeled at the present time. A new concentrating process, however, has been developed and partially installed in the old mill, and an experimental section embodying this concentration process has also been installed at the concentrator at Anaconda. The improved method is a development of the roughing principle. As installed at Anaconda, it has resulted in an important saving in the one section there that so far has been rebuilt.

The blast-furnace department at Great Falls consists at the present time of four blast furnaces, each 56x180 in. at the tuyeres, and one 84x180 in. at the tuyeres, the smaller furnaces having a capacity of about 450 tons of charge per 24 hours, and the larger one a capacity of about 600 tons. These furnaces will not be changed at present, although they may be a little later. The new method of smelting that is being developed at Great Falls, especially the use of the mammoth converters, will probably leave less work for the blast furnaces to do than has heretofore been the case.

The calcining department consisted recently of 22 16-ft. McDougall roasting furnaces. McDougall furnaces 24 ft. in diameter will be substituted and possibly some driers for drying concentrate will be added.

The reverberatory department now consists of three gas-

fired regenerative furnaces, each having a hearth 15 ft. 9 in. by 45 ft. These furnaces will be abandoned and a direct-fired type with hearths 22x102 ft. will be substituted, and the battery will be equipped with hot-blast stoves for heating the secondary air, that is, the air blown in over the bridge wall. The first of the new furnaces is now nearing completion. It embodies many novel features, both in construction and in principle. The furnace masonry is built up inside of a tank of heavy steel plate. Each end of the furnace is rounded. The products of combustion escape through flues in the roof at the chimney end and pass to the hot-blast stoves. The sides of the furnace are supported by buckstays, spaced rather far apart. Between the buckstays the casing plates will bend out a little to allow for expansion. Instead of being tied together by rods across the arch of the furnace, the buckstays are supported by props adjustable by means of jack screws. The accompanying engraving from a photograph, showing one of the propped buckstays, makes the scheme quite clear. It is estimated that the saving in ironing by this method will be from \$5000 to \$6000. The furnace arch is 20 in. thick and the side walls 30 in. thick.

The 43-ft. regenerative furnace now in use in the



GREAT FALLS REVERBERATORY
(Note the propped buckstay.)

works costs about \$50,000 to build. It is estimated that the new 102-ft. furnace will cost about \$100,000.

At the firebox end of the furnace, but separate from it, is a mammoth gas producer, having a shaking grate. The gas passes to the furnace by three brick-lined pipes and meets the secondary air preheated in the stoves by the waste gases. The new furnace is consequently a recuperative furnace, but of a different type from the old reversing regenerative furnaces. In principle the firing is similar to that of the long zinc-distillation furnaces at La Salle, Illinois.

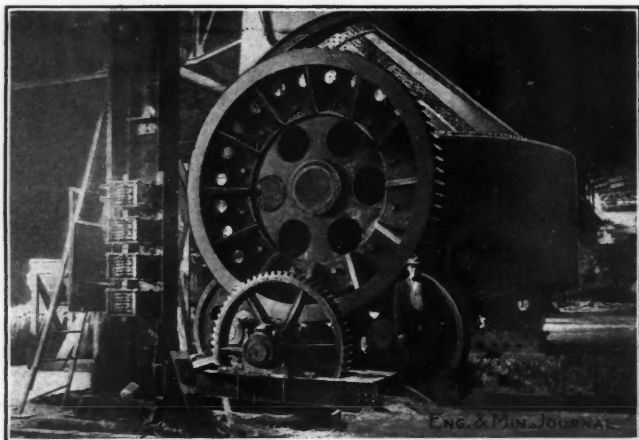
The present gas-producer department comprises 26 small producers. This entire plant will be abandoned upon the adoption of the new type of reverberatory furnace.

The converter department, when rebuilt, will contain three converter stalls equipped with basic-lined upright converters 20 ft. in diameter, each converter having a capacity of about 120 tons of copper per day. The accompanying engraving shows a shell with sixty-two 1¾-in. tuyeres, which was the first tuyere equipment; the present converter has twenty-six 2½-in. tuyeres. The mam-

moth Great Falls converter is an efficient ore-smelting furnace. For each ton of blister copper produced about 0.7 ton of raw concentrate is charged. A large proportion of the concentrates of the works will, therefore, be smelted directly in the converters, after a preliminary drying, when the new installation is completed. This is pretty much of a realization of the dream of pyrite smelting. The converter copper is cast either in anodes for the electrolytic refinery, or in slabs for shipment to the East, in two electric-driven casting machines, the copper being poured into the molds from a pot tilted hydraulically.

The electrolytic refinery at Great Falls has a capacity of about 65,000,000 lb. of refined copper per year. It is different from any other electrolytic refinery in the world in that it is a high-density plant, the ampere density being about twice that of other commercial plants. The furnace-refining department has a capacity of about 30,000,000 lb. per year.

The company built, during 1908 and 1909, an elaborate and complete flue system, a part of which system is the largest and the highest chimney in the world. It is 506 ft. high above the foundation and 50 ft. inside diameter at the top, the smallest point. It is of sufficient capacity to discharge 4,000,000 cu.ft. of gases per minute at a



GREAT FALLS CONVERTER
(Showing tilting gear.)

temperature of 600° F. It was built by the Alphons Custodis Chimney Construction Co., of New York, after specifications drawn by the engineers of the then Boston & Montana company. The first brick was laid Apr. 7, 1908, and the shell was completed Oct. 23, 1908. It has a separate acid-proof lining built in sections and laid in acid-proof cement, so as to protect the main brick work from the action of acid gases. The completed chimney contains 301,000 cu.ft. of material and weighs 18,000 tons. The concrete foundation is octagonal in shape, 23 ft. deep and 103 ft. wide across the flat, and 78 ft. in diameter inside at the base of the chimney. This chimney is of such a size that the Washington monument could be set inside it and only about 49 ft. would project above the top of the chimney.

The chimney serves a flue system consisting of a dust chamber 175 ft. wide and 21 ft. high, and 480 ft. long. This dust chamber is connected to the chimney by a flue 1250 ft. long, 21 ft. high and 48 ft. wide.

It is estimated that this elaborate and costly system of chimney and flues will have paid for itself in about six years. The original cost was about \$1,100,000.

Among the recent installations at Great Falls is an arsenic plant.

Regarded as a whole, the Great Falls reduction works, which dates back about 20 years, constitutes an example of the old ideas of metallurgical construction prevailing before the modern notions of plenty of elbow room and magnificent distances were conceived. Like Topsy, the plant has "just growed," and consequently, it is more cramped than Washoe and its successors. The concentrator is ramshackle in appearance, but it does excellent work in the matter of mineral extraction, so what more can be asked?

Just now the Great Falls engineers are wrestling with the problem of building a new furnace house over and around the old one, installing new roasting furnaces, new reverberatories, and new converters, and keeping the old ones all going. This job naturally presents some hard nuts to crack, but the engineers seem to be proceeding with reasonable equanimity.

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Position of the Titaniferous Magnetites

Joseph T. Singewald, Jr., in his rather complete study of the titaniferous iron ores in the United States, published in Bull. 64 of the U. S. Bureau of Mines, sums up the situation in regard to these ores as follows:

The evolution of the modern blast furnace has taken place in such a direction as to make the utilization of titaniferous iron ores impracticable. Notwithstanding numerous experiments that have been conducted with a view to discovering a furnace charge that will make the use of these ores practicable from the standpoint of furnace operation and economy, there is today no hopeful feeling in regard to the possibilities of smelting these ores in the blast furnace. On the other hand, the introduction of the electric furnace holds out a new hope for the direct reduction of the titaniferous ores.

The results of magnetic-separation experiments conducted with these ores are promising in some cases and disappointing in others. No rule of general application can be formulated as to the behavior of the ores. Some deposits are amenable to magnetic separation, and yield concentrates that require the admixture of only a small proportion of nontitaniferous ores to make a satisfactory ore mixture. Other deposits are less amenable and yield concentrates that would have to be mixed with three or four parts of nontitaniferous ores for furnace use. There are many other deposits in which the percentage of titanium separable in this way is extremely small, so that the utilization of such ores seems to depend on the discovery of a process that will make their use feasible.

The cause of the difference in behavior of the ores toward magnetic separation is revealed in their microstructure, which is readily studied by the metallographic method. This method of investigation shows that the titanium occurs in these ores in the form of ilmenite grains of about the same order of magnitude as the magnetite grains, as ilmenite inclusions and intergrowths of microscopic size in the magnetite, and as an integral part of the magnetite molecule itself. The titanium occurring in the first form, as ilmenite grains, is readily separable by means of magnetic concentration, except in the finest-grained ores with which the degrees of crushing required would make such concentration impracticable. The titanium occurring in the two latter forms is inseparable

by mechanical means. The percentages of titanium occurring in these different forms varies greatly in the different ores, and, consequently, every case must be tested for itself. A metallographic study of the ores of any deposit will at once decide the question of the amenability of the deposit to magnetic separation.

As regards chemical composition, except for their titanium content, the ores are desirable. The coarser-grained ores are usually of high grade in their natural condition, whereas a magnetic separation of the leaner ores yields a high-grade concentrate, with the deleterious constituents at a minimum.

As the iron industry at present demands large deposits of definite extent, the outlook for most of the deposits of titaniferous iron ore in the United States is not promising. As a rule the deposits are relatively small and of irregular extent and distribution. Further, they are of lean to medium grade, and inaccessibly situated as regards transportation facilities. In other words, to put the deposits on a producing basis would require a heavy initial outlay of capital, which the size and irregularity of occurrence do not warrant. There are, however, the two large, high-grade deposits of Sanford Hill, N. Y., and Iron Mountain, Wyo., which are so readily workable that, despite their titaniferous character, their utilization within a few years seems certain.

[The deposit at Sanford Hill, N. Y., will soon be the subject of an extensive experiment conducted by the McIntyre Iron Co., as described in the JOURNAL, Sept. 27.—EDITOR.]



The Coeur d'Alene Power-Rates Case

The question of the new power charges imposed by the Washington Water Power Co., is to be brought before the Idaho public-utilities commission through the instrumentality of the Federal Mining & Smelting Co., states the *Boise Statesman*. Soon after the complaint of the Federal company was filed with the commission an order was issued suspending the new rates against which the complaint was largely aimed.

The Federal Mining & Smelting Co. is not alone in its complaint. A similar complaint is filed by the Tamarack & Custer Consolidated Mining Co., and it is announced that practically every mining corporation in the Coeur d'Alene district is awaiting with deep anxiety the outcome. The commissioners of Shoshone County join in the complaint for the reason that the public-utilities law makes it necessary for the officials of a municipality or county to take this step.

Chief among the complaints is this: Five years ago the power company and the Federal company entered into a contract under which power was to be furnished at a certain price for a term of five years. It is now alleged by the mining company that this price was outrageous, that under it the mining company paid the power company \$900,000, and that enough was paid in Shoshone County to pay all the cost of the power plant and transmission lines furnishing power for that county. But under the new schedule of rates, a still higher price is to be charged. The increase is estimated between 10 and 11%, and in addition to this the new schedule of rates makes it impossible for the consumer to know how much he is to pay because of the confusion in terms.

In addition to this it is said that the proposed contract with the Tamarack and other smaller companies would make it impossible for the consumers to dispose of their own property during the life of the contract, without the consent of the power company. Nor is this all. There are other serious grounds of complaint. In the proposed contract with the Federal company is found this objectionable provision: "It is mutually understood and agreed that the power company does not guarantee the continuous and uninterrupted delivery of electrical energy upon the premises of the consumer and shall not, under any circumstances, be held liable by the consumer for any damage or injury on account of the non-continuance or interrupted deliveries of such electrical energy."

Another provision makes it mandatory on the part of the consumer, before installing any new apparatus, to get the permission of the power company and furnish it plans and specifications. Under this provision it would be impossible to install an electric iron without the consent of the power company. It is so strict that it would prohibit the consumer from putting in an electric-light globe.

Still another provision against which there is vigorous protest is one making it compulsory on the part of the consumer to furnish the power company free title to all necessary rights-of-way over its land. It must furnish title also to a piece of ground 200 ft. long by 100 ft. wide to be chosen by the power company for substation purposes. Sufficient supply of clean water for cooling the transformer must also be furnished by the consumer without expense to the power company.

It is made mandatory in another provision in the contract for the consumer to repay to the power company the cost of the power line to the consumer's premises, and then this becomes the sole property of the power company.

On the expiration of the contract, each party to it is given 10 days to annul the agreement. If no such notice is given, the contract is renewed for a term of five years. It is insisted that the contract, if enforced to the letter, would close practically every mine in north Idaho, dependent on the Washington Water Power Co. for its electrical energy.



Goldfield Consolidated

Report of Goldfield Consolidated for August, 1913, shows a total production of 32,096 tons. From this material \$198,784 was realized, of which \$64,342 came from mining and \$134,442 from milling.

Development cost \$5.40 per ft. and 3094 ft. were accomplished. Combined operating costs are shown in the accompanying table.

	Mining Per Ton of Ore Handled	Milling and Transportation	Total
Mining:			
Stopping.....	\$2.78		\$2.78
Development.....	0.52		0.52
Shipping expense.....	0.34		0.34
Dump moving.....	0.05		0.05
Transportation.....		\$0.07	0.07
Milling.....		1.85	1.85
Marketing.....		0.05	0.05
General expense.....	0.24	0.03	0.27
Bullion tax.....	0.09		0.09
Construction.....		0.01	0.01
Total costs.....	\$4.02	\$2.01	\$6.03
Miscellaneous earnings.....	0.04		0.04
Net costs.....	\$3.98	\$2.01	\$5.99

Relining No. 2 Hamilton Shaft

SYNOPSIS—The shaft timbering is being replaced by concrete. End plates, dividers and partition slabs are cast on the surface and cured. Walls are poured in place. A mixing plant installed on the surface. Rate of progress.

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The No. 2 Hamilton shaft of the Chapin mine at Iron Mountain, Mich., was sunk in 1891, and consisted originally of six compartments as shown in Fig. 1: Two for skips or bailers, 4 ft. 8 in. x 7 ft.; two for cages 4 ft. 8 in. x 4 ft. 6 in.; and two for pipes, etc., 4 ft. 8 in. x 2 ft. 0 in., taken off the ends of the cage compartments.

This shaft was timbered with 16x16-in. material in the main members, the sets spaced 6 ft. 2½ in. center to center, the outside lagged with 2-in. planks, making a minimum rock section of 10 ft. by 24 ft. 4 in. The timbers, due to long service, became badly decayed, so that it was necessary to reline the shaft or abandon it. Early in 1911, it was decided to make it a permanent outlet for the Chapin mine, and install in it the permanent electrical centrifugal-pumping equipment. It was, therefore, necessary to reline it from collar to bottom, a distance of 1434 ft., and since there was a possibility of striking a vug of water in the underground workings at any time, provision had to be made so that bailers could be put in service on short notice. Since it was to be the permanent outlet, further provision had to be made for column pipes and electric cables. To provide for these pipes and cables, it was necessary to increase the inside dimensions of the shaft from 7x21 ft. 4 in. to 9x21 ft. 4 in., making a poured concrete wall 6 in. thick. The outside dimensions of the shaft were not changed. In the new design, the shaft consists of eight compartments: Two for skips or bailers and two for cages, each 4 ft. 8 in. x 6 ft. 4 in.; three for pipes and cable and one for ladder, each 2 ft. 4 in. x 4 ft. 8 in., the skip compartments set off with concrete-slab partitions. The arrangement is shown in Fig. 2.

RELINING METHODS CONSIDERED

Various methods of relining were considered as follows: (1) Replacement of the old timbering; (2) steel sets and wood lagging; (3) steel sets and reinforced-concrete lagging; (4) steel sets, angle studdles and concrete-poured walls; (5) reinforced-concrete dividers, end plates, partition slabs, and poured-concrete side walls. The first and second schemes were neither fireproof nor permanent; the third and fourth schemes were not considered practicable; the fifth scheme was adopted on account of its permanent qualities, it being strictly fireproof and waterproof.

CONCRETE MIXING PLANT

To make the concrete economically, a mixing plant was built near the shaft, as shown in Fig. 5. The material is brought from a near-by gravel pit in dump wagons and contains a large percentage of sand. It is dumped directly into a crusher which discharges to a bucket con-

veyor; this elevates it to a cylindrical revolving screen, which is divided into two sections. The first section is perforated with ¾-in. diameter and the second section with 1½-in. holes. All aggregate passing through the ¾-in. holes is termed sand and all passing through the 1½-in. diameter holes is termed gravel. The oversize is used either for backfilling the concrete walls in the shaft or for recrushing. There are two Smith No. 1 concrete mixers, of 9 cu.ft. capacity. The ingredients are brought to the mixers in tram cars. The body of the car is divided into three sections designed to hold the required amount of cement, sand and gravel for the mixture of 1:2:4, which is used. By moving it under the spouts from the sand and gravel bins, the car is loaded with sand and gravel; the required amount of cement is poured in from sacks. A water-measuring box placed above each mixer discharges the proper amount of water into the batch to be mixed.

The dividers, end plates and slabs are made in steel forms, which are placed beneath the mixers so that the concrete can be poured directly into them. After the

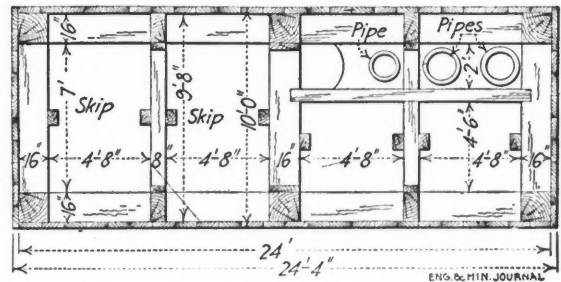


FIG. 1. PLAN OF OLD SHAFT LINING

concrete has had sufficient time to harden, the forms are removed and the molds are picked up by a hand-traveling crane and carried into a drying room, where they are cured. The design of these members is shown in Fig. 3.

THE ROUTINE OF RELINING

The actual work of relining is done in sections, each section being carried upward from permanent bearers which were set to support the old timber sets. A set or two of old timber, usually 12 ft., is removed, loaded on to the cages and hoisted to the surface, where it is unloaded on cars and dumped into the near-by cave. The timber sets above the removed portions are supported by vertical columns with jack screws on the bottom, which rests on 12x12-in. timber placed on the bearers. After the first 6-ft. section of concrete is poured, the 12x12-in. timbers are placed on the reinforced-concrete dividers and end plates, which are themselves supported on the steel wall-forms, as shown in Fig. 4. The steel forms are made in sections, with recesses to support end plates and dividers and are spaced with either 4-ft. or 6-ft. centers. The original forms are designed for 4-ft. centers; when the 6-ft. spacing is used, a section is bolted to the top of the form. Since there are seven sets of steel forms, the footings to carry the weight of old timber sets will bear either on the permanent bearers or on at least five sets, 30 ft., of concrete, i.e., the support of the old timbers above does not depend upon green concrete.

Note—An abstract from a paper by S. W. Tarr, construction engineer, Oliver Iron Mining Co., presented at the Minnesota meeting of the Lake Superior Mining Institute, August, 1913.

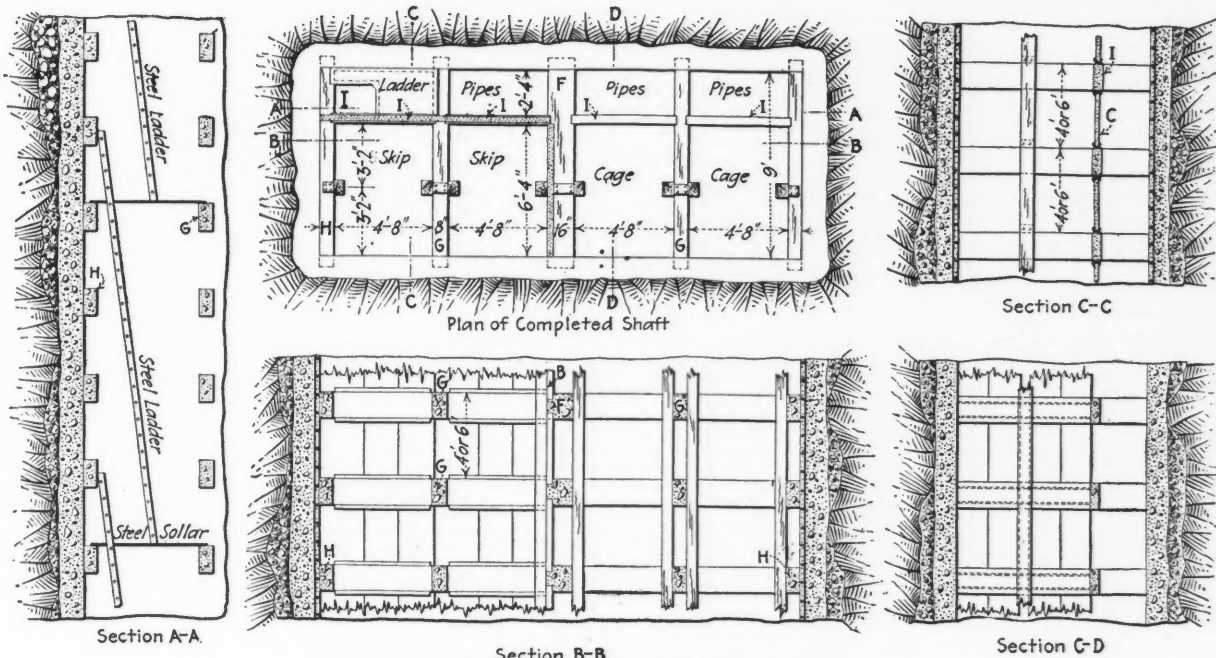


FIG. 2- ARRANGEMENT OF CONCRETE LINING

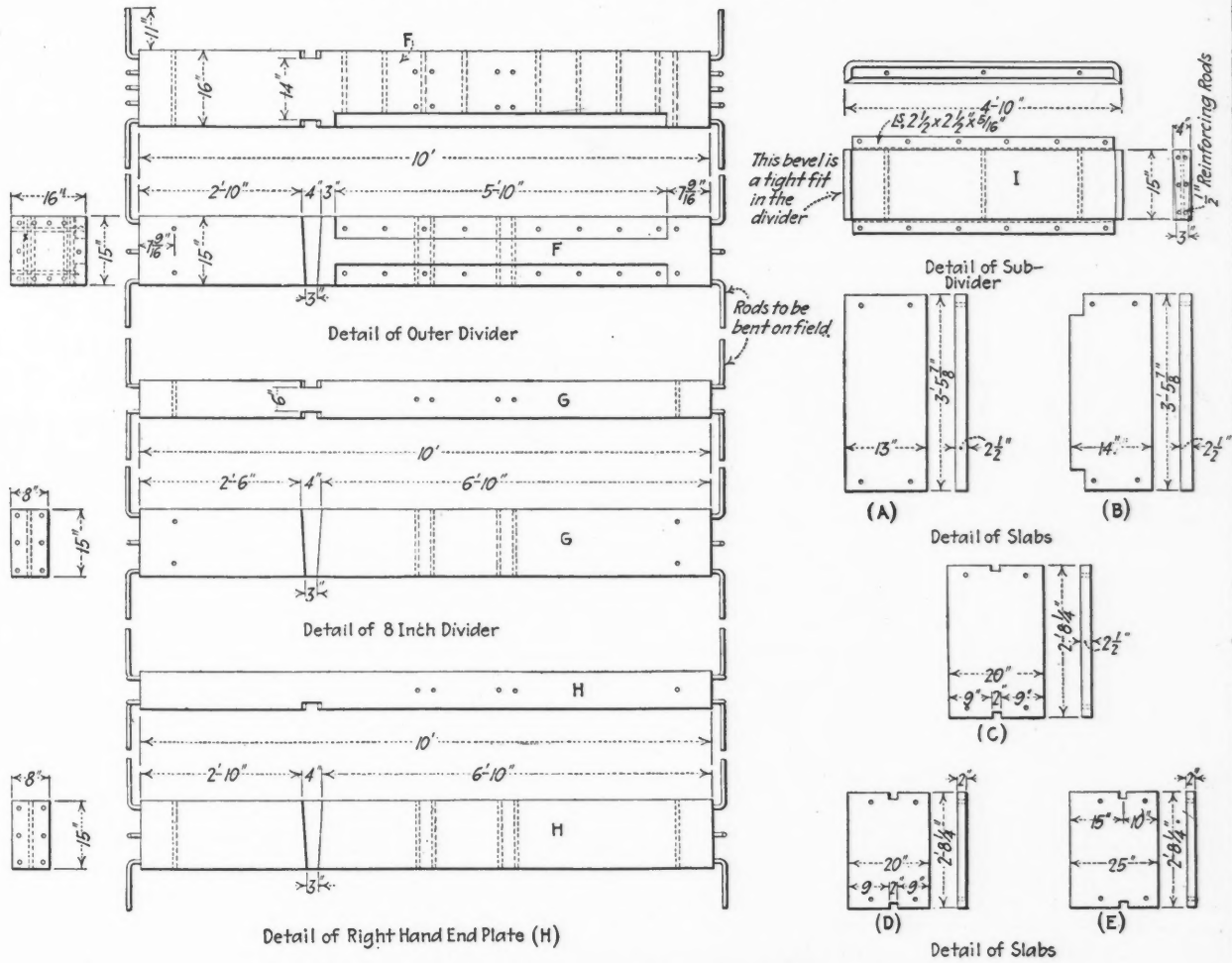


FIG. 3- DETAIL OF CONCRETE DIVIDERS AND SLABS

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THE NEW CONCRETE LINING IN DETAIL AND ASSEMBLED

After a new set of steel forms is lowered in the cages and installed, the dividers and end plates are lowered and placed in the recesses provided in the steel forms with their ends bolted to the forms. These end plates and dividers serve as horizontal struts to hold the forms in position. When a section is placed, the vertical reinforcing rods are put in position and the wall is now ready to be poured. The dividers and end plates have projecting reinforcement rods for anchoring the wall.

The concrete for the wall is mixed in the surface mixing plant and discharged into side-dump steel cars, seen in Fig. 4, which are hand trammed to the shaft. A turntable is installed so as to serve both skip compartments. The concrete car is run on a cage and lowered into the shaft. A revolving chute is attached to the spout of the car and the contents are discharged, as shown in Fig. 4, behind the forms and properly tamped in place. In places there are large crevices in the shaft. Where these crevices occur, they are filled with 10 in. of the steel forms with large stones or rock from the over-size bin before the concrete is poured. The average amount of material for relining one 6-ft. vertical section of shaft is one cord of stone for backfilling, 10 cu. yd. of

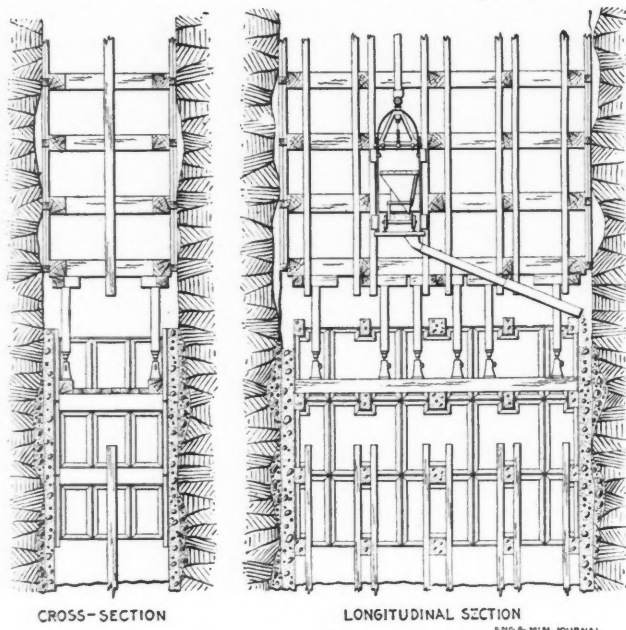


FIG. 4. METHOD OF INSTALLING LINING

concrete, and 550 lb. of steel for reinforcing. The slabs for the skipway partitions are bolted to the dividers.

NUMBER OF MEN EMPLOYED

In removing old timber, five men are required below and one man at the collar. The time required to remove one 6-ft. section varies according to the condition of the material. In placing steel forms or pouring concrete, four men are required below and two at the collar. This does not include the shaft foreman or the concrete foreman, as these two men do not spend all their time on this particular job. The work is carried on with three 8-hr. shifts and the average time required to concrete 6 ft. of shaft is 24 hr., including placing the forms, pouring concrete and removing an equal number of forms from below. When the forms are removed, they are taken to the surface, thoroughly cleaned and given a coat of crude oil before they are used again.

NEW EQUIPMENT

When it was decided to make this shaft a permanent outlet, a new steel headframe, stockpile trestle and idler stand were erected. On account of the heavy flow of water in the underground workings at this shaft, it was necessary to dismantle the old wooden shaft house and erect the new one in the shortest possible time, as bailers might have had to be put in operation on short notice. This work was done in 10 days. The provisions made for installing bailers on 24 hr. notice during relining, proved to be a wise precaution, as a vug of water was encountered Oct. 22, 1912, and the bailers, put in operation within 24 hr., prevented the flooding of the lower mine workings.

PROGRESS OF WORK

The first section of relining was started 83 ft. 3 in. below the collar May 3, 1912, and the lining between this

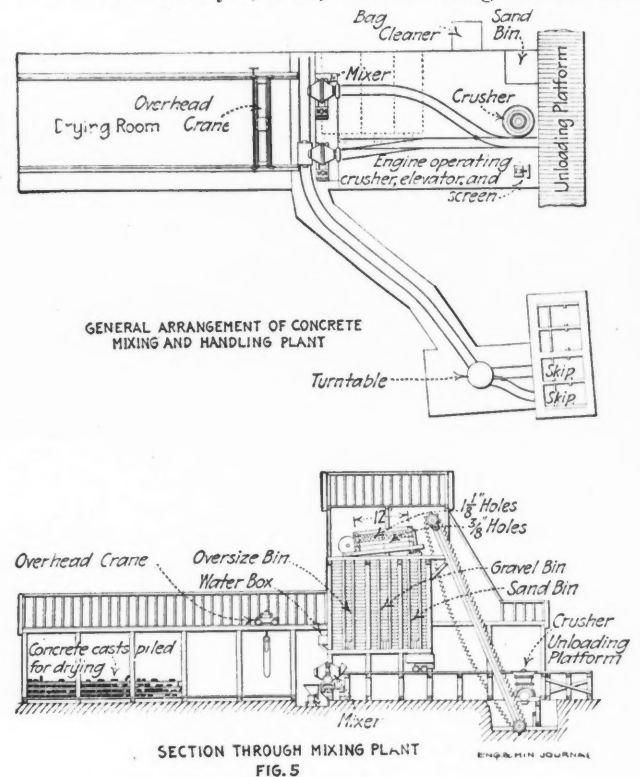


FIG. 5. THE SURFACE PLANT FOR CONCRETE MIXING

point and the collar was completed June 29. The second section was started 302 ft. 7 in. below the collar July 1, and was connected to the first section Oct. 5, 1912. The third section was started at the 551-ft. point Oct. 12, and connected Mar. 15, 1913. In this section work was discontinued from Oct. 22 to Nov. 18 on account of striking the vug of water on the 16 level. One week was also lost between Jan. 11 and 18, 1913, on account of a slip of old timbers. The fourth section was started at 696 ft. Mar. 22, and was connected on May 10. The fifth section was started at 917 ft. May 17, 1913, and on July 5, 813 ft. of the entire shaft was completed.

The average rate of progress since the beginning, without deducting the time due to delays, is 56.7 ft. per month and 63 ft. per month for actual working time. The progress for the last month was 72 ft. The preliminary estimate was based on relining 100 ft. per month. The old shaft timbers, however, were in far worse condition

than could possibly be anticipated, and the slower progress has been due entirely to the difficulty in removing them and the precautions required to protect the lives of men who are employed on this work.

In the portion of shaft completed to date, all the work has proven perfectly satisfactory and entirely up to expectations. The walls are smooth and waterproof. The reinforced-concrete dividers and end plates come from the steel forms perfectly true, straight and smooth, and fit perfectly in the recesses provided in the steel forms.

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An Interesting Park City Accident

BY GEORGE W. SHORT*

The accompanying illustrations show a wreck that occurred in Park City, Utah, on Aug. 30, which might have been disastrous to the city. Three 40-ton cars of lead ore were attached to the forward end of a locomotive and in switching, the engine and ore cars got away from the train crew and crashed into a car containing 30,000 lb. of Hercules powder. After striking the car of powder the force of the collision was such as to cause the cars



POWDER CAR RAMMED BY AN ENGINE AT PARK CITY, UTAH

to travel about 200 ft., striking another string of cars, as shown in the picture. Powder was scattered along the right-of-way under the engine and ore cars for the full 200 ft. The remarkable feature of the accident is that not one stick of powder exploded, if an explosion had occurred probably the whole of Park City would have been wrecked. The tender of the engine is resting on "pulped" powder in the end of the powder car.

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Motion Pictures on the Iron Ranges

In the Iron River district of the Menominee range, Pickands, Mather & Co. are giving free motion-picture shows for the benefit of the employees at the Caspian and Baltic mines. The entertainments are conducted at the clubhouses, the company has provided at both properties and they are attended by assemblages that pack the auditoriums to the doors.

One series of pictures displayed recently showed how the house-fly spreads disease. The reel was furnished by the Michigan state board of health. The movements of the germ-carrying insects, enlarged to great magnitude, were watched with interest. The officials were highly pleased over the result of this particular entertainment and considered the illustration of what a house-fly can do to spread disease as profitable to the employees and of material assistance in the sanitary campaign the company is conducting at its various mines.

*Park City, Utah.

Developments in the Joplin District

SPECIAL CORRESPONDENCE

Interest has been aroused in the outskirts of the Joplin district by the results of new prospecting which may yield additions to the present producing area. At Springfield, Mo., the easternmost camp of the district, discoveries of rich lead and zinc deposits have been made southeast of that city in the old "gumbo" camps which were important 30 years ago, but which have been lying dormant save for the operations of a single company. The Daisy mine which has been in almost constant operation, and which has been among the most profitable zinc mines in the entire field, has attracted the attention of Springfield men and a coöperative citizens' company has again entered the field for prospecting operations. Meyer, Eslinger & Clas have taken up a number of leases in the old camp and will do considerable drilling this autumn. The new developments are upon the Arch Webb land where at a depth of 40 ft. some good ore is being taken out, and upon the Kershner farm where C. D. Meyer is sinking a shaft and is finding indications of ore at 30 ft. The companies

that are now working in the field are the Daisy Mining Co., the Clark Mining Co., Cock Mining Co., Badger Lead & Zinc Co. and Meyer, Eslinger & Clas. The district has always produced a choice grade of ore, the blende running from 60 to 65% zinc, and the lead going to 80 to 84% in the concentrates.

ORE FOUND AS A RESULT OF A DROUGHT

Another development of interest is the discovery of lead and zinc ore $4\frac{1}{2}$ miles southwest of the old Aurora camp in the eastern end of the district. The discovery was entirely accidental and came about through the drilling of a well on the Ernest Pharris farm. The severe drought compelled the sinking of a well and Pharris sought a drill rig from the Aurora field realizing that he could get immediate service by securing a machine from a mining camp. The drill man, accustomed to examine all cuttings naturally examined those taken from this well and found that the drill had struck ore at 110 ft. and continued in good ore to 158 ft. The strike has created considerable interest and this accidental discovery will be the means of starting considerable prospecting in that vicinity.

For several years desultory prospecting has been going on in McDonald County, which is south of the main part of the Joplin district, but little has ever come of the efforts made. Recent work on the George Tatum land at Anderson, Mo., has, however, resulted in the opening of a fairly good, soft ground, zinc mine. The operators are

going ahead slowly and are cleaning the ores upon hand jigs. The good fortune attending these operations has started others into prospecting and a number of drill rigs will be sent to that part of the country.

GRASSELLI AND VINEGAR HILL COMPANIES

The Grasselli Chemical Co. recently became an active ore producer in the Joplin district through the acquirement of the Boyd mine and mill at Sarcoux. This property had been operated by three different companies previously. The property was first opened up by the Cameron Mining Co., was later operated by Dr. H. B. Boyd and then taken under option and lease by the American Zinc, Lead & Smelting Co., but later was released to the Boyd interests again. The mine is well equipped with a modern mill of 350 tons capacity. Mike Lawrence, of Joplin, will be the local manager, but the general manager will be W. A. Underhill, who has had charge of the company's operations in Tennessee. The Vinegar Hill Mining Co. acquired a half interest in the Church-Mabon lease at Miami, Okla., for \$25,000. The property has been well drilled and is in the northern part of the Hattonville camp. Shafts are down and production by the new owners will begin soon.

One unit of the electrical plant of the Ozark Power & Water Co. at the new dam on the White River in Taney County was completed late in August. This means additional power for the mining districts of Missouri, Kansas, Oklahoma and Arkansas. The new plant will be able to deliver 30,000 hp., which will be distributed for power and lighting purposes from Springfield, Mo., on the east to Joplin, on the west. This additional source of power will allow of a greater distribution of the power of the Empire District Co. to the southwest and west, and thus more completely electrify the mining districts of Oklahoma and Kansas.

NEW SOURCES OF ELECTRIC POWER

To southwest Missouri, Kansas and Oklahoma there can be distributed approximately 40,000 hp. of electrical energy, which, coming at a time when natural gas is failing, means a great addition to the power resources. Natural gas for many years has yielded cheap and efficient power for a large part of the mining district, replacing steam and coal in most of the plants. The electrical plants have taken part of this trade since the Spring River Power Co. was organized and the Lowell dam built. The weakening gas wells of Kansas have so lowered the gas pressure that winter seasons see the shutting off of all gas to industrial concerns and in some instances motors have succeeded the gas engines or the boilers. During the last two years practically all the energy that the Empire District Co. could distribute was either taken or the limit was very nearly reached. The Ozark plant on White River, therefore, comes in at an opportune time and will find a growing market for its power, directly in the mining district supplied by the company's other plant on Spring River. The two big plants will supplement each other and should give a much better service than the single plant does.

While the new source of power will be beneficial to the Joplin mining district directly, it will be of more service in helping develop a portion of the north Arkansas field, which has hitherto been difficult for operators to open up on account of the difficulty of securing power. The distance

from railroads precluded hauling coal, but with transmission lines, the only hauling charge will be upon the ore.

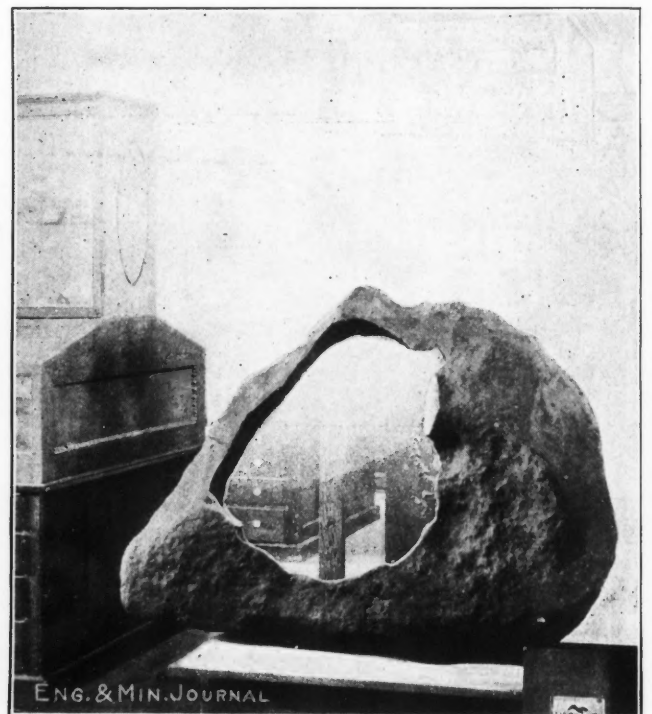
In the hills of Arkansas there are a large number of zinc prospects that are now being looked upon as likely investments on account of the power possibilities now available. A number of Joplin mine operators are looking over that field at the present time and a period of new development is planned for the coming year.

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Meteorite Used as Anvil

By C. L. EDHOLM

One of the most remarkable meteorites ever recovered was found in the days of the Spanish occupation of Arizona by a party of soldiers who carried it to their *presidio*, or military station. After the garrison was withdrawn,



THE IRWIN OR AINSA METEORITE

this mass of iron, weighing 1400 lb., shaped roughly like a signet ring, was set up in Tucson on the plaza as a public anvil. No records show when the meteorite fell, and it was not until 1851 that Dr. John L. Leconte called the attention of scientists to its existence. After that it began a course of wanderings, through Hermosillo and Guaymas, Mexico, thence to San Francisco; thence by the Isthmus of Panama to Santiago, Cuba, and finally to the Smithsonian Institution at Washington, D. C.

It is known as the Irwin or Ainsa meteorite, after two men who made it known to the general public. It is 124x97 cm., with an opening of 68 cm. and a greatest thickness of 49 centimeters.

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The Best Route to Shushanna, which is but 30 miles from the International boundary, has been announced by the Canadian Government. The route recommended is from White Horse through the Kluane district. Canadian customs officials are arranging to facilitate the passage of prospectors with their equipment through Canadian territory. All those not taking in a sufficient supply of provisions will not be allowed to proceed. This measure is taken as otherwise many would starve.

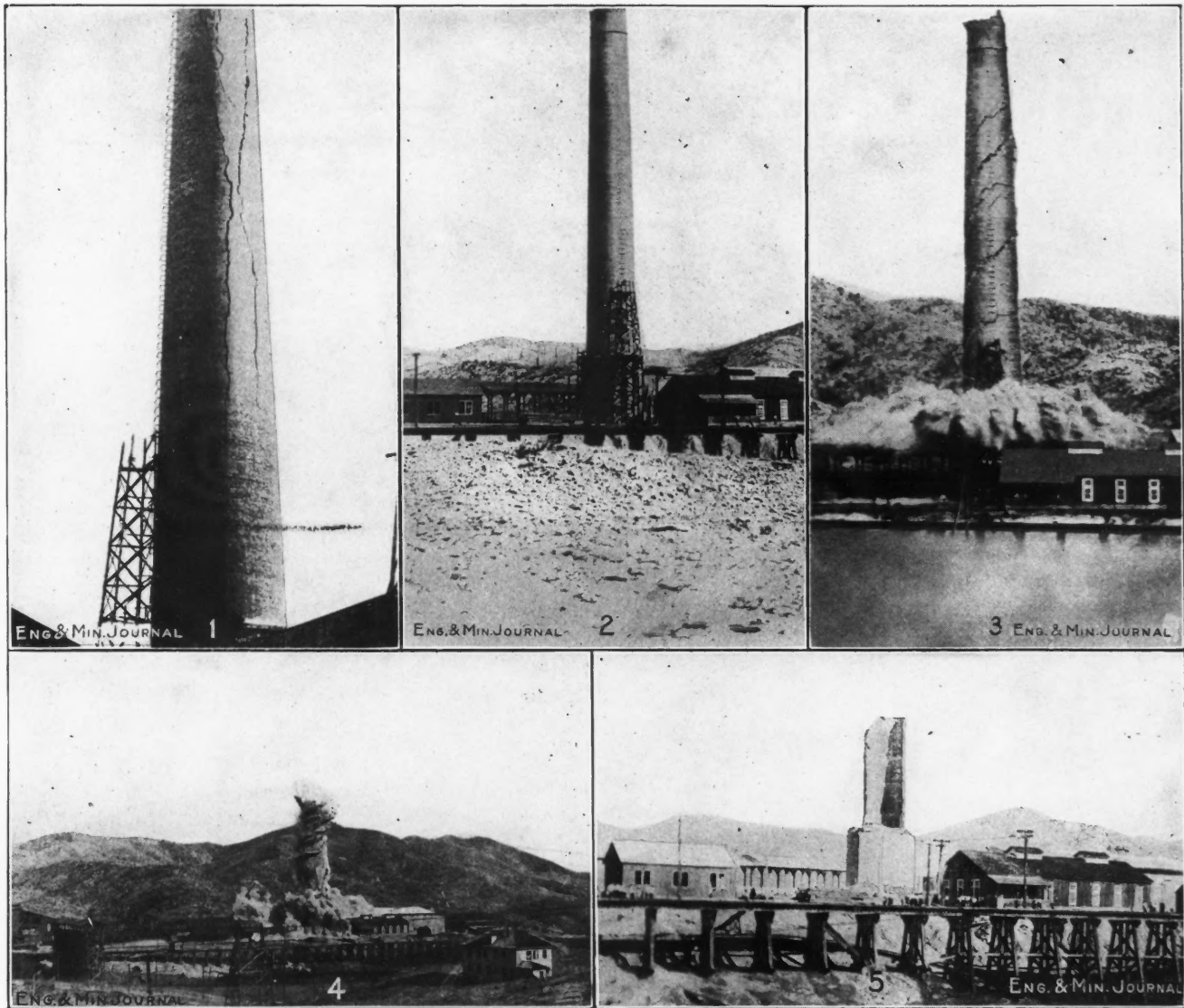
Wrecking the Balaklala Stack at Coram, Calif.

SPECIAL CORRESPONDENCE

The tall, hollow-tile stack at the works of the Balaklala Consolidated Copper Co., at Coram, Calif., was recently wrecked by blasting out the lower part of the round portion of the stack, just above the octagonal base. The stack was 275 ft. high; the octagonal base about 40 ft. high. After the stack had been used 18 months, it be-

would fall from the cornice, making it extremely dangerous, it was feared that, by working on the stack, some of the men might be injured. Fig. 2 is the photograph taken from the west side of the stack and shows how the top had crumbled away, several feet of it having fallen from time to time. In Fig. 3, the condition of the stack at the time of firing the blast, and just before it fell, is shown. In Fig. 4 the stack is shown a little later than in No. 3. Fig. 5 shows a piece remaining after the blast. This piece was taken down a few days later.

In wrecking the stack, 72 holes were drilled around



FAILURE AND WRECKING OF THE HOLLOW-TILE STACK OF THE BALAKLALA CONSOLIDATED COPPER CO.

In June a 135-ft. brick stack in Cleveland, Ohio, was struck by lightning, causing almost the same condition shown in Fig. 1.

gan to crack and flatten on one side. Some people said it had been struck by lightning, but it is not positively known that this is true. The condition of the stack on the south side is shown in Fig. 1. Where the cracks are, the stack had bulged out, and on the left, where the iron ladder-rungs can be distinguished, the stack had flattened so that when one went inside and looked up, there was probably 10 or 12 ft. of the inside which, instead of being a circle, was practically straight across.

Many plans for saving the stack were discussed, such as banding, etc.; but as every few days a lot of brick

half of the base, and in each hole three sticks of 40% powder were placed, and all the holes were fired simultaneously by an electric battery. It is understood that the hollow tile of which this stack was built were imported from Germany. The cost of the original stack was \$35,000. It is probable that the stack will be rebuilt to a height of 40 or 50 ft. above the 40-ft. base, using the same old material; possibly it may be built higher. The staging, which is to be seen in various pictures, was built for the purpose of taking samples of smoke while the Cottrell process was being tried out.

Calumet & Hecla Social Service Work

The late Alexander Agassiz, who was president of the Calumet & Hecla Mining Co., was a man of broad vision, who gave much attention to the men employed by the company. Under his direction the manual-training school in connection with the Calumet public-school system was established; he built the magnificent library at Calumet and stocked it; the company bathhouse was the outgrowth of his suggestion when the library was built; and through his efforts the employees aid fund was organized and operated successfully for many years. By this fund the workers not only received the best of medical and surgical service, but hospital and pharmacy service as well, and partial compensation when kept from work by illness. The story of the work of the fund is in itself a fine illustration of the employees' appreciation of properly directed efforts toward their welfare. The compensation act passed by the last legislature is but an enlargement of that principle, applied in a different way. That law, of course, takes the place of the aid fund and the company is now working out a system of industrial insurance with the balance of this fund as the nucleus.

Early this spring the Calumet & Hecla commenced the erection of a new hospital to do service for the various properties in the vicinity of Calumet. It will cost close to \$200,000 when completed and equipped. There will be none better in the country. It will be fitted with every device of a serviceable, efficient hospital of the most modern type. This will replace the present hospital which is today the largest in the copper country.

In connection with the erection of the new hospital the company had planned the organization of a corps of trained nurses, some of them domestic-science experts. These nurses were to work among the families of the workingmen. To be sure the great majority of the families have no need for their services, but there are, nevertheless, among the thousands of families, always a good many where the domestic problems of the household are more than the wife and mother can work out unaided. These trained women were to teach the others efficiency methods in the homes. In connection with this same social-service work, a row of cottages will be built at Eagle River or Eagle Harbor, on the shores of Lake Superior. These are to be utilized in the summer time for the benefit of the wives of employees, and are planned to give such as are sick rest and recreation under conditions which are likely to insure more speedy recovery.

Plans had been laid before the strike was called, July 23, to elaborate the clubhouse idea. The directors of the Ahmeek had already authorized the expenditure of the money necessary for the erection of a clubhouse for the workingmen at Ahmeek. Five or six others were to follow, one at Isle Royale and Superior, another at Centennial and others in the vicinity of Calumet. These clubhouses were to be erected by the company, but managed by the men, a small fee being charged to convey the rights of proprietorship to the members. These clubhouses will yet be built and will be equipped with reading rooms, gymnasiums, with complete paraphernalia, running tracks baths and whatever else experience may indicate as necessary.

It is planned to make these clubhouses the centers for social life among the workingmen. In many of the outlying districts the men have a limited choice of diversions

when they are through with their work. Athletics of all sorts will receive every encouragement. Indicative of this feature it may be stated that an inter-mine baseball league had been organized and was operating successfully before the calling of the strike. Manager MacNaughton personally offered a suit of clothes to every man on the winning team, and the men in the mines were talking baseball in real earnest. It is believed that similar interest could be aroused among the men in basketball, handball, boxing and indoor-track team work.

To those who point out the difficulties that are certain to be encountered in the actual working out of these social-service endeavors, it may be stated that quite as many difficulties seemed to stand in the way of the success of the library, the company bathhouse, the aid fund and every other similar effort, when it was started, and while there have been a few abuses of the privileges granted, they are insignificant and the majority of the men have appreciated the opportunities and are anxious to take advantage of them.

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Keeping Personal Accounts

BY A. H. SAWYER*

The average recent graduate from technical schools usually has no experience in book-keeping and usually has little theoretical knowledge of the subject. The object of the mining business, in common with all business, is to make money, and it is essential that those in charge should be well informed regarding accounting methods. Here, as in other lines of endeavor, proficiency can best be attained by practice.

Many engineers neglect the study of accounting until they are placed in charge of important work, and while they may learn it then, it is far better to have an understanding of it beforehand. This is shown by the fact that many managers of mines have been selected from the accounting rather than the engineering department.

The keeping of one's own personal accounts affords excellent practice in book-keeping, for while the items differ, the accounts are essentially similar. It has the additional value of showing one's financial condition and encouraging businesslike and economical habits. Too elaborate a system of book-keeping should not be attempted, at least at first, as it soon becomes burdensome and is likely to be discontinued.

A small note book may be ruled for the essential accounts, which are the Journal, Cash Account and Ledger. These accounts can best be explained by means of an illustration and for that purpose we will assume that John Doe, a recent technical graduate, has been engaged by the Sunset Mining Co., at a salary of \$75 per month; that he has \$110 in cash when he arrives and that he opens a checking account with the nearest bank and deposits \$100. The following transactions are supposed to have taken place. Mr. Doe engages a room with board, buys clothes and boots amounting to \$13.50, which is charged to him, and starts work on the first of July. On Aug. 1 his board and room rent, amounting to \$25, are due and are paid by check. During July, Mr. Doe spends \$5.75 cash for incidentals and also subscribes for a technical paper. His first payday comes on Aug. 15, when he re-

*Redridge, Mich.

ceives a check for \$74.50 from the company, the \$0.50 having been deducted for hospital dues.

On Sept. 1 the books might appear as follows:

1913.		JOURNAL	Dr.	Cr.
July 1	Miners Nat'l Bank..... John Doe		100 00	100 00
	Expense, Shirt, \$1.50, Trousers, \$5.00 Boots \$7.00 Mercantile Store Co.		13 50	13 50
Aug. 1	Sunset Mining Co. Labor in July. Profit & Loss		74 50	74 50
" 1	Expense, Board & Room, July 1-Aug. 1. Miners Nat'l Bank		25 00	25 00
" 15	Mercantile Store Co. Miners Nat'l Bank.		13 50	13 50
" 31	Profit & Loss. Expense John Doe.		74 50	49 25 25 25

CASH BOOK

1913		Dr.	1913		Cr.
July 1	Cash on hand	10 00	July 31	Incidentals	5 75
" 10	Miners Nat'l Bank	5 00	" "	Expense, Eng. & Min. Journ.	5 00
			" "	Balance (Red ink)	4 25
		15 00			15 00
Aug. 1	Bal. forward	4 25	Aug. 15	Miners Nat'l Bank	74 50
" 15	Sunset M'g. Co.	74 50	" "	Balance (Red ink)	4 25
		78 75			78 75
Sept. 1	Bal. forward	4 25			

LEDGER

Miners National Bank							
1913		Folio	Dr.	1913		Folio	Cr.
July 1	Dep.	J 1	100 00	July 10	Ck. No. 1	CB 1	5 00
" 10				" 31	Bal. (Redink)		95 00
			100 00				100 00
Aug. 1	Bal. fr'd.		95 00	Aug. 1	Ck. No. 2	J 1	25 00
" 15	Dep.	CB 1	74 50	" 15	Ck. No. 3	J 1	13 50
			169 50		Bal. (Redink)		131 00
Sept. 1	Bal. fr'd.		131 00				169 50

Sunset Mining Co.

1913		Folio	Dr.	1913		Folio	Cr.
Aug. 1	Labor	J 1	74 50	Aug. 15		CB 1	74 50

Expense

1913		Folio	Dr.	1913		Folio	Cr.
July 1	Dry goods, etc.	J 1	13 50	Aug. 31		J 1	49 25
" 31		CB 1	10 75				
Aug. 1	Room & Board	J 1	25 00				49 25
			49 25				

Mercantile Store Co.

1913		Folio	Dr.	1913		Folio	Cr.
Aug. 15	July Acc.	J 1	13 50	July 1		J 1	13 50

Profit & Loss

1913		Folio	Dr.	1913		Folio	Cr.
Aug. 31		J 1	74 50	Aug. 1		J 1	74 50

John Doe

1913		Folio	Dr.	1913		Folio	Cr.
				July 1		J 1	100 00
				Aug. 31		CB 1	10 00
						J 1	25 25

TRIAL BALANCE

1913		Dr.	Cr.
Sept. 1	Cash	4 25	
	Miners National Bank	131 00	
	John Doe		135 25
		135 25	135 25

In practice a check register is used which, in many ways, takes the place of the journal or, in fact, is a journal of all transactions involving payment by check. In this case the journal proper is reserved for only those entries necessary for closing the books. This is an excellent method, but is not shown as beginners are likely to learn more rapidly by making regular journal entries of all transactions other than cash.

It must be remembered that items entered in the debit column of the journal should be debited to the proper account and similarly, items credited should be credited to the proper account.

In the cash book, however, items debited in the journal should be credited in the cash book, and those credited should be debited to the proper account. This is often confusing until it is remembered that the journal is simply a record of transactions, or day-book, the items being set down in the order of the transactions. The cash account is, however, a true account and formerly was a ledger account similar to others. It has been made an account of original entry simply to save time and labor.

In our illustration some of the entries might be made differently and perhaps more properly. For instance, the charge against the Sunset Mining Co., of \$74.50 for labor, should really be \$75, and the \$0.50 entered as an expense. As the dues for medical attendance are monthly, however, it simplifies matters to consider the salary to be \$74.50. Then, too, the entry of \$5.75 for incidentals in the cash account might be itemized, but this is rarely done. It is preferable to keep a petty cash account and enter only the total in the cash book.

In the illustration, the expense account is not balanced in July. This is simply to show that it is not necessary to do so at the end of each month, but it is the usual custom and should certainly be done by beginners.

The trial balance, as its name implies, is for the purpose of testing the accuracy of the books; that is, to prove that for each debit there is an equal credit. In it are set down the balances of those accounts in which there is a balance after the books are closed.



Precipitants of Metallic Sulphides

As the result of a series of experiments conducted for the purpose of throwing light on the solution and precipitation of the metals, as influencing secondary enrichment, Frank F. Grout (*Econ. Geol.*, August, 1913), finds that it is rather difficult to reprecipitate silver and copper sulphides as against native metals. Attempts to form sulphides from dilute acid solutions, under conditions like those assumed to exist where the process is going on in nature, were singularly disappointing. Similar results followed the attempts to form the sulphides by evolving H₂S from minerals, with the idea that it also would precipitate sulphides. But if these minerals, such as pyrite, chalcopyrite, sphalerite, pyrrhotite, stibnite, etc., are treated with a dilute alkaline solution and an acid solution of copper or silver added, the sulphides of

these metals will be precipitated. These conditions seem to correspond with those in nature; there must be a zone in which the acid solutions resulting from surface leaching, meet alkaline solutions formed at depths where alkaline minerals occur and oxygen is not present, and in this zone, precipitation and secondary enrichment might readily occur.

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The New Mill at the Globe Mine, Dedrick, Calif.

BY A. A. WILLOUGHBY

The Globe Consolidated Mining Co., at Dedrick, Calif., had practically completed its new milling and cyanide plant in the middle of August and expected to be in operation by the first of September. The construction of the mill, cyanide plant, aerial tramway and new water flume has been in progress since last fall. The change in management recently brought about radical changes in the original plans. Wallace MacGregor, general manager of the company, is in active charge of construction and will direct the mining and milling operations. He has had much experience in Western mining, particularly at Goldfield. J. W. Rutherford is superintendent of construction. He has had similar experience in the construction of the Mexican mill at Virginia City, Nev., and at the Black Oak, at Soulsbyville, Calif., and other smaller plants.

The 20-stamp mill will embrace the newest ideas in mill practice. The cyanide plant is the second all-slimes plant installed in California, the Black Oak plant being the first. The ore will be thoroughly sampled after passing through the Gates breaker, before reaching the stamps, which is comparatively recent practice in California. From the stamps the crushed ore will pass to a Dorr classifier and thence to a 22x5-ft. tube mill of the closed circuit type. The remainder of the mill equipment includes three Dorr agitators, four thickeners, an Oliver 16-ft. filter and three sump tanks.

The ore will be delivered to the mill by a 6000-ft. aerial tramway, built on a steep incline describing a vertical drop of 2500 ft. This is said to be the second longest aerial tramway installed at a metal mine in California. The one at the Balaklala copper mine in Shasta County is five miles long, but it is not so steeply pitched. The recent installation at the salt mines of the Saline Valley Salt Co., in Inyo County, is 13 miles long and passes over a mountain at an elevation of 8700 ft., representing a drop of about 5000 ft. in a distance of six miles from the mountain to the railroad; but this drop is not so unusual as that at the Globe mine.

The plant will be driven by water power generated by eight water wheels. The water is furnished through a 6000-ft. flume newly built. The flume will carry 25 cu.ft. of water per second and the wheels will be driven under a 450-ft. head. The water is delivered on the opposite side of the cañon from the flume to an inverted siphon installed in the cañon, thus delivering the water to the wheels. The lumber used in the construction of the flume was transported from the sawmill by means of a cable carriage, a simply devised aerial tram, rigged for the purpose.

The entire plant is substantially constructed, and required careful planning, as the mill site is on a steep-

pitched hillside. The whole surface equipment is under one roof, from the ore bins to the sump tanks. This covering is necessitated by the heavy snowfall and the long winter season. The mine is situated in Dedrick district, at about the center of the north half of Trinity County. Much of the district is practically inaccessible in the winter seasons. Dedrick is 80 miles northwest from Redding, the nearest available railroad shipping station. The wagon roads from Redding and other points are fair as far as Junction City, but from that point to Dedrick, a distance of 13 miles, the road is a typical cañon road, mostly rough and extremely narrow, so that travel is rather hazardous. A daily stage service is maintained; and during the past summer an auto-stage service to Weaverville, a distance of 25 miles. The mine owners contemplate the improvement of the road to Junction City.

During the period of construction of surface equipment the mine has been under systematic development. No. 6 tunnel in the Bailey ground adjoining has been advanced and a raise will be driven to connect with the Globe working situated at greater elevation. A temporary two-bucket tram is employed to carry the ore from the Globe through the Bailey crosscut for delivery to the mill. A large tonnage of ore is blocked out and ready for extraction and direct delivery to the mill.

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Influence of Calcite in Manganiferous Gold Veins

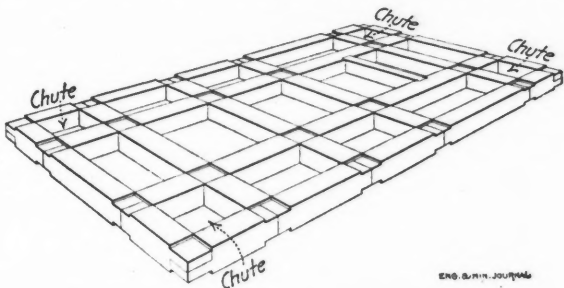
A few years ago, W. H. Emmons in discussing the influence of manganese in gold deposits developed the theory that in a manganiferous vein the tendency was for the gold to be dissolved by free chlorine liberated by the manganese salts formed during alteration, the gold being precipitated at the ground-water level, so as to give an enriched zone in the vein; in a nonmanganiferous vein, on the other hand, the tendency was for the gold to be eroded with the vein material and to form placer deposits. Discussing this theory in the *Philippine Journal of Science*, April, 1913, F. T. Eddingfield notes the point that Emmons' discussion applied to noncalcareous deposits and that certain discrepancies which occurred in the application of the theory were almost always cases of calcite-bearing veins. It happens that many gold-quartz veins in the Philippines contain considerable amounts of manganese and calcite. Examination and experiment indicate that Emmons' theory does not apply to these veins. On account of the presence of calcite, the mine waters are neutral or alkaline at practically all horizons above the ground-water level, which would prevent the formation of free chlorine. Furthermore, if nascent chlorine were generated, it would attack the calcite before the gold, while if gold chloride should be formed, at least some of the gold will be reprecipitated almost immediately by ferrous sulphate produced by the oxidation of the pyrite which is present. The theory was borne out by laboratory experiments and is also found to correspond with the facts as observed in the Islands. Thus in all the examples cited the richest ore occurs at or near the surface, the concentration being due simply to the removal of the other elements in the vein, and, so far as observed, the value of the vein decreases with depth, there being no enrichment at the ground-water level.

DETAILS OF PRACTICAL MINING

Shaft Jacketing in Heavy Ground

In order to relieve side pressure on the shaft when heavy ground is encountered, an arrangement like that shown in the accompanying illustration is employed in Butte. It is usual to raise around the shaft and place these jacket sets after the shaft is sunk; but in some cases they are carried down with the sinking (A. I. M. E. Bulletin, August, 1913). The purpose of the jacketing is to give room for men to work in removing ground to ease the timbers and to provide chutes through which the material removed can be shot down to the station below. The small corner compartments are usually used for chutes. The rock is usually extremely fine and can be picked out. If any of the outer jacket timbers break they can be easily replaced without disturbing the main sets of the shafts.

Sometimes the shaft sets are pushed out of line. In such case, vertical stringers are wedged to three sets all around. The jacket timber of the middle set, which it is desired to bring back to line, can be wedged against



JACKET TIMBERING IN BUTTE SHAFTS

these stringers, while the blocks between them and the shaft timbers proper are removed. It is then possible to bring the shaft set to line by means of a bar and new, shorter blocks can be fitted between the shaft set and the jacket timbers. With one set lined up, the operation is repeated on the next one out of line.

Qualities of Machine Drill Bits

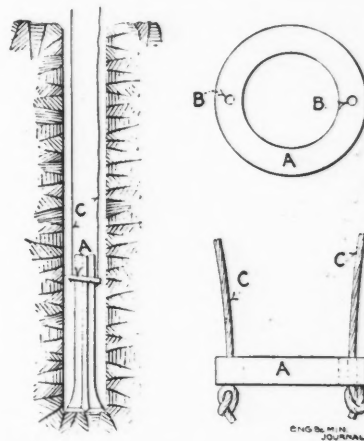
A good bit for use on machine steel should embody the following points, according to a booklet sent out by the Ingersoll-Rand Co.: (1) It should take full advantage of the chipping and fracturing quality of the rock; there is a certain depth to which the rock will be fractured when struck by a sharp tool, and if the edge is driven deeper or if it is dull, it will merely crush the material; (2) the wings should be as thin as is consistent with "mudding" and standing-up quality, since if the wings are heavy there is not sufficient space for the ejection of the cuttings; (3) the bit should be so designed that the cutting edge is its greatest diameter, since, in this manner, it will be always free in the rock at all times, the rock having a tendency to fracture a little bit larger than the length of the cutting edge; (4) the bit should

be symmetrical, so as to allow equal wear on all corners, since otherwise the longest wing will cut a groove in the side of the hole and result in rifling and, furthermore, the wear will be unequal and extra strains set up in the steel will cause greater breakage; (5) the heat treatment should be suitable, precautions being taken not to overheat or to work while too hot; light, rapid blows should be used for forging, and tempering should be properly done, it being advisable to allow the bits to cool thoroughly after forging and to reheat for tempering.

Removing Broken Drill from Hole

BY GEORGE A. ADDY*

An exceedingly ingenious and useful scheme for removing the bit end of a broken drill steel from a hole, is



RING AND CORDS FOR EXTRACTING BROKEN BITS

illustrated herewith. It consists simply of a ring of square iron A of a suitable diameter to slip over the broken steel. Two holes B are drilled on opposite sides of this ring and a stout cord passed through these holes and knotted on the lower sides. The ring is slipped over the steel in a down hole, and by loosening one cord and pulling on the other, the square corners of the ring grip the steel so that it may be removed. In case it is desired to use the device in a flat hole, one of the holes B is drilled large enough to take the pointed end of a scraper, and this tool is used in slipping the ring over the steel.

Electric Signaling from Moving Cage

In the collieries of the Ostrau-Karwin district, various devices are installed for giving signals from a cage moving in the shaft, according to the *Colliery Guardian*, Aug. 22, 1913. Where the electrical method is in use, two systems are possible. In either case a bare wire runs through the hoisting compartment, mounted on insulators, forming one branch of an electrical circuit, the other

*Park City, Utah.

branch of which is the hoisting rope. In one system current is furnished by a battery, and in the other by a magneto on the cage. Where the battery is used, the occupant of the cage gives the signal by touching the bare wire with a metallic conductor, so as to complete the circuit. In the other method, a trolley mounted on the cage is in continual contact with the bare wire, while signals are given by turning the handle of the magneto.

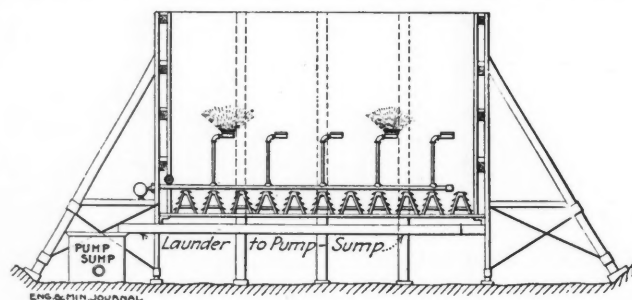
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Spray Cooling Tower

The accompanying drawing shows the cross-section of a cooling tower in use at the South Mine, Broken Hill, Australia. It is designed on rather novel lines, the water to be cooled being admitted in the form of a spray, as shown, so that most of the contact between water and cooling air occurs while the water is suspended in a finely divided state, instead of while it trickles over inclined surfaces and drops from their edges, as in the ordinary type of cooling tower (*Min and Eng. Review*, Nov., 1912). The tower has inclosed sides and admits the cooling air through the bottom. The bottom itself consists of a series of launders into which the water is conducted by louvered frames. By means of transverse launders, the cooled water is conducted to the boiler sump.

Excellent results have been obtained from this type of cooling tower, attributable to the following conditions:

(1) The air has a large and unrestricted inlet to tower



SECTION OF COOLING TOWER USING SPRAY SYSTEM

through the bottom only; (2) the sprayed water meets an equal supply of air in all parts of the tower; (3) the air and the vapor outlet is not contracted at the top and, therefore, there is a minimum restriction to the passage of the air; (4) the air is not retarded in its upward passage by the apparatus which is used to distribute the water, as is the case in most towers.

As illustrated, the tower draws in the air by natural draft, but if desired it may be built lower and the draft furnished by wind shields disposed about the lower portion below the launders and louvers.

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Safety Rules—Ladderways*

(1) There should be provided in addition to mechanical means of ingress or egress at least one means of outlet for the miners, by means of ladders, from the lowest workings of the mine to the surface.

(2) All ladder compartments should be separated from hoisting compartments by a tight wall.

(3) The surface outlet of all ladder compartments should be properly protected with self-closing doors.

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

(4) All floors of sets in stopes and every shaft, winze, raise or incline steeper than 35° from the horizontal through which men are obliged to pass should be provided with ladders and ladderways.

(5) All ladders should extend at least four feet above the collar or landing, and if this is not practicable iron staples or handholds should be provided.

(6) Substantial platforms should be provided at intervals of 20 ft. or less. Under no circumstances shall any ladder extending backward from the vertical be permitted.

(7) Defects in ladderways should be reported immediately.

(8) It is a serious offense to remove a ladder that is used as an exit.

(9) Use care in placing ladders before using them. If there is danger of a ladder's slipping, have someone hold it.

(10) Any ladderways, raises or manholes found unprotected or out of repair should be at once closed and kept closed until put in repair or temporary repairs made and danger signals provided until put in repair.

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Types of Headframes

BY H. L. BOTSFORD*

The structures erected over shaft collars to support and guide the hoisting rope and its conveyance, and to provide facilities for handling the hoisted material, may be classed as follows: (1) Tripod; (2) simple tower; (3) two-post; (4) four-post; (5) A-frame; and (6) special buildings for ore treatment, which also serve to support the sheaves.

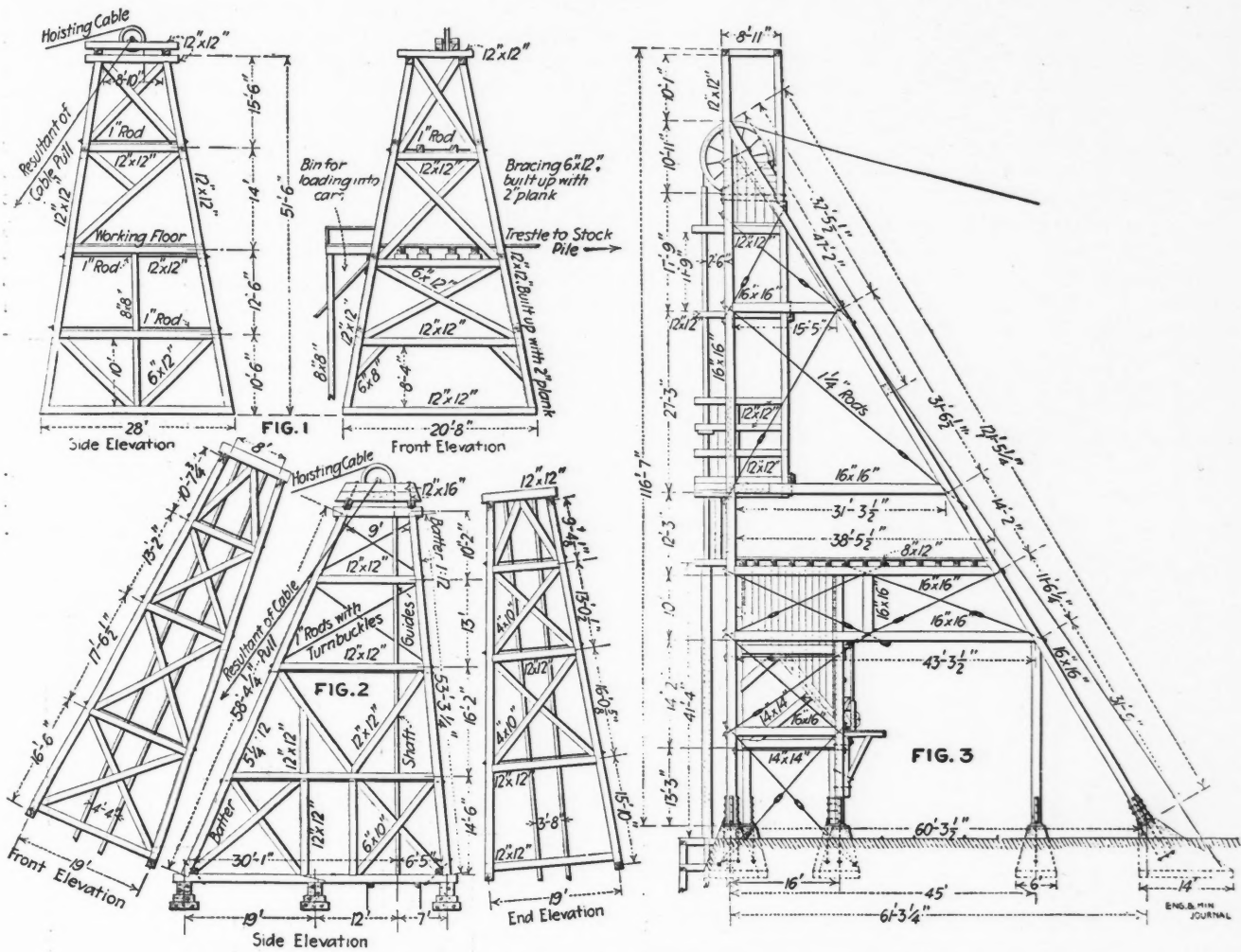
The tripod can be considered a rudimentary headframe. It is well adapted to preliminary prospecting and exploration where hoisting is in buckets. It is cheap and easy to erect, being made usually from round poles obtained in the vicinity.

The simple four-post tower may be of two types, namely, symmetrical with regard to the hoisting engine, or unsymmetrical, having the two posts toward the engine more highly inclined. Fig. 1 illustrates an example of the first type. The four posts which comprise the main frame are battered equally. This particular frame is constructed of timbers built up out of 2-in. planks and is designed for a 3-ton hoisting load. In Fig. 2 the second type is illustrated. This is superior to the first in giving a larger base and thus being a more rigid structure.

The two-post type, which is extremely popular in Western mining districts, is illustrated in Fig. 3 with a rather elaborate example. The height of this particular headframe is noteworthy, as is also the size of the timbers. Considered merely as a support for the sheaves, it is the most economical type for work above the field of the tripod. It is evident that if the unsymmetrical four-post headframe, Fig. 2, had its two sets of posts brought together at the top and the front posts made vertical it would be a two-post headframe. The bracing in this two-post type is simpler than in any of the four-post designs and is easily computed by graphic methods.

The four-post type, Fig. 4, is really a tower with back braces, except that the original four posts are often

*Mining engineer, Creighton Mine, Ont., Canada.



SYMMETRICAL AND UNSYMMETRICAL FOUR-POST TOWERS AND TWO-POST HEADFRAME

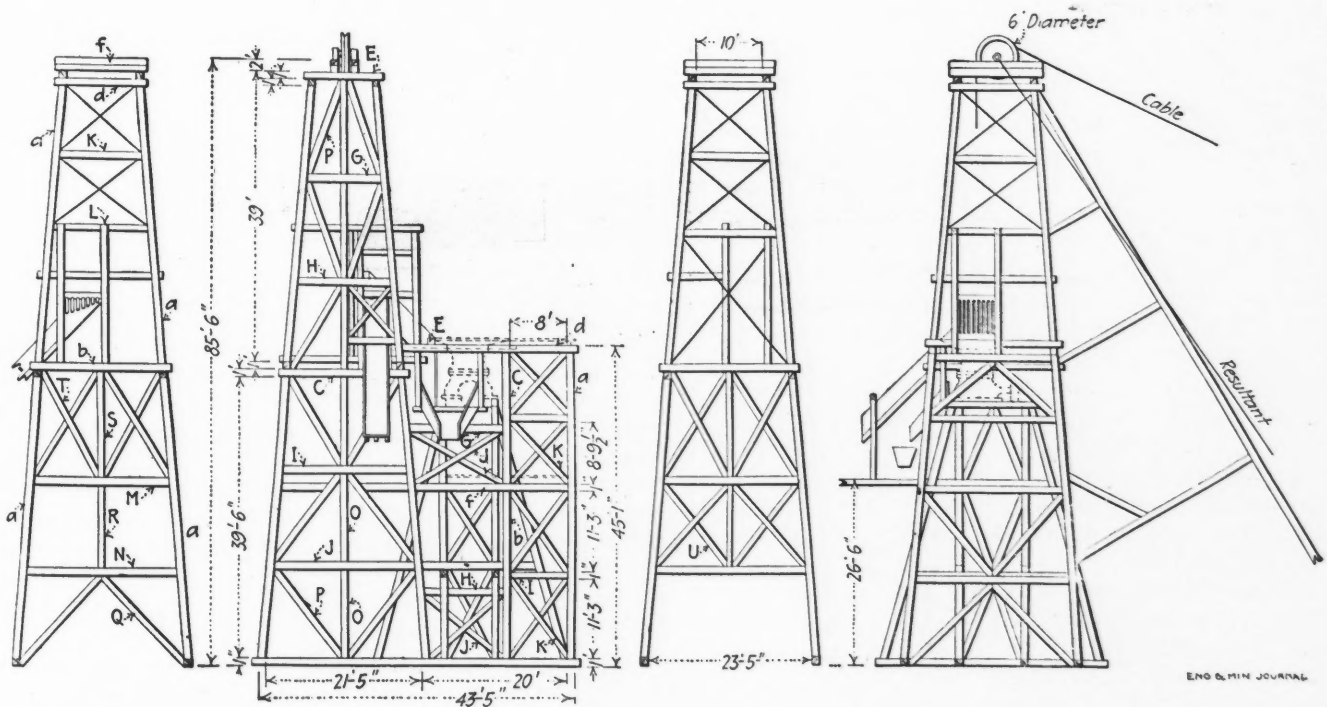


FIG. 4. FOUR-POST HEADFRAME

made vertical. It is especially suited to shafts approximating a square, where all the hoisting compartments are not in the same line. It is also particularly available where heavy work and high headframes are required. It is less economical in the use of material than is the two-post type, but it is extremely convenient, especially for supporting the guides, the dump plates of the skip and the sheaves.

The A-frame type, unillustrated, is used in the case of an inclined shaft and gets its name from the fact that the front posts have a batter to correspond approximately with the inclination of the shaft. Special buildings for ore treatment are really combination headframes and crusher plants, such as are found in the rock houses of the Lake Superior copper country. The design of such buildings entails more attention to the crushing machinery than to the hoisting features, and requires special knowledge of the machinery to be installed.

In a headframe pure and simple, where no crushing machinery is included, the stress of greatest importance is that produced by the weight of the hoisted load and its rope, and the weight of the structure, including sheaves and loaded bins. The stress due to the weight of the rope and its load will be equal along the rope in the shaft and along the rope to the engine, and the resultant of these two stresses will bisect the angle between the two ropes. The position of this resultant with regard to the members of the headframe is a matter of great importance. If it falls inside the base of the structure, there will be no tendency toward overturning and the posts and back braces will all be in compression. If it falls in line with the back braces, these will be in compression and the posts will be neutral. If it falls between the engine and the back braces, there will be a greater or less tendency to overturn, and the front posts will be in tension. When this latter is the case, attention must be paid to the anchoring of the front post into the foundation and to the weight of the foundation itself, this being one of the principal forces opposed to overturning.

In the symmetrical four-post tower, the resultant will rarely fall within the base of the structure, unless, as in the Joplin district, the engine itself is carried in the headframe or close to the post. In the unsymmetrical four-post tower the resultant may be more easily brought within the limits of the base, if desired. In any event, it lies nearer to the back braces and the overturning moment is consequently decreased.

In the two-post type it is good practice to keep the resultants either in exact line with the back braces or between the back braces and the front posts. When the resultant is in line with the back braces, these carry the entire pressure and no stresses are transmitted through the bracing; the front posts merely support the weight of the structure and its attached load. The four-post type, being heavier, tends by its own weight to resist overturning, and the resultant may be safely placed between the back braces and the engine, thus taking advantage of the heavy construction.

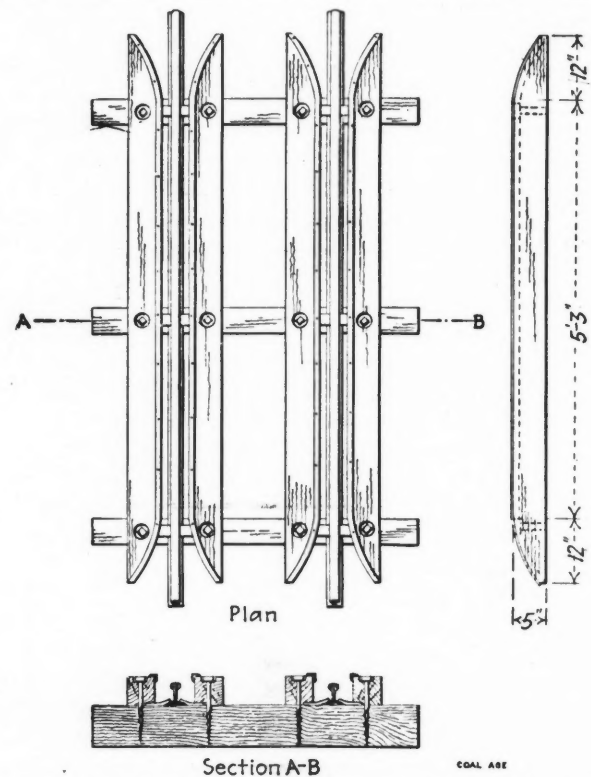
[It is, of course, possible by placing the engine near the shaft to keep the resultant always within the base of any structure. Other considerations often prevent this; but one point which is sometimes dwelt upon should never be considered. It is assumed that the shorter the arc of contact between the sheave and the hoisting rope, the less the bending stresses in the rope. This is entirely a

fallacy, since when the rope has once taken the curvature of the sheave, which it will do with an extremely small arc of contact, much smaller than is ever attainable in practice, any increase in the length of this arc does not increase the bending stress, since the relation between the wires is maintained until the rope leaves the sheave. For this reason there is no advantage in keeping the engine some distance from the headframe in order to reduce the arc of contact. To illustrate the fallacy of this argument, consider the sheave and the drum or reel. The rope is wound many times around the drum or reel and continues to revolve in this position, yet no one would maintain that the bending stress is increased by this operation.—EDITOR.]

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Rerailing Device for Cars

The automatic rerailing device shown herewith is successfully used for mine cars in electric-haulage service at the Shamrock mine in the Herne district, Germany.



PLAN, ELEVATION AND SECTION OF RERAILER

It is described in the "Zeitschrift für das Berg- Hütten- und Salinenwesen," Vol. 61, No. 1, according to *Coal Age*, Sept. 13, 1913. The guide blocks consist of oak posts about 5 in. square and 7 ft. 4 in. long, beveled at the ends to direct the car wheels. These rerailing blocks are usually placed behind the switch and fastened to the ties by wood screws. On the inside they are faced with angle irons, about $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{4}$ in. in size.

✽

Fir Timber is Used for All Shaft Work in Butte, Mont. This may be either Pacific Coast fir, or what is called native fir, from Idaho or Montana (A. I. M. E. Bulletin, August, 1913). The latter seems to be the tougher wood, but it is hard to obtain clear lumber in the lengths and sizes necessary for shaft work. Some of the Anaconda shaft timber has been treated with creosote, but this practice has not become general since the ground of the camp is so heavy that the timbers usually crush before they rot. The sizes of timber most common for shaft work are 12x12, 10x12, 10x14 and 12x14. The new Leonard shaft, however, is timbered with 14x14-in. wall plates throughout.

DETAILS OF METALLURGICAL PRACTICE

Safety Rules—Construction Operations*

(1) In new construction or repairs, the surrounding premises should be kept as clean and orderly as possible. Boards should not be left with nails sticking up in them.

(2) Men working on high elevations from which they are liable to fall, should, where practicable, wear a safety line and belt.

(3) Men working overhead should not drop any material without giving warning to those below. When it is necessary to work above or below other men, those men should be notified. Men working overhead shall place a sign, "Danger, Falling Material," on ground below them. When the light is not sufficient to enable these signs to be readily seen, a red lantern must be placed thereon.

(4) Exercise great care in piling brick on scaffolds to prevent the former from falling. See that toe boards are in good condition.

(5) Do not overload scaffolds.

(6) Keep out from under material being hoisted.

(7) All shafts in which brick is being hoisted should be sheeted so that slings cannot catch.

(8) Be certain that signals used when hoisting material are thoroughly understood.

(9) Never place men at work under masons if it can be avoided; if necessary to do so, provide covering over men working below.

(10) Use care in placing a ladder; if there is danger of slipping, have someone hold it.

(11) Do not go up or down a ladder without the free use of both hands. If material has to be handled, use a rope.

(12) All scaffolds, whether swinging or otherwise, when higher than 10 ft. from the ground, shall be provided with a railing. On swinging scaffolds the railing may consist of a rope or cable attached to the supporting ropes of the scaffold. The planking of the scaffold shall be secure and cover the entire space between the supporting ropes. To prevent planks slipping from the stringers there shall be a hole in the planking on the outside of the stringers, through which a bolt shall be placed.

(13) Every employee before going upon any scaffold should see for himself that the scaffolds and its supports are properly built. Sufficient time at all times should be allowed to each employee to make this examination.

(14) Wire rope shall be used for lashing, except where liable to slip, or where raising light-weight material. In lifting heavy pieces, double lashing shall be provided, and, where practicable, double tackle shall be used. In all cases the man in charge of the work shall ascertain, if possible, the weight of the material to be hoisted, and, before raising, the man in charge shall carefully inspect the tackle and lashing.

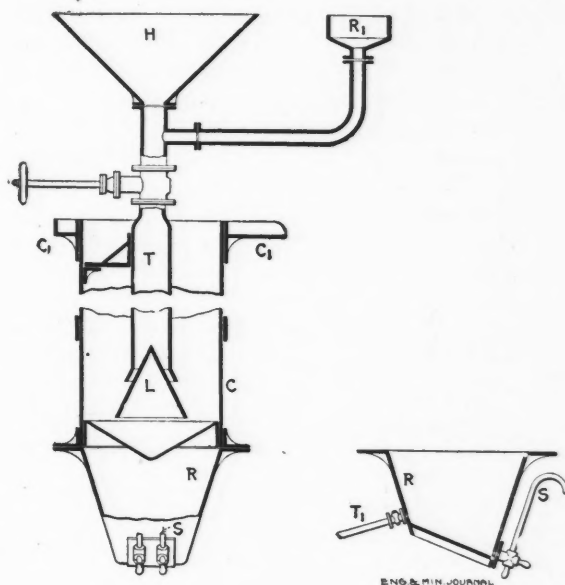
(15) Chain or rope sling should not be used at any place where cable can be used.

(16) When necessary to use runway and horses, employees should see that they use sound lumber, that runways are at least 24 in. wide, cleated underneath and on top of the sides, to prevent slipping of the workmen, and well braced so as not to teeter.



A New Hydraulic Classifier

A new type of classifier has recently been introduced in Central America and Brazil, with, it is believed, satis-



A NEW HYDRAULIC CLASSIFIER

factory results. It is the invention of G. Michel, of Paris, and constitutes a distinct departure from classifiers involving the use of cones, spitzkasten, spitzlutten, etc. Before describing the apparatus, it may be interesting to refer briefly to the principle on which it is based. In the case of sand containing several constituents of different densities, it is the custom in mechanical preparation, to class it according to size by the aid of screens. Examining the law of the free fall of bodies in water, it is found that all bodies falling freely in a medium of density X acquire a velocity v , which at the beginning of the fall is represented by the formula

$$\frac{dv}{dt} = \frac{g(1 - X)}{D}$$

D being the density of the grain. When the speed becomes uniform if the height of the liquid column permits this, this uniform speed becomes in water

$$v = 2.44 a (D - 1),$$

a being the diameter of the hole through which the grains will pass. A short table is herewith given, showing the speeds in meters per second of certain grains at the beginning of the fall and after certain periods.

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

It will be seen that it is necessary, in order to obtain a constant speed of grains of the same size, to have a liquid column of constant section and of a sufficient height. If in carrying out the inverse operation one gives to the liquid column a uniform vertical movement directed from the bottom to the top, and a convenient height to enable the grains of largest size to obtain their constant speed, an apparatus is obtained by which it is possible to carry over those portions of light density and to collect at the bottom of the liquid column the grains of largest specific gravity.

In practice it is not sufficient, in order to separate the larger grains by difference in density, to utilize simply a liquid column in movement, because of the necessity of reducing to a minimum the eddies, and also the friction against the boundaries of the column. It is necessary to employ a cylindrical column of appropriate diameter to avoid sharp bends and present the least surface of resistance, and also to insure a sufficient section to minimize the friction of the grains against themselves. In liquid classifiers dealing with grains of comparatively large diameters it is hardly necessary to take much notice of the phenomenon of surface tension, but this point becomes important when dealing with fine sand. Its effect is due to the fact that the surface of a liquid in contact with air or any other gas presents a resistance to rupture and grains having a density higher than that of the liquid actually float on the surface without being able to break it. To avoid the inconvenience of the surface-tension effect it is necessary to introduce the grains which are to be classified into the interior of the liquid

SPEED OF MINERAL GRAINS FALLING IN WATER

Diameter in mm.	Nature of grains	Speed (Sec.)				
		1/4	1/2	3/4	1	2
15	Galena	0.903	1.441	1.630	1.650	1.650
	Pyrites	0.825	1.174	1.287	1.293	1.293
	Quartz	0.570	0.767	0.801	0.817	0.817
4	Galena	0.704	0.814	0.823	0.824	0.824
	Pyrites	0.586	0.643	0.646	0.646	0.646
	Quartz	0.383	0.409	0.409	0.409	0.409
1	Galena	0.409	0.413	0.414	0.414	0.414
	Pyrites	0.321	0.323	0.323	0.323	0.323
	Quartz	0.203	0.204	0.204	0.204	0.204

column so that they may break the pellicule forming its surface. Moreover, to maintain a constant speed of the liquid column and to avoid the production of eddies it is indispensable to accomplish the removal of the classified products in such a way that there are no eddies set up and no alteration in the speed of the column. It is also indispensable for the same reasons to maintain a constant feed of the material classified and of the liquid.

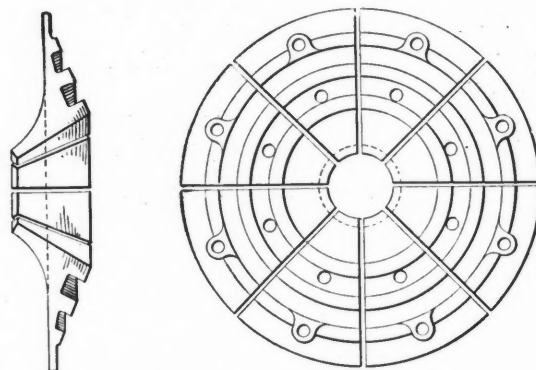
These considerations being noted, reference may be made to the accompanying drawing, showing the construction of the Michel hydraulic classifier. It will be seen that it consists of a vertical cylinder *C* of appropriate height and diameter, at the center of which is fixed a tube *T* in communication with a hopper *H* in which the mixture of water and mineral to be classified is placed. Between the tube and hopper is placed a regulating valve and the liquid containing the mineral grains in suspension passes first down the tube *T* onto a cone *L* and then upward again through the outer portion of the cylinder *C*. The grains are cleared of mud and fine sediment, and the latter particles are carried up with the constantly upward flowing water to an annular trough *C*, from which a regulated discharge is effected. The particles of heavier specific gravity separate and fall on an inverted cone at the base of the cylinder *C*. This cone has numerous holes in it whereby the classified particles fall through into a reser-

voir *R*. This reservoir is furnished with one or more siphons *S*, by means of which the classified matter is quietly and regularly withdrawn. In order to compensate for the water which is drawn away in this manner along with the classified particles, a pipe *T*₁ is attached to the receiver by means of which a stream of compensating clear water is introduced simultaneously with the withdrawal operations of the siphons. In this way disturbance of the main flow is avoided, and there are no eddy currents or speed alterations. The cylindrical form of the apparatus allows material in movement to obtain and preserve constant speed of rising for each grain during the whole of its upward course. The cone *L* has the function of uniformly spreading the flow throughout the whole circumference of the cylinder and in conjunction with the valve has also an effect in regulating the speed. In order to further insure a constant rate of feeding, an auxiliary reservoir fitted with a float valve *R*₁ is attached to the central tube. With this provision it is found that the Michel classifier is capable of doing good and uniform work, and is said to have been adopted with success by the Darien Gold Mining Co., of Central America, and by the Conquista Xicao Gold Mines in Brazil.

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Convex End Liner for Tube Mill

With the usual end liner used in tube mills, the function is simply to prevent wear to the greatest possible



TUBE-MILL END LINING

extent. A new device, however, has been produced by H. C. Holthoff, U. S. pat. No. 1,018,320, the object of which is to assist in the grinding operation. To accomplish this object, the liner casting is made convex, as shown in the accompanying drawing. Grooves or corrugations are placed in the casting, concentric with the entrance and discharge openings, for the purpose of catching and holding pebbles, thus forming a wear-reducing lining of itself, as is the case with the El Oro lining. End liners of this convex shape are said to prevent the exit of the larger ore particles and pebbles, throwing them back toward the center of the mill where they perform more grinding.

✱

The Substitution of Oil for Coal in British Warships as was recently announced by the British Admiralty is of interest to Canadians because the possibility of furnishing a supply from the Canadian oilfields is being considered. For several years the output of the Ontario oil wells has been diminishing, and the expectation that Canada can supply any considerable portion of the British naval requirements is not warranted so far as the known oil resources of the older provinces are concerned. There are, however, indications of oil in many parts of the West, especially British Columbia. These oil lands are on public domain, and the prospect held out by the Admiralty's policy of a steady market for the output will be a stimulus to investigation both by the Government and private parties.

THE ASSAYER AND CHEMIST

Permanganate Titrations

BY DONALD M. LIDDELL*

A point which is ordinarily overlooked in certain determinations with permanganate, is the effect of the filter paper on it. This does not refer to the lime titration, where the filter paper and calcium-oxalate precipitate are usually dropped together into a weak sulphuric acid. Although it is probable that the fading out of the permanganate pink on long standing is due to the slow action of the filter paper, it is doubtful whether this source of error cuts any great figure in the short time necessary for this titration.

The effect I refer to is in those determinations in which sulphide or hydroxide precipitates are dissolved from filter papers by comparatively long acid treatment. In these cases it is certainly unsafe to proceed with permanganate titration on the solution, unless it be carried down to sulphuric-acid fumes, or unless a large excess of permanganate be added, and the solution boiled.

While the cause of this is obscure, it is probably due to acid converting some of the cellulose of the filter paper (or perhaps some of the starch which usually is found in paper) into soluble compounds, probably into one of the sugars. At any rate, the difference in two duplicate iron titrations in which ferric hydroxide has been dissolved and washed off filter paper by comparatively long acid treatment, may apparently amount to 3 to 5 mg. of iron, between the determination which has been thoroughly oxidized before reducing, and that which is put straight through the reductor. A titration made after oxidation before reduction will often hold its end color for hours, while one made without oxidation will often fade in a few minutes, in addition to giving high results.

This error seems to be entirely independent of the method of reduction used, whether zinc or stannous chloride. Where determinations are made by difference, subtracting iron, it is obvious the other determination is also affected by lack of this precaution.

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Manufacture of Filter Paper

Chemical filter papers are generally made on hand molds, while those used for other purposes are manufactured on cylinder machines. The carefully sorted rags, freed from metallic impurities, are boiled with caustic soda and are preferably bleached in chambers with gaseous chlorine after washing and breaking (*Chem. News*, p. 269, 1913). The ash in the purified bleached half-stuff ranges from 0.177% for colored cotton rags down to 0.039% for new shirt cuttings. The water employed must be of the purest description, but even then it generally introduces 0.02 to 0.05% of mineral matter into the paper. The beating is regulated according to the rapidity of filtration and fineness of retention desired.

For analytical work the paper is extracted with hydro-

fluoric and hydrochloric acids and washed until the washings give no opalescence with silver nitrate. It is then pressed and hung in open sheds, where it is frozen to increase its porosity. If dried before freezing, the desired effect cannot be obtained. Extracted filter paper contains about 0.015% of ash. Extreme precautions are taken for the determination of the ash in chemical filter papers; the chief constituents are silica and calcium, aluminum and magnesium oxides. The rate of filtration is determined on a paper 6 in. in diameter, through which 6 cu. in. of water at 90° should pass in 140 sec. as a maximum, to 90 sec. as a minimum.

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Determination of Lead in Unchilled Slags

BY RICHARDSON T. WILDER*

The following method was devised for the determination of lead in unchilled slags, which are being shipped to the local smelter from old dumps in the vicinity of Chihuahua. I shall first give the method used by the smelter's chemist and formerly by myself, the hydrofluoric-acid method, after which the method I have devised will be described in detail.

Half a gram of the slag is weighed into a large platinum dish and 10 c.c. of nitric acid, together with 10 c.c. of hydrofluoric acid. The dish is then placed on the hot plate and heated just below the boiling point for 15 or 20 min., or until decomposition of the slag is complete. Remove, cool and add carefully 5 c.c. of sulphuric acid. Replace on the hot plate and take down to heavy fumes. Remove, cool and transfer to a beaker of convenient size with cold water, and, after boiling and filtering, proceed as in the usual Alexander method.

The newer or sodium-peroxide fusion method is carried out according to the following description. One gram or more, according to the lead contents of the slag, is weighed into a nickel crucible of 35 c.c. capacity, and mixed with about four times its volume of sodium peroxide. Heat gently over a Bunsen or other suitable burner, and as soon as the bottom has fused a whirling motion given the whole will prevent spitting. This fusion requires but little heat and may be accomplished in about two minutes. Take a No. 5 beaker and add about 1/2-in. of cold water and then place the crucible therein on its side and quickly cover the beaker with a watch glass as the action is quite violent. In less than a minute the crucible may be removed and washed with hot water and then with concentrated hydrochloric acid, which will remove the black oxide of nickel from the crucible and leave it bright and clean. Wash again with water and transfer all washings to the beaker, when the solution should be about 1 in. in depth.

Place the beaker on the plate and bring to boiling. If not enough hydrochloric acid resulted from the washing

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*Chemist, Buena Tierra Mining Co., Santa Eulalia, Chih., Mexico.

of the crucible to clear the solution, add enough to make the solution a clear amber, at which point everything should be in solution. While at boiling point add 15 grams of ammonium chloride, and when this is all dissolved, add enough ammonia not only to precipitate the gelatinous silica, which comes down of a yellowish tint, but also some of the iron, which will show red. Now add hydrochloric acid, drop by drop, with stirring between additions, until the solution just clears and is a deep red. At this point there should be no trace of precipitated gelatinous silica as this will delay the filtering of the sulphide. The solution must be at boiling point to perform this neutralization.

Water is now added to a volume of 450 c.c. and hydrogen sulphide passed for 20 min. Place on the hot plate and heat until the solution becomes clear between the suspended particles of precipitate. If the neutralization was properly performed, the lead sulphide will come down black and not greenish or reddish, which happens when the precipitation is incomplete. A drop or two of ammonia at this point will generally correct this without throwing down any silica.

As soon as the solution clears, as above described, filter through a No. 597 or other loose filter of 12½ cm. diameter, and without any washing of the paper and contents, remove it and place in a No. 2 beaker.

Add 10 c.c. of nitric acid and a gram of potassium chlorate and boil until the sulphide is decomposed and the filter paper disintegrated. Now add 6 c.c. of concentrated sulphuric acid to the hot solution, which will not foam or spit as with hydrochloric solutions. Continue boiling till the solution becomes black from separated carbon and then add, by means of a small glass tube, used as a pipette, 1 or 2 c.c. of nitric acid.

This may be done through the lip without removing the watch glass. Evaporate again to concentration, and if the solution again turns brown or black, repeat the addition of nitric acid and add another small amount of potassium chlorate immediately after the addition of nitric. It may be necessary to make another addition of nitric, but usually three additions will leave the solution white on again taking to fumes. As soon as this occurs take to heavy fumes and remove, cool, dilute and filter cold through an 11-cm. close filter and finish the determination as usual.

After the previous operation nothing remains but a small trace of iron, lime, etc., and the mineral ash of the filter paper, besides the lead sulphate. For this reason the solution does not need to be boiled after dilution, and may be filtered cold. This not only saves time, but decreases the amount of lead lost on account of the partial solubility of the sulphate. Cold water may be used for the washes also. This method may, of course, be used on chilled slags and on any ore using the filtrate from the silica or a separate weighing. The time required is one hour and three-quarters.

⌘ Determination of Fluorine in Zinc Ores

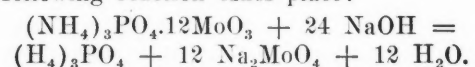
A method for the determination is given by L. Schneider, in *Oesterr. Zeits. Berg. u. Hüttenw.*, 1913 (abstr. "Journ. Soc. Chem. Ind.," July 31, 1913). Ten grams of finely powdered blende or calamine intimately mixed with 5 grams of quartz, and 100 c.c. of

concentrated sulphuric acid are heated to 160° to 170° C. in a 300 to 400 c.c. flask placed in an oil bath, dry air being passed through the apparatus. The gases pass a U-tube filled with small dry quartz fragments, then a flask containing not more than 100 c.c. of water. A fresh flask is substituted after one hour: the operation is interrupted when silicic acid no longer separates. The liquid is evaporated to dryness in a platinum dish after adding 2 grams of potassium nitrate to destroy sulphurous acid. The residue is treated with water, 25 c.c. of strong ammonia added, and the solution boiled with calcium chloride, the precipitate filtered off, ignited in a platinum dish, treated with acetic acid, evaporated to dryness and extracted with hot water. The residue of calcium fluoride and silica is ignited and weighed, the latter is volatilized with hydrofluoric acid, and after again igniting the calcium fluoride is weighed. The first weighing is useful as a check, as the ratio of SiO₂ (taken by difference) and CaF₂ is 1:3.4. This figure is empirical. The results are stated to be low: about 3.5% of the fluorine present appears to escape estimation.

⌘ Rapid Determination of Phosphorus in Steel

A modification of the usual method of estimating phosphorus in low-phosphorus steel is given in *Journ. Soc. Chem. Ind.*, July 31, 1913. The yellow ammonium-phosphomolybdate precipitate, obtained from the steel in the usual manner, is washed with 1% nitric acid until free from iron, and the nitric acid is washed out by means of 1% potassium-nitrate solution until the washings are free from acid. The filter and precipitate are then transferred bodily to a 200 c.c. flask, 20 c.c. of *N/10* sodium-hydroxide solution and 2 drops of phenolphthalein are added, and the excess of alkali is titrated with *N/10* hydrochloric or nitric acid until the last drop completely removes the pink color.

The following reaction takes place:



Hence, 1 gram of phosphorus is equivalent to 31 grams of sodium hydroxide, or each c.c. of *N/10* sodium hydroxide is equivalent to 0.000129 gram of phosphorus. Thus, when working with 1 gram of steel, the percentage of phosphorus is obtained by multiplying by 0.0129 the difference between 20 and the number of c.c. of acid used in titrating the excess of alkali.

The method has been found to give accurate results, in excellent agreement with those obtained by the gravimetric method.

⌘ Tantalum-Platinum Ware

According to British pat. 23,050 of Oct. 9, 1912, granted to Siemens & Halske, tantalum, or a tantalum alloy is plated, coated or sheathed with platinum. The coated metal combines the advantages of platinum and tantalum, and is suitable for all the purposes which have up till now been closed to tantalum on account of its property of oxidizing when heated in the air. The improved metal welds well with platinum, copper and a number of other metals.

Rand Mining Accidents and Deaths in 1912

SYNOPSIS—Figures on the accident death rate for 1912. Analysis of causes. Recommendations for prevention. Tabulation of results for the various mine groups.

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The death rate due to accidents in the Witwatersrand mines in 1912 is the lowest in 10 or 11 years. Thus the rate for surface white workers, based on the men actually at work, is 0.8 per 1000; for white workers underground, based on the men actually at work it is 3.73, and the rate for all the white employees, based on the total number in service is 2.14. The corresponding rates for the natives are 1.72, 4.80 and 3.72. Combination rates are 1.53, 4.73 and 3.56. As might be expected, the death rate for the natives is higher than for the white employees, inasmuch as they are less intelligent and less careful about taking care of themselves. The rates for all mining in the entire Union of South Africa corresponding to the figures given are: 1.27, 4.49 and 3.22. The general Transvaal figure, 3.56, which may be taken as a criterion, is, as stated, the best obtained in the district since the year of 1901-1902, when a large amount of surface work was being conducted immediately after the close of the war. This rate is decidedly lower than the corresponding rate in the United States and somewhat higher than that for the Australian Commonwealth. The government mining engineer considers this far too high and attributes it to the following reasons: Bad health conditions, speeding up to secure large output, and anxiety to reduce working cost. His comments are as follows:

BAD HEALTH CONDITIONS

Throughout the whole Witwatersrand the bad effects of miners' phthisis has now reached its climax; many of the best miners are dead, others have left or are leaving before reaching the worst stages of the disease, and a general panic has set in, preventing fresh miners from coming to the Rand from oversea. The mines now employ largely second-rate types of miners of mixed nationality who are short of the standard of experience and efficiency necessary for dealing with huge outputs and for superintending the work of ignorant natives. A careless and inefficient miner discharged from one property easily obtains work at another mine, and wanders up and down the Reef putting in bad work on a number of mines and assisting to increase the accident rate by his carelessness in dealing with explosives, weakening the strata with injudicious use of heavy machine drills and heavy charges of explosives, and taking little heed of the dangers of badly supported hanging wall.

In some of the deep-level mines a want of systematic artificial ventilation must also affect considerably the health of both white and colored miners, causing them to be listless and nonobservant, and reducing their efficiency and usefulness to a considerable degree. It does not seem possible that men who at the end of a day's hard work have to sit for an hour at a waiting station thick with dust and nitrous fumes, can day after day put in a good day's work, nor can a native who walks a thousand feet up a stiff incline every day be really physically fit for his

work on the following morning. If health conditions were improved, better men would compete for the comparatively high mining wages on the Rand; both white and colored would put in a better day's work, and it is reasonable to suppose that more intelligent white supervision would tend to reduce the accident rate.

If these arguments were considered insufficient from a humanitarian point of view, it might be further urged that improved health conditions, by bringing better and more efficient miners, might tend to actually reduce working costs and cause larger profits to be made. Working under unhealthy conditions the efficiency of the unskilled miner must remain low, and a larger number of persons must be employed to do a certain amount of work than would be under normal conditions. As regards white miners, the skilled miner with all his faculties clear and in working order breaks more ground and uses less explosives than a mere laborer, and the difference between placing machine holes rightly or wrongly is great, and has a far-reaching effect not only on the immediate output from the mine, but on the future cost of timbering and supporting weakened excavations.

SPEEDING UP TO SECURE LARGE OUTPUTS

With increased stamps and mills, and increased depths to hoist from, "speeding up" has to be resorted to to secure a large output. From the consulting engineer down to the last joined gang of boys, every one is rushed, and so safety measures are apt to get scamped, stopes are not properly inspected or trimmed down, packs are neglected, and the contractor, urged to his utmost by those over him, take risks which never were intended to be included among "dangers inherent to the industry of mining."

We have cases where the white man gets killed or injured with his boys, thus sharing with them the result of his careless work, or where he strenuously endeavors to protect the natives under his charge, but in many instances these consequences fall only on the natives, the white miner being away at the critical moment or working elsewhere out of the actual danger zone. If speeding up and rushing mining work to extremes is responsible for accidents, the responsibility rests principally with the controllers of the mine who determine the output on a scale which is frequently in excess of the labor complement available and of the capacity of the mine and its shafts, and who have now to live up to the promises made to shareholders. The manager only increases his anxiety and trouble by forcing work to extravagant limits, the mine officials are averse to driving men and boys, and are incessantly worried with accidents to men and plant.

REDUCTION OF WORKING COSTS

At the present time attempts to reduce working costs are carried too far, and economies in timbering, waste packing, pillar cutting, and other safeguards to underground workers all tend to increase the possibility of accidents. This department has more than once had to insist on an increase in the safety measures mentioned above, which has certainly for the present added to the working costs of the mine. In capital expenditure also a large saving can be and has been effected by straining

Note—An abstract from the annual report of the Mines Department of the Union of South Africa.

mining risks to the utmost, and working a large area with a single shaft. The decrease, however, in efficiency and safety resulting from this departure from one of the most important rules governing mining, makes it improbable that any further attempts will ever be made to save money by mining with single outlet.

FALLS OF GROUND

Of the deaths underground in 1912, 35% occurred through falls of ground, and against accidents due to this cause and to explosives, the technical staff of the department is paying special attention. The beautiful strong hanging wall of the Reef that we have heard so much about in the past, has had its day and has served its purpose, and where formerly stopes were cleaned out and left bare for hundreds of feet, proper mining has now got to be undertaken with necessary filling, packing and timbering. As the deep levels are opened up and the pressure increases, the strain on small pillars and open stopes reaches the breaking point; areas give way on weak fault planes or over improperly supported excavations, pillars burst and stopes and levels crush, all causing increased expense at lower levels, and killing, injuring and frightening the underground laborers. This crush in the mines with its attendant accidents can be met only by systematic filling, packing and timbering, methods that will no doubt involve increased expenditure at first, but which will pay for themselves in the future.

METHODS OF SUPPORT

Sand filling is fortunately becoming more general, but in many instances has been delayed too long; tremendous areas of worked-out ground having to be caught up before a mine as a whole can feel relief from the general strain.

Packing is still unpopular, and is seldom done systematically. Packs are expensive, a trouble, and to be efficient must be packed tight with waste, at times difficult to get. Proper packs are absolutely necessary to reduce our accident rate from falls of ground in stopes, and the criticism that packs anywhere near the face of a stope are necessarily blasted to destruction means bad blasting, bad pack arrangements or both. There does not seem to be any advantage in the few large packs built in the stopes of some of our mines where the pack takes days to build, and for some time resembles only a large pile of loose rock. The efficient pack for safety purposes is one that can be erected quickly under weak hanging to take the place of temporary timber as the stope advances, and which will absorb rather than resist pressure.

To fill and pack and keep the filling and packing close to the face, is the only safe system of working ground under pressure, as with the extensive and continuous mining that has been going on all along the Witwatersrand for the last twenty-five years, it is reasonable to suppose that the pressure in the mines is now greater than ever before.

It is unnecessary to comment on timbering in drives and shafts. Levels have got to be kept open, and traveling ways cannot be allowed to cave; so every working mine has got to attend to shafts and levels or cease to exist. Timbering in stopes, however, leaves much to be desired. In steep stopes loaded stulls should be put in more frequently, as close to the working face as possible. Speaking generally, the use of timber, more or less temporary,

should be far more extensive for the protection of all persons working in or under working places, and temporary propping should be insisted upon. Temporary props get blasted out, but they have served their purpose and can be put in again when the next shift goes to work. The system in which a contractor does his own timbering is not a good one, as he is more intent on making a big profit than on taking safety precautions, and a large gang of native laborers is dependent upon what safety measures he may choose to adopt. A timberman cannot, on the other hand, be in every stope at the beginning of the shift, but the contractor should be encouraged to put in such props as are temporarily necessary until the timberman arrives to make a more permanent job of it. The question of an easily accessible supply of timber for all stopes is, speaking generally, in an unsatisfactory condition, and will have considerable attention from inspectors in the coming year.

AIR BLASTS AND PERIODS OF REST

The rock burst appeared prominently on these fields only some six years ago, and, like artificial ventilation, was enshrouded in a good deal of mystery. It is generally recognized that these pressure bursts are the result of altered strains and stresses due to large excavations and deep mining and intimately connected with faults, fault planes and other lines of weakness. Extra pillars, unless large enough to prohibit economic mining, would not appear to stop the danger, and at times increase it to a marked degree. The remedy is to fill and pack stopes, and to keep this filling and packing as near the stope faces as possible, to avoid stripping ore along fault planes where air blasts are occurring, and to sheathe drift and stope pillars in areas already under pressure.

I am afraid that any suggestion for giving workings a rest will meet with little sympathy, but it is a recognized fact that ground under pressure becomes uneasy after blasting, and if left for a while settles down, the cracks and bursts dying away as the strains are rearranged. By increasing the number of working faces a deep-level mine would be able to allow a settlement after blasting in its worst workings and avoid some of the dangers attendant on trimming down a working near uneasy ground.

MACHINE DRILLING

A fruitful source of accidents from falls of ground is the indiscriminate use by incompetent persons of heavy machines for stoping. Many stopes are tender and uneasy, and only require the jar of one or more heavy drills to bring large portions of the hanging wall down during working hours. Many persons do not appear to realize the bad effect that drills, even working at a distance of hundreds of feet, have on surrounding strata. Here again the rush for rock compels the use of a dangerous, uneconomical machine, as many a stope that could be worked safely with hand stoping and small blasts, becomes dangerous when stoping with machines and heavy blastings are carried on. The skilled miner with his better knowledge and training will only utilize his rock drill for breaking ground along the natural lines of weakness, calculating his holes to break a maximum of ground with a minimum of explosives, but the ordinary ganger of today, knowing the power at his disposal, often breaks indiscriminately into the foot or hanging wall, and ruins the supporting power of the inclosing strata.

The danger in shaft sinking where from 30 to 60 persons may be crowded together in a shaft bottom has caused this department to make every effort to minimize the risk of misfires. In the new regulations a rule has been included making it compulsory to have special supervision in a sinking shaft with arrangements for blowing over the shaft bottom with air or water under pressure as an aid to detect misfires after blasting. In addition to these precautions, a sketch taken after blasting, showing the position of all misfires and sockets, is also compulsory.

These precautions in shaft sinking have been adopted on several of the diamond mines for some years past, but whether their low accident death rate is due to these special safeguards entirely, or is caused by the absence of rushing methods and more careful mining, cannot as yet be ascertained. Certainly these new shaft-sinking regulations have met with a good deal of disfavor among managers partially, in my opinion, on the ground of the expense of the extra supervision, and partially from the suspicion that the Rand record in smart shaft sinking might be lowered by delays caused by these restrictions. A few representative persons appeared to be genuinely afraid of directing air or water under pressure into cavities containing fragments of explosives.

To show that sinking accidents can be kept within a reasonable limit, we have 6300 ft. of sinking done at the South Rand and Turf Mine shafts with a death rate far below the average for the Witwatersrand shaft sinking, all of which work was done at a fair speed and reasonable cost. As a prevention of misfires in shaft sinking especially, it has been suggested to employ a better fuse and a different method of charging and priming. This matter is worth attention and is being investigated. For the time being, at any rate, inspectors have inaugurated a special examination and blowing over of all shaft bottoms, including a sketch and the necessary extra attention that this method involves. This regulation will be given a fair trial and will be rigidly enforced.

GENERAL MISFIRE ACCIDENTS

Accidents from misfires in stopes, raises, winzes and development faces are far too numerous, and, where practicable, the regulation governing the extra precaution to be taken in sinking shafts has been extended to these workings. Numerous accidents are still caused by the carelessness of the ganger in not properly examining his bench before rigging his machine and laying out new holes, and the department is determined to adopt the most severe measures to prevent and punish carelessness of this description. At times the machine man is killed or injured at his machine, sharing the risks with his boys, but more often he is away from the danger point, and death and injuries fall on the native workers alone, who have been left to themselves during the dangerous period of starting to drill a new round.

RESPONSIBILITY OF THE PROPERTIES

If the comparatively recent large amalgamations of mining properties have brought about any of the anticipated advantages to the owners, their accident death rates leave a great deal of room for improvement, as shown by the following figures: East Rand Proprietary Mines, 5.46 per 1000; Crown Mines, 4.28; Geldenhuis Deep, 4.05.

If my remarks contain criticisms against the owners and administrators of the Witwatersrand mines, it is

only fair to make any deductions possible in favor of their increased attempts to reduce the mining death rate. The past year shows an improvement of 0.2 per thousand over 1911, and we can analyze the possible cause. It is not contended that inspection has been any more rigorous or useful than it was in the previous year, nor have the attendant dangers in mining been any less. Miners have been no better than they were before, neither has the native laborer become more intelligent. This small death-rate reduction must, therefore, be attributed to the united efforts of controllers and managers, who, in more ways than one, have given proof that they realize what large room there is for improvement. If the frank criticisms contained in these remarks draw their further attention, and secure, as in the past, their coöperation in remedying the evils indicated, a useful purpose will have been served. The department received continued assistance from those interested in mining in its attempts to reduce accidents, and is quite willing to acknowledge that among both owners and administrators there are men who regard the protection of persons an essential in mining. But, unfortunately, there is the passive resister, the polite person who talks nicely, but will do nothing, and against this class of man, if he will not advance with the times, the department intends to bring the full force of the law to bear.

The average death rates for Witwatersrand gold mines, grouped according to controlling houses, give the following comparisons:

Group	Accidents	Deaths	Injuries	Death-rate
Farrar-Anglo-French.....	224	115	190	4.82
Johannesburg Consolidated Investment.....	174	85	149	4.81
Consolidated Goldfields.....	234	93	199	4.74
General Mining and Finance.....	171	73	138	3.93
Rand Mines.....	434	147	345	3.72
Robinson.....	292	107	248	3.50
Central Mining.....	324	93	301	3.38
Neumann.....	159	40	139	2.84
Goertz.....	91	22	72	2.69

Of the individual mines the Jupiter had the highest rate, 9.41, and the Wolhuter the lowest, 0.40, a remarkably low figure.



New York Section, American Electrochemical Society

The first meeting of the season will be held at the Chemists' Club, 52 East Forty-first St., New York, at 8:30 p.m., Friday, Oct. 17, 1913. The subject for the evening is, "Some Applications of the Microscope to Industrial Work" and the program is as follows:

"Metallography of Carbon," G. A. Roush, assistant professor of metallurgy, Lehigh University; "The Microstructure of Raw and Manufactured Copper," W. H. Bassett, technical superintendent and metallurgist, American Brass Co.; "The Microscope in Mineralogical Analysis," Gilbert Rigg, research engineer, New Jersey Zinc Co.; "Some Remarks on Micrometry as Applied to Alloys," Dr. C. H. Mathewson, assistant professor of chemistry and metallography, Yale University.

These talks will be well illustrated with lantern slides and photographs. Any member is welcome to bring guests who may be interested. All members of sister societies who are interested in the subject will be cordially welcome at the meeting and are invited to participate in the discussion.

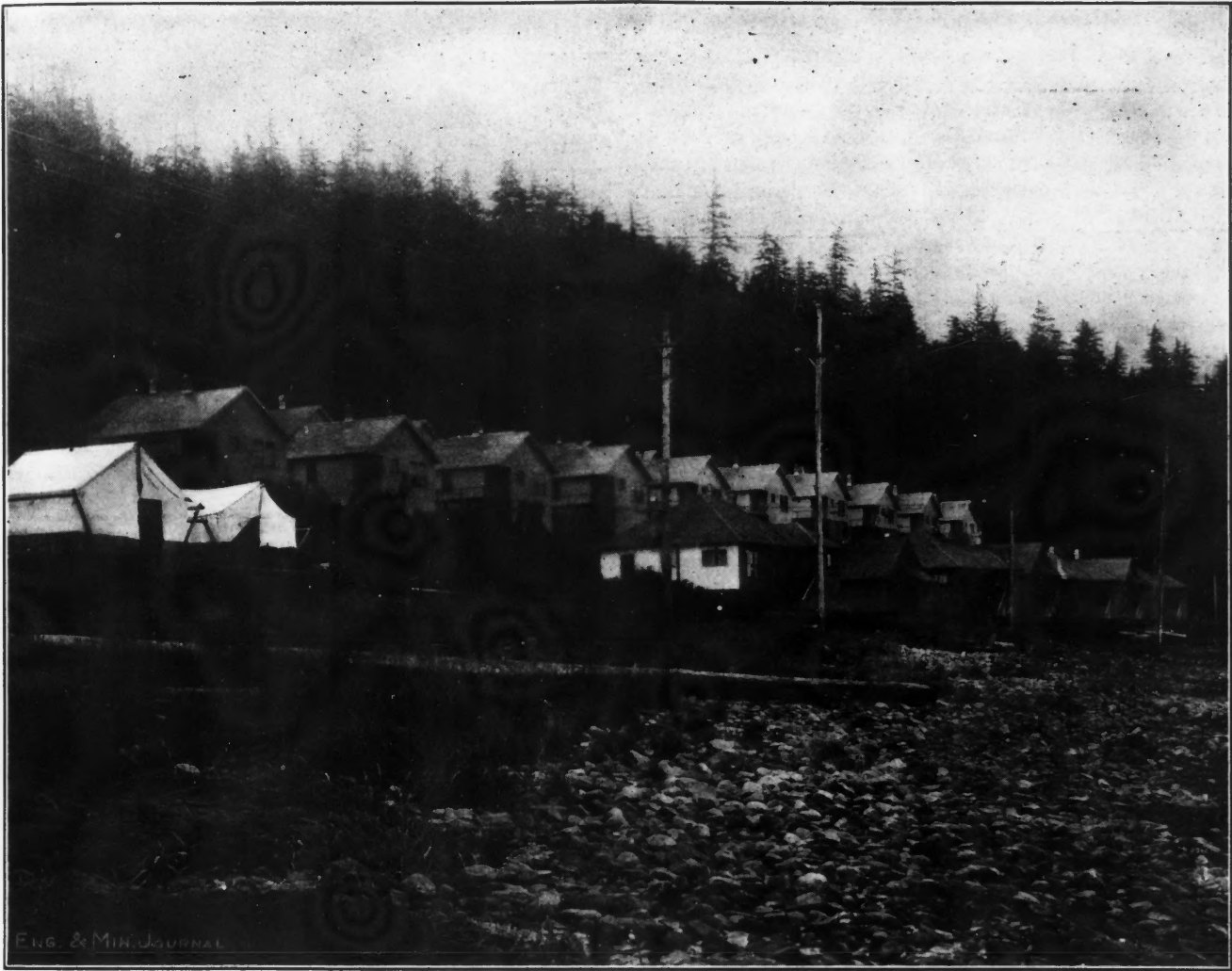
PHOTOGRAPHS FROM THE FIELD



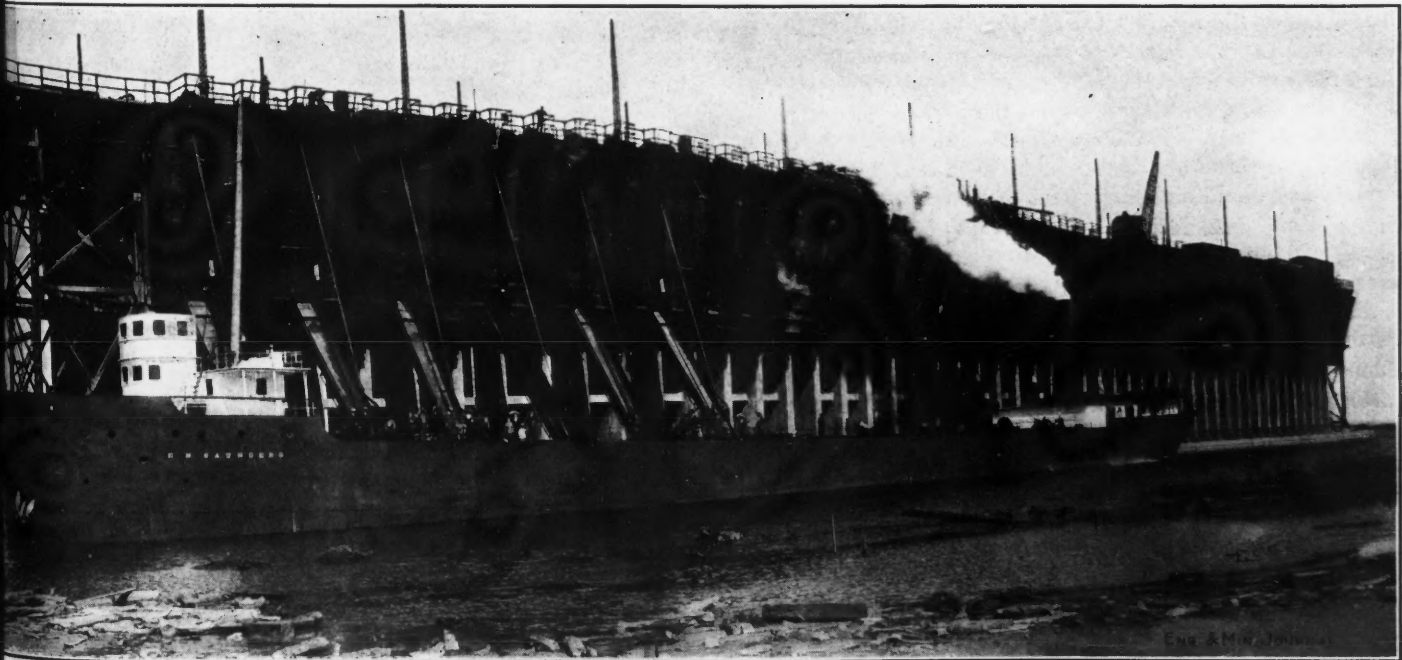
SUBSTRUCTURE OF NEW D. M. & N. RY. ORE DOCK, AT DULUTH, WILL BE LARGEST IN WORLD AND COST \$2,900,000



NEW NORTHERN PACIFIC ORE DOCK, AT SUPERIOR, WIS. S. S. SAUNDERS TAKING THE Dock is of steel and concrete, 684 ft. long; steel approach, 300 ft. long; timber approach, 4200 ft. long; steel used in dock, 35,700 tons; bins have circular fronts, are equipped



COTTAGES AT SHEEP CREEK TOWNSITE OF ALASKA GOLD MINES CO.



FIRST CARGO AUG. 24, THE ORE COMING FROM THE CUYUNA-MILLE LACS MINE
3440 tons, in approach 740 tons; concrete in substructure, 13,500 cu.yd., in bins 3400 cu.yd.; pockets, 102; total capacity, with electrical hoists and Dickerson pocket doors.

Across Alaska by Motor

United States army engineers have just completed a remarkable expedition in a motor truck, driving half way across Alaska to a point within two degrees of the Arctic Circle, the farthest northern point ever attained by a motor vehicle, and officially confirmed. The party drove from Valdez to Fairbanks and return, a distance of 826 miles, in 19 days.

The truck had been shipped to the Alaska road commissioners early in the summer. It was delivered in Valdez on July 26, and two days later it was started on the trail to Fairbanks, there to be joined by Lieut.-Col. Richardson, president of the Board of Road Commissioners, and other engineers. It left Valdez with a load of supplies and a quantity of mail for camps along the military telegraph line. Considerable mail was carried to points where none has been received in over a year. In order that the trip might reveal average conditions, the truck was not especially equipped, except in the matter of fuel and road tools. Food was carried for use only in the desolate regions, where there are no "road houses" or settlements.

Leaving Valdez in a drizzling rain, they crossed the delta of the Valdez glacier, and almost immediately entered Keystone Cañon, 14 miles long. After spending the night at a settlement known as Workman's, they resumed the journey through the cañon and began the real ascent on the trail over the Chugach Mountains, with a steady climb of 25½ miles to the summit at Thompson's Pass, an elevation of 3000 ft. While the temperature was decidedly lower at the summit, the danger of melting snow and ice was not entirely abated, and the truck ran into snow slides at four different places. Fortunately none was of great proportion, and the crew escaped with nothing worse than the extra work of digging themselves out. The descent from the summit was found to be much sharper than the ascent, and the truck rapidly descended into another delta region and forded half a dozen glacier streams before it reached a camp at Beaver Dam.

The next three days were spent on trails that have been opened in the last three years by the Alaska Road Commission in the deltas of the Copper and Gulkana Rivers. Corduroy trails, built of scrub timber, extremely rough and narrow at best, prevented the party from making rapid headway. For many miles the trail passed through dense scrub and beds of Alaska moss into which heavy objects would sink three feet or more.

Much time was lost on the banks of treacherous streams, fed by melting glaciers and churned by huge boulders whose exact location could be determined only by wading out into the stream before attempting to cross with the truck.

From Beaver Dam north the engineers experienced the greatest difficulties of their trip. Following the Copper River valley to the fork of the Gulkana, they traversed a vast area of delta land, where tractive conditions were worse than the region they had just left. The military trail, passing through a low and marshy country, was alternately covered with ice and glacier mud. In the worst places the wheels were wrapped with stout rope, and the truck had no difficulty in pulling through, but it was operated on low gear during the entire afternoon. To pass through several timber tracts it was necessary to cut down scores of trees and blast out stumps, rocks and ice.

Three days of constant trail-blazing and pathfinding brought the truck to Paxson, on the Gulkana River, in the foothills of the Alaska Range. Following the military trail straight north they began a gradual ascent into the ice-clad mountains of Alaska's principal range. According to the engineers, the grades averaged only 6%, but there were many places where it was necessary to climb a 16% grade on a rough surface of ice. At several points the grades were so steep and the turns so sharp that it was necessary to maneuver with the reverse gear to make the turns. No trouble was experienced in keeping the engine cool. In fact the cooling water did not boil at any time on the entire trip, despite long pulls on low gear.

The descent from the summit presented no difficulties other than the necessity for frequent inspection of the trail for considerable distances before driving ahead. After a long spell of cautious and skillful driving, they dropped down into the valley of the Delta River, and camped all night on the Guncreek flats, which were composed almost entirely of glacier mud and quicksand.

Leaving the flats there was a marked change in the character of the country. Flats and marshes were succeeded by giant boulders, subjecting the truck to fearful tests of distortion. Rain added to the discomfort. The military trail to the Tanana River passes a place known as Donnelly, and here the crew found evidence of real road work. A clay and gravel surface with a fairly good foundation began at Donnelly and lasted for 90 miles over a rugged country, with many stiff climbs and scarcely any snow or ice. While the surface was soft, it was easily negotiated by the truck.

The truck was carried across the Tanana River on a ferry to the town of McCarty, and then driven along the bank of the Tanana to Munson's. On the ninth day, after covering 379 miles from Valdez, it reached the northern end of the journey at the town of Fairbanks.

Three days were spent in Fairbanks preparatory to the return trip. The truck was again loaded with supplies and mail. Colonel Richardson took personal charge on the return trip and was accompanied by Superintendent Ingraham, Lieutenants Egerton and Steef, Thomas H. Parramore, Jr., and Homer Jones.

Leaving Fairbanks on Aug. 9, again in a downpour of rain, they retraced their route as closely as surface and weather conditions would permit. When they reached the Guncreek flats they found that the steady rain of three days had made the glacier mud very sloppy and wiped out the trail for considerable distances. Quicksand was also a constant menace. Despite the use of much brush and timber, the danger could not be entirely avoided, and the truck settled deep enough to lose traction. Similar conditions existed throughout the entire dash through the Gulkana and Copper River deltas.

Near Gulkana they met a military pack of six horses, an army field wagon, a buckboard, and a detachment of troops in command of a first lieutenant, sent out by the War Department to investigate an alleged gold strike on the Chisana River. Six horses were required to pull a two-ton load, and most of the load necessarily consisted of feed for the horses. Twenty-six miles south of Gulkana, at Willow Creek, they made a detour to Chitina, adding 68 miles to their journey and lengthening the return trip to ten days.

At Sheep Creek, just before reëntering the Keystone

Cañon, they were compelled to cut a swath in the woods for 500 yd. to avoid a bad washout caused by the torrent of a melting glacier. A bridge 12 ft. above the water when the truck crossed it on the outbound trip, had been completely carried away, and it was necessary to cut through the woods to a suitable fording place.

When they reached the Keystone Cañon the trail had been washed away in many places. Thousands of tons of rock and ice had been dislodged, and, in falling, had carried away bulkheads of solid stone supporting the trail. This forced the crew to fill in great gullies with stones before they could proceed. At the finish of the trip, on Aug. 19, the truck was again placed on the trail to carry supplies and mail to road camps and settlements in the vicinity of Valdez. Colonel Richardson said he believed that the road work contemplated by the Alaskan commissioners will make it possible to go from Valdez to Fairbanks in four days next summer.

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The Kennedy Extension-Argonaut Apex Suit

The most important mining trial ever occurring on the Mother Lode is the suit of the Kennedy Extension Mining Co. against the Argonaut Mining Co. for alleged trespass and extraction of gold ore from the plaintiff's property. The amended complaint brings the total amount sued for to more than \$1,000,000, covering alleged accrued damages up to Jan. 1, 1913, according to the *Jackson Dispatch*.

The Kennedy Extension owns three claims east of the Argonaut claim, namely, the Muldoon quartz claim, adjoining the Argonaut claim, the Jackson quartz next and further east the Jackson placer. The Argonaut shaft has reached a depth of 4050 ft.; it is claimed that the south bottom levels from this shaft are under the placer claim owned by the Kennedy Extension, and that the ore in dispute has been taken from under the surface of this ground.

The suit hinges on a question of apex, it being claimed that the apex of the vein now being worked by the Argonaut company is in the Jackson quartz mine, 600 or 700 ft. easterly from where the Argonaut claims the apex in its Pioneer mine. The Kennedy Extension also contends that the ore fissure is east of a slate belt which runs through the westerly part of the Muldoon claim, and the easterly part of the Jackson quartz mine.

The complaint, until amended, set forth that the Argonaut company had for three years prior to Apr. 10, 1910, wilfully mined and extracted ore from plaintiff's ground to the extent of 50,000 tons, worth \$500,000, and ore was then being extracted at the rate of 5000 tons per month. The levels were alleged to be closed by caves, dangerous and inaccessible, and for that reason, the exact tonnage could not be obtained.

The Argonaut company has admitted taking from under the surface of the Jackson placer something over 60,000 tons of ore, with a mill value of over \$400,000, but it claims extralateral rights to this ore. In addition to this ore, the Kennedy Extension claims that the Argonaut took about as much more ore belonging to the Kennedy from outside the downward projection of the Jackson placer.

The Argonaut company says that no fact relative to the workings has never been concealed and that it has

been willing to allow plaintiff the opportunity of ascertaining any facts connected with ore extraction. Admitting the caved nature of much of its worked-out levels, it states that such caves were from natural causes and not for the purpose of concealment. A denial is made that it is working more than one vein.

The Pioneer quartz claim, sold to the Argonaut Mining Co. in 1893, was located in 1859 and antedates by many years the locations of all other lands involved. From the date of location of the Pioneer to the commencement of this action, no doubt was raised as to the Argonaut company's right to lode patent to the Pioneer claim or its right to the ore mined or that it was not within its own territory.

The plaintiff company first received notice of the alleged trespass through employees of the Argonaut mine, and formed a corporation with a capital stock of \$700,000 for no other purpose, it is alleged, than to prosecute the case. The incorporators named were R. S. Penniman and James Hulme, of Berkeley, and H. G. Perry, of San Francisco. When this company commenced work to sustain its contention, the 800-ft. Muldoon shaft, long idle, was cleared out, retimbered and sunk 200 ft. Levels, crosscuts and general exploration work has been going on ever since in order to support the charge of trespass.

The Argonaut company, through its manager, R. S. Rainsford, has been diligent in protecting its interests since the filing of the complaint and has spent much money in underground work to make doubly certain that no mistake has been made in working the wrong vein. All dividends have been cancelled during the past three years and a large surplus accumulated.

Thus far the Argonaut's attorneys seem to be giving their opponents a free rein in the introduction of testimony. Many Kennedy Extension witnesses have already testified and over 50 exhibits have been introduced in its behalf, having largely to do with the title of the company and maps showing the underground workings of the two mines. A noteworthy feature of the trial is the lack of objections raised by the attorneys, the case being tried without much quibble or argument.

The trial is being reported by Willis & Stockton, of Oakland. They take down the evidence alternately and record it on a phonograph cylinder. This in turn is transcribed on a typewriter. Thus each side has the day's testimony written out for examination shortly after adjournment. Any oversight in the testimony can be corrected the following day.

Among the experts engaged are Messrs. George, Finch and Martin for the Kennedy Extension, and Messrs. Lawson, Wiley and Searles for the Argonaut. Perry & Dailey, Solinsky & Wehe, and Morrison, Cope & Brobeck are attorneys for the plaintiff, and C. H. Lindley, William J. McGee, W. E. Colby and Lillienthal, McKinstry & Raymond are attorneys for the defendant.

The Argonaut company, 15 years ago, in its action against the Kennedy Mining & Milling Co. for trespass, was compelled to prove that the apex of its vein was within the Pioneer lines. This was done at an expense of \$30,000. The north end of the Argonaut was then involved. The present suit concerns the south end and the question of apex is to be fought over again.

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The United States Quicksilver output for 1912 is officially reported at 25,064 flasks of 75 lb. each. These are the U. S. Geological Survey's final figures.

CORRESPONDENCE AND DISCUSSION

Zinc Ore Prices

I have read with interest the editorial on the spelter situation in the JOURNAL of Oct. 4, in which it is remarked that the producers of ore now are having everything their own way. Let me correct the JOURNAL as to this. Many producers are, indeed, getting a large price for their ore, considering the price for spelter, but many of us who are selling on the basis of the average monthly price for spelter are not getting within \$6 or \$7 a ton of what the others are being paid and naturally we do not feel very good about this.

Joplin, Mo., Oct. 6, 1913.

BLACK JACK.

[Our correspondent is correct in his statement, but he does not suggest the explanation, which is simple. In our remarks last week we referred especially to the status of the ore producers who are selling their output from day to day, or from week to week, upon competitive bidding. The shortage of ore and the sharp demand for it has for some time back reduced the difference between the prices of 2000 lb. of 60% ore and 1000 lb. of spelter to about \$9. This is only a rough, convenient way of figuring the "margin." The actual margin is a little larger, inasmuch as out of 2000 lb. of such ore the smelter gets somewhat over 1000 lb. of spelter, but at the best he loses money on smelting alone at these prices. If all the ore supply were taken in at such prices, something would happen very soon.

Fortunately for the smelters, they have some sliding-scale contracts, entered into a long time ago, according to which the price for ore automatically falls with the price for spelter, leaving the smelter a reasonable margin always, although it may shrink along with prices. This is why some miners "are not getting within \$6 or \$7 a ton of what the others are being paid."

When these contracts, which are in all respects similar to the contracts for European and Australian ore, were made, neither party foresaw the situation that has lately developed in the ore market. On the contrary, it is scarcely more than a year ago that everybody was looking for a deluge of ore to come from Montana. The forecast respecting the quantity of the Montana ore was about correct, but nobody expected the checking of other supplies.

As it has turned out the producers who had sliding-scale contracts have failed to enjoy the high prices recently made in competition. However, those prices probably would not have been so high if all the ore had been free. In other times the shoe has been on the other foot, viz., the sliding-scale contracts have yielded the better results while the open ore has been a drug on the market. There is scarcely any kind of business in which anybody can reap all the profit all the time.

This thing is certain: The prices for ore must in the long run average so as to give the miner a fair profit and the smelter a fair profit. If they don't, something in the industrial chain will break. And when we talk about profit we do not mean simply the excess of income over

immediate outgo, but we mean enough to pay back in a reasonable time the money invested in plant, whether it be mining plant or smelting plant.

Many operators in the Joplin district have neglected this principle, to their sorrow; but on the whole the district has been immensely profitable. Its mines have built a large, well equipped city, with many costly buildings and comfortable homes, many smaller towns, an excellent highway system, and many of the other things that go with civilization and betoken prosperity. All of this, together with substantial private fortunes, have come out of the mines. In late years, to be sure, the grade of the ore has declined uncomfortably, but by mining more of it the output of the concentrated product has been maintained. In this the producer of ore has been assisted by the improvements in the art of mining and also by about all of the improvement in the art of smelting. It is hardly more than 15 years ago that blende concentrate fetched only \$20@25 per ton. The miner now thinks he is poorly treated if he does not get better than \$40@50. How has this come about? How can the smelter pay \$50 for the same ore that he obtained for \$25 not many years ago? Simply that he has raised his percentage of extraction and reduced his cost of operation. Competition has compelled him to do that, but the same competition has compelled him to transfer about all the benefit to the miner about as rapidly as he has realized it. He has not done this philanthropically, but merely because he has had to get the ore.

Reverting to the present market situation, it is in no small degree attributable to the excesses of 1912. History has shown that whenever the price for spelter be boosted up into the realm of 7c. there is a penalty that has to be paid. Things are fine for everybody on the producing side while the going is good, but something ought to be laid by for the rainy day. It seldom is. After-complaints are likely to be those of the child who has eaten his cake. At present the sliding-scale miner is paying the penalty along with the smelter. The miner who is free to profit out of the necessities of the smelter is enjoying a sort of Indian summer.—EDITOR.]

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Multiple-Spout Ladle Runner

In the JOURNAL of Sept. 6, p. 437, Ford's multiple-spout ladle runner is spoken of. This is apparently a double-spout affair, only. Mention is also made of multiple-spout runners in the copper business, as being old. Would it not be possible, by means of longer runners, to pour more than two streams of steel, as there is no need to pour equal amounts of steel in all the ladles, as it is with wire bars. Instead, conditions seem more analogous to those in ingot casting. Here, owing to the compactness with which the small molds can be placed, eight or 10 streams may be poured simultaneously.

COPPER REFINER.

Perth Amboy, N. J., Sept. 26, 1913.

EDITORIALS

Washoe and Great Falls

The Anaconda company is going to try one of the Great Falls converters at its Washoe works. It is rather curious that the metallurgists of the Washoe and Great Falls works, which have belonged to the same company for many years, and which treat the same kind of ore, have pursued such different lines. Washoe developed the long blast furnaces while Great Falls stuck to the old-fashioned proportions. Similarly, Washoe adopted the long, direct-fired reverberatories, which have been copied by many other smelters, while Great Falls adhered to its unique regenerative gas-fired furnaces. To be sure, the character of its coal supply had something to do with this. At last, however, Great Falls is going to try the long, big furnace but modified to the principles of recuperative gas firing. On the other hand, Great Falls has developed a peculiar type of converter, which Washoe has been slow to imitate.

It would not be right to imply backwardness on the part of either group of metallurgists, or the works under their direction. One excels in one thing, one in another. Environment, no doubt, has had a good deal to do with developments. Great Falls is a relic of old days, kept up to date but cramped and able to grow only with difficulty, while Washoe was the first in the new era of metallurgical construction, started when ideas first began to be big. Yet, recognizing all this, we cannot help being struck by the absence of uniformity in the technique of the two plants.

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The Titaniferous Iron-Ore Myth

There has long been a semi-popular, semi-scientific belief that the titaniferous iron ores of the United States constituted a national resource of almost immeasurable extent, of no value for present use, but, in effect, a locked treasure house lacking only the key of metallurgical genius to render its stored wealth available for use, and to revolutionize the iron industry. Probably the rather vague ideas of most people on this subject took the form of the belief that by some metallurgical trick or new discovery the titaniferous ores could be utilized unmixed in the furnace in much the same way as other iron ores are at present handled. We publish elsewhere in this issue the conclusions arrived at by Mr. Singewald as a result of his study of this subject under the auspices of the Bureau of Mines. The Bureau has seldom done anything more useful than to authorize this investigation and issue Bulletin No. 64. We have previously printed the preliminary notice of the Bulletin¹ and also an account of an experiment undertaken on the treatment of titaniferous ores in the Adirondack region². These three short articles taken to-

gether give a fair idea of the situation as it stands today.

Two prominent points are brought out by Mr. Singewald in his bulletin. First, that the deposits of this nature are much smaller and much less valuable than heretofore supposed; and, second, that their utilization will be a gradual process achieved slowly by various methods involving detailed modifications of existing practice, rather than by any stroke of original genius. Mr. Singewald states that the only two deposits of real consequence are those at Sanford Hill in the Adirondacks and at Iron Mountain in Wyoming. Subsequent to the preparation of the bulletin was the announcement of the McIntyre company to the effect that it intended to make an experiment on 30,000 tons of the Sanford Hill material. By the time this concentrating operation and furnace run is completed, it should be pretty well known what can be done with these ores, at least. It should be noted, however, that the Sanford Hill ore is more susceptible to magnetic concentration than most of the titaniferous ores. It is hoped, by the concentrating process, to take out at least half of the titanium and leave a product of good grade in iron.

We think perhaps Mr. Singewald is too pessimistic as to the possible use of other deposits. To a stranger surveying the field, the situation would seem to be not unlike that confronting the Mesabi operators when it was first attempted to utilize their finely divided ores. Their use, limited at first, became more and more extended, higher and higher proportions of the Mesabi ores being charged into the furnaces, until now that range dominates the American iron industry.

Similarly it is admitted that a certain amount of titaniferous magnetite can be smelted in a blast furnace without difficulty and without any particular changes in practice. It would seem to be extremely likely that this ratio can be increased as the handling of the ores becomes more understood. It would appear from Mr. Singewald's investigation, although of course no figures of actual tonnages even remotely correct can be given on deposits wholly undeveloped, that probably tonnage of titaniferous ores in the country is much less than the tonnage of the nontitaniferous oxides and carbonate.

It might not be far wrong to assume that the ratio in tonnages would be as one to seven, and if modern blast furnace can handle charges containing one-eighth of titaniferous ore, it would seem likely that the titaniferous deposits would become marketable and be consumed at about the same rate as the nontitaniferous ores, the high-grade ores, accessible, cheaply mined and subject to concentration being used first and the less desirable deposits coming into the market as the general grade of iron mined in the country decreased.

The deposits around Duluth and the Mesabi would seem to be particularly available after the Sanford Hill and Wyoming ore, inasmuch as the amount of titanium in these magnetites is exceedingly variable, some of the

¹Eng. & Min. Journ., Oct. 4, 1913.

²Eng. & Min. Journ., Sept. 27, 1913.

ores being practically nontitaniferous and others high in the objectionable element. The clean ores would naturally be mined first, and probably soon will be; it will then be a natural development to mine the neighboring ores with an increasing content of titanium. Titaniferous ores, of course, would probably always be penalized by the furnace men, similarly to the fine Mesabi ores and this should be considered a charge against operations, in estimating the value of the property.

Another point brought out by Mr. Singewald is the fact that the grade of many of the titaniferous ores is lower than has been commonly supposed. Not only is the iron content lower, but of the total iron content only a certain part is available. The iron is present as magnetite, in the ilmenite and in the ferro-magnesian gangue minerals. If the ore is to be concentrated, most of the iron in the feric minerals goes into the tailings and also a part of the iron in the ilmenite, proportional to the amount of titanium rejected. Thus the iron content of the crude ore and the ratio of concentration are not sufficient data to estimate the iron recovery.

The question of the treatment of titaniferous iron in the electric furnace is one of great interest and importance. The McIntyre Company hopes to find an outlet for part or possibly all of its tailing, by selling it to ferro-titanium manufacturers. The demand for ferro-titanium is limited, however, and to absorb any great amount of high titanium tailing from magnetic concentrators would require a great expansion of the market. The electric smelting of the crude ore, either alone or mixed, so as to make a titanium steel, would seem to be a rather more promising line of attack.

We look to see the titaniferous ores come gradually into use and it is likely that the blast-furnace, the magnetic concentrator, and the electric furnace, will each play a part in their utilization. If not the source of inexhaustible wealth they were at one time supposed to be, they will nevertheless be a welcome addition to the mineral resources of the country, a small value, if real and immediate, being of more economic importance than a fabulous promise for the remote future.

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The Use of Bucket Crossheads

Differences of mining practice in different regions, although conditions may seem identical, make up one of the many and interesting anomalies of the industry. A case in point is the choice between round and flat ropes, another is the use of crossheads with buckets. In many, if not most districts, it is considered advisable to apply a crosshead to the bucket rope in a vertical shaft where the hoisting is done by power. In some localities, however, notably in most parts of Colorado, it is deemed bad practice.

The crosshead is primarily a safety device. It is designed to prevent swinging of the bucket in the shaft and to damp the tendency to spin. In some cases it may carry safety dogs. Its desirability must therefore be considered from the safety viewpoint, and since the most important use of buckets is in sinking, the suitability of crossheads for this operation is a point of prime importance. In the ordinary wooden crosshead the rope passes free through a hole in the center. This is considered necessary in sinking, the crosshead being caught by stops at the bottom of the guides, while the

bucket descends to the shaft bottom for loading. Evidently such a device not only can carry no safety catches, but may itself become a menace. For if it be accidentally caught somewhere on a guide and afterward loosened, as may easily happen, it will cause serious damage in the descent and a miner riding either the bucket or the crosshead will be in danger of his life. The danger can be reduced by making the crosshead of greater height, thus reducing the likelihood of its sticking on the guides. It can be obviated by making the rope fast to the crosshead and suspending the bucket therefrom. This allows the application of safety dogs and, if the bucket be suspended far enough below, is adaptable to sinking conditions. The distance from the crosshead to the bucket need not be enough to permit spinning or dangerous swinging. This long string, however, necessitates extra headroom for dumping.

The most elaborately developed crosshead is fast to the rope under ordinary conditions, but includes a mechanism tripped by a stop at the bottom of the guide to permit the rope's passing through and the descent of the bucket to the shaft bottom, while the crosshead remains suspended. When the bucket is hoisted, it lifts the crosshead and the mechanism again locks in the rope. Such a device, of course, carries safety dogs.

We have then, the following possible methods of bucket hoisting: (1) Without any crosshead whatever; (2) with an ordinary crosshead loose on the rope; (3) with an ordinary crosshead attached to the rope and carrying the bucket; (4) with a safety crosshead attached to the rope and carrying the bucket; (5) with a safety crosshead ordinarily attached to the rope, but capable of release at any predetermined point. As stated, practice in the matter shows great variation, partly because local conditions vary, but also largely because of traditions and prejudice. The JOURNAL would be glad to publish intelligent discussion of this point.

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We wish that the Government bureaus and private companies who have lately become interested in the production of zinc ore in the country west of the Rocky Mountains, statistically and otherwise, would cease reporting output in terms of pounds of zinc. Such figures are next to meaningless, because there is no indication of how much zinc is really obtained. In fact, the percentage is rather widely variable. The unit of commercial interest is the ton of ore. If, in addition, the average grade of the ore may be stated, well and good. The talking about gross pounds of zinc has been very misleading to the inhabitants of the mining districts concerned in the matter. So long as it served merely to magnify in local minds the importance of the local output, making things look good, there was some amusement and no great harm. When, however, the same figures are used by the tax gatherer, the joke becomes less funny.

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Our financiers, who are upon occasions alarmed over the exportation of gold from the United States, are prone to forget the addition to our gold resources that our own mines are making all the time. The mines of the United States produce from \$90,000,000 to \$95,000,000 of gold annually. In addition thereto, our smelters and refiners produce about \$20,000,000 annually from foreign ores and metallurgical products.

BY THE WAY

The Geological Survey again reminds us that the price of gold is fixed by law at \$20.671834625323 per oz. Will some sober and unprejudiced person look into the relationship of the error introduced by omitting the twelfth decimal and that corresponding to the probable error in weighing a single ounce of gold?

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To drop in one field the profits made in another is all too often the story of those who seek to exploit mines. Occasionally singular successes are chronicled, such as those that have attended the activities of P. H. Nelson, and G. Carlson, of Duluth. They have been successful in copper mining in Butte, in lead-silver mining in the Coeur d'Alene district in Idaho, and in iron-ore properties on both the Mesabi and the Cuyuna ranges. It was one of their Cuyuna range properties that was taken over by the Pittsburgh Steel Ore Co. last spring, and they have other proved properties in that new district.

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Karl Helfferich, director of the Deutsche Bank, has made a report to the Kaiser of the wealth of the German nation, showing an aggregate of \$75,000,000,000 to \$78,000,000,000. The wealth of France is placed at \$60,000,000,000, of England at \$57,000,000,000 to \$65,000,000,000 and of the United States, at \$124,000,000,000. The German per capita wealth is placed at \$1100 to \$1200, French, \$1425, British, \$1250 to \$1385, and American, \$1360. The annual income of the German people is reckoned at between \$9,000,000,000 and \$10,000,000,000, of which about one-sixth is used for public purposes.

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The following is an excerpt from an elaborate mining report: "GEOLOGY AND ORE ORIGIN: In order to open up a mine intelligently, to be competent to pass judgment on it as a prospect, and to be sure of discovering all the possible ore at contacts, in fissures, from parallel veins and shear planes, along feeders or robbers, spurs and angles, dikes and blind leads, then the geology, age and sequence in deposition of the various rocks in the vicinity as well as on the ground itself, all this is of paramount importance in determining the origin, occurrence and sources of the economic metals, how they came into their present position and the further whereabouts of the channels filled by enriched thermal waters, welling up from plutonic sources." Oh, shades of Emmons and Clarence King!

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The versatility of one Western genius seems to leave small chance for anyone else in his town to make a living. A *verbatim* copy of his business card follows: "General contracting. Road building, cellars and cess-pools, underground work, wells, tunnels and reservoirs. Team work, plowing, building and wrecking. Surveying, platting. Farm work and planting. Harvesting. Ditch and canal work, dredging and filling, town sights platted and sold. General mine development, old mines retimbered and unwatered. Mills, cyanide and general reduction plants erected and maintained. Oil and coal

lands developed. We buy, sell, trade and lease. Mines and prospects. Mine and metallurgical reports, properties examined, mining corporation and maritime law. We buy, sell and exchange mines. We deal in oil and mining property. We deal in gypsum, potash, nitre and salt deposits. Mines handled under lease and bond. Copper mines, gold, silver, tin and lead mines. Large placer mines. Dry and hydraulic. Cement, placer and rich gravel channels. Oil lands for sale and lease. Have large lists of all classes of property. All kinds of mine and oil property wanted. Submit any proposition. We can handle it if anyone can. Stocks, bonds and securities."

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This touching tale, for the veracity of which we do not vouch, comes from a source that we do not know: "About 1660 a Spaniard, in Peru, named José Salcedo, fell in love with an Indian girl. He proceeded to do a thing almost unheard of in those times; he married her. Out of gratitude, her mother revealed to him a vein of silver of unexampled richness. He worked it, and drew from it considerable wealth—too much for his happiness, for his opulence excited the cupidity of the viceroy, Count Lemos, who had him charged with high treason, the penalty of which was death and the confiscation of all worldly goods. It was in vain that Salcedo demanded permission to appeal to Madrid, and offered to pay two ingots of silver daily during the 15 months that must elapse before a reply was returned. The Count refused, and hanged him in 1669. But the butcher got small good out of it. The Indians, intent on avenging their friend, destroyed the works at the mine, filled it with water, and concealed the entrance so cleverly that it could never be discovered. Neither promises nor threats could extract their secret, which remains so to this very day." This story is more romantic than those of the Gunsight, Pegleg, and several other "lost mines" of the American desert.

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A fatal shaft accident, so unusual in its nature as to deserve some special mention, occurred not long ago in the Speculator shaft in Butte. The account in the *Anaconda Standard* states that while lowering men on the four-deck cages, the men from the lower two decks of one cage were discharged at the 2400-ft. level and the cage then started for the 2200-ft. level. Soon after leaving the 2400-ft. level, the cage was felt to shake and a rumbling was heard in the shaft above; almost immediately a rock came into the top of the cage, striking and killing one John Maki and injuring John Yukovich. The rock, in some manner, bounded off more or less horizontally from the shaft timbers and so entered the cage under the bonnet. It would appear from this, that the use of bonnets on cages is not a complete protection against accidents from falling material. It is also a fact that rocks falling down a shaft will often bound out into a station, and accidents, as well as many narrow escapes have been known to occur from this cause. The remedy is plain, the sets in the shaft should be periodically and frequently cleaned of all material of a size sufficient to cause injury in falling. This is simple and inexpensive, as well as emphatically necessary, and should be as much a part of the mine routine as the inspection of cables and guides, legally enforced with a penalty for nonobservance.

PERSONALS

Dr. Ferdinand Heberlein will visit Mapimi, Mexico.

A. J. Eveland has taken offices at No. 42 Broadway, New York, for consulting practice.

B. M. Snyder, of Los Angeles, is examining mines in Butte and Amador counties, California.

E. Z. Burns of the firm of Simonds & Burns, New York, is in Colorado on professional business.

Allan J. Clark, metallurgist of the Homestake plants at Lead, S. D., was in New York last week.

S. B. Patterson, Jr., is mine superintendent for the Spanish American Iron Co. at Felton, Nipe Bay, Cuba.

F. F. Sharpless has gone to Nevada on professional business. He expects to be away about a month.

E. G. Spillsbury has gone to the Southwest on professional business, expecting to return about the end of the month.

Theodore Sternfeld is at Whitney, N. C., inspecting the works the Southern Aluminum Co. is building there.

H. V. Winchell returned to Minneapolis last week from Nevada and California. He intends to go to Colorado next week.

H. F. Wierum has returned from California, where he was engaged in the installation of the Hall process at the Balaklala smelting plant.

The services of Herman Garlicks, of New York, have been retained by the National Lead Co. to supervise the Collinsville smeltery and the Flat River mines.

Dr. Rudolf Diesel, inventor of the Diesel engine, disappeared while on his way from Antwerp to London. It is feared that he fell overboard during the night.

Robert Linton has left Los Angeles, Calif., to examine some mining properties in Gunnison County, Colo. After completing this work, he will go to New York.

Leon Perret, general manager of the Lenskoi Gold Mining Co., Bodaibo, Siberia, has engaged R. E. Smith as his chief technical assistant on the advice of C. W. Purington.

John Baker, formerly of the Cobalt-Lake Mining Co., Cobalt, Ont., has been appointed superintendent of the Peterson Lake mines in place of J. R. Graham, who recently resigned.

W. Gowland, emeritus professor of metallurgy at the Royal School of Mines, London, is about to publish, through Griffin & Co., a treatise on "The Metallurgy of the Non-ferrous Metals."

C. H. Hitchcock, formerly with the Dominion Nickel Copper Co., and its successor, the Canadian Nickel Co. has resigned, and will take charge of the geological work of the Canadian Copper Co. in the Sudbury district.

Frederick G. Clapp, managing geologist of the Associated Geological Engineers, has returned to Pittsburgh where he will devote himself continuously for some months to the preparation of reports on foreign oil and gas operations.

Carl Zapffe, geologist in charge of Northern Pacific mining and exploration work in the Cuyuna District, Minnesota, testified in the dissolution suit against the Steel Corporation at New York. Hearings were resumed Oct. 1 and Mr. Zapffe was the first to testify.

William James, his wife, and Nels Nelson, the people who discovered gold in the Shushanna district, Alaska, have arrived at Dawson with \$8000 in gold taken from the discovery claim, owned by James and Nelson, and William Johnson, of Dawson. Work at the diggings has ceased for the winter. James and his party are the first to come to the outside. They will winter in Seattle, Wash., and go back in the spring with a big outfit.

OBITUARY

Andrew Jackson Maiden, better known as "Sourdough" Maiden, died at Fairbanks, Alaska, recently, aged 76 years. He was one of the oldest of Alaska prospectors, having gone to the territory 29 years ago, in 1884, when there were only a few miners there, at Forty Mile and some other points along the Yukon. He was a prospector to the last year of his life. He leaves relatives in Roseburg, Oregon.

SOCIETIES

American Institute of Mining Engineers—The October meeting, which is to be under the auspices of the Iron and Steel Committee, will be held on Oct. 16 and 17, in the United Engineering Societies Building, New York. Invitations have been sent out to the members of the following societies, through the respective secretaries, to attend this meeting and the dinner, which will be given on the evening of October 17: American Society for Testing Materials; American Iron and Steel Institute; American Society of Mechanical Engineers; American Society of Civil Engineers; American Society of Electrical Engineers; American Foundrymen's Association. Members of these societies have also been invited to contribute to the discussion of the various papers to be presented at the meeting.

1. W. A. Forbes, "Blast Furnace Gas Cleaning."
2. W. H. Blauvelt, "The Slagging Producer."
3. Prof. F. Peter (Leoben, Austria), "The Generation of Steam by Waste Heat from Furnaces."
4. G. C. Stone, "The Generation of Steam by Waste Heat from Regenerative Furnaces."
5. W. R. Shimer, "Over-Oxidation of Steel."
6. H. F. Miller, Jr., "New Design of Regenerators for Openhearth Furnaces."
7. Dr. Richard K. Meade, "The Use of Powdered Coal as Fuel."
8. H. R. Barnhurst, "The Use of Powdered Coal as Fuel for Metallurgical Furnaces."
9. W. S. Quigley, "The Use of Powdered Coal as Fuel."
10. E. Stuetz, "The Scoria Process for the Manufacture of Fine-Ore Briquettes."
11. Felix A. Vogel, "Briquetting."
12. Felix A. Vogel, "Use and Advantages of Briquettes in Blast-Furnace Practice."
13. R. H. Lee, "The Use of Nodulized Ore in the Blast Furnace."
14. H. M. Howe, "Discussion of the Existing Data as to the Position of Ae₃."
15. H. M. Howe and A. G. Levy, "Determination of the Position of Ae₃ in Carbon-Iron Alloys."
16. H. M. Howe, "Ae, the Equilibrium Temperature for A_n in Carbon Steel."
17. G. K. Burgess, J. J. Crowe, and H. S. Dawdon, "Thermal and Microscopical Examination of Professor Howe's Standard Commercial Steels."
18. H. M. Howe, "The Divorcing of the Eutectoid in Meteorites."
19. R. R. Abbott, "The Influence of Various Elements on the Absorption of Carbon by Steel."
20. J. V. Emmons, "Some Phases of the Practical Treatment of Tool Steel."
21. W. E. Ruder, "Grain Growth in Silicon Steel."
22. J. H. Hall, "Shock Tests of Cast Steel."
23. G. H. Clevenger and B. Ray, "The Influence of Copper upon the Physical Properties of Steel."
24. J. H. Hall, "The Life of Crucible Steel Furnaces."

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.

of The Engineering and Mining Journal, published weekly at New York, N. Y., required by the Act of August 24, 1912.
 Editor, Walter R. Ingalls, New York, N. Y.
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The balance of the stock issued (less than 1% each) is owned by 62 employees, one ex-employee, and 11 others who are wives, daughters or relatives of employees.

There are no bondholders, mortgagees, or other security holders.

C. W. Dibble, Vice-President,
 HILL PUBLISHING COMPANY.

Sworn to and subscribed before me this 29th day of September, 1913.

RICHARD L. MURPHY,
 Notary Public.

(My commission expires March 30, 1915)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Oct. 1

California Has Had a Dry Season this year in some districts, but in others there has been a sufficient supply of water for all purposes. Notwithstanding that it has been considered an unusually dry season the rainfall recorded is 24.70 in. compared with 21.63 in. in the previous season.

The Option on the Hall Process held by the Balaklala Consolidated Copper Co. has been extended for six months from the end of September. The actual tests that were delayed by the incompleteness of the gas plant at the Coram works and which were held up awaiting negotiations for the extension of the option will be resumed as soon as the new and larger gas holder is installed.

At Stanford University Dr. John Casper Branner was inaugurated as the second president, Oct. 1. Dr. Branner has for several months been acting president, having succeeded Dr. David Starr Jordan, who was made chancellor. Dr. Branner has been connected with the university and associated with Dr. Jordan for several years. Dr. Jordan was the first president that Stanford University has had. He was inaugurated 22 years ago on Oct. 1, 1891. Dr. Branner announced at the inauguration that he would retire at the end of two years when he will have reached the age of 65 years. He stated that he has no new policies to announce, no new theories to try out and no new reforms to use.

California the Leading Gold Producer in the United States in 1912, according to the Mint and records of the Western mining states, produced \$20,008,000. Colorado produced \$18,741,200, Alaska \$17,198,600, Nevada \$13,575,700, Utah \$4,412,600, Arizona \$3,785,400, Montana \$3,707,900. While California has not produced as much gold in later years from deep quartz mines as in former years from the placers there has been a steady growth in quartz mining, and the state has had no great new camps developed since the discovery and development of the Randsburg district. Most of the increase in production in quartz gold has been from old mines either through progressive development and operation or the reopening of old mines which had been abandoned in the earlier years of quartz mining. It is an interesting fact that a large proportion of the gold from dredging operations is from the old placer and hydraulic mines that could not be worked to their full prospective capacity under the methods adopted before the introduction of gold dredges.

DENVER—Oct. 4

In the Mid-West Oil Case Judge Hook of the U. S. Court of Appeals has certified the case to the Supreme Court without hearing arguments. The court will prepare in brief form the main questions involved, submit them to the highest tribunal in the land and then await the decision. The hearing will then be set again and after arguments a decision will be handed down by the Court of Appeals in accordance with the Supreme Court views on the vital issues. This action was taken to save possibly two years in court procedure.

Regarding the Coal Strike in a general way, the operators express themselves as satisfied and say that conditions are improving daily and that the production of coal is about 55% of normal. Most of the miners that went out were compelled to do so by threats of violence and death if they did not respond to the strike call and they would gladly return to work but for such threats. On this account strong pressure is being brought by the operators on Governor Ammons to send the militia into the southern field to protect the miners who go back to work. Equally strong pressure is being brought to bear by the heads of the mine workers, who tell the governor there is no reason for sending out troops. Thirty shots were fired into two camps this week, the bullets going through miners' dwellings, but nobody was injured. It is stated that this was done by the strikers, the operators having issued a statement to that effect, signed by five witnesses. "Mother" Jones is visiting all the southern camps and is making inflammatory speeches. On Oct. 3 one end of a shack in which Bulgarian strikebreakers employed at the Mitchell mine, at Lafayette, were boarded, was blown up by an explosion of a bomb hurled over the stockade that incloses this property of the Rocky Mountain Fuel Co. The bomb explosion was followed by 500 or 600 revolver and rifle shots. The attack was made when but few of the strike-

breakers were on the surface at the mine and no one was injured. That same night an explosion destroyed the powder house and partly wrecked the company store of the Primrose Coal Co. at the Primrose mine, 35 miles north of Trinidad; 400 lb. of giant powder, stored in a small building adjoining the company store, was fired. The damage to company property is estimated at \$3000. It is the theory of mine officials that a hole was drilled through the wall to drop the lighted fuse.

BUTTE—Oct. 1

Electrification of the Butte, Anaconda & Pacific R.R. between the mines at Butte, and the Washoe smelting works at Anaconda, has been completed, and Sept. 30, two test runs were made over the line with an electric train.

The Closing of the Washoe Works at Anaconda was made necessary chiefly because of the condition of the flues. These have been cleaned out and the 10-year accumulation of material will be run through the furnaces. The work should be completed by another week and arrangements will be made so that more frequent cleanings can be made.

Anaconda Agricultural Lands, it has been announced, comprising about 500,000 acres situated in Lincoln and Flathead Counties, will be disposed of to prospective settlers. The principal part of this land was purchased by the Anaconda company from the Northern Pacific R.R. Co., which obtained it as a land grant from the Government. Although a large percentage of the land is covered with timber, yet much of it is valuable for agricultural purposes and will be sold to homesteaders on easy terms of payment.

SALT LAKE CITY—Oct. 2

The Output of Park City for September totaled more than 6200 tons of ore and concentrates, which is slightly less than the average. The output for the first nine months of the year was about 70,000 tons, as compared to a production of 92,648 tons during all of 1912.

The International Plant at Tooele, since the blowing in of the fifth and last lead furnace a short time ago, has been running full blast. The copper furnaces have not been operated at full capacity on account of insufficient ores of this character. The Utah Consolidated has been sending approximately 500 tons of ore per day, as against previous shipments of 600 tons of copper ore.

The Smoot Bill was recently discussed by the committee on mines and mining of the Salt Lake Commercial Club which met Sept. 22 with Senator Smoot and others for the purpose of pointing out the objections which the metal miners of Utah have to the bill now pending before the Senate. The purpose of this bill is to perfect the title of states to school lands within their boundaries to which there may be objection preventing a valid transfer. The matter was discussed pro and con without arriving at an understanding. Another meeting is to be held, and an endeavor will be made to come to some agreement, if possible, as to the proposed law.

CALUMET—Oct. 4

Rioting and General Lawlessness have prevailed throughout the north end of the Lake Superior strike district for the last week following the dissolution of the injunction against picketing and parading by Judge O'Brien. The injunction was granted by Judge O'Brien on complaint of the various mining companies, Sept. 20, and was dissolved Sept. 29. During the interval quietness prevailed throughout the district, but immediately upon the removal of the restraining order the trouble started with renewed vigor. Monday night, a party of about 50 men from the Ascher agency, employed as mine guards, arrived at Ahmeek, but did not disembark from the Pullman coach, owing to the mob that surrounded the train. The windows in the cars were demolished and the men returned to Calumet for the night. They were taken to Ahmeek early the next morning in automobiles, and in making the run, a fusillade of shots was fired from the surrounding hills and woods; some of the automobiles were hit by the bullets but none of the occupants was injured. Parties of hunters going into Keweenaw County were fired upon from ambush and one man received a gunshot wound in the shoulder while the chauffeur had the tip of one of his fingers grazed by a rifle bullet. As a result of this and the absolute

disregard of law and order that has prevailed throughout Keweenaw County, the sheriff, prosecuting attorney and the supervisors have petitioned Governor Ferris for aid. General Abbey, in charge of the militia, which consists of a small force of mounted men, has taken charge of the situation and practically martial law prevails throughout the village of Ahmeek. Three more companies of militia have been ordered to prepare for a return to the Copper Country. A riot broke out the evening of Oct. 3 at the Wolverine location and about 50 arrests were made. A special trolley car was used in taking the prisoners to the County Jail at Houghton. Since the inception of the strike hundreds of arrests have been made, but few convictions, and the same people are arrested time after time only to be released on small bond.

DULUTH—Oct. 6

Lake Superior Ore Movements for September indicate that the shipments for the season of 1913 will show an increase over those of 1912. Some authorities have expressed the opinion that the shipments this year would not exceed those of 1912, but would doubtless be approximately the same as a year ago. The figures now at hand indicate that the shipments for this season to Oct. 1 were 32,401,249 gross tons as compared with 29,758,818 tons in 1912, indicating a net increase to the first of this month of 2,642,249 tons. September has shown a decrease of 353,671 tons from the gain which was shown to Sept. 1, when the increase was shown to have been 2,995,920 tons. This decrease is moderate, all things considered, and it will take a sharp falling off during the last two months of the shipping season to reduce the net gain for the season below a full 2,000,000. The present season will show a record of about 50,000,000 tons, possibly a little less, but yet a fair gain over 1912, when the record was 47,800,000 tons.

MARQUETTE—Oct. 6

The State Tax Commission of Michigan has taken under advisement a protest by the Marquette iron range mining companies against the valuation placed on the ore in stock at the mines at the time R. C. Allen, state geologist, made his inspection to determine at what sums this class of property should be assessed. It is the contention that the method of valuation employed gives results that are not equitable. Professor Allen treats the stockpiles as if they were immediately salable. He estimates their value on the basis of the Lake Erie prices of the different grades of ore, less the transportation and other selling charges. By this method he has figured a value of approximately \$5,600,000 on the more than 1,800,000 tons in storage when he made his inspection. As a result, though the reality of the companies is assessed at some \$2,000,000 less than formerly, the aggregate of valuations shows, on the tentative figures, an increase of approximately \$3,000,000. And, in addition, all of the buildings owned by the companies and not used for mining purposes, which had previously been covered by the general assessment, are assessed separately. The mining companies suggest that the value of the ore in the piles be appraised at a figure less than Professor Allen employed, or that account be taken of the equities involved in determining the realty values of the mines whence the ore comes. The reasons for the companies' contentions are outlined by George R. Jackson, superintendent of the properties of the Cleveland-Cliffs Iron Co. in the Gwinn district, where 560,000 tons of ore is stocked. "Much of this ore," he said, "has been mined not because at the time it is salable, but because conditions surrounding the operation of the mines are such that it is not practicable not to mine it. There is really nothing to do but go on mining, even if the market for the ore produced happens to be inactive. The closing of a mine is a serious piece of business." While the commission was busy in the iron-mining district of upper Michigan, George B. Horton, one of its members, took a side trip to Bessemer, Gogebic range, in company with Professor Allen, to hear a complaint of the Oliver Iron Mining Co. because the Bessemer board of review had assessed the Tilden mine at \$200,000, whereas its value was placed by the commission at \$150,000. The commissioner took the matter under advisement. The case is regarded as of considerable importance, for the reason that it bears on the right of a mining company to keep a valuable mine idle and escape paying the taxes that would have to be paid were the property worked. The Oliver company holds the Tilden under a sub-lease from the Tilden Mining Co. running for 36½ years. This lease provides for an annual payment to the Tilden company of \$100,000 and an annual payment to the Keweenaw Association, of Boston, the fee owner, of \$100,000 for the first six years and \$50,000 annually thereafter. The Tilden is inactive at present. It was contended at the hearing that the fact that the Oliver company

would pay \$150,000 per year for the right to mine showed conclusively that the value of the property is many times the figure placed on it by the Bessemer assessor and which the Oliver company is now protesting is \$50,000 too high.

The Steel Corporation has ceased its explorations on lands of the Michigan Land & Iron Co. in the Fence Lake country, midway between the Marquette and Menominee ranges, the last of the drills having been removed several weeks ago. While no announcement has been made, there is an impression abroad that the tests resulted unfavorably. However, if such be the case, it is still to be proved conclusively that the district does not contain ore of commercial quality. The field is extensive and the drills were operated into very little ground. Many mines might have been missed. The Fence Lake territory is considered well worth giving an extensive and systematic trial. It is believed that still further east, near Republic, ores of value will be found. Steps to drill a large territory are now being taken.

FLAT RIVER—Oct. 4

The Saint Joseph Company's Internal Troubles have been adjusted and the suit for a receivership has been dismissed. The insurgent Holmes faction has been given representation on the board of directors and some of the economies Holmes suggested have been adopted.

Operations at All the Lead Mines are again at full scale and efforts are being made to make up for the time lost by the strike. As the result of the 11 days' strike, the miners secured an advance of 25c. per day, but the union was not recognized. As the operators only offered an advance of 15c. per day, the union is claiming the credit for obtaining the additional raise and has begun an active campaign to force all the men into the ranks of the Western Federation, threatening to beat up the nonunion men if they don't promptly join. That there will be another and worse strike next year seems to be generally conceded, as the Western Federation will again try to force the recognition that was refused this year. While none of the mines were completely flooded by the stoppage of the pumps, from one to three weeks was required to pump them out before work could again be started.

The Consolidation of the Saint Joseph and Doe Run lead companies has been practically effected. The committee appointed by the companies has made its report, which has been accepted by the directors of the two companies and the final approval of the stockholders will be obtained at stockholders' meetings to be called by each company within a few weeks. As a majority of the stockholders are known to be in favor of the proposition, the merger will soon be an accomplished fact. The merger will be accomplished by the absorption of the Doe Run by the Saint Joseph company, in exchange for which \$5,000,000 in shares of the treasury stock of the Saint Joseph company will be given to Doe Run stockholders. As only \$10,000,000 of the \$20,000,000 authorized capital of the Saint Joseph company has been issued, this permits of the absorption of the Doe Run without any increase in stock. As \$250,000 in dividends has been paid by the Saint Joseph company while the merger has been under consideration, the Saint Joseph will pay over to the Doe Run \$125,000 in cash as its proportionate share of the profits that its stock would have earned if the merger had been promptly accomplished. The committee recommends a total of \$55,000 for the salaries of the officers and that the New York expenses be limited to \$15,000 per annum. The committee retained the services of J. R. Finlay to examine and report on the technical details. He finds that out of 9254 acres of land owned by the Saint Joseph company 6444 are ore bearing. He finds that the Doe Run company has 4445 acres, of which 3108 acres are ore bearing. He estimates that the Saint Joseph has 11,200,000 tons of ore in sight and that promising and partly developed land increase this to 22,275,000 tons. He estimates that the Doe Run has 8,250,000 tons of ore in sight, which partly developed lands increase to 12,700,000 tons. The actual operations of the two companies will mainly continue as before, as the ownership of the two properties has always been largely identical. There will be a marked saving in the administration expenses in thus having the two properties under one management, and it will make the new company one of the largest lead producers in the world.

PARKER, ARIZ.—Oct. 1

The Mining Outlook Around Parker, in Yuma County, is brighter. C. L. Beckwith, examining engineer for Phelps, Dodge & Co., will visit some of the mines and prospects in the Seneca district as soon as cool weather sets in. The district is north of Parker and on the east side of the Colorado River. There are many good prospects and a few mines now idle for want of capital.

THE MINING NEWS

ALASKA

A SEVERE STORM AT NOME, one of the worst recorded in that region, is reported to have practically destroyed the city, Oct. 6; 500 houses have fallen and the damage is estimated at \$1,500,000. The storm devastated two square miles of territory on the coast. Nearly every structure on the main street was wrecked including the pumping plant, so that little could be done to check the devastation caused by the fire that followed. Four are dead so far as known. Seattle is raising a relief fund. The steamships "Victoria" and "Corwin" made for the open sea and escaped damage. It is feared that there will be much suffering as winter is at hand and it will be almost impossible to get in supplies.

AN IMPORTANT DISCOVERY AT NOME is said to have been made. One group of lode claims has been bonded to Anheuser-Busch interests of St. Louis and options have been taken on others. The consideration was about \$500,000. The Nome stamp mill will run all winter making tests. The gold occurs in what was long thought to be barren rock, but its structural similarity to impregnated rock found in Chihuahua, Mexico, led R. L. Kite, a mining engineer representing St. Louis men, to test the Nome rock for gold with the result that from 5 lb. he is said to have got a yield of \$2.40; 500 lb. of the material has been sent to St. Louis for tests.

GOLD KING (Valdez)—The new stamp mill is now operating.

OLD GLORY (Smugglers' Cove)—A 4-drill compressor is to be installed at this mine, recently taken over by the Alaska Venture company.

RAMBLER (Shoup Bay)—A rich strike has been made on this property. The vein is 7 ft. wide, and can be traced for more than 1500 feet.

MILLIONAIRE (Valdez)—A shaft is being sunk on this claim, owned by the Mineral Creek Mining Co. Considerable tunnel work has been done.

ELDORADO—This group of claims in the Mount McKinley district has been leased to a company, and it is stated that new hydraulic machinery will be installed.

ALASKA-JUNEAU (Juneau)—The first unit of the mill will be in operation by Dec. 1, and 400 men will be employed. When completed the entire plant will consist of four units, each of a capacity of 3000 tons of ore per day.

ARIZONA

Maricopa County

RED ROVER (Phoenix)—The upper portion of the wagon road, which was washed out by a cloudburst some time ago, has been repaired and shipments of ore will be resumed.

Mohave County

KINGMAN COPPER (Mineral Park)—The third drill hole has been begun.

Navajo County

CHURN DRILLING IN THE COAL FIELDS, covering approximately 3000 acres, has been completed. An exhaustive report will be ready in October. Unofficial reports are to the effect that workable deposits of coal have been proved and that early in 1914 extensive developments will be started.

Pinal County

A NEW STRIKE OF RICH SILVER ore is reported from the Roskrige Range south of Tucson.

THE SURVEY FOR THE RAILROAD FROM TUCSON TO AJO has been completed and the company is now running a line from Gila Bend on the main line of the Southern Pacific to Ajo to determine the best route. This work is being done by the Calumet & Arizona to get railroad connection between the mines at Ajo and the smelting plant at Douglas. Development work at the mine has been stopped until the road is finished. This road from Tucson to Ajo will open up some rich mineral country in the Baboquivari, Comobabi, and Quilotoa Mountains that heretofore has been impossible because of the long haul and lack of water.

OLIVE (Twin Buttes)—The concentrator will soon be working 16 hr. per day as development work increases. Arrangements have been made to mill the ore for some of the lessees in the district.

Pima County

PAPAGO CHIEF (Baboquivaries)—Work has been resumed on this mine and shipments of high-grade ore are being made to Douglas.

RAY-ARIZONA (Kelvin)—The churn-drill hole is down nearly 400 ft. It is reported that for the last 60 ft. the drillings have shown good concentrating ore.

MAMMOTH (Mammoth)—Arrangements for development at this old mine are progressing rapidly. The company intends to make Tucson its headquarters for supplies. It is 55 miles from Tucson to Mammoth and only 26 miles from Winkelman to Mammoth, but the fact that the San Pedro River is impassable at times caused the company to decide on Tucson. From the road funds of Pima and Pinal Counties \$15,000 is available to spend on the road. One large auto truck is used now and another has been ordered.

Yavapai County

TEMPE-VERDE OIL (Camp Verde)—The second well being drilled in search of oil has reached the depth of 675 feet.

HAYNES COPPER CO. (Jerome)—The shaft is down to the 1000 level. Extensive crosscutting will be begun at the 1200-ft. level.

FORTUNE (Prescott)—A reduction plant is planned. There are about 8000 tons of milling ore on the dumps and a year's run blocked in the mine.

LITTLE DAISY (Jerome)—A new shaft is being opened from three points of attack. Work is proceeding from the surface and from the 800-ft. level where both raising and sinking are going on.

CALUMET & JEROME (Jerome)—A crosscut 500 ft. deep, and now in the mountain upward of 750 ft., is being driven to the vein. The formation is changing considerably, thought to be evidence of proximity of the ore.

ARKANSAS & ARIZONA (Jerome)—Extensive developments are being made. A large installation of hoisting machinery has been completed for the further sinking of the shaft which is down now to about 1400 ft. This is said to be the largest hoisting plant in the county. This shaft is to be sunk to a depth of 1800 or 2000 ft. A new store building has been completed near the mine which is well stocked.

CALIFORNIA

Butte County

FIRE AT FORBESTOWN, Sept. 22, destroyed the Gold Bank Hotel, the postoffice and the store, the church, nine residences, three barns and a lumber yard. So far as learned none of the mine buildings was burned. The amount of property loss has not been ascertained.

Placer County

YUKON GOLD DREDGING CO. (Auburn)—It was expected to have the dredge ready for operation on Mammoth bar on the middle fork of American River about Oct. 1.

POVERTY BAR DREDGE (Auburn)—Since the death of A. Tredidgo some changes in the ownership has occurred. The dredge operated lower down on American River by the Beaver Gold Dredging Co. will be dismantled and the machinery will be installed on the new hull built at Poverty Bar by the Eldorado & Placer Counties Co.

Sierra County

TELEGRAPH (Downieville)—The power house was recently destroyed by fire, together with all machinery except a Pelton wheel, entailing a loss of nearly \$10,000. The plant will be rebuilt.

EL DORADO (Alleghany)—A rich strike has been made at this mine on Kanaka Creek, in a raise 150 ft. above the main working tunnel. The vein is 3 ft. wide at that place, and full of free gold and arsenical sulphides. More than \$1600 worth of coarse gold was picked up after the blast that uncovered the find. Fessler Bros. are developing the property and the 10-stamp mill has been started since the strike was made.

PED LEDGE (Scott's Flat)—Three thousand feet of new road has been built to connect the millsite with the new Alleghany cut-off road, and stamp-mill machinery has been delivered and will be installed as soon as lumber can be gotten in to build a mill. A boarding house and other improvements will also be added. The ore carries nickel, as well as gold and silver, and an attempt will be made to save the nickel as well as the gold and silver.

MORSE BROS. GRAVEL MINE (Downieville)—A rich strike has just been made at this property, upon reaching bedrock by a 90-ft. incline. Pieces of gold worth \$10 to \$20 each were found at the bottom of the shaft, all of which is coarse. This ground is an ancient river channel, covered by a mountain slide and lying 30 ft. lower than the present river bed. Early-day miners started an incline for this channel, but abandoned it after reaching huge granite boulders half way down. The present owners have spent nearly a year in sinking the incline, and will now start drifting.

Tuolumne County

A SKIPTENDER WAS KILLED in the Harvard mine in the Jamestown district, Sept. 17. He had been loading the skip at the 1100-ft. station when he must have been caught by it for later he was found dying. A coroner's jury could find no negligence on the part of the mine management.

Yuba County

YUBA NO. 14 DREDGE (Hamonton)—The completed steel hull and the heavier parts of the superstructure of this new dredge was floated at noon Sept. 17. Initial construction work was begun with the laying of the center bottom plates Aug. 7. The first riveting was done Aug. 11. There was some delay in receiving material, so that the actual construction of the hull was begun with the arrival of the last of the bottom chords which were placed on Aug. 15. The hull was completed with the exception of finishing the riveting of the steel deck, Sept. 15, and the boat was then ready to float, awaiting the filling of the pond. The actual time required for construction of the hull ready for flotation was 30 days, or 45 days to the floating of the hull.

COLORADO
Clear Creek County

ALCO (Freeland)—The shaft is being sunk an additional 100 ft. The last 30 ft. of sinking has opened a 6-in. vein of \$25 ore. Drifts will be advanced east and west from the shaft.

TOBIN (East Argentine)—Machine drills have been installed at this property. A shoot of smelting ore 18 in. wide is being opened on the Wheeling vein. Returns from recent shipments indicate a value of \$90 per ton.

BARD CREEK MINING CO. (Georgetown)—Small shipments of smelting ore are being maintained, while the milling ore is being blocked out and held in reserve, pending the construction of a 50-ton concentrator under consideration.

San Juan Region

ALTA—The development and operation of this property in Gold King Basin continues under the management of Wagner Bros., with gratifying results. The operators are shipping about 20 cars of concentrates per month.

BALLARD (Telluride)—The construction of the tramway from the mine to the mill is under way. All of the equipment, excepting the cables, will be furnished by the Telluride Iron Works. The tramway will have a total length of 6200 ft. There will be seven towers on the line and the longest span will be 1700 ft. where the tramway passes over the cliffs below Mount Ballard. There will be two buckets, each having a capacity of one ton. The mill construction is being pushed and the company plans to have 10 stamps dropping within 60 days.

Summit County

WELLINGTON MINES CO. (Breckenridge)—Five carloads per week is the present output of zinc and lead concentrates from the magnetic separator mill, which is treating about 55 tons of middlings per day.

FRENCH GULCH DREDGING CO. (Breckenridge)—The Reiling dredge has been dismantled and is now ready for its trip overland to some ground a mile up the gulch, which is said to be rich in coarse gold. It is said that this dredge has averaged \$1000 per day for its actual running time this season.

COLORADO GOLD DREDGING CO. (Breckenridge)—The Bucyrus dredge of the company has taken out a large amount of placer gold this season, and a recent 15-days' operation is reported to have cleaned up \$22,000. It is now digging in Swan Valley. The Ben Hall lease on the high bars of the Mekka placer, Nigger Hill, is said to be \$6000 ahead for the season.

Teller County

DUMP SHIPMENTS HAVE BEEN HEAVY LATELY. Ore has been moved from four shafts on the Isabella Bull Hill estate and lessees were also shipping from the dump at the Little Pearl, a fractional claim near the Trachyte mine of the United Gold Mines Co. Teams have also been moving dump ore from the Pharmacist mine, on Bull Hill, to the Rex plant, on Iron Clad Hill.

JERRY JOHNSON (Cripple Creek)—The tenth annual report for the fiscal year terminated Aug. 31, shows production for the year of 4380 tons of ore with a gross bullion value of \$86,136. Deducting \$27,533 for freight, hauling and treatment, the net value of the ore was \$58,593, and the total amount in royalties paid into the treasury of the company was \$14,444. The cash balance in the treasury was \$21,059.

IDAHO

Cœur d'Alene District

CENTER STAR (Pine Creek)—The tunnel will be driven 250 ft. farther to cut the vein.

VIRGINIA (Sunset)—A new tunnel is being driven from Carbon Creek and will give 100 ft. additional depth.

COMET (Mullan)—A contract has been let to drive 50 ft. of tunnel. The vein will be followed in the new work.

JACK WAITE (Union)—No mill is to be built at this mine and it is officially stated that it is not known when a mill will be needed.

AMY-MATCHLESS (Pine Creek)—Work has started after a shutdown of several months. A shaft will be sunk on the ore showing in the tunnel.

IDORA HILL (Wallace)—The mill is being operated 16 hr. per day, and records show that concentrates worth \$83 per ton are being produced. The product is hauled eight miles to the railroad, by a six-horse team, and one car has already been shipped to the smelters.

REINDEER-COPPER QUEEN (Mullan)—A consolidation has been effected between these two companies, the negotiations having been under way for several months. The ore from the Reindeer property pitches into the Copper Queen. The long tunnel of the Reindeer company can now be continued into the Copper Queen and the ore can be worked from the Copper Queen ground with little development. Work will start immediately.

H. E. M. (Burke)—Plans for a 100-ton mill have been completed and work on its construction will begin soon. The No. 4 tunnel has been started. It is 260 ft. below the No. 3 tunnel and 1000 ft. from the outcrops. This tunnel will cross-cut the vein at 2100 ft. In the No. 3 tunnel a body of concentrating ore from 11 to 15 ft. wide and 150 ft. long has been opened.

HIGHLAND-SURPRISE (Kellogg)—Contract to drive 100 ft. of tunnel has been let to Martin & Hanson. It is the intention to drift on the vein opened last spring. This vein was struck on the Highland side, and the work is being conducted from the Surprise tunnel, which has been extended into this ground. The property is equipped with a mill, and last year considerable milling was done, chiefly of zinc ore. The distance from the railroad and the almost impassable condition of the road along Pine Creek in the autumn and winter caused the shutdown of the mill at present, in order that efforts might be given to development work alone.

MINNESOTA
Cuyuna Range

CUYUNA-MILLE LACS (Crosby)—The new 2000-gal. centrifugal pump has been put in operation.

THOMPSON (Crosby)—A night crew has been put on to hasten the stripping operations; property owned by Inland Steel Co. and formerly an underground operation but being turned into an openpit.

ROGERS-BROWN ORE CO. (Crosby)—The three shafts controlled by this company, the Armour No. 1, Armour No. 2 and Kennedy, have shipped over 600,000 tons so far this season. The Armour No. 2 has quit shipping and is stockpiling the ore.

BARROWS (Barrows)—The first shipment of ore from the South Cuyuna range was made Oct. 2, when a shipment of 14 cars was sent from this property owned by the Virginia Ore Co., a subsidiary of M. A. Hanna & Co. Other mines are being developed in the district and it will not be long before there will be several producers on the South Cuyuna.

ARMOUR (Ironton)—It is not at all unlikely that the Armour No. 1 and Armour No. 2 will be transformed from underground to openpit mines in the near future, as the management is now considering the change. J. S. Lutes has demonstrated at the Pennington what can be done in the stripping way on the Cuyuna, and others seem favorable to following the example set by him. It is far cheaper to mine with steam shovels than by underground methods, providing the overburden is not too deep, and it is not deep at the Armour

Mesabi Range

A NEW SIGNAL CODE is advocated by the Practical Mining Mens' Institute, which includes the mine captains of the Mesabi range. At a recent meeting it was agreed to introduce a bill in the legislature making the use of a uniform signal code in the mines of the state compulsory.

MESABI CHIEF (Hibbing)—The initial shipment was recently made. This fee is owned by the state and the royalty goes to the permanent school fund. Property contains 5,000,000 tons, and is operated by Arthur Iron Mining Co., the operating name of the Hill interests.

GRANT (Hibbing)—This mine lately broke all records for shipments from a state lease, shipping 40,000 tons during one week, or 10,000 tons in excess of any previous record. The fee to this property is owned by the State of Minnesota and the royalty goes to the state permanent school fund.

WEED (Aurora)—The Oliver Iron Mining Co. has decided to call its new property, near Aurora, the Weed. A track was recently completed to the mine and material is now being received. The work of sinking will be started within a few days, and as large a force as can be worked advantageously will be employed in order that shipping may be started next summer. The Oliver company has done considerable diamond drilling and test-pitting in the Aurora field during the last few years, and it is not unlikely that other orebodies have been located.

INTER-STATE IRON CO. (Grand Rapids)—This company, a Jones & Laughlin subsidiary, is using a hydraulic dredge to remove the overburden from the orebody. The dredge draws but 28 in. of water, and was erected by the Marine Iron Works, Duluth, Minn.; total cost of dredge and machinery, \$30,000, dimensions, 75x35 ft. It is planned to remove only such surface as lies adjacent to the Mississippi River. The dredge is fitted with a contrivance for breaking down the earth, which is then handled by the sandsucker and deposited at any desired distance. The scheme is patterned somewhat after the operation now being conducted by the Pittsburgh Steel Ore Co. at its Rowe mine, on the Cuyuna range.

MISSOURI

Joplin District

VINEGAR HILL (Thoms Station, Mo.)—This mine was sold to J. A. Hardy, Sr., of Webb City, for \$15,000. It is situated on a lease of the Snapp land.

BONITA (Thoms Station, Mo.)—The shaft is 150 ft. deep and both lead and zinc are found. A lease on 40 acres has been obtained by John W. Griffin and others.

LAWTON MINING CO. (Lawton, Kan.)—Mineralized ground was recently encountered with the drill, one hole showing lead and the other zinc. The ore is found from 35 to 65 feet.

NORTH JOPLIN MINING CO. (Joplin, Mo.)—This company's mine is one of the good small producers of the district. Ore which yields a heavy mill recovery is being mined at the 95- and 150-ft. levels.

RICKMAN LAND (Joplin, Mo.)—A lease on 250 acres has been granted to local men and a drilling campaign is to be started. Previous operations have been confined to "gouging" but the lessees believe deeper ore exists.

LOST TRAIL (Hattenville, Okla.)—Two new shafts are being sunk for ventilation as well as to facilitate the hoisting of ore. The mine is on the Frosty Morning land. A 200-ton concentrator is kept in constant operation.

CHAPMAN & CO. (Joplin, Mo.)—A lease of the Dixon land, will be operated on an extensive scale. The Wyatt mine is situated on the lease, and good productions have been made. The intention is to sink the south shaft deeper.

MEARES TRACT (Carthage, Mo.)—A 37-ft. face of pay ore has been encountered by the drill. Discovery was made by a farmer, while drilling for water. The ore lies at a depth of 185 ft. and continues to a depth of 222-ft. where drilling was stopped. A lease on 12 acres of the farm has been granted to W. C. Thomas, of Carthage.

DEXTER (Joplin, Mo.)—The 200-ton mill is to be started up this week. Development work on the lease was begun several months ago and an unusual orebody was discovered at a depth of 160 ft. Drifts have been driven at that level from the shaft. Sufficient ore has been blocked out to keep the concentrator in operation several months.

MONTANA

Butte District

BUTTE & SUPERIOR (Butte)—The largest tonnage of ore to be mined and milled at this property in one day was recorded Sept. 25, when 1320 tons were hoisted and sent to the mill for treatment. An average of about 1100 tons of ore was hoisted during September, producing about 13,000,000 lb. of metallic zinc, as compared with 11,000,000 lb. in July. It is estimated that net earnings for September will approach \$200,000.

ELM ORLU (Butte)—This property is expected to begin producing zinc next spring. Work has been commenced on the new concentrator and it is estimated that in four or five months it will be in operation. The mill will have a capacity of 250 tons to start with but before the summer is out it is expected that it will be enlarged to 500 tons per day. Many difficulties had to be overcome and problems considered before commencing construction. One of the important ones was the securing of sufficient water to operate the concentrator. A dozen wells were sunk and after connecting them a 12-in. pipe line was laid from the wells to the site of the mill, a distance of 1½ miles. It was discovered that a pumping station would have to be provided to force a sufficient flow of water through the pipe to the mill. The sinking of the wells and the laying of the pipe line cost \$40,000. Another matter of serious consideration was the process to be adopted in treating the zinc ore. For upwards of a year several experts had been at work testing out various methods and an examination was made of a process in use in Germany. A short time ago the conclusion was reached that the flotation process was the best available and a contract was made with the Minerals Separation Co., for the use of its method of treatment. The machinery for the concentrator has been ordered and just as soon as the building is ready to receive it the work of installation will commence, as arrangements have been made whereby it will be shipped a month ahead of the time required.

Chouteau County

BEAVER CREEK—A new mill was recently built at this gold mine in the Little Rockies. The company is preparing to use steam shovels to lift ore into the mine cars.

Lewis & Clark County

FRANKLIN—Thomas Cruse, of Helena, who is operating this mine in the Scratch Gravel Hills under a lease and bond, has opened galena on the 200-ft. level. The property is being rapidly developed by a large crew of men.

ROCK ROSE—This property in the Grass Valley district, which has been idle for several years, is being unwatered preliminary to an examination by engineers representing Pittsburgh men. The shaft is 200 ft. deep, and considerable ore containing gold, silver and a little copper, was mined and shipped to Helena and Butte prior to the shutdown.

Lincoln County

HAZEL T (Libby)—A sawmill will be sent to the company's mine eight miles, southwest of Libby, at once. The sawmill will be used in sawing lumber for a flume, concentrator and other buildings. Plans for the concentrator are being drawn now and additional mill tests are being made to determine the best methods of treating the ore.

CRIDERMAN PLACERS (Libby)—A survey has just been completed for the pipe line and ditch on these placers 16 miles south of Libby, and development work is in progress. C. E. Lukens, of Cut Bank, recently purchased an interest in these claims and it is the intention to at once install a hydraulic plant and work them. According to the agreement between Lukens and Criderman, this plant must be completed by Sept. 1, 1914.

Missoula County

IRON MOUNTAIN TUNNEL CO. (Superior)—About 40 men are engaged in mining between the 1800- and 2000-ft. levels. A considerable tonnage of lead-silver ore is being hoisted. New electrical machinery and an air compressor have been installed recently.

NEVADA

Eureka County

BUCKHORN MINES CO. (Buckhorn)—Work is progressing rapidly and it is expected that the new mill will be treating ore before winter sets in.

EUREKA-WINDFALL (Eureka)—Following an examination by W. H. Leathers, of Chicago, said to represent several eastern stockholders, incorporation papers of the Alkali Mines Co., of Illinois were filed in the office of the county clerk. This company has been organized to take over and operate the Eureka-Windfall mine and mill sold at sheriff's sale last February.

Humboldt County

THE OPAL DEPOSITS OF VIRGIN VALLEY, in the northern part of the county, are attracting attention.

CINNABAR DEPOSITS owned by W. G. Adamson and opened up 50 miles south of Winnemucca appear to be among the largest ever found. The Adamson group comprises 21 claims. A furnace is in operation and there is plenty of ore for a long run.

Lyon County

BURLINGTON-NEVADA (Mason Pass)—Ore of shipping grade is now being mined. Development is progressing with satisfactory results.

WHEELER (Bald Mountain)—The cyanide plant which was erected to treat tailings from the Wheeler mill now has two 40-ton tanks in operation. A third tank is being installed.

YERINGTON-BULLION (Yerington)—It is reported that this company will replace its gasoline engine with electric power. This will require a two-mile line from the main power line of the Truckee River General Electric Co.

EMPIRE NEVADA (Yerington)—Notices to all lessees have been issued, stating that their leases will continue for only 60 days longer. This would appear to mean the abolishment of the leasing system, extensive work by the company and the probability of the erection of the proposed leaching plant to treat these and other ores of the district.

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MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Sept. 25, 1913, were as follows: From Mason Valley mine, 2210 tons; from Nevada-Douglas, 873 tons; from other mines, 1045 tons; total 4128, or a daily average of 583 tons. During the same week four cars of matte were shipped.

Mineral County

CALIFORNIA GOLD EXPLORATION CO. (Aurora)—Development on this company's group of 12 claims on Silver and Last Chance hills has been satisfactory. It is reported that a mill will be built next spring.

AURORA CONSOLIDATED MINES CO. (Aurora)—About two-thirds of the concrete work on the mill has been completed. Lessees on the 400-ft. level are mining ore assaying \$50 per ton. The double-track haulage tunnel is now in 1700 ft. and will be driven 100 ft. farther to cut the vein. The intersection will be at a depth of 400 ft. The Last Chance Hill and Juanita claims will be prospected by a crosscut from the main tunnel.

Nye County

FAHEY-NELSON (Ione)—This cinnabar property was sold recently; a compressor plant will be installed.

EARLE (Manhattan)—The mill formerly operated by the Brady lease has been purchased and is now in operation.

MERCURY MINES CO. (Ione)—A large tonnage of ore is being developed. Weekly shipments of 30 flasks of mercury are being made.

NEVADA CINNABAR CO. (Ione)—This company's property adjoins that of the Mercury Mines Co.; new furnaces are being installed. The first step, the burning of 450,000 brick of good quality, has been successfully accomplished on the property.

BIG FOUR (Manhattan)—A shortage in the water supply is responsible for milling below normal capacity. The sinking of the shaft on the Brady lease on the Union No. 9 to a depth of 600 ft. is nearly completed. A station will be cut at the 580-ft. level and a drift run to the vein. The drift on the 480-ft. level will be advanced.

MUSTANG (Manhattan)—It is stated that this property has been sold to San Francisco men, and that control of the Jumping Jack, Indian Camp, and Stray Dog, have also been secured and that these will be operated together with the Manhattan-Crescent and Riley Fraction. The ores will be treated in the War Eagle mill, and the addition of more stamps to the mill is contemplated.

TONOPAH LEASING & MINING CO. (Tonopah)—The shareholders at their special meeting in Salt Lake, recently ratified the proposition of the board of directors to dispose of their interests to the company owning the ground on which the lease was held. This is part of a deal whereby the Ross and Kirchen interests of Utah and Nevada take over territory in Tonopah. The proposition to dispose of the leasing stock was passed, and the leasing stock is to be exchanged for stock in a new company now under process of organization. The new company is to be known as the Tonopah Cash Boy Consolidated, its capitalization to be \$2,000,000, divided into 2,000,000 shares of stock, par value \$1. Of this capitalization, 500,000 shares are to be retained in the treasury; 935,000 shares go to the Tonopah Cash Boy company for its property; 265,000 shares go to the Tonopah Victor company for its property, and 300,000 shares go to the Tonopah Leasing & Mining Co. for its relinquishment of the two-year lease held by it on the Cash Boy territory. The leasing company will turn in its present stock, therefor receiving one share of the new for each four shares of the old.

NORTH CAROLINA

Union County

HOWIE (Waxhaw)—Work has been under way at this mine where a dry-crushing plant of 500 tons capacity has been remodeled. The result is a modern fine crushing, continuous treatment cyanide plant of 50 tons daily capacity, consisting of Gates rock breaker, two sets of Allis-Chalmers rolls crushing in solution, followed by a Dorr classifier. From the classifier the sand will go to a tube mill and be returned to the classifier. The slime passes to a thickener or dewatering tank, and the thickened pulp is diluted and agitated by air jets, after which it is alternately dewatered and thinned to wash out dissolved gold, and run to waste without filtering. The shaft is being retimbered and the mine is being unwatered. The intention is to work old dumps while developing. This is the mine where the first successful cyaniding was carried on in North Carolina, some \$30,000, having been taken out of tailings eight years ago.

OREGON

Baker County

HOMESTAKE (Sumpter)—The owner of this group of claims is preparing for some improvements, and will continue operations throughout the winter.

FLAGSTAFF—Ore assaying \$147 per ton has been encountered at this mine in the Baker district, and an increased force of men will be put to work at once.

Malheur County

A NEW MINING DISTRICT, about 20 miles east of Jordan Valley post office, is being opened up to development. The orebodies consist of deposits of lead, copper and iron ores, and gold ore of good grade is found. At Flint, an English syndicate is now developing some properties, having built a large mill of 100 tons daily capacity and having put on a force of 50 men.

PENNSYLVANIA

Allegheny County

AMERICAN ZINC & CHEMICAL CO. (Pittsburgh)—Good progress is being made in the construction of the 400-ton zinc reduction plant; the foundations being about completed and by another month the buildings will be well up.

UTAH

Beaver County

MONTREAL (Milford)—Operations at this property have been suspended on account of the death of one of the chief owners.

BLACKBIRD (Newhouse)—This property is being developed through the South Utah workings, and milling ore carrying chalcopryite has been opened.

Juab County

TINTIC SHIPMENTS for the week ended Sept. 26 amounted to 133 cars.

EAGLE & BLUE BELL (Eureka)—Gross earnings in August amounted to \$46,700. Operating expenses were \$13,700, leaving \$33,000 net earnings as compared with \$15,900 in July.

BLACK JACK (Mammoth)—Ore for the trial run at the new Knight mill will probably be furnished by this property. This will come from old dumps at the Star Consolidated workings, a short distance from the Knight railroad.

GRAND CENTRAL (Robinson)—The shaft is to be re-timbered from the 400-ft. level up, and this work will probably require a short shutdown. High-grade copper ore from the 2400 is being mixed with lower grade from the 2300 level.

EUREKA HILL COMPANY (Eureka)—This company, which supplies a large part of the water used in Eureka from its pumping plant at Homansville formerly run by steam, is now using electric power supplied by the Utah Power Co.

IRON BLOSSOM (Silver City)—The new vein east of the main ore channel has been opened at another place on the 500 level. This vein was first found from the No. 1 workings, and later from the No. 3 shaft. The work above-mentioned cuts the vein between these points.

CENTENNIAL-EUREKA (Eureka)—A dividend of \$1.50 per share has been declared. In April a dividend of like amount was paid, making a total of \$300,000 thus far for 1913. There are 100,000 shares, practically all of which are owned by the United States Mining Co.

UTAH MINE (Fish Springs)—The September output amounted to two cars of high-grade silver-lead ore. This came largely from the upper levels, but as far down as the 800. Water has interfered somewhat with operations, on account of insufficient pumping equipment.

Salt Lake County

MICHIGAN-UTAH (Bingham)—Repairs to the tramway have been completed, and operations resumed on a good-sized scale by the company.

OHIO COPPER (Bingham)—About 2500 tons of ore are being mined and milled daily. Little has been made public in regard to the recent directors' meeting, though it is understood that an effort will be made to reduce the charges of 15c. per ton on ore hauled through the Mascotte tunnel.

MONTANA-BINGHAM (Bingham)—This company has received 50,000 shares of the Bingham Amalgamated Copper Co. in accordance with the tunnel agreement between the two companies. The Montana-Bingham transportation tunnel had been driven 2020 ft., Sept. 15, which gave this company the right to the amount of Amalgamated stock above mentioned.

U. S. SMELTING, REFINING & MINING—The usual quarterly dividend of 87½c. per share on the preferred and 75c. per share on the common stock has been declared, payable Oct. 15. The total distribution amounts to \$307,217 for the preferred, and to \$364,740 on the common, which will bring an aggregate on both stocks to \$18,520,506. Large coal properties have been acquired in this state.

Summit County

DALY-JUDGE (Park City)—Work under contract by J. A. McIlwee is being done at this property, and during August, 1500 ft. of development was accomplished with a working force of 70 men.

DALY WEST (Park City)—A fissure carrying some ore in the quartzite is being followed on the 900-ft. level. The objective point is the limestone-quartzite contact. An increased tonnage of better grade ore is coming from the 1700. Development is being done by the McIlwee Company under contract.

Utah County

YANKEE (American Fork)—Ore hauling will be started in the near future.

DUTCHMAN (American Fork)—Lead-silver ore of good grade has been mined from a new strike during the summer, and there is nearly a car of ore at present in the bins.

WASHINGTON

Pend Oreille County

PEND OREILLE COUNTY consists of the eastern portion of what was formerly Stevens County, the county having been recently divided.

METALINE OROIOLE MINING CO. (Metaline)—Plans for the 50-ton mill were to be ready by Oct. 1, and the work of erection will begin at once. It is the intention to install two tables at once so as to treat about 20 tons per day. There are about 300 tons of ore on the lower dump and 1200 tons blocked out above the lower tunnel level. Below the lower tunnel level there is an incline shaft 100 ft. deep on the vein which dips at this place about 60°. A drift has been driven to the west 70 ft., and is in ore all the way. The ore assays about 11% lead, 27% zinc, 20 to 60 oz. silver, about \$5 in gold, and carries some copper and iron. From five to eight tons of ore yields one ton of concentrate.

Spokane County

GERMANIA—Active operations are to be resumed at this mine in the near future.

LAME FOOT—This group of claims near the boundary has been taken over by the Grandby Consolidated company, which will do considerable development work.

CANADA

British Columbia

A NEW PLACER FIELD is reported to have been found on Sibola Creek, 50 miles east of the head of Gardner Canal. Stampedeers are going in by way of Francis Lake. The entire creek has been staked and shafts are being sunk to bedrock.

PTARMIGAN—This group near the center of Vancouver Island, has been purchased by an English syndicate headed by the Earl of Denbigh. The group contains large bodies of low-grade copper ores.

UNION (Gloucester)—In a 75-ft. tunnel and at a depth of 100 ft. from the glory hole from which the recent shipment of ore was made, the vein has been reached. The 23-ton shipment made to the Granby smelting plant at Grand Forks netted about \$50 per ton.

OWEN LAKE (Hazelton)—This group has been bonded to Frank A. Brown for \$50,000. Five veins are exposed in the workings which show good zinc, silver, lead and copper ore. The veins range in width from 4½ to 10 ft. The group is 14 miles from the Grand Trunk Ry. and about 100 ft. higher.

Ontario

STERLING (Arsenic Lake)—This mine was sold at public auction by order of the courts, Oct. 1, to the Montreal Trust Co., for \$230,000.

THREE NATIONS (Porcupine)—Testing operations of the 10-stamp mill have proved satisfactory, and between 40 and 45 tons of ore per day are now being treated. A directors' meeting, shortly to be held in Montreal, will consider the matter of increasing the number of stamps to 20 and adding a cyaniding plant.

DOME (South Porcupine)—The concrete work for the new 40 stamps will be completed about the middle of the month, when work on the steel work will be commenced. It is not expected that the additional stamps will be ready for regular operation before Mar. 1, 1914. The main shaft has reached a depth of 425 ft., where a station for the fifth level is being cut.

MEXICO

Mexico

DOS ESTRELLAS (El Oro)—The employees have appealed to the director of the bureau of labor against the action of the new manager who proposes to do away with the practice that formerly prevailed of giving medicine free of charge to the families of the miners. The possibility of a strike by the miners is suggested in the petition.

Sonora

THE SHIPMENTS FOR SEPTEMBER from Mexico through the port of Agua Prieta totaled 13,594 tons of ore, 72 bars of bullion and 40 cars of precipitates distributed as follows: Nacozari, 299 cars, 11,985 tons; El Tigre, five cars, 211 tons; Monte Cristo, one car, 16 tons; El Temblor, one car, 18 tons; San Nicholas, 1 car, 32 tons; El Vaquero, two cars, 66 tons; Crestoncito, 1 car, 33 tons; Ventana, 1 car, 37 tons; La Union, one car, 22 tons; Agua Buena, one car, 25 tons; Estrella, nine cars, 239 tons; Santa Marguerita, 11 cars, 310 tons; El Gallo, 17 cars, 546 tons; and El Tigre, 72 bars gold and silver bullion, 40 cans precipitates, estimated value, 200,000 pesos. The copper ore was worth 1,960,500 pesos; silver ore, 878,900 pesos, and the gold ore, 468,700 pesos, a total of 3,308,100 pesos.

MOCTEZUMA COPPER CO. (Nacozari)—The Pilares shaft which has now reached a depth of 1100 ft., will be continued on down to 2000 ft., which will make it the deepest shaft in Sonora.

LA UNION (Fronteras)—G. B. Bell is working about 30 men and making regular shipments to the Douglas smelters. An engineer is now on the ground making an examination for Eastern men.

EL TEMBLOR (Esqueda)—The new shoot of ore recently encountered has improved and a shipment is now at the smelters. One streak of ore contains some high-grade ore, which is sorted out and stored at the Tigre; the ore will average \$1 per pound.

MINNEAPOLIS COPPER CO. (Cumpas)—When this company closed down about two months ago it was expected that work would be resumed in a short time. The property is now in charge of a watchman while creditors are trying to get some satisfactory settlement without taking over the property.

NACOZARI CONSOLIDATED COPPER CO. (Nacozari)—Work is being rushed on the foundations for the concentrator, which will be of 100 tons capacity. In the mine the whole breast is in ore containing silver, copper and lead. More ore is being developed all the time, and there is enough ore in sight now to keep the mill running for many months.

CHURUNIBABI (Nacozari)—The leases on the properties of the Moctezuma Copper Co. will run out next month and few of them will be renewed, as the Copper Queen smelting works will not accept any more ore from this district on the siliceous basis. It is claimed that more ore of this kind is being received now than is needed. The ore contains about \$20 in gold and silver and about 80% silica.

AFRICA

West Africa

Gold production of the Gold Coast and Ashanti in August was 30,247 oz. For the eight months ended Aug. 31 the total was 225,903 oz. in 1912, and 268,587 oz.—or \$5,551,693—in 1913; an increase of 42,684 oz. this year.

Rhodesia

Gold production in Rhodesia in August is reported at 59,555 oz., or 287 oz. more than in July. For the eight months ended Aug. 7 the total was 426,985 oz. in 1912, and 454,410 oz.—or \$9,392,655—in 1913; an increase of 27,425 oz. Other production for August included 90 carats diamonds, 11,777 oz. silver, 25 tons lead, 79 tons asbestos, 11,712 tons chrome ore and 20,494 tons coal.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Oct. 8

The metal markets have been inclined to quiet and prices have shown a slight declining tendency. Fluctuations have been small.

MONTHLY INDEX NUMBERS

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

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

Copper, Tin, Lead and Zinc

Copper—A good deal of nervousness has been exhibited on the part of some producers and quotations have consequently extended through a wide range. Sporadic sales of near-by electrolytic have been made up to 16.65c. delivered in Europe, equivalent to about 16.40 here. On the other hand an offer by a dealer to sell a substantial tonnage for October-December at about 16c. cash, New York, failed to find acceptance. The efforts of some impatient dealers to force speculative lots for sale has been a feature of the market. There has been no demand from domestic consumers. The transactions of the week have been quite mixed and we can but generalize the quotations, representing neither the higher nor lower extremes. The situation in Lake copper remains unchanged. Casting copper has been rather pressed for sale.

The statistics which were published on Oct. 8 again emphasized the excellent statistical position of the metal, and it is hoped that in consequence of the further decrease in the available supply consumers will be more inclined to anticipate their requirements. At the close Lake copper is quoted at 16½@17c., and electrolytic copper in cakes, wire-bars and ingots at 16.20@16.30c., while casting copper is quoted at 16@16.05c. as an average for the week.

The London standard market has been depressed throughout the week and at the close is about £1 lower, the quotations being cabled at £73 2s. 6d. for spot, and £73 for three months. The position of the market is exceedingly sensitive, due to the small visible supply.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., car-load lots at mill.

Exports of copper from New York for the week were 7635 long tons. Our special correspondent gives the exports from Baltimore at 2672 tons for the week.

Visible stocks of copper in Europe, Oct. 1, are reported as follows: Great Britain, 15,130; France, 2710; Rotterdam, 2700; Hamburg, 1120; Bremen, 1480; other European ports, 800; total, 23,940 long tons, or 53,625,600 lb. This is a decrease of 1200 tons from the Sept. 15 report. In addition to the stock, above 1320 tons are reported afloat from Chile and 3450 tons from Australia, making a total of 28,710 tons.

Tin—There was little activity in the market during the past week. The London bull party seems to be resting for the time being and to be leaving the market to its fate. It therefore displayed a sagging tendency and interest on part of consumers was entirely lacking. The close is somewhat firmer at £185 15s. for spot and £186 5s. for three months, and about 40¼c. for October tin in this market.

Visible stocks of tin on Oct. 1 are reported as follows, including tin afloat: London, 5648; Holland, 1938; United States, excluding Pacific ports, 5357; total, 12,943 long tons, an increase of 1682 tons during September.

Lead—The market is demoralized, due to the apprehension that a further cut in the official price of the leading sellers is imminent, and a great deal of metal has been pressed for sale in anticipation, as a result of which prices have experienced a sharp decline. The market is weak at 4.25@4.35c., St. Louis, and 4.40@4.50c., New York.

The London market for Spanish lead has also suffered a

recession, the closing quotations being cabled at £20 for Spanish and £1 higher for English.

Spelter—With the passage of the Underwood bill, the position of the foreign market was brought to the attention of consumers, and in some cases orders were placed for foreign spelter, which, however, did not affect the price abroad. In consequence, consumers held aloof from the domestic market, while smelters, who did not wish the foreigners to take their business away from them, reduced their price below the import parity. All these developments have greatly unsettled business, and the market closes in this state at 5.20@5.25c., St. Louis, and 5.35@5.40c. New York. A considerable tonnage was placed at the sharp concession in price.

Good ordinary spelter in London is quoted at £20 15s., and specials 12s. 6d. higher.

Base price of zinc sheets was reduced ¼c. on Oct. 6, and is now \$7.75 per 100 lb., f.o.b. Peru, Ill., less 3% discount. Extras and discounts unchanged.

DAILY PRICES OF METALS

NEW YORK

Oct.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.		Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.
2	4.8600	61½	*16½ @17	16.25 @16.35	41½	4.50 @4.60	4.35 @4.45	5.40 @5.45	5.55 @5.60
3	4.8595	61½	*16½ @17	16.25 @16.35	40½	4.50 @4.55	4.35 @4.40	5.35 @5.40	5.30 @5.35
4	4.8580	61½	*16½ @17	16.25 @16.35	40½	4.45 @4.50	4.30 @4.35	5.35 @5.40	5.20 @5.25
6	4.8570	61	*16½ @17	16.20 @16.30	40½	4.40 @4.45	4.25 @4.30	5.35 @5.40	5.20 @5.25
7	4.8550	61½	*16½ @17	16.20 @16.30	40½	4.40 @4.45	4.25 @4.30	5.35 @5.40	5.20 @5.25
8	4.8550	60½	*16½ @17	16.20 @16.30	40½	4.40 @4.45	4.25 @4.30	5.35 @5.40	5.20 @5.25

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Oct.	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.
2	28¼	74½	16.10	74	79½	187½	188½	20½	4.48	20½	4.51	
3	28½	73½	16.02	73½	79½	186½	186½	20½	4.43	20½	4.54	
4	28½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	28½	73½	15.89	73	79½	184½	185½	20½	4.40	20½	4.54	
7	28½	73½	15.94	73½	79½	184½	185½	20	4.35	20½	4.51	
8	28½	73½	15.89	73	79	185½	186½	20	4.35	20½	4.51	

The above table gives the closing quotations on the 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. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately, Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

Other Metals

Aluminum—The market has been quiet with only a moderate quantity of business. Quotations are rather nominal at 20@21c. per lb. for No. 1 ingots, New York. The foreign market is reported firm.

Antimony—Business has been more active and there is quite a demand for spot and early deliveries. The passing of the new tariff law has been followed by a general adjustment of prices, which are from 0.75 to 1c. lower. Cookson's is quoted at 7.60c.; Hallet's 7.12½@7.37½c. per lb.; while 6.35@6.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—The market is rather quiet still. The New York quotation is \$38.50@39 per flask of 75 lb. for large orders; while 55@56c. per lb. is asked for jobbing lots. San Francisco, \$38.50 for domestic and \$36 for export. London price is unchanged at £7 5s. per flask, with £7 named by second hands.

Gold, Silver and Platinum

Gold—Prices of gold on the open market in London have been unchanged at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some £1,100,000 was reserved for Egypt and £120,000 for India, the balance of the supplies received being taken for Germany.

Iridium—This metal continues at a high level, dealers asking \$83@85 per oz. New York.

Platinum—No change is reported and prices are a little irregular. Dealers hold for \$45 per oz., but there are sales at \$43@44 and the market can be quoted at those figures. For hard metal \$49@52 per oz. is quoted.

Silver has barely maintained its high level; this owing to the fact that when the information became public that the India government had made large purchases of silver and a large shipment of about £1,000,000 had been consigned from London to the East, presumably for the government, the market reacted and silver has declined about ½d. to 28¼d., and is today quiet at this figure.

Shipments of silver from London to the East, Jan. 1 to Sept. 25, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India.....	£7,551,200	£5,163,500	D. £2,387,700
China.....	933,500	652,000	D. 281,500
Total.....	£8,484,700	£5,815,500	D. £2,669,200

Imports of silver at New York week ended Oct. 4 were \$214,246, chiefly from Mexico and South America. Exports were \$842,720, to London and Paris.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Oct. 4

The base price paid this week for zinc ore was lower, \$45 down to \$43 per ton of 60% zinc. The base price paid for 80% lead ore was \$55 per ton.

SHIPMENTS WEEK ENDED OCT. 4	Zinc		Sulphur
	ore, lb.	ore, lb.	
Week	2,481,040	64,450	1,090,760
Year to date	114,100,910	5,295,640	45,121,610
Shipped during week to separating plants, 3,299,620 lb. zinc ore.			

JOPLIN, MO.—Oct. 4

The high price of zinc blende is \$48, the base per ton of 60% zinc \$43@45 for choice grades. These prices ruled Friday for next week's delivery, and the market was decidedly weak, with no encouragement for a better condition soon. The shipment was practically the same. Calamine sold on a basis of \$21@23 per ton of 40% zinc and the market continued strong to the week-end. The average of all grades is \$42.02 per ton. Lead declined in some instances \$2 per ton for week-end and early next week's delivery, but the bulk of the shipment was on last week's quotations. The high price is \$59.50 and the base \$54 per ton of 80% metal contents. The average of all grades is \$55.66 per ton.

SHIPMENTS WEEK ENDED OCT. 4	Blende Calamine Lead			Value
Total this week..	10,797,530	729,640	2,477,810	\$311,165
Total, 40 weeks..	429,288,340	32,150,750	72,035,560	\$11,989,664
Blende value, the week, \$232,515; 40 weeks, \$9,651,526.				
Calamine value, the week, \$9690; 40 weeks, \$414,749.				
Lead value, the week, \$68,960; 40 weeks, \$1,923,389.				

MONTANA ZINC ORE

The Butte & Superior Co. reports total concentrates produced as follows: July, 8700 tons; August, 11,000; September, 11,500; total for the quarter, 31,200 tons.

IRON TRADE REVIEW

NEW YORK—Oct. 8

Reports published in the daily press early in the week that cuts of \$1 to \$3 a ton in steel prices had been "announced" following the enactment of the tariff bill, are entirely without foundation. There has been practically no noticeable decline in steel prices in the past week, though in some lines the market is a trifle softer. Sheets, which were specifically mentioned as having been reduced \$2 a ton, are really the steadiest line in the whole list, with the possible exception of rails and merchant bars.

It is universally recognized that there will have to be declines in some steel products in order to start a fresh buying movement, but as buyers show not the slightest disposition to take hold for forward deliveries the mills in no hurry to offer concessions. Meanwhile they are still able to make fairly large shipments—against old orders, and are booking a moderate amount of new business—for quick shipment.

Price adjustments on account of the new tariff may prove to be less drastic than was expected. The main readjustments will be in finished products along the Atlantic and Gulf seaboards, and as the advantage of doing business with domestic mills is probably valued at \$1 to \$3 a ton the readjustments may prove to be slight. At present prices pig iron, unfinished steel or finished steel could not possibly penetrate inland as far as Pittsburgh.

PITTSBURGH—Oct. 7

The steel mills in the Pittsburgh Valley district continue to run practically full. While they are being operated under slightly reduced pressure, there are no departments definitely closed, and the actual tonnage output is probably equal to fully 90% of the rated capacity. In bars and shapes the large mills are comfortably filled for three months' run in the majority of instances, while in plates they have nearly as much business. Eastern mills, it is reported, are not running nearly as well. Shading in plates has increased somewhat, so that an order does not need to be as desirable as formerly to bring a concession from 1.40c., which, however, remains the quoted market on small lots. On shapes 1.40c. is common although 1.45c. is sometimes quoted. It develops that wire prices were shaded considerably more in the buying movement of the past few weeks than was reported, and it seems all the important business was placed at concessions of from \$1 to \$2 from the nominal prices, based on \$1.65 for nails. The market on fairly attractive lots is now quotable at \$1.60 for nails and 1.40c. for plain wire, with concessions possible in the case of very desirable business.

Buyers are apathetic and are making purchases only for absolute wants in the immediate future. As a result prices are not under much pressure and whatever yielding there may be eventually will hardly occur until inquiry increases and there is more tonnage to figure upon.

Pig Iron—The market continues stagnant throughout, but without any weakening in producers' quotations, which are well held. Production is less than six months ago and the current output is well taken on old orders. Consumers are indifferently covered for the present quarter and have bought nothing for the new year so that an active market will necessarily be developed within 30 or 60 days. W. P. Snyder & Co. announce the average of bessemer iron in September at \$15.75, and of basic iron at \$14.1375, Valley, these averages each showing an advance of about 9c. from August, the first advances shown this year. The compilations are made from the actual sales of valley iron, in lots of 1000 tons or over. The September computations included 15,000 tons of bessemer and 4000 tons of basic, the smallest tonnages for several months. The market remains quotable as follows. Bessemer, \$15.75; basic, \$14; No. 2 foundry, \$14; malleable, \$14.25; forge, \$13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Through ferromanganese being placed in the free list in the tariff law which became effective Oct. 4 the pool price of \$52.50, Baltimore, becomes \$50 as the former price was subject to the old duty of \$2.50. We quote the market for prompt and forward at this figure, with \$2.16 freight to Pittsburgh and very little interest manifested by buyers.

Steel—Still lower prices are quotable on steel. Hardly any steel is passing in the open market, but mills having contracts have freely made adjustments at lower and lower figures on current shipments, to prevent their contract customers going elsewhere. We quote as the outside of the market on desirable orders \$23 for billets and \$24 for sheet bars, maker's mill, Pittsburgh or Youngstown, either bessemer or open-hearth, a decline of \$1 from last week's quotations.

Rods are quotable 50c. lower, at \$26.50 on ordinary lots and \$27 on small lots.

British Exports and Imports of iron and steel and manufactures thereof are valued by the Board of Trade returns as follows for the eight months ended Aug. 31:

	Exports	Imports	Excess
Iron and steel.....	£36,841,732	£10,000,475	Exp. £26,841,257
Machinery, hardware, etc.....	41,539,450	10,548,809	Exp. 30,990,641
Total.....	£78,381,182	£20,549,284	Exp. £57,831,898
Total, 1912.....	62,702,948	17,799,474	Exp. 44,903,474

Quantities of iron and steel exported were 3,091,429 tons in 1912, and 3,336,002 in 1913; quantities imported were 1,251,715 tons in 1912, and 1,436,794 in 1913. Exports above include value of new ships built for foreign countries.

IRON ORE

Shipments of iron ore from the Lake Superior district in September were 6,166,687 long tons. This makes the shipments to Oct. 1 a total of 32,401,249 tons; an increase of 2,642,431 tons, or 8.9% this year.

The Canadian Venezuelan Ore Co. is pushing its work and expects to be able to ship 2500 tons of its Imataca iron ore daily. It is shipping now about 16,000 tons a month.

COKE

Connellsville Coke—The demand for prompt and October furnace coke was all satisfied without absorbing anything like all the cut-price coke available, and the market is quotable at \$2.15@2.25 for prompt, with contract coke available at \$2.25. With the recent accretions to the ranks of operators who sell through the Producers Coke Company there are now about 5000 ovens thus represented, with an asking price of \$2.50 on furnace coke, and about 5000 ovens are controlled by other companies which are also quoting \$2.50. There remain in the Connellsville and lower Connellsville region about 5000 ovens the product of which is offered at various prices. The coke market is likely to be quite uneventful during the next two months while in December there should be considerable activity for 1914, as many contracts expire with the end of the year.

Anthracite Shipments in September were 5,572,279 tons. For the nine months ended Sept. 30 the totals were 44,835,219 long tons in 1912, and 51,281,885 in 1913; an increase of 6,396,666 tons.

Coal Passing Sault Ste. Marie, season to Sept. 1, short tons:

	1912	1913	Changes
Anthracite.....	926,926	1,809,401	I. 882,475
Bituminous.....	8,063,094	10,533,201	I. 2,490,107
Total.....	8,990,020	12,362,602	I. 3,372,582

The increase this year was 37.5%. Gains were large, both in anthracite and bituminous.

Coal and Coke Tonnage of Pennsylvania R.R. east of Pittsburgh and Erie eight months ended Aug. 31, short tons:

	1912	1913	Changes
Anthracite.....	6,452,287	6,851,626	I. 399,339
Bituminous.....	30,207,895	33,396,286	I. 3,188,391
Coke.....	8,597,730	9,731,462	I. 1,133,732
Total.....	45,257,912	49,979,374	I. 4,721,462

The total increase was 10.4%. The largest proportional increase was in the coke tonnage.

CHEMICALS

NEW YORK—Oct. 8

The general market is still in good condition, with a fair amount of business forward.

Arsenic—The market remains dull. Quotations are \$3@3.25 per 100 lb. and are rather nominal.

Copper Sulphate—Business is good. Prices are unchanged at \$5 per 100 lb. for carload lots and \$5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—The market remains dull, but steady, and prices are unchanged. The quotations are 2.40c. per lb. for both spot and futures.

PETROLEUM

Exports of mineral oils from the United States in August were 181,627,779 gal. For the eight months ended Aug. 31, the total exports were 1,197,999,755 gal. in 1912, and 1,314,452,536 gal. in 1913; an increase of 116,452,781 gal., or 9.7%, this year.

The monthly report of the "Oil City Derrick" gives the number of new wells completed in September as follows: Pennsylvania grade, 752; Lima-Indiana, 129; Kentucky, 26; Illinois, 163; Kansas-Oklahoma, 970; Texas-Louisiana, 153. A grand total of 2193 wells were completed, with an initial production of 54,330 bbl. There were 340 dry holes and 160 gas wells. Compared with the August report there was a decrease of 188 in completions. Illinois and Kentucky were the only divisions that gave an increase in completions and initial production. The largest decrease is in Texas and Louisiana. On Sept. 30, there were 686 rigs up and 2352 wells drilling.

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.

	May	June	July	August	September
Alaska shipments	1,771,508	2,203,191	2,705,136	1,847,785	.....
Anaconda.....	25,600,000	21,500,000	22,100,000	22,500,000	.....
Arizona, Ltd.....	3,200,000	2,600,000	2,600,000	1,800,000	1,800,000
Copper Queen.....	8,301,605	7,477,936	8,369,607	8,252,404	.....
Calumet & Ariz.....	4,300,000	4,000,000	3,800,000	4,500,000	.....
Chino.....	3,883,611	3,682,706	4,831,185	6,050,867	4,308,296
Detroit.....	2,001,633	1,750,601	1,549,224	2,187,223	.....
East Butte.....	1,268,595	1,055,646	1,060,257	1,800,000	.....
Mammoth.....	1,700,000	1,750,000	1,800,000	1,750,000	.....
Giroux*.....	625,000	610,000	610,000	.....	.....
Mason Valley.....	1,186,560	1,097,014	908,892	867,060	.....
Miami.....	1,943,900	2,612,000	.....	.....	.....
Mammoth.....	.....	.....	.....	.....	1,750,000
Nevada Con.....	5,933,275	6,344,863	5,403,919	.....	.....
Ohio.....	650,071	537,400	601,700	.....	.....
Old Dominion.....	2,749,000	2,511,000	2,526,000	2,524,000	2,679,000
Ray.....	4,384,400	4,392,612	4,097,000	4,269,519	.....
Shannon.....	1,080,000	924,000	880,000	1,248,000	1,232,000
South Utah.....	200,000	185,000	140,000	223,498	.....
Tennessee.....	\$1,037,115	1,379,220	1,247,804	.....	.....
United Verde*.....	3,000,000	2,900,000	3,000,000	.....	.....
Utah Copper Co.....	10,003,227	11,637,949	9,849,043	10,302,251	.....
Lake Superior*.....	18,705,000	16,500,000	17,500,000	9,700,000	.....
Non-rep. mines*.....	6,300,000	6,000,000	6,200,000	.....	.....
Total prod.....	109,824,500	104,051,138	101,758,167	.....	.....
Imports, bars, etc.....	22,205,942	18,255,267	29,029,990	.....	.....
Total blister.....	132,030,442	122,306,405	130,788,157	.....	.....
Imp. ore & matte.....	10,528,562	7,497,002	8,527,046	.....	.....
Total Amer.....	142,559,004	129,803,407	139,315,203	.....	2,688,000
Miami.....	.....	.....	2,890,000	3,097,500	.....
Shattuck-Arizona.....	1,026,170	1,059,625	1,019,388	1,001,634	.....
Brit. Col. Cos.....	.....	.....	618,379	.....	.....
British Col. Cop.....	618,076	634,238	618,379	.....	.....
Granby.....	1,782,570	1,789,000	1,664,102	1,847,344	1,824,659
Mexican Cos.....	.....	.....	.....	.....	.....
Boleo†.....	2,424,800	1,984,640	2,240,720	2,264,640	.....
Cananea.....	2,272,000	2,908,000	3,228,000	3,186,000	3,148,000
Moctezuma.....	2,695,881	3,438,793	2,693,006	3,542,047	.....
Other Foreign:	.....	.....	.....	.....	.....
Braden, Chile.....	1,150,000	1,804,000	1,046,000	1,572,000	1,332,000
Cape Cop., S. Af.....	387,520	414,400	.....	.....	.....
Kyshtim, Russia.....	1,490,000	1,000,000	2,500,000	.....	.....
Spassky, Russia.....	721,280	835,520	660,800	1,048,320	.....
Exports from:	.....	.....	.....	.....	.....
Chile.....	3,584,000	5,824,000	9,856,000	8,736,000	.....
Australia.....	7,840,000	7,616,000	10,304,000	7,720,000	.....
Arrivals-Europe†.....	13,661,760	5,277,440	11,728,640	14,624,960	.....

* Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

‡ In operation only 20 days in May.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
IX, '12	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.....	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.....	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.....	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,382	78,491,840	183,804,222
II.....	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.....	136,251,849	76,585,471	77,699,306	122,302,590	81,244,800	203,547,390
IV.....	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.....	141,319,416	81,108,321	88,285,978	75,549,108	85,948,800	161,497,908
VI.....	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.....	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII.....	131,632,362	73,649,801	73,263,460	53,594,945	66,420,480	120,015,385
IX.....	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X.....	.....	.....	.....	29,793,094	53,625,600	83,418,694

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

Assessments

Company	Delinq.	Sale	Amt.
Alpha Con., Nev.	Sept. 22	Oct. 15	\$0.02
American, Utah	Sept. 18	Oct. 18	0.001
Blue Star, Ida.	Sept. 20	Oct. 16	0.03
Challenge, Nev.	Sept. 30	Oct. 21	0.05
Confidence, Nev.	Sept. 23	Oct. 14	0.10
Cons. Virginia, Nev.	Oct. 3	Oct. 24	0.10
Copper King, Ida.	Sept. 14	Oct. 14	0.01
Emma, Utah	Sept. 19	Oct. 18	0.005
Honolulu, Ida.	Sept. 23	Oct. 24	0.0011
Iron Spar, Ida. (postpo'd)	Sept. 13	Oct. 11	0.0025
Lucky Swede, Ida.	Sept. 20	Oct. 16	0.003
Michigan Copper & Gold, Utah	Oct. 8	Oct. 25	0.0025
New Hope, Ida. (postpo'd)	Sept. 19	Oct. 18	0.002
North Bunker Hill, Ida. (postpo'd)	Aug. 16	Oct. 16	0.002
Overman, Nev.	Oct. 2	Oct. 23	0.05
Raymond-Hilincis, Utah	Oct. 11	Oct. 27	0.005
Royal Copper, Ida.	Sept. 29	Oct. 29	0.001
Sandstorm-Kendall, Nev.	Sept. 19	Oct. 24	0.01
Santaquin Chief, Utah	Oct. 13	Oct. 31	0.0025
Santaquin King, Utah	Oct. 9	Oct. 27	0.0025
Sierra Nevada, Nev.	Sept. 25	Oct. 25	0.10
Silver Mountain, Ida.	Sept. 15	Oct. 15	0.002
St. Louis, Nev.	Sept. 22	Oct. 14	0.01
Sunset, Nev.	Sept. 2	Oct. 13	0.01
Sunshine, Ida.	July 1	Oct. 15	0.001
Teddy, Ida.	Sept. 15	Oct. 15	0.001
Tuscumbia, Ida. (postpo'd)	Aug. 23	Oct. 23	0.003

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	52.043	61.290	58.990	24.486	28.215	27.199
July	53.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	60.640	24.209	29.088	27.986
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

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

COPPER

Month	New York				London Standard	
	Electrolytic		Lake		1912	1913
	1912	1913	1912	1913		
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	16.328	17.698	16.799	78.762	73.125
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

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

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.140
March	42.577	46.832	192.619	213.615
April	43.923	49.115	200.513	224.159
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	42.410	223.762	193.074
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

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

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	4.698	4.924	4.579	22.292	20.648
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

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

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	5.694	7.313	5.544	27.048	21.148
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

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

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	\$15.12	\$18.15	\$13.32	\$17.35	\$14.00	\$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	17.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	16.65	16.03	15.04	15.63	14.93
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	\$16.01	.....	\$14.93	.....	\$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Oct. 7		SALT LAKE Oct. 7	
Name of Comp.	Bid.	Name of Comp.	Bid.
Aracela	\$.02	Beek Tunnel	\$.05
Cripple Cr'k Con.	\$.01	Black Jack	\$.10
C. K. & N.	\$.07	Cedar Tailman	\$.00
Doctor Jack Pot.	\$.05	Colorado Mining	\$.10
Elkton Con.	\$.54	Columbus Con.	\$.00
El Paso	3.00	Crown Point	\$.00
Flindlay	\$.02	Daly Judge	6.00
Gold Dollar	\$.08	Grand Central	\$.47
Gold Sovereign	\$.02	Iron Blossom	1.22
Isabella	\$.09	Little Bell	\$.10
Jack Pot.	\$.04	Lower Mammoth	\$.00
Jennie Sample	\$.05	Mason Valley	3.87
Jerry Johnson	\$.03	May Day	\$.06
Lexington	\$.005	Nevada Hills	\$.90
Moon Anchor	\$.006	New York	\$.03
Old Gold	\$.01	Prince Con.	\$.30
Mary McKinney	\$.58	Silver King Coal'n	\$.35
Pharmacist	\$.01	Sloux Con.	\$.01
Portland	\$.98	Uncle Sam	\$.03
Vindicator	\$.88	Yankee	\$.08

TORONTO Oct. 6			
Name of Comp.	Bid.	Name of Comp.	
Balley	\$.05	Foley O'Brien	\$.20
Conlans	7.40	Hollinger	16.75
T. & Hudson Bay	\$70.00	Imperial	\$.02
Timiskaming	\$.20	Jupiter	\$.12
Wetlaufer-Lor.	\$.13	Pearl Lake	\$.19
Apex	\$.01	Porcu. Gold	\$.08
Blg Dome	10.00	Preston E. D.	\$.01
Crown Chartered	\$.00	Rea	\$.10
Doble	\$.10	Swastika	\$.03
Dome Exten.	\$.07	West Dome	\$.08

LONDON Sept. 27	
Name of Comp.	Cig.
Camp Bird	£0 16s 0d
El Oro	0 15 0
Esperanza	0 18 9
Mexico Mines	5 17 6
Oroville	0 7 0
Santa Ger'dis	0 18 9
Stratton's	0 1 6
Tomboy	1 6 3

SAN FRANCISCO

Oct. 7

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	7.00
Alta	\$.07	Belmont	.....
Belcher	\$.21	Jim Butler	\$.65
Best & Belcher	\$.05	MacNamara	\$.10
Caledonia	1.90	Midway	\$.41
Challenge Con.	\$.12	Mont-Tonopah	1.15
Chollar	\$.02	North Star	\$.38
Confidence	\$.39	West End Con.	1.51
Con. Virginia	\$.17	Atlanta	\$.14
Crown Point	\$.20	Booth	.....
Gould & Curry	\$.03	C.O.D. Con.	\$.02
Hale & Norcross	\$.09	Comb. Frac.	\$.04
Mexican	1.12	Jumbo Extension	\$.12
Occidental	\$.70	Pitts-Silver Peak	\$.38
Ophir	\$.22	Round Mountain	\$.40
Overman	\$.50	Silver Pick	\$.04
Potosi	\$.03	Tramp Con.	\$.01
Savage	\$.18	Argonaut	2.50
Sierra Nevada	\$.12	Bunker Hill	1.75
Union Con.	\$.10	Central Eureka	\$.12
Yellow Jacket	\$.46	So. Eureka	\$.25

N. Y. EXCH. Oct. 7		BOSTON EXCH. Oct. 7	
Name of Comp.	Cig.	Name of Comp.	Cig.
Amalgamated	75	Adventure	1
Am. Agr. Chem.	44	Ahmeek	280
Am.Sm.&Ref.com	65	Alaska Gold M.	23
Am. Sm. & Ref., pt. B	100	Algoma	1
Am. Sm. Sec., pt. B	82	Aflouez	35
Anaconda	35	Am. Zinc	18
Batopilas Min.	1	Ariz. Com. cts.	4
Bethlehem Steel, pt.	70	Bonanza	32
Chino	41	Boston & Corbin	75
Federal M. & S., pt.	38	Butte & Balak	3
GreatNor.ore.ctf.	32	Calumet & Ariz.	65
Guggen. Exp.	44	Calumet & Hecla	430
Homestake	104	Centennial	14
Inspiration Con.	15	Cliff	1
Miami Copper	23	Copper Range	39
Nat'l Lead, com.	45	East West	2
National Lead, pt.	105	East Butte	12
Nev. Consol.	161	Franklin	3
Phelps Dodge	188	Granby	73
Pittsburg Coal, pt.	89	Hancock	161
Quicksilver, pt.	3	Hedley Gold	30
Ray Con.	19	Helvetia	40
Republic I&S, com.	19	Indiana	4
Republic I&S, pt.	80	Island Cr'k, com.	51
SlossSheff'd, com.	29	Island Cr'k, pt.	84
Sloss Sheffield, pt.	89	Isle Royale	19
Tennessee Copper	31	Keweenaw	11
Utah Copper	53	Lake	8
U. S. Steel, com.	56	La Salle	3
U. S. Steel, pt.	106	Mass.	2
Va. Car. Chem. pt.	96	Michigan	1
		Mohawk	41
		New Adrealdan	1
		New Idria Quick	2
		North Butte	27
		North Lake	1
		Ojibway	75
		Old Dominion	51
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