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Tin Deposits Near Cape Town

By E. M. Weston*

SYNOPSIS—Tin occurs near Cape Town, South Africa, in lodes and alluvial deposits. The latter are being worked by hydraulic methods. This results in destruction of vineyards, etc., so that provision for resoiling is made. Water is carefully conserved.

The geological structure of the Cape Peninsula and its neighborhood shows basement granite capped by the slates and quartzites of the Malmesbury series, again overlaid by the Table Mountain sandstones. Cassiterite has been found occurring in veins and associated impregnations in granite and also in the rocks of the Malmesbury series and in detrital deposits resulting from denudation of these rocks. Examples of the first type are found about 18 miles east of Capetown on the properties of the Kuils River and Cape Bischoff tin companies; they are found on the upper slopes of a low range of granite hills and tin occurrences have been traced for about a mile. The granite is a coarsely porphyritic variety with biotite mica. The veins are connected with a fine-grained light-colored leucocratic dike rock composed of quartz albite and muscovite. The veins are of compact white quartz with muscovite concentrated on their selvages. The cassiterite occurs as crystalline masses and crystals, and is associated with wolframite, molybdenite, chalcopyrite and arsenopyrite.

Finer tin ore occurs impregnating the granite along shear zones. The veins run northwest and dip 30° to the east. Though they carry rich tin ores in places, they did not appear to me to hold much promise of successful mining. Their denudation has, however, formed some rich alluvial deposits in a valley about one mile long. The Kuils River Co. owns the upper portion of the valley which is laid out in woods and vineyards. The company worked some of the shallower ground by primitive hand sluicing, wheeling the deposits to long boxes for washing. This method proved most expensive and little profit was made. Later on, the company was reorganized by an English syndicate acquainted with Australian methods and a semi-portable barge equipped with a 10-in. centrifugal pump was installed. A general view of the present workings is shown in Fig. 1.

There is a scarcity of water, necessitating great care in its use; there is no storage for débris except in worked-out ground; the ground, if resoiled, is valuable. These three considerations govern the method of working employed. There is from 20 to 30 ft. of sandy overburden above the old stream bed. Hydraulic sluicing through a 2-in. nozzle is carried on under natural head from two storage dams higher up the valley and the large boulders are stacked by hand labor. The tin ore and sand are sluiced into the sump as shown and elevated to the sluice boxes shown in Fig. 3. At the head of these is set a grizzly with bars about 1 in. apart, where natives pick out all larger stones and débris. The tin ore, which is generally the size of a pea and under, is caught on the Australian system. While sluicing is proceeding, natives keep loosening the moving wash by means of sluice forks and as the tin accumulates, the height of the various riffles shown in the illustration is increased until the sluice is full of a partially concentrated deposit. This is period-

Fig. 1. Kuils River Workings and Barge

Fig. 2. Workings Showing Sluice

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ically cleaned up under a smaller flow of clean water.

At the end of the sluice there are two spitzkasten. From the bottom of the first, the coarser sands are run out and led to refill the excavated portion of the channel between the dredge and the boundary of the property. The underflow, carrying the soil and slimes, is carried temporarily to a slimes dam and settling pit in the valley somewhat higher up. When the deposit under this slimes dam is attacked as work proceeds up stream, these slimes can be easily sluiced away to resoil over the coarse tailing below the dredge. The position of the dredge will be moved higher up the valley when necessary, but it will be seen that by lengthening the suction pipe and carrying it up stream, the suction head will be reduced and a new sump can be blasted out, so that the old channel can be filled past where the dredge is now situated without stopping the work. Of course, much tin ore remains in the ground sluices to the sump, and is sent to the sluice boxes only during cleaning up, when the rush of water is less.

The method of conserving water is of interest. The overflow from the last spitzkasten is pumped up to the storage dams and reused for sluicing. Both the slimes and to a certain extent the sands drain back into the sump. It seems a pity at first sight to see the beautiful vineyards, orchards and plantations being eaten up, but it is easy to imagine that with this system of working in a few years the damage will be largely repaired.

The lower portion of the valley is under different ownership and this deposit will be sluiced direct to some barren, sandy, lower lying land, which will be resoiled in a somewhat similar manner.

The lode tin deposits in the Malmesbury beds are being explored on the Devils Peak of Table Mountain. The mill and workings are shown in the foreground of Fig. 4. No large production has so far been made. Veins are also being explored on the Tygerberg hills to the north of Capetown with encouraging results.

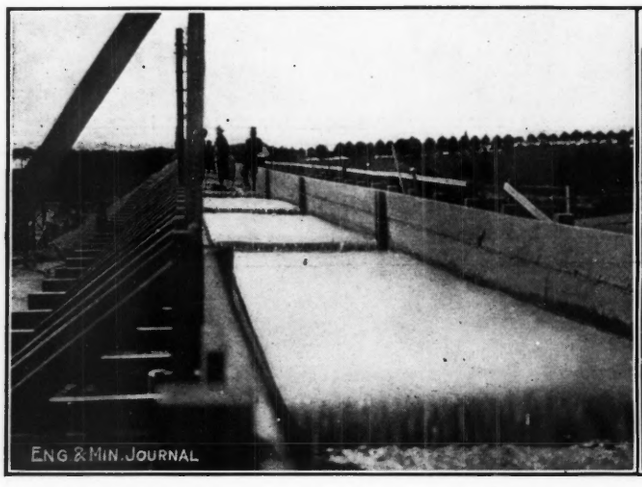

FIG. 3. THE SLUICE AT CLEANING-UP TIME

FIG. 4. TIN MINE ON TABLE MOUNTAIN IN FOREGROUND, CAPE TOWN IN DISTANCE

Aluminum Precipitation

The manufacture of aluminum dust is an expensive process, while the solid metal is more cheaply obtained. For this reason the solid form is preferred as a precipitant in cyanide processes. Heretofore, however, it has been impossible to use solid metal because it becomes coated with a deposit, which arrests chemical action. In order to use the solid form, granulated aluminum, Charles Butters has patented a process (U. S. pat. 1,092,765), whereby the metal is placed in a tube mill, and the metal-bearing solution passed through it. The mill itself may be lined with aluminum plates, though this is not considered necessary.

Franklin

According to the 1913 report of the Franklin Mining Co., Houghton, Mich., the company ended the year with a deficit of $100,264, after crediting the surplus of $41,839 carried forward from 1912. Total expenses amounted to $306,660, of which $235,063 was spent at the Franklin mine, exclusive of smelting and selling charges on copper sold. Owing to the strike the report only represents an operating period of a little over six months; during this time 1,021,440 lb. of copper were produced from 123,179 tons of rock stamped or 127,033 tons of unsorted ore. Development work totaled 1947 ft., and exploration work consisted of 452 ft. of crosscutting and 897 ft. of diamond drilling. Measurements show that 160,162 tons were mined underground, indicating an increase of 33,129 tons of mill rock now in the mine. Some of the details of mining costs are as follows: 117 ft. of shaft sinking, $10.06 per ft.; 397 ft. of raising, $5.86 per ft.; 1299 ft. of drifting, $5.181 per ft.; 134 ft. of crosscutting, $4.90 per ft.; 8898 fathoms of stoping, $6.15 per fathom. These costs do not include air or drill charges, hoisting expense, or miscellaneous surface and underground expenses. Drifts are now being driven at intervals of 250 ft. instead of every 125 ft., as was the custom. This increase in the height of stopes has in a great measure been made possible by the one-man drill. The main benefits from this change will be the reduced cost of drifting and timbering, and increased efficiency of trammers. A crosscut on the 32d level recently cut the Allouez conglomerate and shows a remarkable increase in copper contents above what it carried in the upper levels. One sample of 4½ tons and representing 15 ft. of lode assayed 31.8 lb. per ton; another sample of eight tons representing a 15-ft. section assayed 35.2 lb. per ton.

Concreting the Junction Shaft

By Robert H. Dickson*

SYNOPSIS—Timber lining replaced with poured concrete. Some light reinforcement used. Quarry opened, storage and mixing plant erected in headframe. Wooden forms bound with iron. Routine consisted of pulling old timber, transferring lowest forms to new position and pouring concrete, which was shot from surface in pipe, caught in bucket and distributed. Method of setting guides. Speed and costs.

The Calumet & Arizona Mining Co., of Bisbee, Ariz., has just completed replacing the timbers of its Junction shaft with concrete. The new shaft, 27 ft. 3 in. long and 6 ft. wide, has been concreted to the surface from a point 1535 ft. below. This was accomplished in eight months and 24 days. The Junction shaft is located in the heart of the Bisbee or Warren district, and being the deepest, is used as a central pumping shaft for all the mines. A fire in this shaft, necessitating stopping the pumps, would flood the lower levels of the deeper mines, in a short time. The primary object in concreting was to eliminate this risk and incidentally provide a thoroughly uptodate hoisting shaft.

Concreting was started 25 ft. below the 1510 level and was carried up in 5-ft. sections. Except at the stations, standard sets of forms, which could easily be set up and taken apart, were used. The materials used for the concrete were stored in overhead bins, from which they could easily be fed to the concrete mixer. After mixture in the proportion of one part cement, three parts sand, and five parts rock, the concrete was dropped through an iron pipe to that part of the shaft where it was to be placed. Steel reinforcement of ¾-in. rods with a tensile strength of 50,000 lb. per sq.in., was used in the curtain walls which separated the shaft compartments; in the columns required at stations; and in the shaft walls, where back-filling was required.

Quarry and Storage Methods

Since the work required 8374 cu.yd. of concrete, a good deal of time was spent in erecting storage bins and equipping a quarry, before actual concreting. A limestone quarry, ½ mile away, and near the railroad tracks, was opened and equipped with a crushing plant. The quarry was so situated upon the side of a hill that the rock could be trammed over a trestle and fed direct into a jaw crusher. A trommel classified the rock into two sizes, ⅜ in. to 1¾ in., which was used as crushed rock in the concrete; and under ⅜ in., which was mixed with the sand, although at no time did it compose over 40% of the sand used. The quarry force consisted of one white boss, with one crusherman, three trammers and two drillers, all Mexicans. Plugger machines were used for drilling.

The rock was taken from the quarry in regular 50-ton ore cars to the storage bins at the mine. The rock and sand were dumped into these bins from a trestle, over which the cars were hauled by a compressed-air hoist and cable. As required, the rock and sand were drawn out of these large storage bins through doors at the bottom into mine cars, which were trammed to the shaft and then hoisted in cages to the shaft storage bins. These bins, shown in Fig. 4, were made of 10x10-in. timber with 4-in. bottom and sides, and were divided into three compartments, one for rock, one for sand, and one for cement. They were set above the concrete mixer.

Mixing

The rock, sand and cement were drawn out of the overhead storage bins into a special measuring car which held the right quantities of the materials for the 1 : 3 : 5 mixture. This car was run on a track in front of the bins and filled, and then the charge was dumped by releasing the side door into the hopper of the mixer.

The concrete was mixed in a Smith mixer, of ½-cu.yd. size, run by an electric motor. This mixer consists of a double conical drum supported and guided by a frame

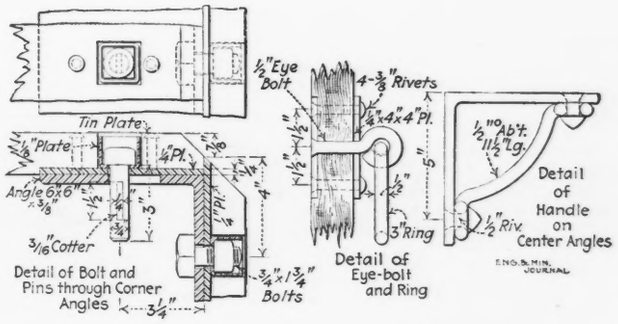

Fig. 1. Details of Some of the Form Fittings

which can be tilted at will while the drum is revolving. As the charge was fed to the mixer, which was always revolving, the requisite quantity of water was added by means of an overhead tank fitted up with two valves. While a batch was being discharged from the mixer, the operator opened the intake valve so as to admit water into the tank until it discharged through an overflow pipe. The tank now holding the requisite amount of water could be discharged rapidly into the mixer by opening the valve in the large discharge pipe.

Design of Shaft

The shaft as concreted is 18 in. wider and 13 in. longer than the old shaft, the dimensions of all the compartments being increased. The relative size of the old and new shafts is shown in Fig. 3, compartments 1 and 5 being pipe compartments; 3 and 4, the main hoisting compartments; and 2, the dinky cage compartment. A dinky is also run in No. 5 to facilitate repairing the steam and water lines. The concrete curtains, noted as reinforced with steel rods, separate the compartments from one another, except that between Nos. 1 and 2, a wooden partition is used.

In the walls, the concrete was placed usually so as to fill all the space between the forms and the solid rock. At places where the rock opened out so as to make necessary a wall over 2 ft. thick, a dry wall was built of

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rock and loose rock was thrown in behind. The concrete wall was never less than 8 in. thick, except where a rock of less than 4 sq.ft. in area projected no closer to the form than 4 in. At 10-ft. intervals, 2x5-ft. windows or air vents were left in the curtain walls between the hoisting compartments to obviate the suction which would be created by the cage moving in so long a tube. Scaffolding boxes were left every 5 ft. in the pipe compartments, so as to permit staging to be erected at any part of the shaft. I-beams for carrying the pipes were set every 20 ft., and others for electric cables every 40 ft. from the 1510 level to the 770, and every 100 ft. from the 770 to the surface. The reinforcement in the curtains was placed horizontally about every 2½ ft., one rod being close to one side of the curtain, the next to the other. The ends of the rods were bent at 45° to give a grip on the side walls.

The Forms

A novel feature was the type of form. These consisted of sections 5 ft. high. As soon as concrete filled all the space back of one section, another section was set up on top of it, and filled in like manner. Three complete sets of forms were used, the lowest being taken out as needed above. They were made of 2-in. timber, dressed to 1⅝ in., and fastened together with ½-in. plates. Before being put together, the boards were thoroughly soaked in water so as to be in the same condition while making, as they would be while in use. The forms consisted of four pieces for each compartment, or more, in the case of those compartments where pipes in the shaft did not allow the handling of large pieces.

In general braces were used across the compartments between the horizontal sections of the forms. These were 2x3x¼-in. angles. They stayed the forms so that there was no bending and movement as the concrete was poured.

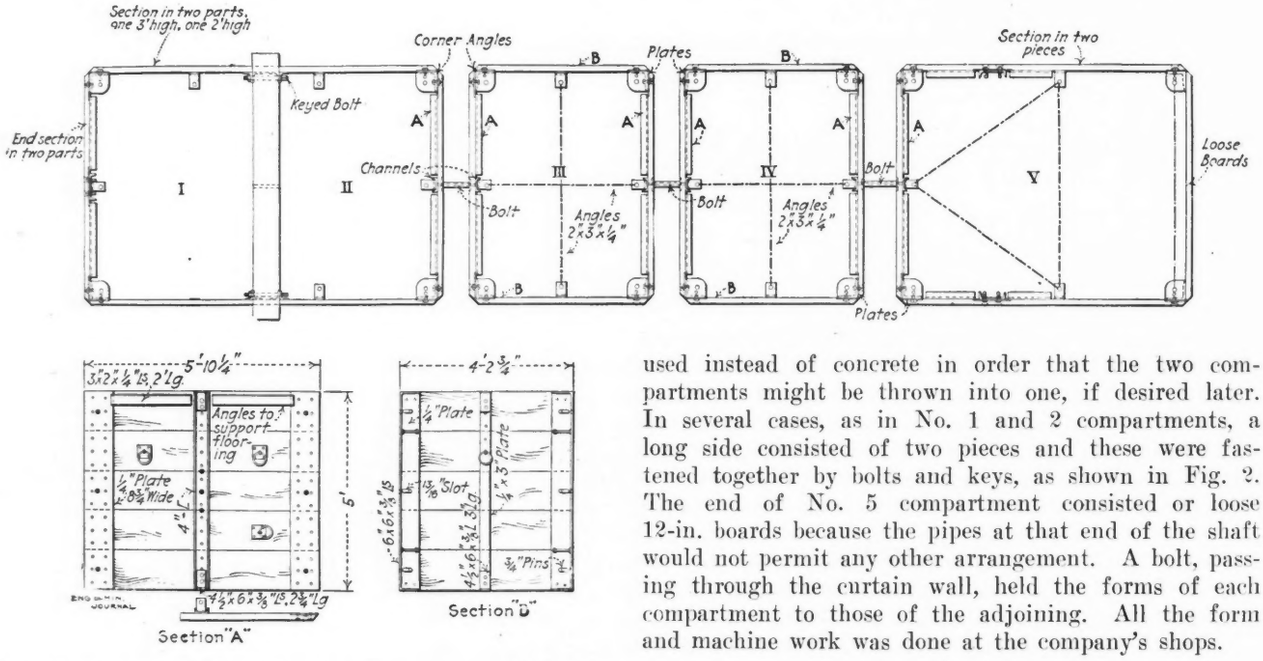


Fig. 2. Arrangement of the Forms in the Shaft and Details of Two Sections

In No. 4 compartment, which is typical of the others, the forms consisted of two sides, marked *A* in Fig. 2 and the two ends, *B*. The boards of each piece were fastened together with a 4-in. channel at the center and a ½-in. plate at each end, which was planed so as to make the pieces fit snugly together. Horizontal angles at the top reinforced the forms against buckling and also supported the boards of the working floors. As the angles were below the top of the form, these boards did not project over the curtain walls and were held in place. All four corners of the set were beveled as shown in the drawing so as to allow them to be more easily removed from the concrete. Each piece was provided with a ring at or near the upper half of the center of the form so as to permit easier handling. The four pieces were held together by a 6-in. angle iron, at each corner of the compartment. In compartment No. 1, the end was made in two pieces so to allow it to be slipped out from behind the pipes. Compartments No. 1 and 2 are really one large compartment, separated by a timber partition. Timber was used instead of concrete in order that the two compartments might be thrown into one, if desired later. In several cases, as in No. 1 and 2 compartments, a long side consisted of two pieces and these were fastened together by bolts and keys, as shown in Fig. 2. The end of No. 5 compartment consisted or loose 12-in. boards because the pipes at that end of the shaft would not permit any other arrangement. A bolt, passing through the curtain wall, held the forms of each compartment to those of the adjoining. All the form and machine work was done at the company's shops.

Stations and Pocket

Concrete columns 16 in. square took the place of walls at the stations where openings had to be left in the sides of the shaft. Curtain walls extended between the two opposite columns, as in the case of the walls above. The columns were reinforced with ¾-in. steel rods tied with wire. At the 1400 level an ore pocket 17x17x28 ft. was concreted. Forms were made underground, as needed for the station columns and this pocket, and the concrete was poured into these in the same manner as with other parts of the shaft.

Method of Work

Work was started on Dec. 2, 1912. A wooden bulkhead was built across the shaft about 30 ft. below the 1510 level upon which the first set of forms rested. Fig. 2 shows a section of the shaft, illustrating the ar- Fig. 4 shows a section of the shaft, illustrating the ar- standard conveying pipe extended the whole length of

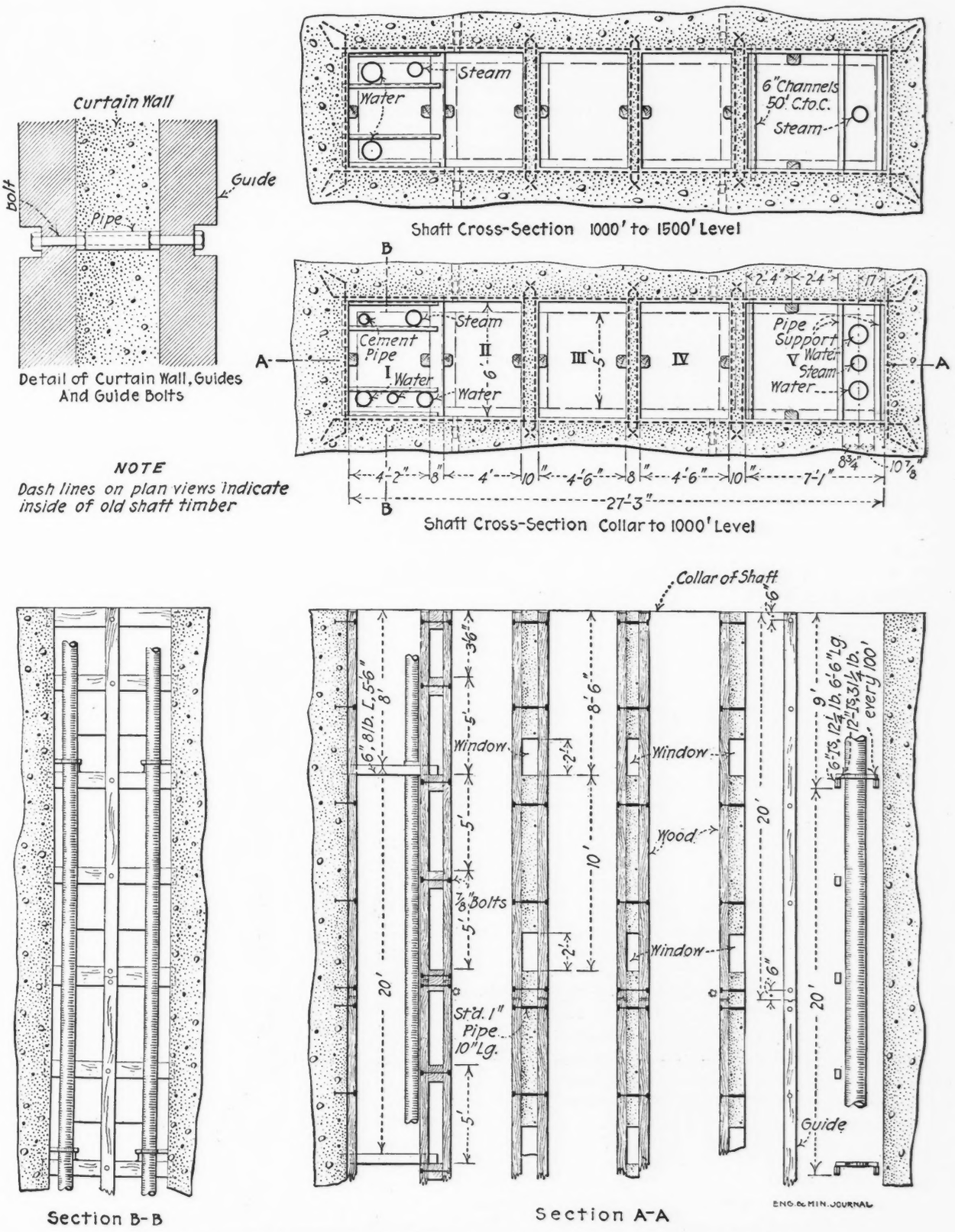


FIG. 3. SHAFT SECTIONS SHOWING RELATIONS OF CONCRETE AND OLD TIMBER

the shaft and terminated 4 in. above the top of the receiving bucket. Concrete from the mixer was dropped through this pipe into the bucket, and thence poured through chutes so as to fill all the space between the forms and the rock walls.

In order to give a clear idea of the work involved in concreting a 5-ft. section, a brief description of the different steps might be given. The cycle of operations involved concreting, removing timber, pulling forms from below and setting them up above. After a set was filled with concrete, a board floor was placed across the top of the last set of forms and upon this the men worked in removing the shaft timber.

Pulling Timber and Handling Forms

Only enough timber was taken out at a time to permit the progress of the concreting. One man split the nuts of the 1½-in. hanging bolts of the set above with a compressed air cutter, while the concrete was being poured. At first, several of the dividers were chopped in two and pulled out of place by a chain fastened below the hoisting cage. This loosened the wall plates, which were in two pieces; thus the posts could be removed. Then by fastening the chain to the wall plate, it was pulled from its position. As each piece of timber was dislodged, it was placed on the cage. The removal of the timbers often dislodged some loose rock. In the case of bad ground, before a portion of the set was removed or immediately after, long pieces of lagging or stringers were placed up against the walls so that their upper ends could be blocked behind the last set of timbers in place, if possible, and their lower ends held in place against the wall by stulls or braces extending across the shaft. Often the stringer or lagging was held in place by several stulls. Except at stations, the open ground above a set to be concreted never exceeded 10 ft. As concreting proceeded, these stringers or lagging pieces were removed, if possible. In removing timber and in fact, in all the work, the hoist proved to be the most useful tool on the job. It was used to break timbers, to dislodge them, to raise forms, and to hoist men, old timber, rock, etc.

After removing the timbers, the temporary floor was taken up and the forms were pulled from the lowest set in place, set up, and blocked. Two bulkheads were always kept below the men, one 5 ft. below the lowest set of forms and one 30 ft. below this. In pulling forms, two men loosened them below while two above set them in place. The only tools required were a wrench and short bar. Beside the three sets of forms, used in the shaft, two other sets were kept to supply repair parts. As stated, the four pieces of form for each compartment were held together by bolting to angle irons at the four corners of the compartment. In the end pieces, the nuts were contained in the form, as shown in the detail drawing, Fig. 1, so that by unscrewing the bolt, leaving the nut in the form, the corner angles could be speedily removed from the keyed bolt of the side pieces. The ends of the angles had one flange turned over and welded. After taking out the corner angles from below, they were taken to a point above the last set of forms in place and were fastened to the corner angles of this set by means of keys and bolts through holes in the turned over ends. Then the sides were pried off from the walls below and fastened to a chain suspended from the hoisting cage by which they were taken above, and there dropped into place and fastened to the respective corner angles. The chain was then fastened to the end pieces, the keys removed from the bolt which passed through the curtain wall, and the end pieces were taken above, set up, and similarly fastened to the corner angles. In this manner the complete set of forms was taken out from below, hoisted and set up above. Eight men with two hoisting cables were able to pull and set up forms in two compartments at the same time.

After setting up, the forms were leveled and blocked in place. In order to set and block them, a line was

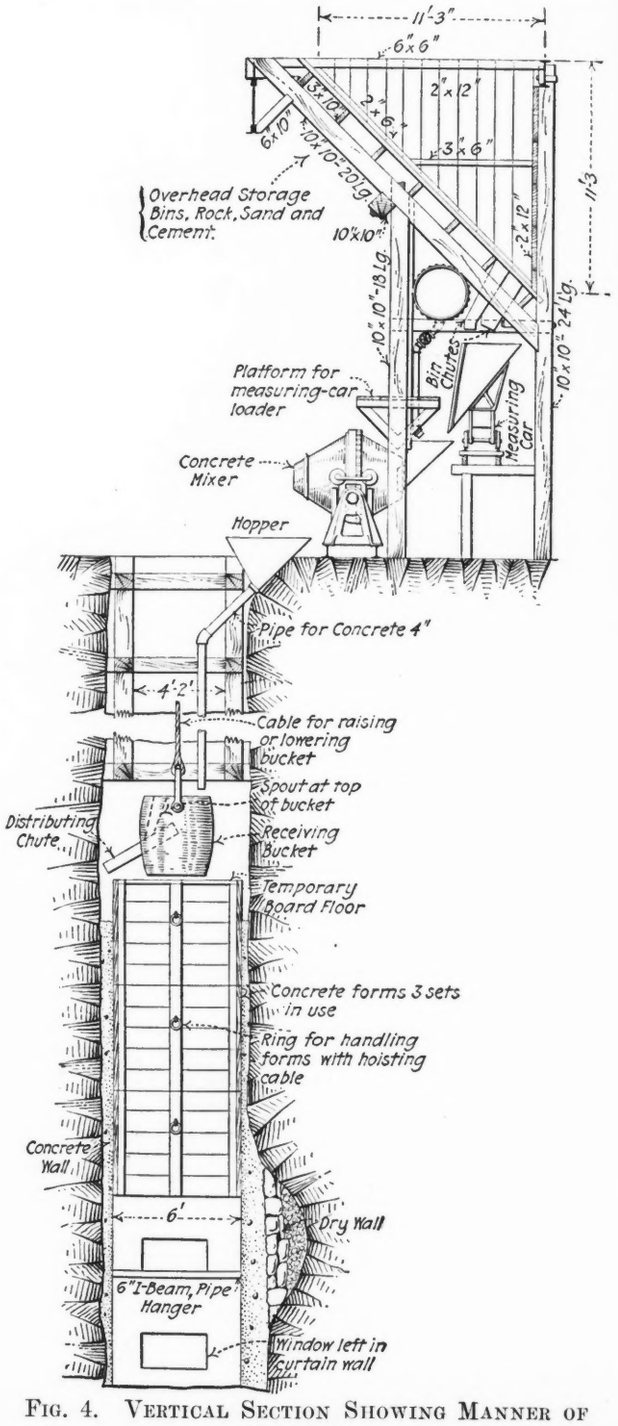


Fig. 4. Vertical Section Showing Manner of Operation

stretched across the shaft between two plumb lines which were placed in the manner described in the JOURNAL, Aug. 9, 1913, and the upper edge of one side set of forms was blocked out from the rock wall so that it came a certain distance from this line, and similarly with one end. The lower edge of the set was held in position by fastening to the set below. The forms were carefully leveled by means of a straight-edge. Small iron wedges were placed under the corners of the forms to level them up, if necessary. Window and staging boxes were placed in the forms as required.

CONCRETING

The forms were now ready for concrete. At the surface one man filled the measuring car and dumped its contents into the mixer, while another added the water to the mixer, and discharged the concrete into the conveying pipe. About 1¼ min. were required to mix ½ of a cu.yd. The concrete dropped from the surface through a conveyor pipe open at both ends, the lower end of which was placed about 4 in. above the receiving bucket. The bucket was of the same type as used by Mr. Michaelson at Globe, being an ordinary sinking bucket with a spout attached. The bucket was usually hung in No. 2 compartment, the bottom usually 3 to 4 ft. above the top of the set. From the spout the concrete was conveyed to the point of deposit through chutes which telescoped like coal chutes used in cities. The bottom of the last set of timbers was usually 2 or 3 ft. above the top of the form. In dropping with so great a velocity, the concrete was literally churned in the bucket and mixed more thoroughly than would be possible in the mixer. The concrete was tamped into place behind the forms. After a section was concreted, the placing of the floor over the forms, the timber removing, the pulling, lining and blocking of the forms, and the concreting was repeated.

SPEED OF WORK

Three shifts each of eight men and a shift boss, made up the shaft crew. Each shift completed as much of a cycle as it could and the next shift started where the preceding shift left off. The time required to remove timber, pull forms and concrete, varied exceedingly under the changing conditions, such as the experience of the men, character of the ground, etc. When first started, the work required as much as two shifts to pull forms, while later on, the average time was five hours. During the months from February to June, it required an average of about 20 hr. to complete the cycle, the time being distributed approximately as follows: Removing shaft timbers, five hours; removing waste or back filling, four hours; pulling forms, lining and blocking, eight hours; concreting three hours. For the upper 450 ft., the average time required for a cycle was 12½ hr. with an approximate distribution of time as follows: Removing timber, two hours; drilling and shoveling, four hours; pulling forms, lining and blocking, five hours; concreting, one and one-half hours. For this instance, the walls had to be blasted all around an average of 8 in., making about 25 cars per 5 ft. of shaft. The actual concreting was finished Aug. 24, 1913. During the whole work, no man was fatally or even permanently injured.

SETTING GUIDES

The guides were bolted to the curtain walls. A short length of pipe was set in the curtain wall while concreting, with wooden blocks at its ends, as shown in the detail, Fig. 3. When setting the guides, the blocks were removed, the guide bolt inserted and held tight to the pipe by nuts which were screwed on to occupy the cavities left by the blocks. The guides were placed over the bolts and held by nuts in recesses. The guides were set from a "go-devil," a box as long as a guide with a section to fit the compartment, the four corners formed of four long stringers, held together by crosspieces and tie rods. On the crosspieces were laid floors, so as to form three decks on which the men worked. In this way, three men at a time could bolt on a guide, one on the top, one on the middle, and one on the bottom.

In the cost table, waste and filling include the labor and supplies used in enlarging the shaft, the removing of the waste dislodged while tearing out the old timbering and the labor and supplies used in refilling caves in the shaft caused by removing timber. Concrete cost includes the cost of quarrying and crushing the rock, the freight, sand, cement and supplies, the mixing and storing of the concrete, and the cost of reinforcement.

COST SHEET PER FOOT AND PER CUBIC YARD FROM DEC., 1912 TO AUG. 24, 1913

	1912 Dec.	1913 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Yardage	444.8	900.3	933.2	1096.5	1120.2	1093.8	931.5	1000.2	853.5
Footage	60	140	170	185	180	200	170	235	196
Alteration in piping, per ft.	$7.84	$4.42	$4.09	$3.44	$5.45	$3.87	$4.42	$1.94	$2.35
Alteration in transmission lines, per ft.	0.74	1.37	0.58	1.14	2.36	1.16	0.54	0.57	0.98
Removing shaft timber, per ft.	19.40	9.52	6.66	7.66	9.27	8.77	7.08	4.27	3.87
Waste and filling, per ft.	4.37	2.88	2.57	4.09	4.41	4.68	10.75	7.11	12.06
Guides, per ft.	0.14	0.32	2.35	1.49	0.00	2.74	5.33	6.57	6.07
Hoisting, per ft.	29.26	12.15	10.42	10.37	9.96	9.78	*a*20.37	6.25	7.36
(1) Repairs to concrete pipe, per ft.	....	....	....	0.07	0.10	0.15½	0.12½	0.01	0.00
(1) Repairs to concrete pipe, per yd.	....	....	....	0.01	0.017	0.03	0.03	0.00	0.00
(2) Forms, per ft.	3.24	6.29	4.72	4.05	2.93½	2.15	2.25	1.60	1.85
(2) Forms, per yd.	0.44	0.98	0.86	0.68	0.38	0.39	0.30	0.38	0.43
(3) Cost of concrete materials, per ft.	53.83	43.52	26.00	30.31	21.33	23.68	24.93	18.50	19.66
(3) Cost of concrete materials, per yd.	7.26	6.77	4.73	5.11	3.43	4.33	4.55	4.35	4.53
(4) Moving forms, per ft.	27.17	16.37	11.63	10.18	8.93	8.57	8.20	7.11	7.00
(4) Moving forms, per yd.	3.73	2.55	2.12	1.72	1.43½	1.57	1.50	1.67	1.65
Distributing concrete, per ft.	9.20	6.64	4.06	3.17	2.77	2.25	2.73	1.90	2.50
Distributing concrete, per yd.	1.24	0.92	0.66½	0.53	0.44½	0.41	0.50	0.45	0.58
Concrete totals 1-2-3-4, per ft.	93.44	72.82	46.41	47.78	36.07	36.80	38.23	29.12	31.01
Concrete totals 1-2-3-4, per yd.	12.67	11.22	8.38	8.05	5.72	6.73	6.88	6.85	7.19
Supervision, per ft.	*b*15.65	*b*6.81	1.49	1.39	1.39	1.30	1.50	1.00	1.00
Supervision, per yd.	2.11	1.06	0.27	0.24	0.24	0.14	0.27	0.24	0.23
Miscellaneous, per ft.	2.08	0.67	0.47	1.45	0.52	0.84	1.69	0.73	0.62
Total, per ft.	172.92	110.96	75.04	78.81	69.43	69.94	89.92	57.56	65.32

Total yardage, 8374.1; total footage, 1536.
a Includes cost of new hoist rope.
b The shift bosses during Dec. and Jan. were carried under supervision.

Zirconium Silicate Is Being Used as a substitute for tin oxide in enameling iron ware. This industry has been absorbing about 3000 metric tons of stannic oxide per year. ("Journ. Soc. Chem. Ind.," Jan. 31, 1914). The natural zirconium silicate is treated with alkali and a product containing about 83% ZrO_2 is obtained, which is the one used.

Carbon Tetrachloride as a Fire Extinguisher*

In recent years carbon tetrachloride has received considerable attention as a fire-extinguishing agent. This is due largely to the activity of certain manufacturers of fire extinguishers which use liquids, the basis of which is carbon tetrachloride.

This substance is a water-white liquid and possesses when pure a rather agreeable odor somewhat similar to chloroform. A considerable proportion of the commercial article upon the market, however, contains sulphur impurities which impart a disagreeable odor. The substance is heavy, its specific gravity being 1.632 at 32° F. It is noninflammable, nonexplosive, and it is readily miscible with oils, waxes, japan, etc. When mixed with inflammable liquids it renders them noninflammable provided a sufficient quantity is added. Its vapor is heavy, the specific gravity being about 5½ times that of air, consequently it settles rapidly.

As an extinguishing agent it operates by diluting the inflammable liquid, rendering it noninflammable, or at least less inflammable, and by forming a blanket of gas or vapor over the burning liquid which excludes the oxygen of the air.

It may not be out of place to mention that the claims made by certain manufacturers producing extinguishers which use liquids, the basis of which is carbon tetrachloride, are grossly exaggerated. These preparations, none of which is more efficient than carbon tetrachloride, are not the equivalent of the ordinary water extinguishers for general use on such materials as cotton, wood, paper, oily waste, etc.

On volatile liquids, oils, etc., carbon tetrachloride has, however, shown satisfactory results under some conditions, but the readiness with which a fire can be extinguished with it depends to a considerable extent upon the skill of the operator and the nature of the fire. In tank fires the length of time that the liquid has been burning is an important factor, and in such cases where the sides of the tank become heated the only way in which the fire can be extinguished is to squirt the liquid forcibly at the sides. If the carbon tetrachloride is squirted directly into the liquid it is much more difficult, if not impossible, to extinguish the fire.

The height of the liquid in the tank is also an important factor. Where the liquid is low the sides form a pocket which retains the vapor and aids considerably in smothering the blaze. When the tank is nearly full, however this condition does not exist, and it is then very difficult, if not impossible, to extinguish a fire in a highly volatile liquid, such as gasoline; only the most skilled operators are successful in these cases. The size of the tank or the extent of the fire if upon the floor is, as would be expected, of considerable importance. In tanks larger than about 28 in. by 12 in., more than one extinguisher and operator working at a time are necessary to extinguish a fire in such materials as gasoline. In one test where a tank 60 in. by 30 in. was used, no less than seven operators were necessary, and even then it was only with the greatest difficulty that the fire was put out.

All of the above remarks apply to carbon tetrachloride in the ordinary one-quart extinguisher as generally sold. It is probable that a large extinguisher which could throw a large stream would prove more efficient, but on account of the great weight of carbon tetrachloride such an extinguisher would have to be specially designed to make it readily portable by mounting on a truck or some similar means. Expelling the liquid by means of a hand pumping arrangement would probably be unsatisfactory, and it would, therefore, be necessary to force it out in some other way.

The fumes of carbon tetrachloride, although of a pungent nature, do not produce any permanent injury under ordinary conditions where the operator can make his escape after he has inhaled all he can stand, but they are distinct handicaps in fighting a fire and are one of the objectionable features to carbon tetrachloride as a general fire-extinguishing agent. In large rooms or where a small quantity of carbon tetrachloride is sufficient to extinguish a fire, the gases are, of course, less objectionable.

*Excerpts from the "Journal" American Society of Mechanical Engineers, December, 1913.

The Power Problem in the Electrolytic Deposition of Metals

At a joint meeting of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, and the New York Section of the American Electrochemical Society, held in the Engineering Building on Jan. 9, 1914, papers were read from each of the societies on the electro-chemical problem.

In narrowing down the question to a copper-refining plant, which is by far the most important of the electrochemical processes, Lawrence Addicks, formerly of the U. S. Metals Refining Co., Chrome, N. J., said that there were several limitations imposed by present practice. The first of these, the direct current, is obviously required by the nature of the process. The amperage is fixed by the current density and the electrode surface per tank. In turn, the current density is fixed by a balance between the interest on copper tied up, the cost of power and the difficulties in practical handling of a rough deposit. Twenty amperes per square foot of active cathode surface may be taken as representing practice in the vicinity of New York, with an ampere efficiency of 90% and an average consumption of about one kw.-hr. at the switchboard per 6 lb. of copper. Electrode surface per tank has steadily increased until 30 pairs of electrodes, 3 ft. square, are used in one case. This calls for a current of 10,800 amperes. Conditions may come into use which require greater amperage, but at present, this may be taken as a maximum for discussion.

Current Requirements

In regard to voltage, carefully studied construction is necessary to avoid serious trouble from leakage currents. These not only waste energy, but wherever current jumps from the electrolyte to a lead pipe or other metallic conductor, an equivalent quantity of copper is deposited thereon, and when crossing acid-soaked wood of high resistance, a quantity of heat is developed sufficient to cause danger from fire. An installation of 1500 kilowatts is a little larger than most units at present installed, but may be taken for a typical case and probably represents the desired size for a new installation. Electrical connection between generators is unde-

sirable, as indicated by the statement on current leakage, and it would probably be necessary to use motor generators instead of rotary converters in any a. c.-d. c. scheme distributing power from a large unit over several circuits.

Uniformity of conditions is the first principle to be observed in the operation of an electrolytic refinery. The process is simple in theory, but delicate, and economy depends upon the successful balaneing of conditions to obtain the best results. Current should therefore be held at a fixed value, following variation in the resistance of a circuit with the voltage. Hand control of the field of shunt-wound generators is satisfaetory as the changes in resistance are gradual, with the exception that in the case of cutting out sections of tanks for several hours when drawing copper, it may not be done.

Electrolytes have a high positive temperature coefficient of conductivity. This amounts to about 0.5% per degree, and as the electrolyte represents about half the ohmic resistance of the circuit, it is evident that its temperature must be considered. The electrical energy dissipated in the tank generally maintains a temperature of 90° to 100° F. and it has been found economical to add sufficient steam in closed-coil heating tanks to keep the circulating electrolyte at an average temperature of about 130° F. Exhaust steam can be used, and roughly an amount equal to one-fourth the steam supplied to the engines is required. Additional steam is required for light and power, compressed air, pumping, and the manifold requirements of a refining process of which the electrolysis is but one step, so that figuring for the moment on the use of live steam for heating the electrolyte, only about one-half the total boiler capacity is used for electrolytic power generation. On the other hand, waste-heat boilers attached to the reverberatory furnaces which form a necessary part of every refinery will generate more than enough steam for heating the electrolyte and any other uses where steam, as such, is essential.

Steam and Fuel Conditions

American copper refineries vary from 4,000,000 to 35,000,000 lb. monthly capacity. At 6 lb. per kw.-hr., a 1500-kw. generator would take care of about 6½ million pounds per month. Aside from the smaller plants and allowing for some future extension of larger ones, we should consider from two to six circuits of 1500 kw. each equivalent to from 15,000,000 to 39,000,000 lb. of copper per month. In the present practice in the vicinity of New York, a cheap source of fuel is found in No. 3 anthracite "buckwheat" at $1.75 per long ton delivered. With this fuel steam can be produced for about 15c. per 1000 lb., including all operating expenses, but excluding administration, taxes, depreciation and interest charges. At this base price for steam, a kilowatt-hour can be safely figured at 0.4c. on a similar basis, allowing for auxiliaries and a reasonable departure from ideal conditions in everyday operating. An approach to 0.3e. can be made with first-class conditions. In present practice use is made of moderate superheating and vacuum, with the highest grade of reciprocating engines. At the Raritan Copper Works four-cylinder Nordberg triple-expansion engines have recently been installed, while at the Chrome plant of the U. S. Metals Refining Co., a triple-expansion unit using a compound Hamilton corliss engine with a Rateau turbine for the third expansion is being tried out. Previous installations have been chiefly confined to compound-condensing units. The installation is of particular interest on account of the successful commutation of 6000 amperes at 1500 r.p.m. by a Rateau-Smoot generator. The installation cost of such power plants may be roughly taken at $100 per kilowatt, including the disproportionate boiler equipment and auxiliaries.

In his paper dealing with the mechanical side of the problem, H. E. Longwell, consulting engineer with the Westinghouse Machine Co., showed that any engine, the exhaust steam of which is fully utilized, can be considered as operating at 100% efficiency. In comparing the performance of a steam-turbine plant with a gas producer installation, each made up of 1500-kw. units, and operating at high load factors, he estimated that when using a good grade of fuel containing 14,500 lb. Fahr. heat units per pound, the gas-producer plant would probably show a saving of ½ lb. of coal per kw.-hr. over the consumption of the steam-turbine plant. With coal at $3 per ton, this would amount to a saving per kilowatt-year of $6, to gain which an extra investment of $50 per kilowatt would have to be made, over and above the cost of the steam-turbine plant.

Exhaust Steam for Heating

Mr. Longwell said that since the auxiliaries extract little useful heat from the live steam, their exhaust can be used advantageously for heating, so that the entire amount for auxiliaries and heating need be only about half of that required for the main prime mover. He said that, regarding the theoretical advantages of arranging the reciprocating compound engines for exhaust into low-pressure turbines, the low-pressure turbine cost about 75% more per kilowatt than the complete-expansion unit, and that few triple-compound engines are sufficiently better than two-cylinder units to make the addition of the intermediate cylinder worth while.

With careful supervision, a really good turbine-driven plant of 6000 to 9000 kw. could be built for about $75 per kw. approximately. With coal at $3 per ton and allowing 10.5% for investment charges, it should be possible with capable and reasonably economical management and careful operation at 100% power factor, to produce energy at the switchboard for 4.3 mills per kw.-hr. approximately.

Sources of Direct Current

F. D. Newbury, of the Westinghouse Electric & Mfg. Co., spoke on the sources of direct current for electrochemical purposes. Of the methods of power supply using steam turbines that are available, it was shown that direct-connected, direct-current, turbo-generators are available only in small units and cannot be designed as conservatively, from the commutation standpoint, as is desirable. Turbine-driven unipolar generators have been unsatisfaetory on account of the difficulties in collecting the current. Combined a.c. turbo-generator and converter units probably afford the best all-round method. They are economical, reliable and flexible, and their particular fields are where large units and long transmissions are required. Standard medium-speed, direct-current generators, gear-connected to high-speed turbines, afford another satisfactory unit. In water-power plants, direct-current, direct-connected generators and alternating-cur-

rent generators with converters are practical. With reciprocating-engine units there are some advantages, although they have little application in modern plants. The lower speeds, common with such units, permit a larger number of poles and armature circuits. On this account there is no reason for considering other schemes than the simple direct-connected commutator-type direct-current generator with such units.

Radium-Prospecting Device

By Arthur J. Hoskin*

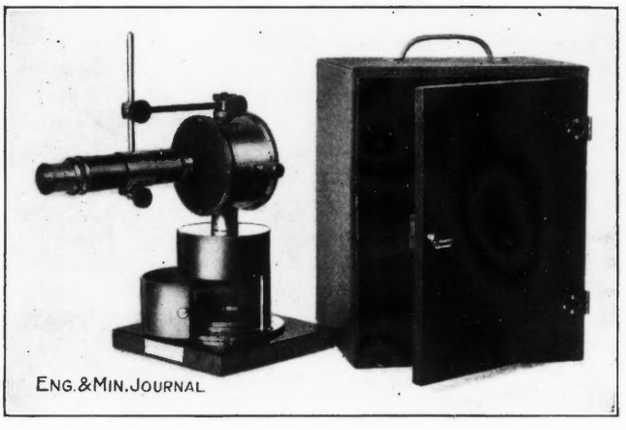
Recent articles on the therapeutic properties of radium and the efforts to put the location and exploitation of radio-active mineral properties under governmental control have stimulated prospectors to such a degree that, despite the unusually severe winter throughout the Rocky Mountains, field work has continued, almost without interuption. The districts that have been looked upon as favorable for the minerals containing radium are somewhat remote from towns where analyses may be made. This fact, and with the present high, though justifiable, charges for such tests have seriously interfered with the work of the prospectors to whom radio-activity is still a novelty. There being a demand for some simple method of testing minerals in the field, the Denver Fireclay Co. has just put upon the market an electroscope shown in the accompanying illustration.

Prospectors for uranium, thorium and other radio-active metals will find this device as indispenable as is the pan in gold prospecting. It is not new in principle, but heretofore similar instruments have been costly and intended for laboratory use only. This new instrument is practically fool-proof and its price—$60—is so low that its cost will be saved many times during even a brief prospecting campaign. Results obtained with it, while not precise, are of sufficient accuracy to enable a prospector or miner to gage his efforts within reasonable limits.

Inside the lower compartment, the door of which is here shown open, may be seen a shallow, removable brass tray. Into this is charged a small amount (about a teaspoonful) of finely pulverized material. The door is then closed. Above this tray is a circular brass plate suspended by a heavy brass wire that passes up through insulation in the central cylindrical neck to the upper compartment which is, in this case, also cylindrical and is provided with wire screen ends. The wire terminates above in a flat strip, ¼ in. wide and about 2 in. long. It stands upright centrally and reaches almost to the top of the compartment. Attached lightly to the upper end of this strip is a strip of thin aluminum foil, ¼ in. wide and 2 in. long, hanging vertically. The post and screws on top of the instrument have no connection with this inside apparatus but are for the support of the microscope shown in front. On the right-hand side is shown a small knob for turning a bent brass wire that may, at will, be brought into contact with the heavy upright wire inside.

Part of the outfit is a 7-in. solid, hard-rubber rod, ½ in. in diam. If this rod be electrified by rubbing against woolen cloth, fur, or the hair of one's head and the end be then applied to the knob, the static electricity will be transferred to the two metallic strips inside the compartment. These two strips will then repel one another with the resulting deflection of the foil from its normal vertical position. By next using the microscope, the operator can easily read, on the scale engraved therein, the number of units the lower end of the foil is pushed away from the brass upright. The effect of radio-active substances is to absorb static electricity from neighboring objects. Accordingly, the sample of mineral in the lower compartment, if it be radio-active, will act through the metallic parts and will immediately reduce the charge in the strips, until eventually the foil will resume its normal, suspended, vertical position. The rate at which such discharge is effected is readily observable through the lenses.

If the prospector have a single sample that has been quantitatively determined, he will use this as his guide and by comparing the actions of this and his unknown samples, he is able to estimate the grades of his finds. The apparatus will not, of course, distinguish between different radio-active minerals but, as a rule, the prospector and miner are concerned with the testing of particular varieties of mineral and their chief concern is to know approximate strengths or contents. By timing himself with a watch and noting the subsidence of the foil in a given time (say one minute) a man should soon become expert in arriving at results that are sufficient for field purposes.



Electroscope for Determining Radio-Activity

The aluminum foil is the only delicate part of the apparatus, but fortunately it is both cheap and quickly renewable. With care, it might never require renewal.

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Effect of Addition Agents in the Electrodeposition of Iron

The paper of O. P. Watts and M. H. Li on this subject reviewed the advantage of depositing iron with a chloride electrolyte over one consisting of sulphates of iron and ammonia. Excessive rusting that ensued with a pure chloride electrolyte led to the use of a mixed chloride and sulphate electrolyte, which gave a fairly smooth deposit with minimum rusting. It was found that the addition of two organic agents, ammonium oxalate and formin, assisted in the prevention of nodules.

Pulverized Coal as a Fuel

SYNOPSIS—The statements made in this article have been collected from the papers of several experts in the proceedings of technical societies or other technical publications.[1] *Coal dust has long been used as a fuel in the cement industry and for a shorter time in certain metallurgical works, but progress has been slow in adapting the fuel for boilers, due principally to the difficulties arising from disposal of the fine ash, which clogs flues and coats tubes.*

Pulverized coal in suspension and mixed with the proper proportion of air will, when blown under favorable conditions into a combustion chamber, burn with a flame in many ways similar to crude oil. The work of developing a method of using pulverized coal as fuel was begun 30 years ago, and its first adaptation to commercial use was by the manufacturers of portland cement, who found the method well suited for heating the cement-burning kilns. For the last 20 years the use of pulverized coal as a fuel has been quite common among cement manufacturers. Ten years ago the American Iron & Steel Manufacturing Co. commenced the experimental use of this fuel in metallurgical furnaces, it proving to be a commercial success for furnaces for puddling and heating, and furnaces of smaller sizes for reheating nut, bolt and spike bars. The experience of this company and of others working along similar lines has shown that it can be used with equal economy for basic openhearth-steel furnaces either with or without firebrick checkerwork. So satisfactory has been the use of this fuel over a number of years and so economical, that the company is largely increasing its installation and is about to apply it to openhearth-steel furnaces.

Work on the adaptation of this method of using coal in firing steam boilers was begun 20 years ago, but much has yet to be learned before the use of this fuel can be extensively recommended. Charles F. Shelby tried pulverized coal as a fuel for reverberatory furnaces at Cananea, Mexico, six or seven years ago, and found great difficulties arising from the accumulation of the coal ash in the flues.[2] It is this particular point that gives rise to most of the difficulties encountered in trying to use pulverized coal as a fuel, and is particularly aggravating in the case of adapting this fuel for boilers. It has been stated by one authority that the greater portion of the ash produced in certain metallurgical works escapes up the stack, and it is quite to be expected that wide adaptation of this fuel in boiler practice would result in the drafting of laws requiring a removal of all suspended ash in the flue gases before discharging into the atmosphere, because the air would become so highly charged with dust particles as to be a serious menace to public health and welfare. With certain kinds of coal, considerable difficulty has been experienced in the fine ash slagging and making an accumulation which could be removed only with great difficulty. These aspects of the use of powdered coal as a fuel are more consequential in boiler practice than in metallurgical furnaces.

[1] "The Use of Pulverized Fuel in Metallurgical Furnaces," by James Lord, Proc. the Engineers' Society of Western Pennsylvania, October, 1913; "Powdered Coal in Boiler Furnace," by William A. Evans, "Power," Apr. 7, 1914; "Powdered Coal as a Fuel," by Joseph Harrington, "Power," Mar. 10, 1914; "Pulverized Coal as a Fuel for Boilers," by R. C. Carpenter, "Sibley Journal of Engineering," December, 1913; "The Use of Pulverized Coal as a Fuel," by W. L. Quigley, in a paper read at annual meeting of American Foundrymen's Association.

[2] "Eng. and Min. Journ.," p. 541, Mar. 14, 1908.

Long- and Short-Flame Methods of Burning Coal Dust

Pulverized coal may be burned by either or two methods. The first of these may be called the long-flame method. This is a progressive burning of the coal, and is used where the character of the work and form of furnace demand that the flame shall be elongated, so that the ultimate burning may be well within the chamber to the end that the heat may be developed in close proximity to the work done and not conveyed by gases from the initial point of firing.

This is accomplished by projecting the primary air, which carries the fuel into the furnace, with high velocity. In this method the air of projection would be less than 25% of that ultimately required. Additional air must, therefore, enter from other sources to supply that which is necessary for complete combustion. This additional air may or may not be preheated in order to assist combustion. If preheated by appropriation of waste heat, considerable saving in fuel may be effected. It has been estimated that approximately 4 B.t.u. per degree of preheating is saved per pound of fuel fired when 50% excess air is admitted.

Fired as described with a high jet velocity, complete combustion can only be effected upon the outside of the cloud of fuel entering the furnace. The inside of this cloud is the fuel with less air mixed with it than is necessary to burn it. This forms a more or less elongated cone with its base the pipe of entrance, burning on its surface, as it is rapidly shot forward with greater or less rapidity. This action is affected also by the greater or less intensity of the chimney draft. The action is somewhat similar to the burning of a candle where the gases evolved from the hydrocarbons fed by the wick burn upon the surface of the gas body as oxygen obtains access to it. Doubts are entertained, however, as to the genuineness of the claim that this jet of entering fuel as described can be effectively projected beyond a limited distance in any particular direction. With the rapidly expanding air without and within the jet, and its corresponding reduction in density, coupled with the swirls and eddies of currents of varying velocities, it seems that little actual control could be exercised. This air at high velocity should, however, not be directed against the furnace walls. It then is a large and active blowpipe. Impingement should be confined to the charge in the metallurgical furnace, and impingement should be avoided before the combustion is complete.

The Short Flame Less Destructive to Brickwork

The second method involves a shorter flame and low velocity. This produces a lazy flame with the least cutting action upon the charge or brickwork. It consists in admitting the air supply entire with the coal at low velocity. Under this condition the fuel burns close to the nozzle and combustion develops through the whole fuel cloud almost instantly. The cone formed is short in the fuel cloud.

In the long-flame method it is certainly possible to introduce with the fuel all of the air and excess air required for combustion, and it is probable that this practice may prevail with further developments. At present such practice seems to develop difficulties in the direction of cutting out the firebrick. Taking up, say 75% of the air from a condition of low velocity, it acts as a deterrent or brake upon the current of high velocity, due to high pressure, minimizing thereby the destructiveness of blowpipe conditions. For this reason it is believed by some that use under the conditions of full air supply at high velocity is at present premature. As a matter of fact, the short-flame or second method has been the latest developed, and from it may be expected a vast expansion of the field of usefulness of pulverized coal.

The conditions favoring the use of powdered coal as a fuel are, first, that the mixture of coal dust and air be discharged into a combustion chamber, under such conditions that the required temperature for ignition may be maintained. In adapting the use of this fuel to boilers, it was found that the air and fuel withdrew heat from the brickwork so that it became necessary to supply some form of auxiliary flame to keep up the temperature to the ignition point. This has been done in one case, at least, by causing the flame to reverberate upon itself.

The first essential of powdered-coal furnace is a large combustion space where the flame can occupy about four times the volume of the flame produced by an ordinary grate fire. This entire combustion space must be free from any metallic cooling surface. The possibility of such a cooling surface does not enter into most metallurgical furnaces, but this is mentioned because the presence of metallic cooling surfaces is regarded by some authorities as the reason why powdered fuel has not been more successful under boilers. Contact with the cooling surfaces stifles the flame and stops combustion.

Dry Coal Usually Essential to Success

Success in the use of powdered coal as a fuel requires that both the free and combined moisture be expelled by artificial heat, down to ½%. Where wet coal is used, not only is the amount of heat required to change the moisture into steam lost, but an igniting flame has to be provided. Furthermore, a moist fuel would cause trouble by balling or clogging after being pulverized. Moisture is also apt to interfere with the free discharge of the material from the machines used to pulverize the coal. Some sort of machine as the Ruggles-Coles dryer is found to be efficient for drying the coal prior to pulverization.

Authorities differ as to the size to which the coal must be reduced. Some recommend that it be pulverized, so that 95% will pass through a sieve of 100 meshes per sq.in., and over 80% will pass through a 200-mesh sieve. Others state the pulverization should not be less than 85% to pass the 200-mesh screen, and not less than 95% to pass the 100-mesh screen. At this degree of fineness all the coal will burn suspended in its air supply provided the furnace is big enough.

Explosions of Dust Can Be Minimized by Cleanliness

The danger of explosion in the use of pulverized coal is negligible except when suspended in air. A so called explosion is simply intensified combustion, and occurs only when conditions of mixture with air enables this combustion to leap from one particle to another in progression.

There are several machines for grinding the coal, such as the tube mill and the Raymond mill, and the Areo pulverizer, both of which last withdraw the pulverized product by a draft induced by a centrifugal fan.

Of course, in an installation for the use of pulverized coal, all passages, after the coal has been delivered to the pulverizer, must be tight, so that coal dust will not be delivered into the air, except where it is desired to burn it. Floating dust in the atmosphere can be taken care of by a well designed plant. It is quite possible to retain the dust within the storage bin. Moist coal should not be stored, as it does not flow freely, and causes much trouble in the burners. Of course, in the matter of explosions it would seem that there must be many places in connection with a coal-pulverizing plant where conditions are ideal for a dust explosion. It would seem almost impossible to grind coal without having dust escape, but on the other hand, there seems to be plenty of opportunity for a rapid change of air which should minimize possibility of dust explosions. Cleanliness and ventilation are the essentials to avoid explosions, and, of course, prohibition of the use of any kind of fire in the rooms where there is possibility of dust escaping. In this respect the ducts and hoppers should be designed as if gas and not a powdered solid were to be conveyed by them.

No Dearth in the Design of Burners

A great many types of burners have been designed. Any mechanism which will give a uniform mixture of coal and air, with both under control, can be used for feeding powdered coal. Burners are usually made up of a screw conveyor of variable speeds, which drops the coal into a blast of air. One thing to be guarded against is powdered coal flushing. It almost seeks its own level, as water. It will sometimes run along a screw conveyor so as to get ahead of the latter. For this reason, the screw is usually made very long, so as to introduce enough friction to keep back the flush of coal. One successful burner uses no mechanism, everything depending upon the drawing of air through a pocket of powdered coal. This air picks up enough of the powder in its passage through it to provide for combustion. In the point of burners, there are probably as many patents recorded in the U. S. patent office for powdered fuel burners as there are for oil burners. For use as powdered fuel, most authorities agree that the coal should have a high volatile content, not less than 30%, although some coal containing as little as 20% volatile matter has been used. The coal used by the American Iron & Steel Manufacturing Co. contains volatile matter 33.2%; fixed carbon, 56.07%; moisture, 1.12%, and ash, 9.61%. While it is possible to burn the poorest grades of fuel, in the powdered form, there are so many complications introduced as to overcome any economy. The extensive use of culm or slack piles does not seem to promise to become a possibility.

How Ash Causes Trouble

Ash, of course, is liable to give considerable trouble in any installation where powdered coal is used as a fuel. This trouble may be experienced in the combustion chamber, on the hearth of the metallurgical furnace, or in its flues. Slag formed is difficult to handle. In the combustion chamber it can be provided for by the use of a bed

of cinders, which will remain loose and can be pried out. On the hearth of a reverberatory furnace the ash forms a slag, which can be drawn off with other impurities. In the flues, control of the heat should be such as to keep the temperature so low as to prevent the forming of slag. In any case, frequent and easy access should be given for cleaning.

Powdered coal is destructive upon the furnaces. This is because of concentrated heat of blowpipe tendency, wearing effect due to the impinging of coal, and tendency of the ash and brick to flux together. These objections are somewhat overcome by the use of low-pressure air, introducing the coal at a low velocity, spreading the flame over as large an area as possible, the use of brick having similar chemical tendencies with the ash, and cooling of the brickwork by water circulation. Much has yet to be learned in the design of furnaces for this fuel. Where the fuel blows against the bridge wall, the latter requires repairing every four or six weeks. The roof of the reverberatory furnace stands somewhat longer. Better results in the bridge wall have been obtained by circulation of water, but there is still chance for improvement.

At the plant of the Canadian Copper Co., at Copper Cliff, Ontario, pulverized coal has been used successfully and continuously for firing reverberatory furnaces. Attempts of an experimental nature have been made at various other plants, notably at the Highland Boy by Sorensen, and at Cananea by Shelby, but while these demonstrated that pulverized-coal firing was possible and possessed several important advantages over the usual method, still coal-dust firing has not yet superseded the elder practice.

There are two reverberatory furnaces in use at Copper Cliff, each being 19 ft. wide by 112 ft. long. The roof is 4½ ft. above the surface of the bath of molten matter and slag. The material charged consists of 85% calcined ore and 15% flue dust. These furnaces were put in commission two years ago and no other system of firing has ever been used.

Boundaries of Mining Claims

By A. L. H. Street*

The rule that a locator of mining claim will not be permitted to assert title to a greater area than is called for in his notice of location, and that where there is a substantial variance between the description of the claim in such notice and the markings of the claim on the ground any conflict with an adjoining location will be settled in favor of the latter, was applied by the Idaho Supreme Court in the recent case of Swanson vs. Koeninger, 137 *Pacific Reporter* 891. The court said in part:

The general principle that, in case of conflict between the location notice and the boundaries of a claim as marked by the stakes, the stakes should control applies only so far as there is no substantial variance between such stakes and the notice of location. There is no doubt that this rule should apply where the stakes can be definitely located, but in the case at bar there seems to be much uncertainty as to the original location of the stakes. . . . The object of the law in requiring the location of a mining claim to be marked upon the ground is to fix the claim, to prevent floating or swinging, so that those who in good faith are looking for unoccupied ground in the vicinity of previous locations may be enabled to ascertain exactly what has been appropriated, in order to make their location upon the residue. . . . It is contrary to the policy and spirit of the mining laws to permit a mining claim of excessive size to be staked and then afford the opportunity for the stakes to be shifted at the locator's pleasure to include ground proved to be rich in minerals through the development of other orebodies.

*Attorney, St. Paul, Minn.

The Rand's High Level of Production

By A. Cooper Key*

The statement of evidence presented to the Economic Commission by the Transvaal Chamber of Mines on the future of the gold-mining industry has attracted wide attention, and the opinion expressed that, "given an adequate labor supply, it would seem that for the next five years there is no reason that a rate of crushing equal to about 28,000,000 tons per annum, roughly speaking, the present annual milling capacity, should not be dealt with: But after that date, owing to the exhaustion of some of the shorter-lived properties, the annual output would decrease, and it is estimated by 1930, it would fall to half the figure quoted," has provided food for much reflection by the thoughtful person.

Emphasis is laid on the fact that the calculation applies exclusively to present producing mines. Besides these are three areas comprising 4140 claims in the East Rand locality, in which development is proceeding at present, whose prospective milling capacity may be taken at 1,800,000 tons per annum. These mines are the Government Areas (Modderfontein), the Modder Deep and Springs Mines. In the same locality are eight other properties comprising 6420 claims (presumably Apex, Benoni, Rand Klip, Cloverfield, Welgedacht, Rand Collieries, Van Dyk, and Geduld Deep), lying idle as development funds have been exhausted, and the value of the ore, so far encountered, is not sufficiently encouraging for investors to provide further capital under existing conditions. But cheapening of costs would have a great bearing on the provision of further funds. Still further, there are 86,000 claims in the far Eastern Rand known to be deep-bearing, the mining rights of four-fifths of which are vested in the state. It is impossible to forecast, even within wide limits, the amount of ore which this area will eventually produce. So far, drilling results have not been encouraging, and a considerable portion of the area must be deemed of doubtful mining value. Moreover, there is only one reef in this section, and this lies at a low angle, thus yielding a considerably less tonnage per claim than on the Central Rand.

It is rather curious to see the *Mining Journal* characterizing these forecasts as "dismal, jaundiced and doleful" and the whole document as a piece of special pleading, to persuade the Commission to advocate the reduction of taxation and railway rates, and, one may add, special pleading to support the case for the wider employment of a skilled class of native, discussed in statement No. 14 of the evidence. Those who have

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knowledge of the care with which the statement was prepared will scarcely allow themselves to be lulled into a sense of false security by the implication that the report is ultra-pessimistic and may therefore be placed aside as of little value. The technical man is bound to review the facts as he finds them, and is not entitled to erect an elaborate edifice of future expansion upon insufficient data. It is to be hoped, and the belief is not an unreasonable one, that the Far East Rand will turn out better than predicted. The optimist will talk glibly of the tonnage that could be worked at a cost of 12s 6d. per ton, but it must be remembered that during the six years past, the rate has been stationary between 17s. and 18s. per ton, that new mines lies at great depths, involving enormous capital commitments and high development redemption rates.

The Chamber's evidence merely brings into focus the information which should be at the command of every mining investor, i.e., the life of the mine into which he purchases. Six years ago, the Mining Industry Commission was told by the engineering talent of the Rand that the profitable life of the mine would be comparatively short unless working costs could be brought down to 16s. per ton. The figure is now just under 18s., but the rate of exhaustion has been enormously accelerated, 25½ million tons being crushed in each of the last two years in contrast with 15½ million in 1907.

The current evidence of the Chamber takes into account rock which it is profitable to work, and it is only on this basis that its estimates can be explained by those optimists who point to mining extending well into the next century. Undoubtedly, as long as there is a margin of a shilling a ton, Rand mining will continue, since the world's demand for gold is insistent and brooks no denial. The Chamber of Mines experts, in pointing to 1930 as the year when the output will drop to half, are in close agreement with the independent expert, G. A. Troye, who in the *Mining Magazine*, of July, 1913, expressed the opinion that in 1930, dividends will drop to half the present amount. The Chamber talks of production, Mr. Troye of dividends, but there is, of course, a certain rough relation between the two, though that relation may vary from time to time, especially in the course of years. In 1908, Mr. Ralph Stokes, in "Mines and Minerals of the British Empire," declared many of the good mines were nearing the end of their industrial existence, and others not coming forward adequately to replace them. That is one of the most lamentable features of the present outlook.

Engineers are, of course, like other professional men, liable to error, and none of them claims infallibility. In the evidence previously placed before the Mining Industry Commission, appeared a table showing the mines which were expected to cease working during the succeeding nine years, i.e., to the end of 1915. Particulars were given of the stamps, gold production and dividends, and from these clues, it is possible to find the names of the companies in four of the five periods, but the last period does not admit of so easy an analysis. What were these mines and how have the forecasts turned out?

In the first period, 1907, it was indicated that the Champ d'Or and Bonanza would cease. The Bonanza was liquidated that year, but the Champ d'Or survived four years, crushed 300,000 tons and produced nearly £500,000 of gold after the due date of its exhaustion.

In the second period, 1907 to 1909, the following companies were expected to finish:

Stamps		In 1906 Value	Dividends
100	May Consolidated	£300,527	£129,938
120	Crown Reef	549,053	264,000
90-95	Jumpers	250,343	50,000
135	Glencairn	223,553	27,500
120	Gelndenhuis Estate	366,249	160,000
50	Jubilee	90,208	25,000
615-620		£1,779,933	£656,438

Of these six mines, two are still working, the May Consolidated has milled 900,000 tons and produced a million and a quarter of gold since the year of 1908, the mean year of the period named. Jumpers crushed 200,000 tons and won £400,000 worth of gold. Thanks to remarkably low costs, the Glencairn is still at work. Others lost their separate identities by amalgamation.

The concerns which were to stop active operations in the third period, 1909-1911, were:

Stamps		Value	Dividends
80	Durban Roodepoort	£239,453	£68,750
120	Ferreira	655,558	285,000
125	New Primrose	369,303	227,500
50	Salisbury	85,501	10,000
70	Meyer & Charlton	272,752	60,000
110	Roodepoort United	238,383	.....
555		£1,860,950	£651,250

Out of these six companies, only in the cases of the Salisbury and Ferreira was there anything like an approach to actuality. Both the Meyer & Charlton and Roodepoort United increased their areas, and both have long expectations; the one as rich as the other is poor. The Durban Roodepoort and Primrose estimates were wide of the mark. The former has produced £600,000 worth of gold since its mean date of exhaustion, according to the book (1910), while the New Primrose has been unkind enough to confuse the estimates by turning out £1,250,000 of gold, since the time it should have flickered out. Both concerns have a further period of usefulness; in 1907 costs were 20s. per ton, now they are in the region of 15s. 6d., and 13s. 6d., respectively. Here is an indication of what can be done with low working costs, when the development work is done.

Some Bad Estimating

In the fourth period, 1911-1913, the engineers figured that the following companies would drop out:

Stamps		Value	Dividends
100	Robinson Deep	£543,944	£330,000
220	Village Main Reef	680,474	188,800
210	Robinson	1,035,232	550,000
160	City & Suburban	492,449	170,000
90	Treasury	135,375	.....
750		£2,887,474	£1,238,800

Only the Treasury out of these mines has yet succumbed. The Robinson, left to work out its own destiny, should last until the middle of 1917, the Village Main Reef to about the same date. City & Suburban has secured a new lease of life by its purchase of claims from the City Deep, but even without, was expected to run until 1920. Variations in costs are not sufficient to explain this incorrect estimation of profitable durations, in point of fact, City & Suburban costs are rather higher than in 1907. Robinson Central Deep would have been exhausted, but was amalgamated with the Crown mines, shareholders in the former now receiving 38½% per annum. Since 1907, working costs have fallen 3s. per ton, and this in part, explains why the mines have lasted longer than expected. What effect a further reduction of similar amount would have, appears difficult of close appraisement.

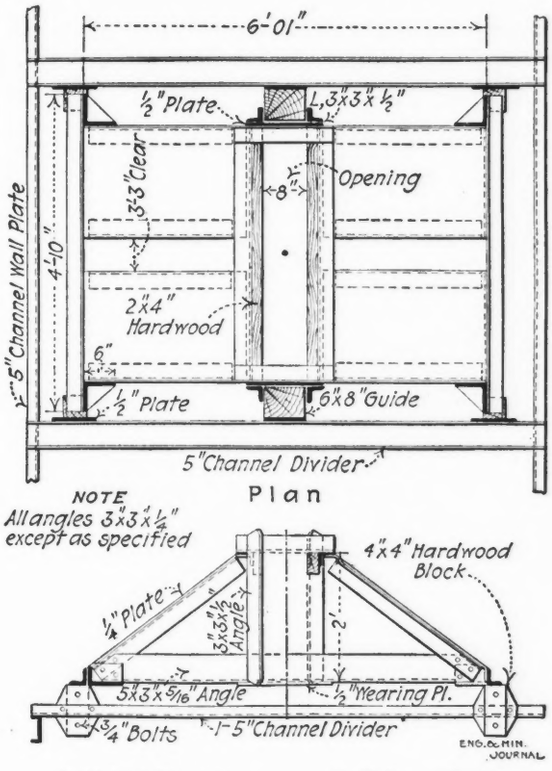
Details of Practical Mining

Safety Bonnet for Shaft Opening

By E. H. Edyvean*

The accompanying drawing shows a safety guard or bonnet protecting the cage compartment of the shaft at the Bristol Mine, Crystal Falls, Mich. It is in use at a point in the shaft house, some distance above the ground where the waste rock is landed after hoisting in the cage.

The bonnet is constructed of steel with a hardwood lining for the top opening. The 3x3x¼-in. end angles are extended 6 in. outside the body of the bonnet and serve as the means of support. These ends are reinforced with



Shaft Cover Operated by Cage

corner brackets as shown in the drawing. The sloping sides are made of ¼-in. steel plate, reinforced with 3x3x¼-in. angles. The opening between the plates gives plenty of room for the lever operating the safety catches on the cage. The shoes are of the same gage and move on the same guide as those on the cage. The wood lining in the top opening protects the top frame from the hoisting rope.

The bonnet is held over the shaft by four supports, one on each corner. These consist of ½-in. steel plates securely riveted to the dividers, and of hardwood blocks bolted to the plates; the blocks are easy to replace in case they are broken.

The yoke of the ascending cage catches the bonnet, raises it and supports it while the cage is at the landing. When the cage descends the bonnet drops on its supports and closes the shaft opening almost entirely, thus serving as a simple and effective safety device.

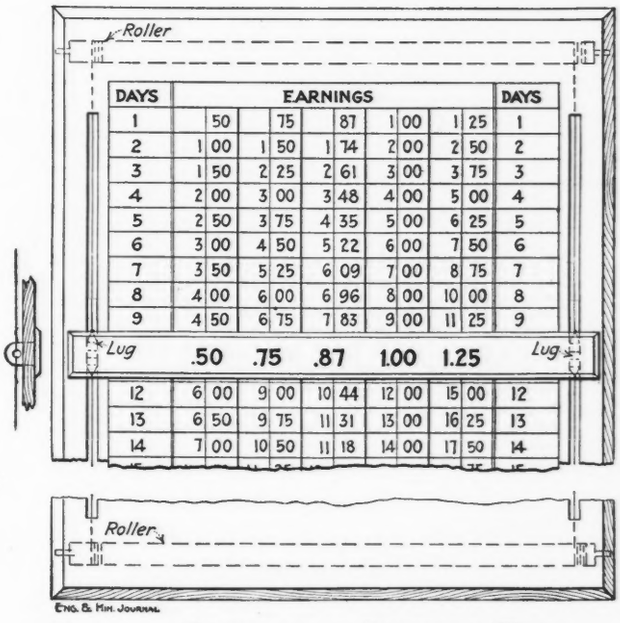
*Chief engineer, Bristol Mining Co., Crystal Falls, Mich.

Device for Making Up Payroll

By J. B. Moore*

The accompanying illustration shows part of a device used at the Jimulco Mining Co.'s property in Mexico, to reduce the work of making up the payrolls at the end of the month.

On each edge of a sheet of paper the number of days in the month from 1 to 31 are indicated, and in between,



Board and Indicator for Computing Wages

in five columns, are shown the earnings for any number of days at the different rates of wages paid. This paper is attached to a board arranged for the purpose. On a narrow strip of sheet-iron, the different rates of wages are printed in position to come exactly over the proper columns. This strip has two small lugs near its ends, which pass through slots cut in the board and are attached to endless cords on the back of the board. The cords pass around two rollers fixed as shown.

The board is fastened upright at the back of the timekeeper's desk so that the lower roller is below the desk. From this roller another endless cord passes around the shaft of a small crank placed near the corner of the desk in easy reach of the occupant when he is writing.

*Globe, Ariz.

By turning the crank, the sheet-iron strip can be moved to the proper number of days, as shown in both right- and left-hand columns, and the amount indicated below the proper rate will be total earnings for that number of days.

By making the colors of the figures from left to right alternately red and black, and having red "rates" come over black "earnings," any confusion in looking up amounts is avoided.

Development System, Lyon Mountain Mine

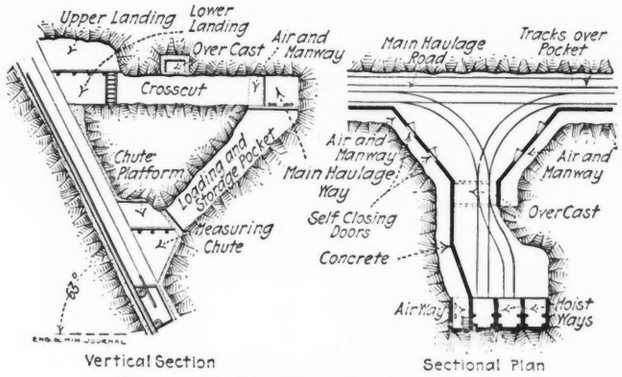
The Lyon Mountain mine, of the Chateaugay Ore & Iron Co., in northeastern New York, has been opened for many years on one of the great low-grade iron deposits of the country. The mill heads have recently been running about 28%; the concentrates, something over 60%, with remarkably low phosphorus and sulphur. It is commonly stated that the whole deposit contains 500,000,000 tons of 30% iron ore.

The description of a proposed scheme of development and the accompanying drawings are taken from the *Iron Trade Review*, Apr. 2, 1914:

The mine has been worked for a depth of 700 to 900 ft. vertically, and for about 3000 ft. along the surface. The average dip of the deposit is 60° to 65°, but in the western portion it flattens to about 45°. Room-and-pillar methods of mining have heretofore been followed. The problem of continuing the operation in depth necessitated the adoption of some new method. It has been decided to sink an inclined shaft at 63° for 1200 ft., the shaft ultimately to be extended to 1800 ft. and perhaps 2400 ft. The results of diamond drilling indicate with reasonable certainty an orebody containing 12,000,000 to 15,000,000 tons, with a thickness up to 200 ft. in places, and an average workable width of 24 to 40 ft., some portions pinching down to 12 or 14 ft.

The new shaft will be concrete lined and will have four compartments, three hoisting compartments, each 5 ft. 6 in. wide by 6 ft. 6 in. long, and a ladderway and pipeway compartment 4 ft. 3 in. by 6 ft. 6 in. Two compartments will be used regularly for skip hoisting, the third for auxiliary purposes; while, at the time of changing shifts, double-deck man cars will be substituted for the skips. The man cars will be provided with safety catches running on timber guides, and these timber guides will also act as back rails to prevent the skips from derailing. Levels will be established at every 300 ft. in the shaft, and crosscuts driven to the vein. The stopes will be opened out and worked on a shrinkage system, all ore being loaded by gravity into mine cars and electrically hauled to the shaft bins. The bins will be equipped with auxiliary measuring pockets. There will be a 100-ft. headframe over the shaft collar, containing a crushing plant, consisting of a 24x36-in. Blake crusher, a Gates gyratory, and a pair of Anaconda rolls, by which all the hoisted product will be reduced to 1½ in. for transportation to the mill. The improvements were based on an ultimate hoisting capacity of 3200 to 3600 tons per 24 hr. The headframe, crusher house, hoist, and other accessories will be designed to handle this tonnage when it is necessary, but since the capacity of the mill is less than 1000 tons at present, the motors driving the hoist, as well as the skips, will be designed to handle about 1600 tons per day. The present concentrator capacity will be increased to 1500 tons by the coarse-crushing plant in the headframe. It is estimated that about a year and a half or two years of development will be required to raise the underground capacity of the mine from 1500 to 3000 tons per day. Ultimately, a new mill will be required.

[The beginning of this new work at Lyon Mountain is a matter of congratulation, inasmuch as this great deposit has been treated heretofore in a most niggardly manner. The designs for the shaft and stations, as shown in the accompanying drawings, present features of interest. We assume that the engineers in charge carefully considered the question of vertical or inclined shaft, and that the choice of an inclined shaft is based on good reasons. New inclined shafts are rather unusual today at this high angle, at least outside of the iron industry. The most noteworthy point in the design as shown is the provision for an air- and man-way on the levels. We had understood that the ventilation at Lyon Mountain was admirable, and the reason for the construction of this airway is not altogether apparent. It is a fact, however, that ventilation of metal mines is receiving increased attention, and more and more elaborate systems of ventilation are likely to be worked out. There is this to be said, that the separation of the manway and the haulageway on the main levels affords splendid protection to the men, and, as a safety measure, is highly desirable.—EDITOR.]



PROPOSED STATION ARRANGEMENT

Overloading Centrifugal Pump and Motor

The motors of the centrifugal pumps used by the Penn Iron Mining Co. have wound rotors with a device for short circuiting the secondary current and relieving the brushes from wear by lifting them from the rings (*Bull.* A. I. M. E., February, 1914). These pumps were rated at 900 gal. per min., and that was about the quantity of water that they handled at first. Soon after the quantity to be pumped increased to 1100 gal. per min. This was too much for one pump and not enough for two, so that it was necessary to start and stop one pump frequently. As this quantity of water continued for some time, it was found that by increasing the speed of the generators at the falls from 60 to 62½ cycles per sec., the pumps were each capable of handling from 1200 to 1300 gal. per min. This overloaded the motors, however, and after running for a considerable time it was found that the insulation

had been baked until it was brittle, which made trouble when it became necessary to repair the windings. A dropping off in efficiency will also overload the motor, so that it is well to have centrifugal-pump motors of a larger size than the specified head and quantities under normal conditions call for.

An Improved Type of Ore Bin

By Wilbur E. Sanders*

In mining and metallurgical operations, bins are employed for purposes of collection and of distribution, as receptacles within which materials may be collected, wherein reserve materials may be stored and from which such reserves may be drawn as required. The important functions of bins may therefore be summed up as those of storage and the delivery of materials. The two general types of bins are the flat bottom and the inclined bottom.

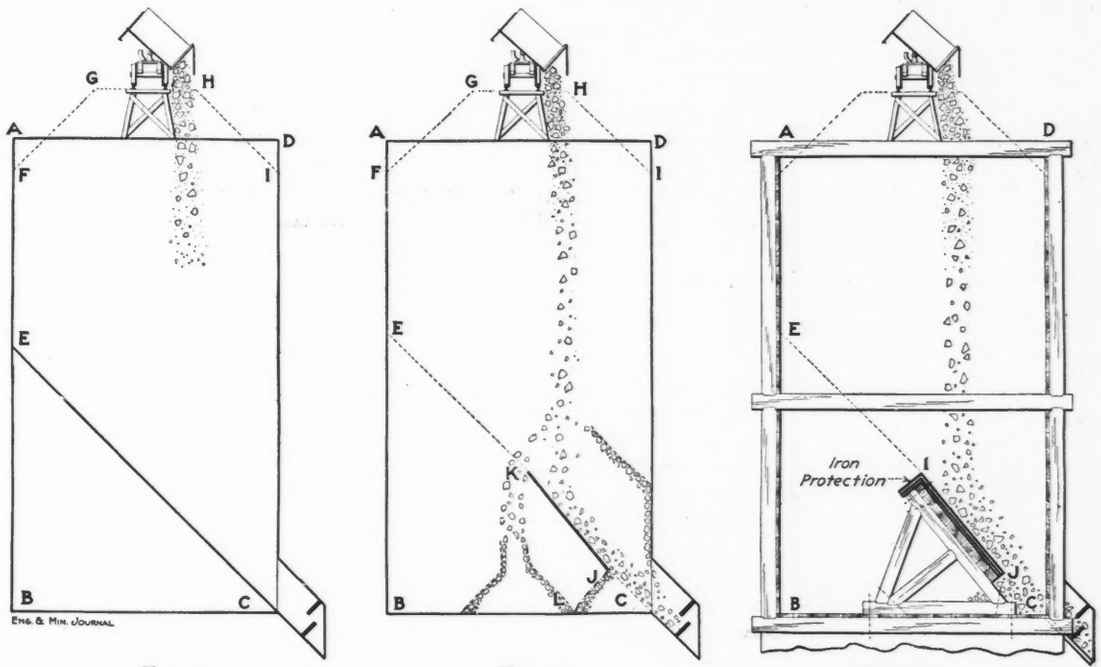


Fig. 1 Fig. 2 Fig. 3

Diagrams and Sections of Bins of Different Types

In Fig. 1, *ABCD* represents the outline of a flat-bottom bin in vertical cross-section. It will be noted that it is essentially self-contained, its frame being supported directly upon the solid bed or sill parts. This type is unquestionably the simplest to construct, the strongest when constructed, and of itself, in all respects save that of immediate delivery at the chute, the most satisfactory, being per ton of capacity the most economically built, reinforced and repaired.

When filled, the upper surface of the material will have "coned" to approximately the outline *FGHI*, when the entire cubical contents of the bin will be available for the storage of material. Discharge can take place until a line *EC* is reached, coinciding with the angle of repose of the material, when delivery will cease. The material in the space *EBC*, will remain in place within the bin as reserve or stored material. From the surface *EC* delivered material will be deflected and discharged through the chute. With material thus rolling or sliding upon similar material in its discharge from the bin, the effects of shock and abrasion are minimized.

The slope of the inclined plane *EC* will vary with the angle of repose of the material in the bin. Fluent materials will flow readily at a relatively low angle, while others will discharge only at a steeper angle. Material of a clayey wet nature may stick so that only excessive weight of overlying material will force it to discharge and even the bin may become all but clogged.

The material stored as reserve within the triangular space *EBC*, since it can be shoveled out, is available for use in the mill if the supply to the bin should cease. This is a characteristic of the flat-bottom bin, of great importance in emergencies. It is counterbalanced, however, by the fact that when such a reserve is once shoveled out, it must be replaced before the bin can again automatically deliver material.

In Fig. 1, *AECD* may be taken to represent a cross-section of an inclined-bottom bin. The inclined-bottom bin is fundamentally less securely foundationed than is the flat-bottom structure; is essentially unstable, in that it represents a wedge supported on edge. Its construction presents difficulties that can be overcome only by using an ample factor of safety. Furthermore, the excessive weight of superimposed material tends to pack that within the wedged portion of the bin so hard that it presses against the front parts of the structure and even may spring them outward and force them from position. The inclined bottom is also subjected to excessive wear and breakage by falling material and to abrasion by the sliding of the material during its discharge. Repairs to the bottom are consequently extensive and expensive.

The large space, represented by *EBC* is wasted, where otherwise it would be available for a reserve of material. The real value of the inclined-bottom bin lies in its

*Mining engineer, Sonora, Calif.

facility of discharge, whether it be empty or full. All material that is contained or may be dumped, is available for immediate discharge except for negligible remnants in the corners.

By the application of a simple device, the favorable characteristics of both types of bin may be obtained in a single structure with the practical elimination of their unfavorable characteristics. In Fig. 2 is shown an inclined leaf, shelf or platform, *JK*, within the bin, approximately coincident with or at a slightly steeper inclination than the angle of repose of the material to be handled and placed preferably independent of the bottom, front and rear of the bin. Its lower edge is far enough above the bin bottom to permit material beneath and behind it to be shoveled into the chute. Usually the leaf alone would properly deliver the material, but under some conditions it might become advisable to connect it with the chute by a false or removable leaf; this false leaf may be removed whenever it is necessary to shovel out the stored material. The upper edge of *JK*

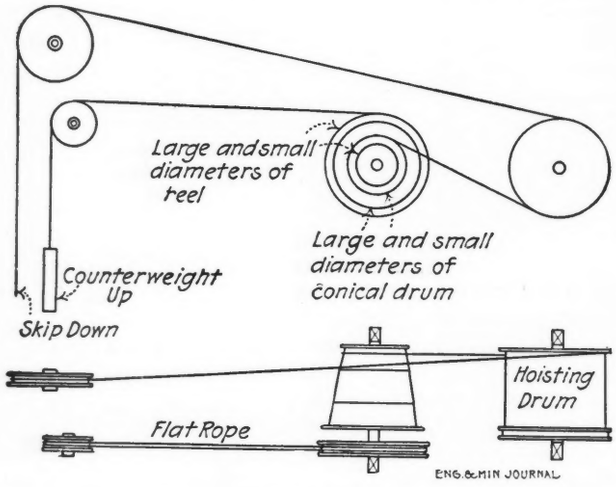


FIG. 1. REEL AND DRUM COUNTERBALANCE FOR 3000-FT. VERTICAL SHAFT

extends far enough to catch all the falling material from above.

If the bin be empty, the falling material will flow back beneath the lower edge of the leaf, forming a pile *JCL*, over the front surface of which any added material will slide to the chute. This means almost immediate delivery of material dumped after the bin has been emptied.

If the chute is closed and dumping is continued, the material will cone up on the floor of the bin and on the leaf, and will then overflow the upper edge of the leaf so as to fill the space behind and below it. There is thus no waste space, except that occupied by the inclined leaf and its supports.

The leaf *JK* can be readily applied to any flat-bottom bin already constructed. Since before any great mass of material rests on the leaf, it will be supported by that which has been forced beneath it, it is evident that it will not have to support any extraordinary weight and need not be of extraordinary strength. It must, however, be so constructed as to withstand the impact of falling material and abrasive action. It may be constructed as an integral part of the bin structure or may be made removable; it may extend the full length of the bin, or may be of a length only sufficient to catch the dumped material and direct it to the chute.

Fig. 3 exhibits one method of applying the leaf to a timber bin; simple angle-frames attached to the sill-pieces by lag-screws support the device. To these frames, spaced at proper intervals, the flooring of the leaf is attached, and this flooring is sheathed either with sheet steel, or with railroad rails. The surfacing is bolted to the timber floor of the leaf, secured by nuts and locknuts applied from beneath. Thus the leaf may be repaired with little difficulty since all parts are accessible. Furthermore the wearing parts are of relatively small size and therefore the expense of making repairs is reduced to a minimum.

Conical Drum and Reel for Counterbalance

The Penn Iron Mining Co. makes a practice of hoisting with single skips and balancing them with counterweights in the shaft. A further balancing of the variable rope-weight is obtained by using conical drums on which the counterweight ropes are wound. These conical drums may be driven by direct connection to the hoisting-drum shaft or by a rope to the hoisting drum.

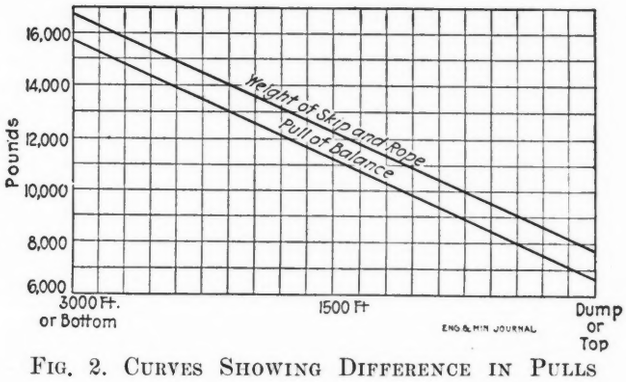


FIG. 2. CURVES SHOWING DIFFERENCE IN PULLS

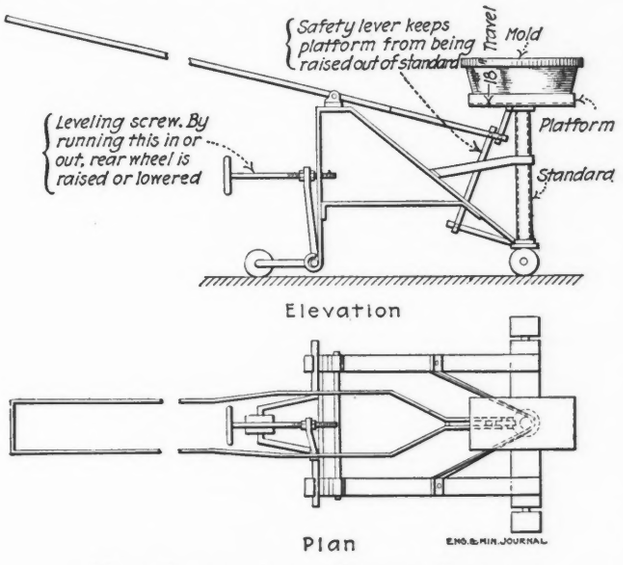
In the latter case, it is customary to mount two conical drums on the same shaft, driving one from the hoisting drum and winding the counterweight rope on the other. A variation on this latter plan is installed at one of the Republic shafts according to the *Bulletin* of the A. I. M. E., February, 1914. Here a conical drum and a reel are mounted on the same shaft, the drum driven by a rope from the hoisting drum and the reel used to wind the flat rope of the counterweight. The conical drum has only a small difference in the two diameters. As shown in Fig. 1, the face has three angles of slope, thus approaching a curve and giving a more nearly perfect balancing.

This method of counterbalancing can be used for a depth of 3000 ft., in which case the balancing effect is as shown in Fig. 2. It will be noticed that there is a constant difference between the two weights, showing a close balancing. This difference is necessary to allow the skip to descend without the application of power. The weights on which the curves are constructed are: 1⅛-in. hoisting rope 9000 lb., ⅜x2½-in. flat counterbalance rope, 5100 lb., skip, 7600 lb., balance, 8400 lb., load of ore, 12,000 pounds.

Details of Milling and Smelting

Mold Platform for Tilting Furnace

The tilting furnace for making bullion bars has come into wide use, but one of its drawbacks has been the difficulty of pouring from a full crucible into a mold set on the ground or on a stationary platform. Due to the fact that the crucible lip is constantly changing—lowering—during the pouring operation, the distance between crucible lip and mold at the beginning of the operation is so great that splashing and loss ensues. Several devices



MOLD PLATFORM FOR TILTING FURNACE

have been brought out for maintaining a constant, short distance between the two, one of which has already been described[1] in the JOURNAL. Another now in use at the Alaska Treadwell Gold Mining Co.'s mill is illustrated in the accompanying drawing. It is a carriage mounted on wheels, so as to be movable from one furnace to another. The height of the mold is regulated at will by a long lever, ensuring the maintenance of the mold close to the crucible lip. The drawing shows the construction of the machine and indicates the method of operation.

Smoke-Flue Roof Construction

The replacement of the roof of the main smoke flue of the Washoe works at Anaconda, Mont., is now about 60% completed. This roof is of sheet steel, about $\frac{3}{32}$ in. thick. The old roof was riveted. Water got in around the joints, and in connection with the sulphur gases, dust, etc., badly corroded not only the roof, but also the supporting I-beams. In laying the new roof the joints are being made airtight and watertight by oxyacetylene welding. About eight miles of such welding was required for the job.

[1]Apr. 19, 1913.

Treatment of Complex Silver Ore

A great many efforts have been made to find a cheap process for treating high-grade silver ores which contain metallic silver in addition to compounds of other metals and elements. The ores of Cobalt, Ontario, are usually considered an example of such material, and it is a fact that they have formed the stimulus for research with the object of finding a cheaper method than by cyanide, and in addition, one which would provide for the recovery of the nickel, cobalt, arsenic and perhaps copper.

Upon the basis of Cobalt ores, Oscar Dyckerhoff, of Karlsruhe, Germany, has devised a process, founded upon chloridization, which he believes will satisfactorily comply with technical and economical conditions. A simple chloridizing roast, with addition of salt, is a failure when large quantities of silver are present, but Dyckerhoff has found that it is entirely practicable if clay or loam be added to the mixture of ore and salt. When this mixture is roasted, a decomposition occurs, with the formation of sodium silicate and liberation of chlorine or hydrochloric acid. The chlorine attacks the silver, while the alumina and the undecomposed clay, used in excess, absorbs the silver chloride and allows the hydrochloric acid to attack and further chloridize metallic silver.

The salt decomposition occurs at a bright-red heat, but at low-red heat the process is incomplete. In order that the loss of silver shall be reduced to the lowest possible point, the roasting heat should be kept as low as possible, and a further addition to the ore mixture is desirable of some material which will induce the reactions and complete them at low-red heat. Pyrites or sulphur and metal oxides have been found to fulfill the conditions. The addition of the pyrites must be based not only on the requirements for salt decomposition, but also on those of the cobalt, nickel and lime in the ores. The cobalt and nickel must be brought, through roasting, into such form that they can be dissolved by the dilute acid produced by the absorption of gases from the roasting furnace in the usual absorption towers. This form is the basic sulphate, as it is obtained by roasting the ore and mixed compounds. Since the sulphides of nickel and cobalt begin to decompose into oxides at 600° C., the temperature may not exceed about 580° C.

If a temperature of about 750° were used during the roasting, at which temperature the chloridizing of silver would be complete, even without the aid of pyrites, the extraction of nickel and cobalt with weak tower acid would be impossible. On the other hand, a temperature of 580° C. is sufficient to decompose again completely the ferrous sulphate formed between 400 and 450° C., while the ferrous sulphate formed acts as an oxygen carrier very favorably on the sulphatizing of the cobalt and nickel and also on the conversion of the arsenic to sodium arsenate. The addition of pyrites is further to convert the calcium carbonate into calcium sulphate; this change being produced by double decomposition with

the sodium sulphate formed during the roasting from the common salt, the calcium being transiently present as calcium chloride in the mass being roasted.

The sodium chloride being reproduced, the decomposition begins again to continue so long as calcium carbonate and sulphur dioxide (from the pyrites) are present. The simple final result of the several reactions which occur is that all the silver, free and combined, is converted into chloride; cobalt and nickel are in greater part present as basic sulphate; all lime is converted into sulphate. The greater part of the arsenic remains as sodium arsenate, together with sodium sulphate in the roasted mass, and is dissolved by the tower acids; another smaller part passes away as arsenious acid with the furnace acids and is caught in the absorption towers. The furnace gases contain hydrochloric and sulphuric acid beside a little chlorine; they are recovered in condensing towers of usual construction and are then used as tower acid for extracting the cobalt, nickel and arsenic.

RESULTS OF THE FIRST SERIES OF ROASTING IN STAGES—AMOUNT OF SILVER EXTRACTED AFTER THE SEVERAL ROASTINGS

I. Roasting	11.34 per cent.	=	67.54 per cent. of the total silver.
II. Roasting	5.38 per cent.	=	32.06 per cent. of the total silver.
III. Roasting	0.052 per cent.	=	0.31 per cent. of the total silver.
IV. Roasting	.....		.....
	16.772 per cent.	=	99.91 per cent. leaving in the residue
	0.016 per cent.	=	0.09 per cent.

Since by a single roasting only some 11-12% of silver can be extracted, the roasting must be repeated when ores which contain more than about 10% of silver are under treatment, so as to extract by stages an ever-decreasing percentage of silver, until there is only a small amount left in the residue. It is also found that when such large proportions of chloride of silver are formed in the ore, a leaching operation must follow each roasting, and further that it is better to dissolve first the cobalt, nickel and arsenic (the last as sodium arsenate) by means of the tower acid and then to extract the silver chloride with sodium thiosulphate or ammonia; the dried residue from the leaching is mixed with a fresh quantity of salt, pyrites and clay, and again roasted.

Instead of pure iron pyrites, poor sulphur ores, in which the sulphur has hardly any value for other purposes, may be used, and even ores of this kind which contain a more or less high content of copper. The copper sulphide is in this case roasted to copper chloride and extracted by the tower acid. The combined leaching liquors containing the cobalt, nickel and arsenic, in the event of their containing copper derived from the ores or from the additions which have been made, are mixed in the cold with calcium sulphide or sodium sulphide, then separated from the precipitated copper sulphide, then treated with fresh ore containing calcium carbonate, so as to neutralize the free acids present (this ore is afterward added to the mixture to be roasted), and then treated with calcium sulphide or sodium sulphide to precipitate the cobalt and nickel. The remaining liquor, which contains sodium arsenate, as well as sodium sulphate, is evaporated to crystallization for the purpose of either recovering the salts as such, or after further treatment with suitable substances. The combined silver liquors obtained from the several stages of the roasting are mixed with a solution of calcium sulphide or sodium sulphide in due proportion. The precipitated silver sulphide is brought into the form of metallic silver, and the regenerated liquor is returned to the process.

For the clay used as an addition, there may be substituted wholly or in part loam, or sand containing clay or marl. In the case of ores poor in silver, pure sand may be used instead of clay. It is also possible to substitute wholly or in part for the clay siliceous minerals containing aluminum and iron; for instance, the so called fullers earth. As an example of the gradual extraction, there may be given the results of two experiments made by roasting in stages. In both series there were in all, four roastings. In the first series only the silver was extracted with dilute ammonium, without respect to the extraction of nickel and cobalt; in the second series nickel, cobalt and arsenic were first extracted by means of acid water (5 volumes per cent. of concentrated hydrochloric and 5 volumes per cent. of concentrated sulphuric acid), and then the silver was extracted by means of a solution of sodium thiosulphate of 5% strength.

RESULTS OF THE SECOND SERIES OF ROASTING IN STAGES—SILVER, COBALT AND NICKEL EXTRACTED AFTER THE SEVERAL ROASTINGS

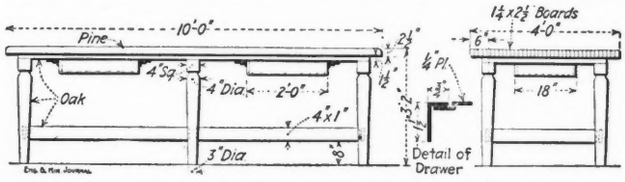
I. Roasting	7.52% CO+Ni and 12.64 Ag.	=	75.85% of the total silver.
II. Roasting	2.77% CO+Ni and 3.10%	=	18.603 of the total silver.
III. Roasting	2.39% CO+Ni and 0.72%	=	4.32% of the total silver.
IV. Roasting	1.10% CO+Ni and 0.156%	=	0.934% of the total silver.
	13.78% CO+Ni and 16.619%	=	99.707 leaving in the residue
	4.30% CO+Ni and 0.048%	=	0.29

In the table, the values left in the residue are calculated on the values in the original ore under treatment. In these experiments the residue contained 1.3% of arsenic so that about 95% of the total arsenic was recovered. The process has been patented in the United States under No. 1,085,675.

Simple Strong Drafting Table

By L. L. Wilcox*

The accompanying illustration represents a drafting table which has given excellent satisfaction for the past



Substantial Drafting Table for Mine Maps

four years in the Gilbert office of the Republic Iron & Steel Co.

It has a white-pine top made of 1¼x2½-in. strips laid edgewise to avoid warping so far as possible and also to afford sufficient thickness to dress the top if necessary. Along each side between the first and second strips is a slot through which the maps and drawings can be passed. This prevents creasing the maps, which may happen when they project over the edge and someone leans against them. The frame is of oak, designed so as to give a maximum amount of room between the foot rest and the top, there being only a 1½-in. oak strip below the top. The drawers are supported on iron slides and are so arranged that not only can they be opened from either side, but they also allow the draftsman to push them well away from his knees, no matter on which side of the table he may wish to work.

*Chief engineer, Missabe range mines, Republic Iron & Steel Co., Gilbert, Minn.

The Assayer and Chemist

Detection of Platinum Metals in Cupellation Beads

In a recent paper before the Institution of Mining & Metallurgy, C. O. Bannister and G. Patchin investigated the effects of the platinum metals on cupellation buttons and the detection therein. Some of the effects of platinum have long been known. According to Rose, "the button is dull and crystalline. If the alloy contains as much as 7 to 8% of platinum, cupellation proceeds slowly; brightening is obtained only at a high temperature, and the button appears flattened, and has a rough crystalline surface and a gray color. According to Fulton, "When platinum alone or with little silver is present, the bead from the cupellation (at a comparatively high temperature) is rough, dull gray, flat, and contains lead. If more silver is present, but less than two parts silver to one of platinum, the beads are rough, flat, and have a crystalline surface. If more than two parts of silver are present, and not over 15, the bead approaches more nearly the appearance of a normal silver bead, but has a more steely appearance, and is flatter in proportion to the platinum contained.

Over 1.6% platinum in silver beads produces the characteristics mentioned by Rose, but so does palladium, and it is necessary to emphasize that the platinum beads are frosty, rather than those in which the facets of the crystals are distinctly visible.

However, under a low-power microscope, beads from 1.6% Pt down to 0.3% have a distinctive appearance. The beads are placed under a low-power objective ¾ to 1 in., after cooling, without squeezing, hammering or brushing. A small platform fitted with a ball-and-socket joint was designed for this work.

Below 0.3% it is difficult to detect the presence of platinum, but at that point the boundaries of the silver crystals begin to become distorted, and a banded structure to develop. Rapid cooling makes little difference. The effect of platinum on gold is similar but less marked. Beads containing equal quantities of silver and gold have the "frosted surface" appearance caused by over 2% Pt.

Iridium makes the bead more spherical. Under the microscope, the crystal facets appear strongly marked with lines crossing one another after the manner of slip bands. The marks are ascribed to internal stresses resulting from occluded oxygen. The effect due to 0.4% Ir is clearly visible.

Traces of rhodium, as little as 0.004%, cause a distinct crystallization in silver beads, different from the frosted appearance due to platinum, for the facets of the crystals were so distinct as to give the bead the appearance of a cut gem, and when viewed in a ray of light, of a white opal. With as much as 0.03% of rhodium the beads spit in an uncontrollable manner, and have a tendency to a bluish-gray color. Repeated cupellation of these spitting bluish-gray beads yields normal silver beads if but little rhodium is present, due to its oxidation.

Gold with 0.2% Rh has a ruby color, and with 0.8% is covered with a black film. Ruthenium produces a black crystalline deposit at the edge of the bead near the bottom, and gives a "single-sided herring-bone structure" to the surface of the bead. The deposit with 0.004% Ru is small but distinctly visible to the naked eye. No increased tendency to spit was observed.

While palladium has practically the same effect as platinum on the buttons, in parting the color of the solution gives a reliable test. In the presence of 0.0002 grams of palladium, the parting acid becomes faintly yellow in color, which changes to orange with increase in the palladium content, and is pinkish by artificial light.

Osmium produces no effect, according to the authors, and osmiridium produces the same effects as iridium.

In the discussion Dr. T. Kirke Rose called attention to the fact that there were two distinct surface appearances to buttons, according to whether they had or had not blicked. Mr. Bannister's photographs accompanying the original paper were all of buttons which had not blicked. Any button which had flashed would show a minute frosted structure. Nonflashing had been suggested as a proof of rhodium, ruthenium or iridium in the button.

H. J. Rawlins suggested that the authors had not given the parting tests their entire due. Platinum usually disintegrates the button badly and discolors the gold in the first acid.

Sodium Nitrite as a Reagent for Potassium

Sodium nitrite is suggested as a reagent for potassium by M. B. Kamm (*Bull. Assoc. des Chim. de Suc. et de Distil.*, January, 1914, p. 515). The reagent is made up of a mixture of the following solutions:

(A)	Sodium nitrite	220 grams
	Water	400 c.c.
(B)	Cobalt acetate	113 grams
	Water	300 c.c.

to which is added 100 c.c. of acetic acid. This is warmed *in vacuo*, filtered and made up to one liter.

The solution to be tested ought not to contain either heavy metals or ammonia. To 100 c.c. is added one drop of the reagent, and a few drops of $\frac{n}{100}$ silver-nitrate solution. Potassium is shown by a yellow or yellow-orange precipitate (potassium-silver-cobalt nitrite). The precipitate, however, retains silver and soda salts, so that it is not suited for quantitative determination. Ammonia, rubidium, caesium and thallium interfere.

Volumetric Determination of Vanadium

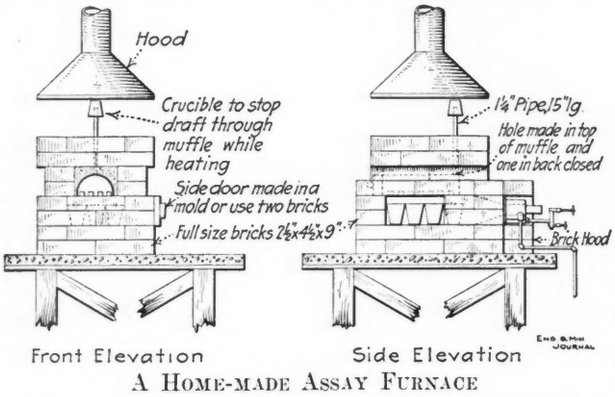
Titration of vanadium solutions with permanganate after reduction with sulphur dioxide gives a maximum error of 0.2%, says F. Halla (*Chem. Zeit*, 1914, p. 100; abstr. *Journ. Soc. Chem. Ind.*, Feb. 16, 1914). The

error caused by chloride can be eliminated by adding manganese sulphate. In presence of iron the reduction is effected with alcohol. The iodometric estimation, involving the use of potassium ferrocyanide, is reliable. The production of pure pentoxide from vanadium oxychloride is described; but for ordinary purposes it is sufficient to ignite commercial ammonium vanadate which has been four times recrystallized.

A Practical and Economical Assay Furnace

By Hugo W. Miller*

Custom assayers who frequently have to fire up for single assays, and also mining companies so situated that the freight or fuel costs are high, will find the assay furnace described below, both practical and economical. Though it does not differ essentially from the several combination furnaces on the market, there are points indicated which might be of considerable importance to parties desiring an all-round good furnace. Its economy



A Home-made Assay Furnace

of installation and operation makes it worthy of consideration. It has the advantage of being clean, and it turns out the work quickly on short notice. It may also be conveniently used for melting small lots of bullion rapidly.

The accompanying sketch will be sufficient for the building of similar furnaces, as there is nothing complicated about its construction. The top opening needs be only ½x4½ in., and is made by shortening brick No. 2 a little.

MATERIALS NEEDED AND COSTS

Fire brick, about 70 @ 10c. each, 2½x4½x9"	$7.00
Fire clay (adobe mud plus borax or cement will also do)	0.50
Muffle 5x12x4" high	1.00
One challenge burner	12.00
One 10-gal. tank, pump pipe valves, etc.	22.50
One piece 1¼-in. pipe about 15 in. long	0.10
Total (not including about ¼ shift labor)	$43.10

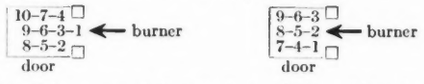
The supply catalogs never mention the fact that distillate may be used in the different burners. I find that it burns as well as gasoline and possibly gives a little higher heat. This is quite a saving, as distillate usually costs about one-half of what the higher grade gasoline costs, as will be shown from the following data obtained in my office. The runs were made on different days and started with cold furnace. It will give a good idea of the cost of the average use of the furnace for assays on ores of many different classes where the lead buttons vary in size from 8 to 40 grams, and often require scorification.

*Assayer and engineer, Nogales, Ariz.

OPERATING DATA AND COSTS

	Using Gasoline	Using Distillate
Number of runs, or times firing furnace	7	11
Total time using the fuel in burner	14 hr.	18 hr.
Total amount of fuel used	8 gal.	11 gal.
Total number of assays run	28	44
Total cost of fuel	$2.60	$2.53
Hence an average run would be:		
Time to complete assays	2 hr.	1.64 hr.
Number of assays run	4	4
Amount of fuel used	1.14 gal.	1.00 gal.
Cost per assay on small lot of four samples	9 cents	6 cents
Possibilities by making 10-gram lead buttons with careful watching:		
Time to complete (1 to 10 assays)	1 hr.	1 hr.
Fuel used as per above assays average	0.57 gal.	0.61 gal.
Number of assays made	1 to 10	1 to 10
Cost per each assay depends on number made	17½c. to 1.7c.	11c. to 1.1c.
For large lots of mine work, say 70 samples per day, the cost would be:		
Time to run 70 fusions (after experience with furnace)		4 hr.
Fuel used in four hr.		2½ gal.
Cost of fuel, per gal., in Nogales, in large lots 18c		45c.
Hence the cost per assay would be reduced (for fuel)		0.64c.

The furnace will hold ten 20-gram, or nine 30-gram crucibles. The muffle will hold thirty-two 1-in. or twenty-one 1¼-in. cupels. The average time of fusion is from 20 to 40 minutes, depending on the assay charges, air pressure in tank, etc. The arrangement of the crucibles in the fusion chamber if put in as shown in the diagrams will be found convenient in many respects:



The use of a crucible on top of the pipe to shut off the draft through the muffle will be found almost essential in order to have the muffle hot enough to cupel after the first fusion is ready. It is hard to get a door for the muffle that is airtight. This crucible is, of course, removed when cupellation has begun. It is also essential to have the pipe cemented to the muffle to keep out the reducing atmosphere of the fuel.

The placing of a brick on its edge in the fusion chamber will reduce the size of the chamber to fit the number of assays to be made and will thus save time and fuel, and not affect the heating of the back part of the muffle. The building of a brick hood over the burner helps to keep it heated and get a better generation of gas for combustion. It also prevents the burning back of the burner if there is a draft in the room.

The use of the Challenge burner gives very good results with distillate. The other hydrocarbon burners would probably answer as well, but not having tried them, am unable to say what results would be obtained. I find that if I have an air space in the tank, equal to about 2 gal. of fuel and no leaks in the pipes, by pumping the pressure to 45 lb. per sq.in. I will have enough to make one run of assays or one hour's use of the burner. This is not as inconvenient as is often thought by those prejudiced to the use of gasoline.

Iodimetry of Arsenic, Copper and Iron

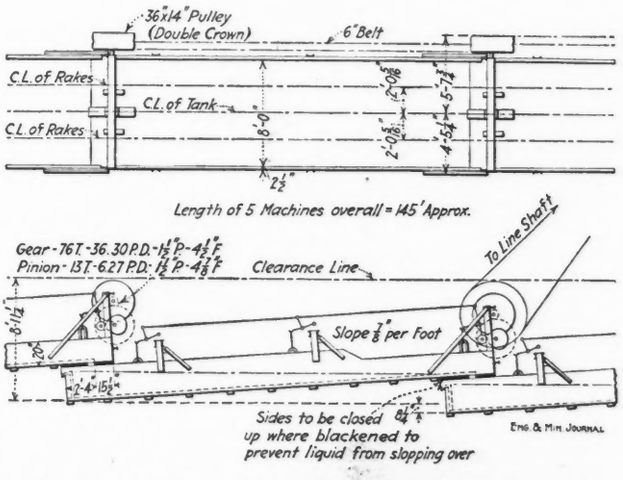
At the annual meeting of the Society of Public Analysts, a paper was presented by G. D. Lander and J. J. Geake on the above subject. They conclude that cupric and ferric salts do not liberate iodine from potassium iodide in the presence of rochelle salt and sodium bicarbonate. The quick volumetric process of Curry and Beans for arsenic-copper mixtures is based on this fact. The authors extended this method in the cases of copper and iron. Cuprous salts were oxidized by iodine in the presence of tartrate and bicarbonate, but in the case of ferrous salts this reversed action was incomplete.

Mining & Metallurgical Machinery

Dorr Classifiers for Copper Leaching

A recent development in leaching is the installation at the Butte & Duluth Copper Co.'s plant, Butte, Mont., of a series of specially designed Dorr classifiers for the leaching of copper ores.

The manner in which the series of machines was installed is illustrated in the accompanying drawing. The first installation consisted of five Dorr classifiers in series, but instead of using the ordinary steel tank, wood tanks were used for the classifiers, and their scrapers and stringers were built of acid-proof material. Later two more machines were added to this series. Five machines for a second series were then designed, but these were 8 ft. wide and 30 ft. long, as shown in the illustration. This series will handle several hundred tons of material per day. The first series of 4½-ft. machines handles between 100 and 200 tons per 24 hours; the extraction being about 85 per cent.



PART OF A 5-DECK DORR CLASSIFIER INSTALLATION

Leaching in tanks was practiced before the installation of the Dorr classifiers, but gave a much lower extraction. The period of contact of the solution with the material in passing through the first series of classifiers was approximately 40 minutes, and the machines took only 3¾ hp. for operation. Wear on the scrapers has proven inconsiderable, as far as cost is concerned, during the five months they have operated. On account of the short period of contact in the Dorr classifiers, it is understood that there is not so much aluminum and iron going into solution, which is a decided advantage over leaching in tanks, because due to the long period of contact in the tanks, a large amount of iron and aluminum would go into solution, which we understand gave trouble in the electrolytic precipitation of copper.

The ore for treatment in the classifiers is ground to approximately 10-mesh, and is mixed with approximately four times its weight of 8 to 10% sulphuric-acid solution. The whole of the slime and the solution from these machines will be run to an acid-proof Dorr thickener. While the use of Dorr classifiers for this purpose has been considered before and some practical work done on it in the East, Captain Wolvin and Mr. Sherwood are entitled to the credit for having put it to this work.

Measuring Hook for Steel Tapes

A simple and apparently effectual device that will enable one person to do certain kinds of measuring with steel tapes, is being sold by the Lufkin Rule Co., Saginaw, Mich. The operation of the attachment, which

THE HOOK WITH TAPE IN POSITION

consists of a nickel-plated hook having a serrated face, is evident from the sketch. The hook is designated for ¼- or ⅜-in. wide tapes that measure from the end of the ring, the latter being slipped between the flat spring and the point of the hook, and into the slot at the back. When so inserted and used, the hook grips the end of the article to be measured and the zero point falls exactly at the inside of the hook.

Balanced Impeller for Sand Pumps

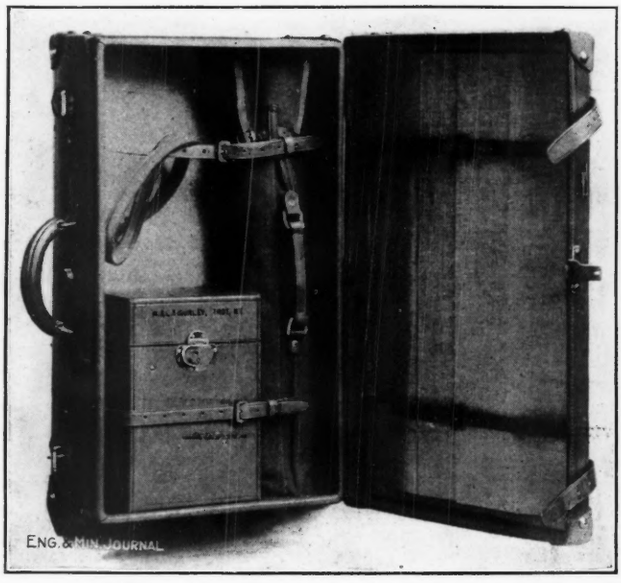
While the introduction of sand pumps was a step forward in the lifting of solutions carrying solids of varying size, their use has often been attended with some troublesome features. Among the latter, the most prominent, perhaps, was the excessive thrust from the impeller, for heads over 30 ft. This resulted in loss of power and caused a leak around the shaft, through the stuffing box, which in turn rapidly cut the stuffing box and the shaft. The Traylor Engineering & Mfg. Co., Allentown, Penn., has developed what it calls a balanced impeller, for use in its sand pumps, and which is designed to overcome these difficulties. This impeller has slots in it, near the center, which permit the solution to pass through it and thus to equalize the pressure on each side. The vanes are cast on the impeller in such positions that when rotating, they help to deflect the water or solution into and through the slots, the latter having edges beveled in the proper direction to aid in this purpose also. It is claimed that the result of this design has been to remove the thrust on the impeller and to make unnecessary the use of a thrust collar or thrust bearings. The pumps containing these impellers remain single suction

pumps, as before, but the suction action on each side of the impeller is the same, resulting in the stuffing box being used to keep air from entering the pump, and not, as before, to keep the solution from getting out.

In the pump itself, some improvements have also been made in the method of holding the linings in place. The latter are now held and adjusted by setscrews from the outside, instead of by bolts, making it possible to cast the liner castings without any openings in which sand might eddy. At the Anaconda concentrator, the following pumps with the balanced impellers are being installed: Six 6-in., 2-stage, lined pumps, each direct-connected to 100-hp. motors, and four 6-in. duplex pumps, direct-connected to 75-hp. motors. The 2-stage pumps are at work against an actual head of 90 ft., which may amount to 100 ft., including frictional head. The duplex pumps will work against a head of practically 50 feet.

A Light, Compact Surveying Outfit

It is now possible for the engineer on exploration work, or for the consulting engineer on an examination, to take with him, in a suitcase, a standard transit, level and tripod, besides having room for a number of the usual accessories, the whole enabling him to do work with as great accuracy as is desired. The combination is the product of the W. & L. E. Gurley factory, at Troy, N. Y. The transit included in this outfit is known as the Explorer's transit, a high-grade instrument and standard except as to size and weight.



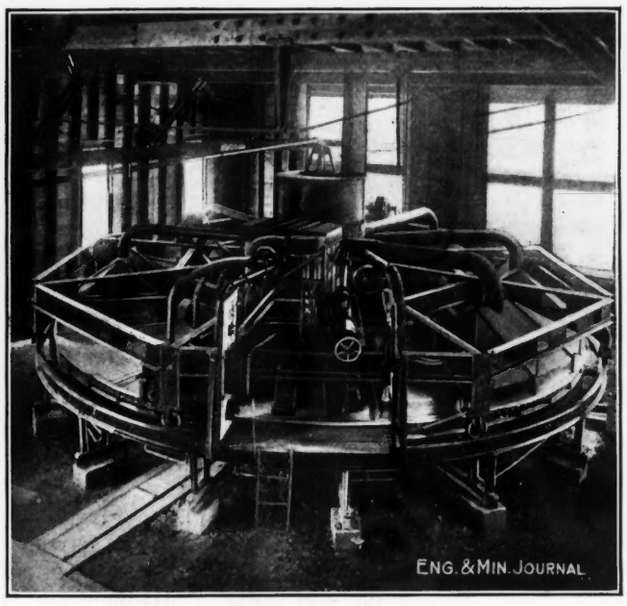
SUITCASE SHOWING TRANSIT AND TRIPOD PACKED WITH SPACE FOR LEVEL

The telescope has a power of 16 diameters, is 6½ in. long, is fitted with platinum cross- and stadia-wires and will focus on an object 3 ft. from the center of the instrument. The vertical circle is 4 in. in diameter, is graduated on sterling silver and is read to single minutes by one double vernier. The compass needle is 2¾ in. long. The horizontal limb is 4 in. in diameter, has the graduations in silver and is read to single minutes by two double, opposite verniers. The transit itself weighs about 5 lb., and the total weight of the transit, its leather-covered box, which is equipped with shoulder straps, lock and key, and the tripod, which collapses to about 22 in. long, is about 14 lb. This includes the accessories, such as plumb bob, sight glass, etc.

The level is of approximately the same proportions as the transit, having a telescope 6½ in. long, with erecting eyepiece; the power is 16 diameters. The weight of this instrument alone is 2½ lb.; with its 7¾x6x4-in. mahogany box and accessories, the weight is 5 lb. The transit tripod, having a standard head, can be used with both instruments, and when the entire outfit is placed in a 24-in. suitcase, which is also furnished by the Gurley company, the total weight is under 25 lb. Sight and level rods, collapsing to approximately 3 ft., are also obtainable, and are easily carried in separate canvas cases. These instruments are moderate in price and the workmanship that goes into them is the same as that in the most expensive machine made by this company.

The Macklind Annular Drier

The Macklind drier is a machine devised for drying pigments. It consists of a table of 40 sectors, set in a circle, and heated from below by live steam. Over these passes a spider carrying various devices which distribute the sludge, remove the moisture and remove the dried material in turn.

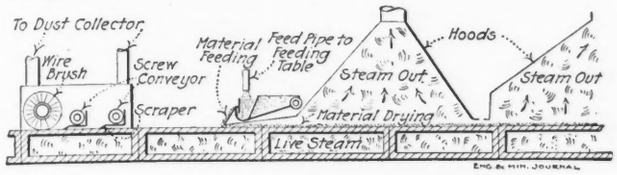


GENERAL VIEW OF THE DRIER

A feeding table, making about 300 vibrations per min., feeds the sludge to each sector in turn as the spider revolves clockwise. A succession of hoods follow this and remove the vapor formed as the sludge is heated by the steam. Behind these is the removing device consisting of scrapers, brush and screw conveyors, by which the dried material is taken from the table and carried to the receiving hopper. This removing device is inclosed in a tight steel case and kept under suction so that no dust can escape.

The machine weighs 80,000 lb., and has a minimum diameter of 30 ft. There is 414 ft. of drying surface.

The maximum temperature at which the machine operates is 330° F., corresponding to 90 lb. of steam. It is driven by three direct-current motors, of 5, 3 and ¾ hp. The time for drying varies from 1 to 3 min. Material consisting of 50% water and 50% solids, or 40% water and 60% solids can be handled, but the water should be in all cases at least 40%. One man attends to all the operation of the drier.



SECTION THROUGH THE SECTORS AND REVOLVING APPARATUS

Advantages claimed for the machine are its high efficiency, 75% of the heat in the steam being used for removing the moisture from the sludge, the fact that it creates no dust, its continuous operation and its simplicity. The machine is built by the Sherwin-Williams Co., Cleveland, Ohio.

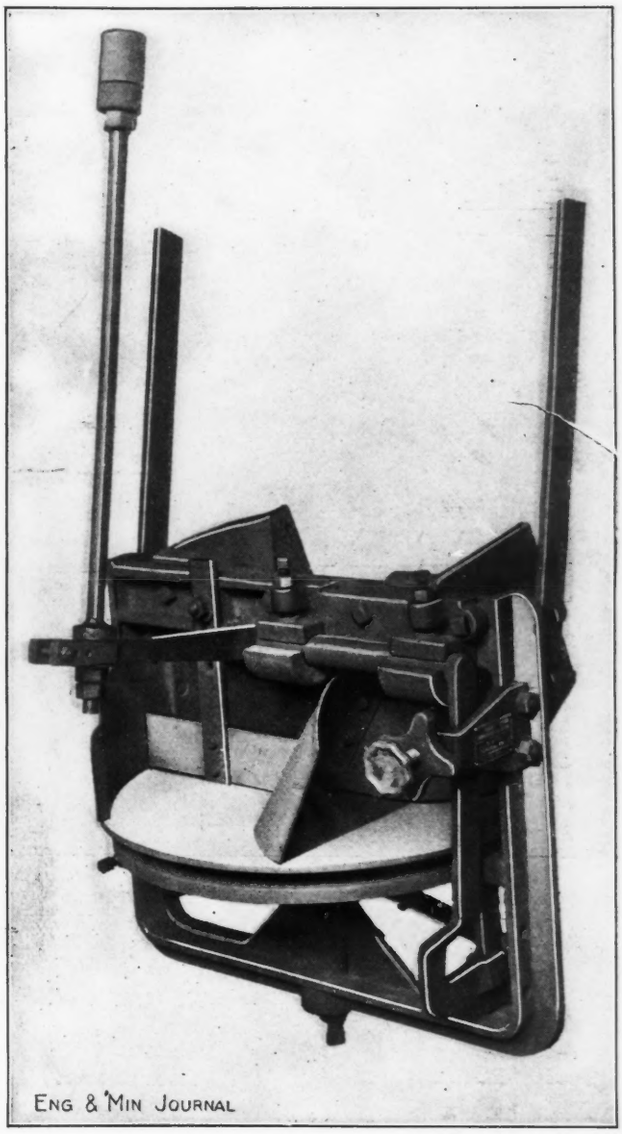
A New Dumpy Level

A new level, known as the "Lo-Set" dumpy level, is being made by the Hanna Mfg. Co., Troy, N. Y., for which a number of advantages are claimed. As its name implies, it is of low construction and compact, tending toward rigidity and accuracy, and affording considerable protection to the spirit level. The bar of the level is round and hollow, the upper portion is integral with the lower, and the spirit level is completely incased, except for the portion where it is read. Because of this construction, the level is said to offer less resistance to the wind and to possess great strength. With fewer parts than the "Y" level, the adjustments are claimed to be less liable to derangement, and although a precise instrument, it is capable of much rough usage. The telescope is 18 in. long, is provided with a dust guard to the object glass slide, and the whole instrument, above the leveling head, is finished with cloth. The total weight of the instrument is 10¼ lb. The Hanna company is also making now a full line of transits, from the light mountain type, weighing 10½ lb. up through the heavier engineer's and surveyor's instruments. Included in these is an explorer's transit, costing $160, and weighing 6½ lb. The standards of this transit are cloth finished.

A New Tappet-Driven Ore Feeder

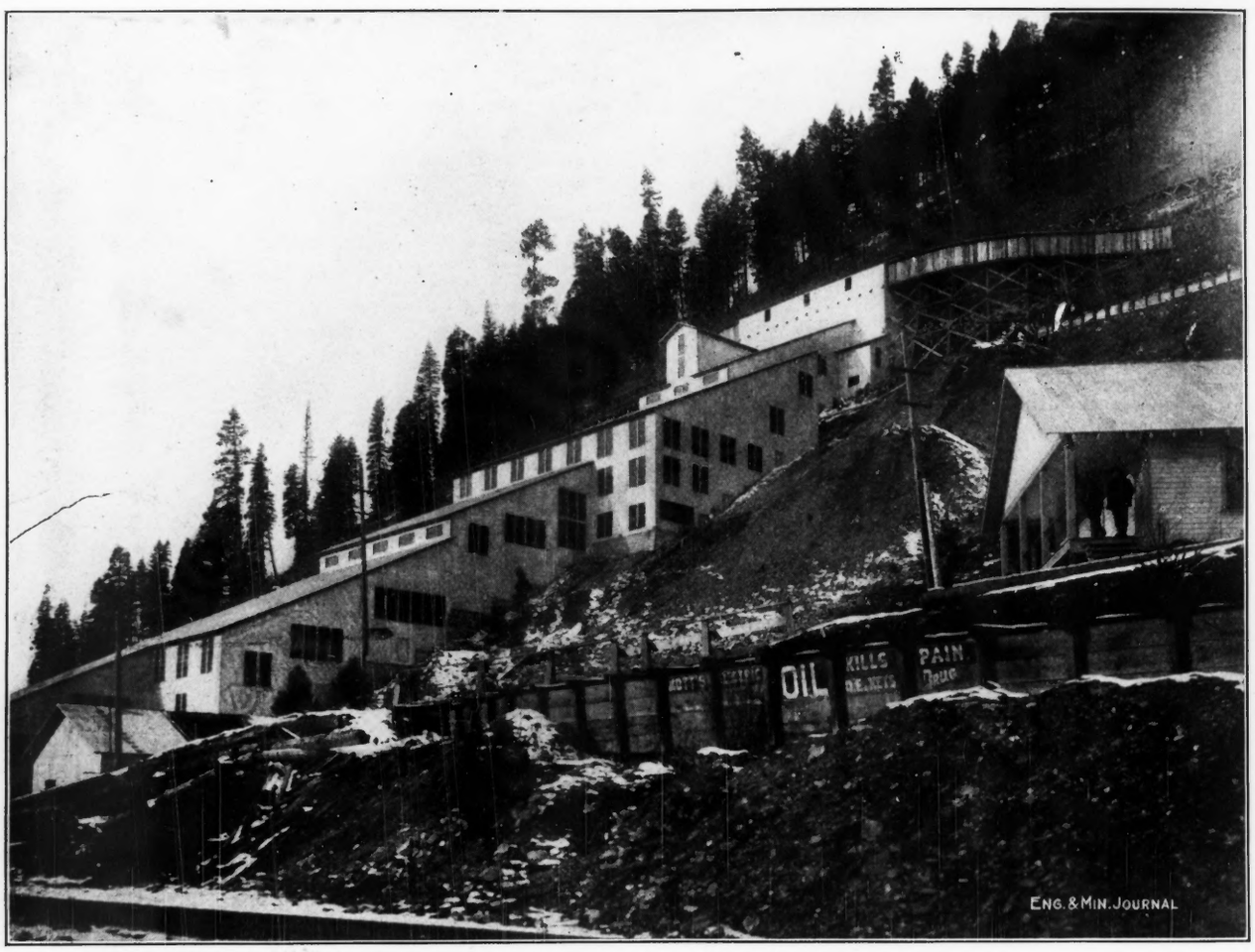
This feeder retains the revolving disk and stationary plows of the well known challenge type, while the improvements affect principally the operating mechanism. The number of parts is reduced compared to the usual mechanism, and the wearing parts are such that they can be made by any good blacksmith. There are no gears, cams, clutches, pawls and ratchets, shoes, delicate springs, or other troublesome parts. Only one heavy spring is used.

The monkey-wrench type of grip gets its name from its similarity to the monkey-wrench when applied to the rim of a pulley for the purpose of forcibly moving it. This grip, applied on the edge of a secondary disk below the main disk of the feeder, is shaped like the open jaws of a monkey-wrench. When pushed in one direction by the action of the falling tappet, the jaws cramp on the disk and carry it around. When pushed in the opposite direction by the spring, the jaws slide along the edge of the disk instead of clamping and are then in position for the next movement to carry the disk around again. The tappet arm, shaft, and depending lever which actuate the grip are in one piece. The shaft is carried in two bearings with adjustable caps. The hand screw adjusting the range of grip movement has a heavy four-winged check nut which may be set with a hammer. The feeder disk has a renewable steel wearing plate and the feeder-disk shaft is adjustable vertically by a setscrew at its lower end. The gate is adjustable in the usual manner. The feeder hopper is open at the back with bolt or rivet holes suitably located along the edges for connecting to the sheet-steel or wooden chute from the ore bin. The device is made by the Denver Engineering Works, of Denver, Colorado.



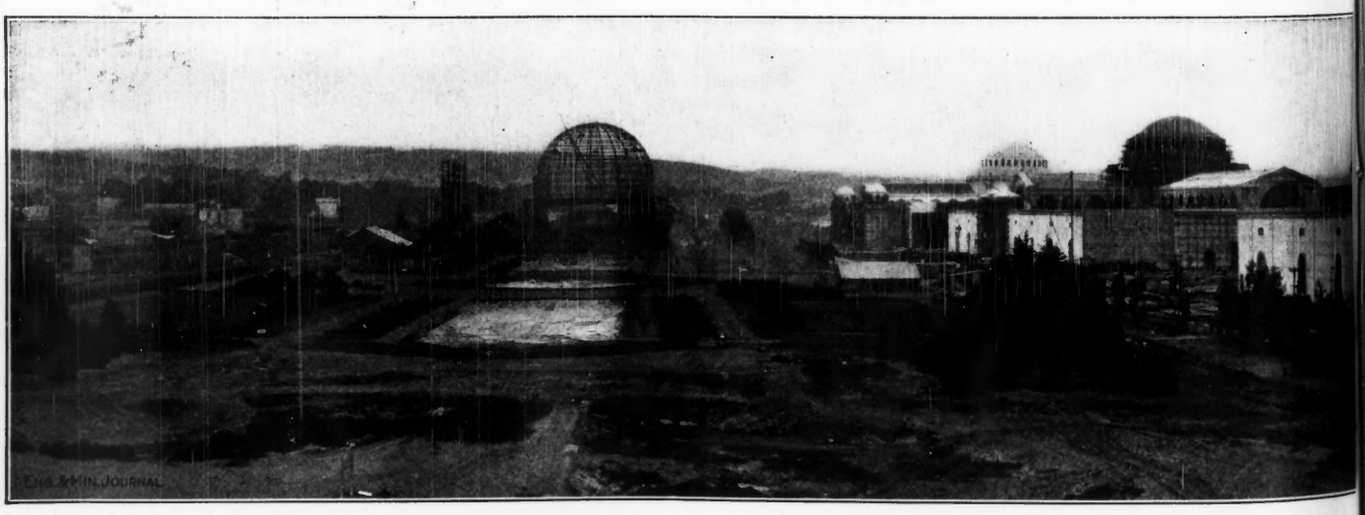
TAPPET-DRIVEN ORE FEEDER

Photographs from the Field



NEW 500-TON COPPER CONCENTRATOR OF THE NATIONAL COPPER CO., NEAR MULLAN, IDAHO

Copper minerals are recovered by concentration and flotation, a high extraction being made.



A RECENTLY MADE VIEW OF THE GROUNDS OF THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION AT SAN FRAN-

The white dome is on Education Bldg.; the similar unpainted dome to the right is on the Liberal Arts Bldg.; next to right, built; next dome is on Transportation Bldg.; and

PORTAL OF NATIONAL COPPER CO.'S 4800-FT. TUNNEL AND NEW CAMP HOUSES IN DEADMAN'S GULCH NEAR MULLAN, IDAHO

The electric railway connects the mine with the mill in the Cœur d'Alene Valley, three miles away.

CISCO FROM THE SOUTH SIDE OF THE GROUNDS, SHOWING STEEL DOME OF BUILDING FOR HORTICULTURE AT LEFT

in distance is dome of Food Products Bldg.: the next building to the right is Manufactures Bldg., on which dome is not yet one at extreme right on Varied Industries Bldg.

South African Labor

LONDON CORRESPONDENCE

The South African labor fashions have an interesting history. In 1902, Mr. Creswell was struggling ineffectually to work the Village Main Reef mine with white labor only, and to persuade others to try the same experiment. This proved a failure and in 1904, as there were not enough Kafirs to meet the requirements of the mines, 40,000 indentured Chinese laborers were imported. However, the Radical party at home successfully engineered a big outcry against the Chinese on the ground that they were slaves, probably the most ridiculous ground on which a general election was ever won, so the Chinese were sent back on the conclusion of their contracts. Now efforts are being made to improve the status of the Kafir and give him more responsible positions, in other words, to increase the ratio between blacks and whites, as it is quite frequently the case that the white boss receiving about 10 times the wages of the Kafirs he is superintending, knows less of the work than many of them. Naturally enough, this policy is approved by the shareholders, but is highly unpopular with the white labor unions.

Important Nevada Mining Legislation

BY ALBERT G. WOLF*

Several laws relating to mines and mining were passed by the Nevada State Legislature of 1913. A brief summary of the most important of these laws is given here from which it will be seen that their object is the protection of the life and health of the miner.

Passageways connecting contiguous mines must be kept free from doors and bulkheads, and the right to use such outlets in case of accident must be granted. Doors may be placed which can be quickly opened or readily broken; in the latter case the necessary tools must be kept near at hand in a conspicuous place.

All machine drills or boring machines used in stopes or raises must be equipped with sprays, water jets or some device equally as good for allaying dust. Water supplied to sprays or jets must be free of pollution by organic or other noxious matter. When means of preventing escape of dust are supplied, it is unlawful for anyone to run drills or boring machines in raises or stopes without their use.

All chutes in mines or ore houses must be equipped with sprinkling devices to allay the dust. This does not apply to chutes in the open air, or to mines employing less than 10 men. The inspector of mines may exempt any mine where such an installation is impracticable.

Gasoline may be used underground only as follows: Gas engines of not more than 8 hp. may be operated not more than 100 ft. below the surface, provided the exhaust is into a pipe leading to the surface, or they may be operated to a depth of 250 ft., if an exhaust fan is attached to the pipe which leads from the exhaust of the engine to the surface. All gas-engine installations underground shall be subject to the approval of the inspector of mines.

No sinking or other work may be done in vertical shafts at a depth of more than 350 ft. unless cages, skips or crossheads used in hoisting and lowering employees are provided with safety appliances and iron bonnets. Safety apparatus must be securely fastened to cage, skip or crosshead, and must be of sufficient strength to hold it when loaded. Where a safety crosshead is used for any other purpose than sinking, it must be equipped with gates as provided by law for cages. When a skip is used for other than sinking purposes, platforms for men to stand on when being hoisted or lowered must be placed in the skip not less than 4 ft. from the top thereof, and an overhead bar must be provided for men to hold to. When a crosshead is used without safety appliances in a shaft less than 350 ft. deep, a platform must be placed above the crosshead for the employees to ride upon.

It is unlawful to employ in any underground mine, or for handling explosives either underground or on the surface, any person who cannot clearly speak and readily understand the English language, or who cannot readily read and understand any sign, notice or list of rules, or directions printed in the English language in regard to rules of safety in underground mines, or governing the handling of explosives.

Penalties provided for the violation of these laws are fines varying from $100 to $500, or imprisonment from 30 days to six months, or both, according to the nature of the law violated.

*Mason, Nevada.

Nevada Consolidated Copper Co.

The Nevada Consolidated Copper Co. for first quarter of 1914, shows a production of 15,597,592 lb. of copper: 5,791,122 lb. in January; 4,588,243 lb. in February; and 5,218,227 lb. in March; 792,754 dry tons of Nevada Consolidated ore were milled, containing an average of 1.53% copper. Ninety-four per cent. of the tonnage came from the pits and 6% from the underground workings of the Veteran mine. In addition, 27,243 dry tons of Giroux ore were milled.

The cost per pound of copper produced, including Steptoe plant depreciation, and all charges, except ore extinguishment, was 10.21c. Earnings are figured on a basis of 14.431c. per pound.

Overburden stripped was 906,097 cu.yd., costing $319,589. Charge to undivided profits for the quarter was $177,044, after payment of dividend No. 18 of $749,796, and the further payment of $143,559 to the Steptoe company for depreciation.

Duriron

Duriron is a noncorrosive iron alloy which is resistant to both alkalis and acids. Its exact composition and method of manufacture are not known, but it is supposed to be a modification of ferrosilicon, containing about 10% Si. In the JOURNAL of May 2, 1914, p. 917, it was said that this material had failed to stand up as a tube-mill lining in the Chile Exploration Co.'s experiments in Chuquicamata ores, where it was exposed to solutions carrying $CuSO_4$, $CuCl_2$ and H_2SO_4. As a matter of fact, it did prove resistant to these solutions, and earthenware linings were chosen solely because they were thought to be cheaper.

Sampling and Testing the Chuquicamata Orebody

By E. A. Cappelen Smith*

SYNOPSIS—The testing of drill-hole samples and selection of large samples for leaching tests is discussed; two methods for the graphic presentation of drill-hole data are also described.

In the development of low-grade copper properties, in which the large expenditure of capital is determined by the result of drillings, the method of handling and testing the samples becomes one of considerable importance.

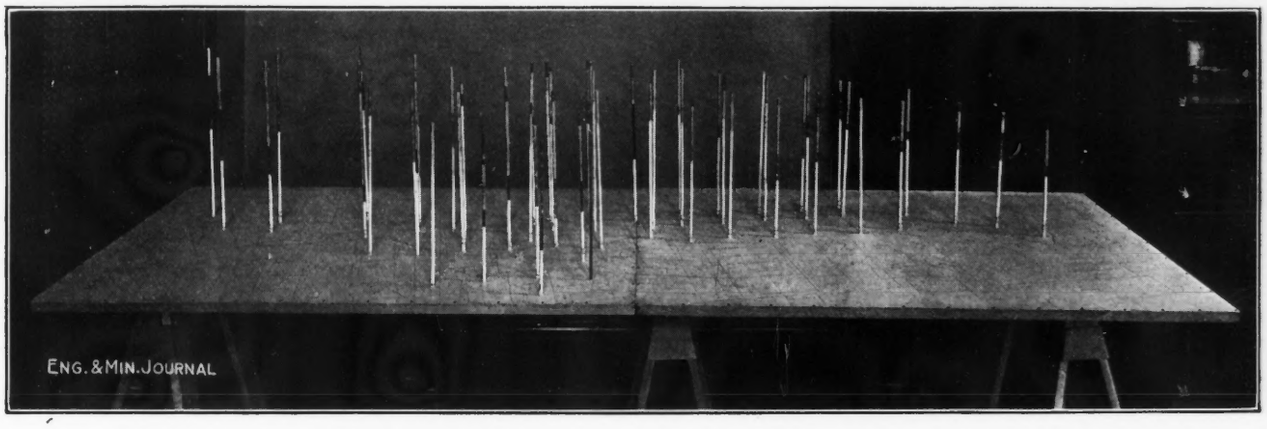
The methods followed by the Chile Exploration Co. in sampling and testing the ores at Chuquicamata are as follows: As pulp was brought up from the drill hole by the bailer, the entire mass, water and all, was put over a split sampler. After reducing in this way, the sample was dried at a low temperature, to avoid decomposition of unstable salts, and was then quartered down in the usual manner. Each 5 ft. was sampled thus, and assays for total copper, soluble copper and chlorine were run in the field assay office in Chile. Most of these determinations were run by the cyanide method, occasionally a check was run by iodide. For the first 50 ft. these 5-ft. samples were sent to New York; below 50 ft., composite samples, each representing five 5-ft. samples, were made up and forwarded.

These were run in New York by the electrolytic method for total, water-soluble, acid-soluble and insoluble copper, most of them by two men, and the sum of the soluble and insoluble must check the total copper. Total and water-soluble chlorine; total, water-soluble, and acid-soluble iron; manganese; total and water-soluble SO_3; lime; sulphur as sulphide; and nitrates were also determined. Some idea of the amount of analytical work necessary may be judged from the fact that we had six to eight analysts employed for about a year and a half.

Leaching tests were run on all of these samples, in addition to those on our large shipments, which amounted to about 800 tons, and since the drill holes cover the entire property, the leaching experiments may also be considered to cover it. These small-scale leaching experiments, over 2000 of which were made, have given as good results, both as regards copper and impurities as do the large scale, and indeed, they point to better results, since they show only one-tenth as much chlorine, one-twentieth as much nitric acid, and less soluble iron than the big samples we have treated.

The large samples were taken from locations selected by Mr. Yeatman and me while on the ground. At that time we had some drill-hole results to guide us, and also had the old dumps, stretching from one end of the property to the other, beside some preliminary work on 23 lots of ore. With these to go by, 13 lots of ore were selected, in which the attempt was made to get ore high in copper, low in impurities; high in copper, medium in impurities; high in copper, high in impurities; and similar combinations with lots of low-copper ore, as well as lots of average ore.

Following these, six lots were made up which we considered were representative of the orebody, as determined by our previous experience. On these we made our main experimental run. As an additional check on our analytical work, to eliminate personal errors, some of our heads and tails samples from leaching , and other samples, were sent to three outside assayers.



Peg-Board Model of Chuquicamata Drill Holes

In short, everything possible was done to render these tests on drill-hole and leaching samples as accurate as possible.

The subject of the presentation of a great mass of drill-hole data is also one of interest.

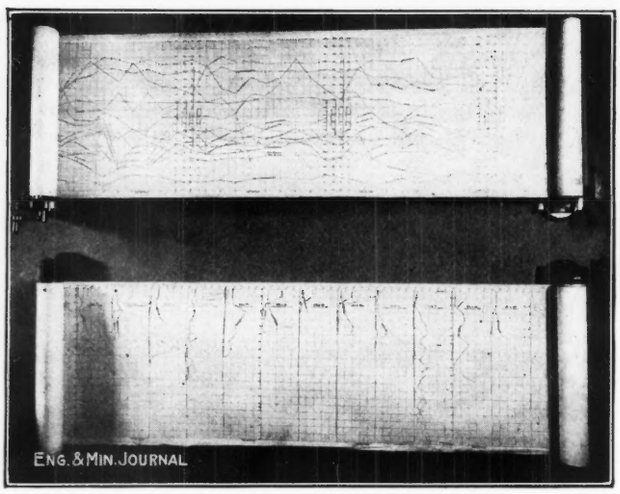
The form of record shown in the first illustration is known as the peg-board method. The table represents a datum plane, lying in the case of the Chuquicamata deposit, about 1200 ft. below the surface of the earth. On the surface of the table is laid out a projection of the claim lines and any topographical features it seems desirable to show. The pegs are brass rods, cut so that their height represents the elevation of the surface at that point. As a result of this, the tops of the rods give the surface contour.

Paper strips are made, graduated to represent 5-ft. intervals with heavier divisions at 25-, 50- and 100-ft. in-

*Consulting metallurgical engineer, M. Guggenheim's Sons. New York.

tervals. These strips are wrapped around the brass rods and a glass tube slipped over them. They have this advantage over wooden pegs in that any legend put on the paper will remain clean, and the paper is easily marked on, which wooden pegs are not.

These paper scales are painted at the various depths in different colors, to represent capping, brochantite, mixed brochantite and sulphide (one way if the former predominates, another way if the latter), straight sulphide, and country rock. The scales also bear little squares in which the copper assays at various depths are entered. Consequently, when one looks across the pegs, one sees in colors a geological section of the deposit, so far as drilling has determined it, while by closer inspection the depths and assays can be read off for any particular point. When further results are received on



WALL CHARTS ON ROLLERS

any drill hole, the paper is taken off the peg, appropriately colored and marked to the new depth, and returned to its place.

Another method is that shown in the second illustration, in which a long strip of cross-section paper mounted on wall rollers is used. (In this particular cut, the plotting on the upper roll represents leaching and electrolyzing experiments, on the lower, drill-hole data.) A vertical rectangle is assigned to each drill hole. The ordinates down from the zero line at the top of the paper, represent depths, while percentages of total copper, soluble copper, nitrates, chlorides, sulphuric acid, etc., are plotted as abscissas, using the left-hand line of each rectangle as zero axis. Any required drill hole is easily found by its number, which appears over the rectangle.

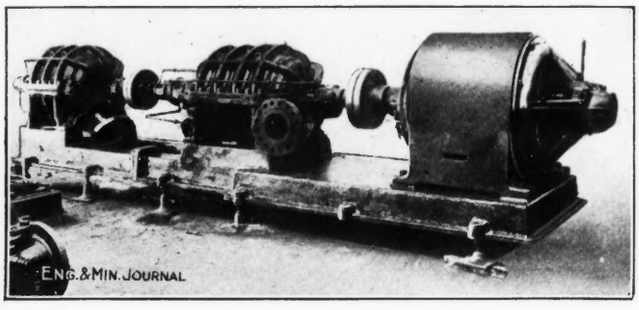
The advantages of this method of plotting, shown particularly in the leaching curves, are that a larger number of results are visible at one time than in the usual graphic methods; a great number of results can be quickly looked over, owing to the method of mounting on rollers; and as a result of these first two, causal connections and variations are rapidly detected.

Tax Assessment of Colorado Mining Property

The Colorado tax laws do not authorize assessment of gold-mining property on the basis of one-fourth of the gross value of ores extracted, but on the basis of one-fourth of the proceeds of the mine, less cost of transportation and reduction, according to a recent decision of the Colorado Supreme Court in the case of Paxson vs. Cresson Consolidated Gold Mining & Milling Co., 139 "Pacific Reporter," 531.

Heavy-Duty Centrifugal Pump

The accompanying photograph shows an 8-in., 7-stage, direct-connected, motor-driven centrifugal pump recently made by the Alberger Pump & Condenser Co., 90 West St., New York City, for the Negaunee mine of the Cleveland-Cliffs Iron Co., at Negaunee, Mich. The seven stages are divided into two units of three and four stages each. To show that it is doing heavy duty, its requirements are 1000 gal. per minute, against a head of 1000



HEAVY-DUTY CENTRIFUGAL PUMP

ft., and to perform this, 350 b.hp. are required, with a speed of 1750 r.p.m. The manufacturers guaranteed an efficiency of 72% and report that this was exceeded on test. It is claimed that the size of the rock chamber to be cut had some weight in determining upon this type of pump.

The Mining Law Commission

WASHINGTON CORRESPONDENCE

On May 7 the Senate, with little or no debate, passed a bill creating a commission to amend and codify the mining laws of the United States. This bill has been pending for some time past and had been reported from the committee on mines of the upper chamber with amendments. The first amendment provides that the commission consist of two lawyers of large experience in the practice of mining law and one mining engineer, who shall have had practical experience.

Another amendment extends the scope of the contemplated code, so as no longer to exclude lands containing deposits of coal, oil, gas, phosphates or soluble potassium salts. A third amendment provides for the report of the Commission within one year after the passage of the act. Two other amendments are of minor importance.

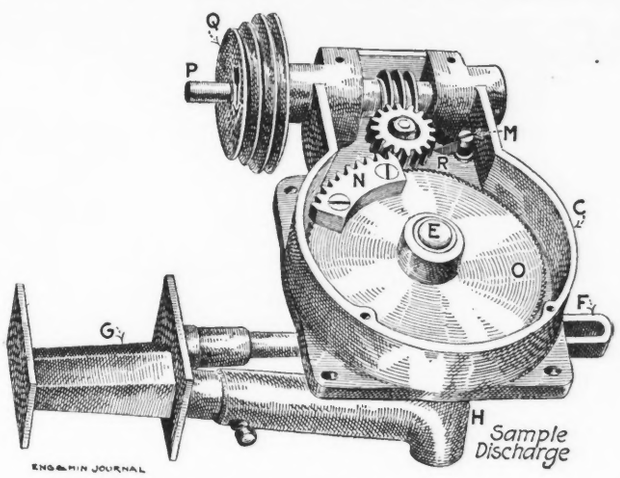
There seems to be a pretty general understanding that in the House the measure will not encounter any serious opposition, but will be passed with a minimum of delay and with but few amendments. In the House draft of the bill now under consideration, there may doubtless be certain changes designed to limit the scope of the commission, as contemplated by the Senate, but there is an evident disposition to afford some means for the study of the mining laws now in effect and for the recommending of such changes as will tend to make them more adaptable to actual needs.

Correspondence and Discussion

A Pulp-Stream Sampler

In view of the remarks published in the JOURNAL of Jan. 3, 1914, we would like to submit a description of the improved Elmore sampler, which is free from the objectionable features added by Mr. Nichols, such as the hit-and-miss pin, the knuckle-jointed arm sliding on a horizontal path terminating in an angular path for disengaging the swinging arm from the pin, the wire and counterweight, and the pivoted pawl on the end of the arm.

In this machine, by simply sliding the adjustable arm on the center pin, the machine is at once adapted to various widths of launders. It is put into operation by motion imparted through a round belt on the grooved pulley *Q*, which is keyed to the shaft *P*. This in turn rotates the worm engaged with the worm pinion. This



THE ELMORE PULP SAMPLER

worm pinion operates an eccentric (not visible on the illustration) which reciprocates the pawl *R* causing the main ratchet wheel *O* to advance one tooth at a time. Thus the main ratchet wheel *O* is caused to rotate slowly.

To the upper face of *O* a toothed segment *N*, equal to about one-sixth of the periphery of *O*, is securely attached, the teeth of which are of the same pitch as those on the worm pinion.

By the slow rotation of the main ratchet wheel *O* the segment *N* gradually approaches the worm pinion and engages with it, which immediately results in the quick movement of *N* and *O*; and as these carry the pin *E*, to which is attached the sampling cup and discharge pipe *H*, it follows that during about five-sixths of each revolution (the nonsampling period) the main ratchet wheel *O* is moving at a very slow rate, whereas, for the other one-sixth of the revolution (the sampling period) the rate of movement is rapid, and the sampling cup thus cuts through the whole stream of pulp at a uniform rate of speed during the period of sampling, and always at the same relative angle.

The movement of the sampling cup is secured by a positive-geared drive, eliminating the uncertainties of friction drives, springs, brakes, etc.

The machine has been proved by use to be certain in action, substantial in construction, and owing to the whole of the operating gear being completely inclosed in an oil bath, wear and tear is reduced to minimum.

F. W. BRACKETT & CO., LTD.

London, Feb. 23, 1914.

Magnetite Lining for Converters

Referring to Milo W. Krejci's letter published in the JOURNAL of Apr. 18, 1914, relative to basic lining in converters at Garfield, I wish to correct a misunderstanding on Mr. Krejci's part in regard to the output of copper per converter lining. He states that he visited a number of smelting plants in 1912 and found that the highest output was 4400 tons *per basic lining*, and this was at the Garfield works.

Owing to the comparatively small diameter of the Peirce-Smith converter as now constructed, resulting in intense action in a confined space, it has been found difficult to maintain the magnetite coating along the tuyere line, hence it has been necessary to make certain comparatively small repairs along the tuyere line after 4500 to 7000 tons of copper output. Much of this mending might be accomplished without cooling off if the tuyere line were as accessible as in an upright converter. These periods between mendings are called runs, and on such runs Mr. Krejci is applying the output per converter lining. One converter relined at Garfield has an output of about 50,000 tons of copper to its credit. Others still operating may show higher. In fact, the magnetite coating has been protecting the basic linings for years, an experience not confined to Garfield or Great Falls, but to all users of basic converters.

Messrs. Wheeler and Krejci can be complimented on having developed a converter of marked efficiency, but I fail to see how the quotation from Dr. Edward Weston's comment has any bearing on my letter, or on the Wheeler and Krejci patent.

W. H. HOWARD.

Garfield, Utah, Apr. 22, 1914.

Resistivity of Metals at High Temperatures

In the account of the recent meeting of the American Electro-Chemical Society, there is one error that should be corrected. In the JOURNAL and other papers, it is stated that "practically every metal lost its function as a conductor of electricity at 1600 to 1700° C." This is wrong, because they are all good conductors still at that temperature. I think what Prof. E. F. Northup said was "that practically every metal has a resistivity strictly

proportional to the temperature, at 1600 to 1700° C." Professor Northup was insisting on the fact that melted metals are better to study than solid metals, since the past physical history of the metal is wiped out as soon as it melts, and then you get the uniform properties of the pure metal, unchanged by any previous thermal or mechanical treatment.

JOSEPH W. RICHARDS.

South Bethlehem, Penn., Apr. 28, 1914.

Calculation of Strike and Dip

I have read with interest the article, "Calculation of Strike and Dip," by Theodore Simons, in the JOURNAL of April 11. The equation

$$tan\ \theta = \frac{tan\ \beta}{sin\ b}$$

may also be derived as follows: Referring to Fig. 2 of Mr. Simons' article,

$$\frac{CC_1}{C_1D} = tan\ \beta, \text{ and } \frac{CC_1}{C_1F} = tan\ \theta$$

$$\frac{tan\ \beta}{tan\ \theta} = \frac{\frac{CC_1}{C_1D}}{\frac{CC_1}{C_1F}} = \frac{C_1F}{C_1D} = sin\ b$$

or

$$tan\ \theta = \frac{tan\ \beta}{sin\ b}$$

If this equation is changed to the form

$$tan\ \theta = \frac{tan\ \beta}{cos\ \Delta}$$

where Δ is the angle $DC'F$, the complement of the angle b of the right triangle in the horizontal plane, it will be found useful in determining the projections of mine workings on vertical planes. For example, let CD represent an incline raise, the bearing and inclination of which are known. It is desired to project this raise on a plane CC_1F, the strike of which is known. We then have known, Δ and β and desire θ, which is determined from the equation given ($\cos \Delta = \sin b$).

ALBERT G. WOLF.

Mason, Nev., Apr. 16, 1914.

In looking over the article, "Calculation of Strike and Dip," by Theodore Simons, in the JOURNAL of Apr. 11, 1914, it occurs to me that the graphical solution, shown in Fig. 5, gives the easiest method of calculation as follows:

First determine length of the line C_1D from similar triangles; $250:1000 = 600:C_1D$, from which $C_1D = 2400$ ft.

In the triangle AC_1D, we have angle C_1AD + angle $C_1DA = 180 - 133° = 47°$; and $(C_1D + AC_1):(C_1D - AC_1) = \tan ½$ (angle C_1AD + angle C_1DA): tan ½ (angle C_1AD — angle C_1DA); or $3700:1100 =$ tan 23° 30′ : tan ½ (angle C_1AD — angle C_1DA); whence, tan ½ (angle C_1AD — angle C_1DA) = tan 7° 22′. We have, then, ½ (angle C_1AD + angle C_1DA) = 23° 30′; and ½ (angle C_1AD — angle C_1DA) = 7° 22′. Adding, we get angle $C_1AD = 30° 52'$; subtracting, angle $C_1DA = 16° 8'$.

With these angles determined, the directions of strike and dip can be readily obtained.

To get the angle of dip, we have in the triangle CC_1M,

$$tan\ \theta = \frac{CC_1}{C_1M} = \frac{CC_1}{C_1F} = \frac{600}{1300\ sin\ 30°\ 52'}$$

From which $\theta = 41° 59'$.

L. J. HOHL.

San Francisco, Calif., Apr. 15, 1914.

Bering River Coal Field

In the JOURNAL of Apr. 18, 1914, your Valdez correspondent ventures the opinion that a Government railway to the Bering River coal fields is unlikely, since the Navy's test of the coal did not show satisfactory results.

As I was on hand when the Government examiners came to pass on the coal for Navy use, and conversed with many interested friends on the ground, I may be presumed to know something about it. I also met a man of unquestioned ability and judgment who had, at his own expense, spent two months in careful examination of the field. He was enthusiastic over the possibilities of the field, and his only criticism was that some of the coals were friable.

The coal for the Navy's test was taken out during the winter and exposed to the weather until the next July, and was repeatedly handled. Those acquainted with conditions report that the coal was not selected with a view to satisfactory results, as it was taken from near the surface, had slacked, and had been exposed to weathering for a long time. Does not any coal deteriorate under such conditions?

The Bering River coal field has never had a square deal since Pinchot started his conservation press bureau at Government expense. Now the jealousies of different sections in Alaska are serving to continue the misrepresentation. All the Bering River field needs is a square deal.

G. L. SHELDON.

Ely, Nevada, Apr. 22, 1914.

Davis-Daly Assessment

The report of the levying of an assessment by the Davis-Daly Copper Co., and comment thereon, which appeared in the JOURNAL of Apr. 18, p. 834, contained errors as follows: It was said, that the assessment was the third, whereas it is the second; that the company proposes to sink from the 1300- to the 1900-ft. level, when, in fact, a depth of 2000 ft. has already been reached; and that the assessment brings the total sum paid in to $9.50 per share, whereas it is but $8.50 per share.

C. G. SCHIRMER.

Boston, Mass., May 6, 1914.

Mortar Foundations

Comparing my notes with those of Bernard MacDonald in your issue of Apr. 25, 1914, in respect to the concrete mortar block with tunnel through center of base for replaceable bolts, I yield to him the priority of its adoption, and hope this style of construction will in future be referred to as the "Parral" mortar block, as named by Mr. MacDonald.

ALGERNON DEL MAR.

South Pasadena, Calif., Apr. 28, 1914.

Editorials

The Copper Statistics for April

The report of the Copper Producers' Association for April was more favorable than anybody expected. Nearly everyone was looking for an increase of 10,000,000 lb., or more, in the stock. In fact, the increase was only 5,700,000 lb. There would have been no increase at all, if the production had not increased by nearly 6,000,000 lb., the total attaining the unparalleled figure of 151,600,000 lb. There is some mystery in connection with that figure. The production of American mines has not been increasing during the last six months. A comparison of the smelters' and refiners' figures is as follows:

Period	Smelters	Refiners
Fourth quarter, 1913	375,971,079	412,148,610
First quarter, 1914	391,663,194	399,983,263

The production of Lake copper in April increased by about 2,000,000 lb., and now probably will continue to increase until the normal of about 18,000,000 lb. per month is attained.

During 1913 the refiners' production outran the smelters', which was explainable by the working up of an accumulation of blister copper that was strongly surmised to exist at the beginning of 1913. By the end of that year, however, the smelters and refiners were supposed to have come about into step, which the statistics for the first quarter of 1914 seem to indicate. However, what we call the smelters' statistics are not just that in all respects, some of the copper, including the Utah, Chino and Ray, being reported on the basis of ore, with an allowance for smelting, and that ore may not always go through the smelteries at the same monthly rate as reported. The large increases in the productions of March and April, therefore, were probably due in the main to the working up of some accumulated intermediate products, and the large totals for those months were most likely accidental rather than the portent of such figures as the regular thing. Anyway, it is certain that the mine figures have not been increasing materially during the last six months. We may, therefore, see a relapse in the refinery production in May or June.

The deliveries of copper to Europe continued large in April, although the total was less than in March. The maintenance of these large figures shows that Europe is needing a great deal of copper and that its demand is a bulwark of the market. The talk that was current some weeks ago about copper being shipped to Europe on consignment, and going into invisible supply, was mostly moonshine. Nobody has been able to produce any evidence of that sort. On the contrary, the charge is categorically denied by the leading exporters on this side and, moreover, reports from the copper manufacturers in Europe indicate an advancing tendency of their business.

The great puzzle is with respect to the domestic consumption of copper. The average of domestic deliveries in 1911 was 59,134,300 lb. per month; in 1912, it was 68,305,496 lb. per month; in 1913, it was 63,938,480 lb. per month. During the first quarter of 1914, it was 57,205,898 per month. In 1913 the industrial depression was distinctly reflected, especially in the last quarter. During the first quarter of 1914 the taking of copper was at only 83% of the rate in 1912; if consumption had experienced the normal rate of increase, the deliveries at the present time would have been at the rate of 75 or 80 million pounds per month. Thus slow has business been during the early part of 1914.

In spite of this unsatisfactory state of affairs stocks have been decreasing. Although Europe and America combined showed an increase of about 12,000,000 lb. in April, the total on May 1 was 22,000,000 lb. less than on Jan. 1. It is probable that there will be no material increase in production in the next six months. An average of about 140 million pounds per month by the American refiners is to be expected. Europe seems to be requiring about 80 million pounds per month. Let American demand rise to the normal, as sooner or later it must, and we shall see some snap to the market. We have learned from past experiences that sudden changes of form may happen, e.g., in the fall of 1911. The statistical position is certainly much stronger now. Carefully considered, the April returns do not seem to have weakened it.

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Lining Shafts with Concrete

Concreting mine shafts is not so novel an operation in American metal mining as it was a few years ago, but it is still infrequent enough to render of great interest a clear and detailed account of any large concreting job, especially if information on costs be included. Such an account is that by Robert H. Dickson, describing the lining of the Junction shaft at Bisbee, published in this issue of the JOURNAL.

Concrete linings for shafts are far from standardized as yet. In general, the circular or elliptical form yields itself to concreting better than does the rectangular. The Brier Hill shaft, at Iron Mountain, and the Negaunee, on the Marquette range, are well known examples of the circular form. Recent work, however, has demonstrated that even the long, narrow rectangular section can be successfully lined with concrete poured in place. On the other hand, if the convenient rectangular form be adhered to, shaft-set members of reinforced concrete can be cast and cured on the surface and handled underground like timbers. This is being done on an elaborate scale at present by the Oliver company on the Mesabi. A central factory at Hibbing turns out wall plates, end plates, posts, dividers, lagging slabs, etc., in quantity, and these are transferred to a half-dozen or so shafts, where they are installed as sinking progresses. The relining of the Chapin, at Iron Mountain, was a combination of the two methods. Finally, the drop shafts put down by the Foundation Company through water-bearing surface formation are massive, monolithic cylinders with rectangular shaft openings down their centers.

Lining a shaft as sinking progresses and relining a shaft already sunk are different undertakings. In relining, it is possible to start at the bottom and work up, taking out only so much of the old lining as is necessary to allow placing the new, thus keeping practically the whole length of shaft supported. This was the procedure in the case of the Junction shaft.

The operation there resembled in many ways the relining of the Kingdon shaft, at Globe, following a fire, and is interesting for the following points among others: Little reinforcement was introduced; all the material was poured in place, no previously cast members being used; distinct gain in shaft area was obtained over the old timber lining by reason of the thinner walls possible; wooden forms were found satisfactory.

It should be noted that the determining consideration in adopting concrete for the relining was the elimination of the fire hazard. The importance of the Junction shaft was so great as to make it imperative that it be absolutely fireproof. Concreting generally is bound to be a good deal more expensive in the first cost than timbering, although there may be districts where market prices for cement and timber would make concreting actually cheaper. The economy of the method must be looked for in its permanency; reconcreting should never be necessary, while retimbering is common enough. Consequently, if the ore deposit be such as to justify the expectation of the mine's lasting longer than the shaft timbering, concreting begins to show in a more favorable light. Add to this the fact that damage by fire and consequent interference with the mining operations is done away with, and concreting becomes a still more attractive method of lining. In general, we may expect a gradually increasing application of concrete to this purpose, just as its field of application in the support and lining of other underground workings is constantly widening.

Mexican Affairs

Although the Becker trial has to some extent displaced the Mexican matter as the headliner in Mr. Hearst's papers and their imitators, the mischief-making writers continue to find much opportunity for the circulation of their rumors, fabrications and plain lies. In fact, nothing decisive has happened in Mexico during the last week. The diplomats have been making ready to meet, the constitutionalists have been gaining more ground by arms, and Zapata has been more active in the South. President Wilson appears to be more than ever determined to avoid any more active intervention. Well informed opinion is that he cannot. Consequently the army is anxious to press on to Mexico City and strike while the iron is hot. In diplomacy Huerta seems to be more wily than our foreign office.

Huerta's greatest mistake was in letting Madero be killed; Wilson's in failing to know Mexican character. He has wanted the Mexicans to have a free and fair election. That is just what they have been doing, in the only way they know how; i.e., with rifles. Wilson might have said to the two parties: "We'll let you have all the arms and ammunition you can pay for, both of you. Go in and have your election." In the end he would have known whom the Mexicans want to have govern them.

But at first he kept the constitutionalists from getting supplies and now he has cut off the federals. The present danger is that the wily Huerta may bring on a fight with the United States in order to surrender to it rather than to Villa, which would probably be safer for him.

The elimination of Huerta will, no donbt, transpire in the not distant future, but what then? How is the agrarian question, the root of all the trouble in Mexico, to be settled, and how is Mexico to be reorganized with a new constitution, for that is what it needs? A writer in the last *Atlantic Monthly* considers the trouble with the disorderly states of the world to be not in climatic conditions or racial characteristics, as to which he conclusively proves his case, but in the possession of impracticable constitutions. His diagnosis seems to fit the condition in Mexico.

Lake Superior Ore Prices

As briefly noted recently the prices for the season of 1914 of Lake Superior iron ore delivered at a Lake Erie port have been fixed at $3.75 per ton for Old Range bessemer; $3.50 for Mesabi bessemer; $3 for Old Range nonbessemer and $2.85 for Mesabi nonbessemer. This is a reduction of 65c. on bessemer and 60c. on nonbessemer ores, which means a reduction of $1.20 to $1.30 per ton of pig iron made. This reduction applies actually to about 30% of the ore shipped. The balance is mined by companies owning both mines and furnaces, and they obtain their ore at the actual cost to them of mining and shipping.

The prices just named are the same as those for 1912, but we must go back to 1905 before we find another level as low. The lowest prices recorded in 20 years were in 1897, when they ranged from $2.60 for Old Range bessemer down to $1.90 for Mesabi nonbessemer ore; and in 1898, when the range was from $2.75 to $1.75. These low prices were followed closely by the highest on record during the 20 years, for in 1900 the range was from $5.50 for Old Range bessemer to $4 for Mesabi nonbessemer.

Up to 1907 the base iron content was 55.7% natural iron for bessemer ores and 52.8% for nonbessemer. Since 1907 the bases have been 55% and 51.5% iron, respectively.

The Cleveland *Iron Trade Review* has figured out the equivalents per unit of iron for a series of years. From its table we give below for 10 years the prices per ton and per unit of iron; the unit prices are in cents:

	Old Range Bessemer		Mesabi Bessemer		Old Range Nonbessemer		Mesabi Nonbessemer	
	Per Ton	Per Unit	Per Ton	Per Unit	Per Ton	Per Unit	Per Ton	Per Unit
1905	$3.75	6.61	$3.50	6.17	$3.20	6.06	$3.00	5.66
1906	4.25	7.50	4.00	7.05	3.70	7.01	3.50	6.60
1907	5.00	9.09	4.75	8.64	4.20	8.16	4.00	7.77
1908	4.50	8.18	4.25	7.73	3.70	7.18	3.50	6.80
1909	4.50	8.18	4.25	7.73	3.70	7.18	3.50	6.80
1910	5.00	9.09	4.75	8.64	4.20	8.16	4.00	7.77
1911	4.50	8.18	4.25	7.73	3.70	7.18	3.50	6.80
1912	3.75	6.82	3.50	6.36	3.00	5.83	2.85	5.53
1913	4.40	8.00	4.15	7.55	3.60	6.99	3.40	6.60
1914	3.75	6.82	3.50	6.36	3.00	5.83	2.85	5.53

The lower prices may result in some increase in the use of Lake ore by Eastern furnaces. At the rate given at Lake Erie port Mesabi nonbessemers could be delivered in eastern Pennsylvania at a price equivalent to 8.3@8.4c. per unit of iron. This would be about the same cost as foreign ore delivered at Philadelphia for 7@7.2c. per unit. Doubtless there will be plenty of Lake ore for Eastern delivery if it is wanted, and to compete with it Newfoundland or Swedish ore must come down to the

price last named. It is not necessary to consider Cuban ore, since very little of that ore is sold, nearly all of it being used by the steel companies which control the Cuban mines. Last year some was offered for sale by a company having a surplus, but that was an unusual occurrence.

Idaho's Annual Mining Report

None of the many reports of state, national and provincial mining departments or mining inspectors that come to this office can compare in pure interest with that got out by Robert N. Bell, state mining inspector of Idaho. Mr. Bell has the happy gift of picking out the salient and interesting points in the industry, and presenting them most acceptably to the reader. We commend the 1913 report as well worth reading by anyone for whom the accidents, geology, milling, past history or underground development of the mines in the Cœur d'Alenes and other Idaho districts, hold elements of interest. Excellent photographs add not a little to the attractiveness of this volume, but to our mind, it is the personal touch which Mr. Bell applies to his descriptions, the result of a long and intimate acquaintance with the great mines whose interests he seems really to have at heart, that distinguishes his reports from the standard type of statistical report, the latter resembling more the output of a dry concentrator than the product of a human mind.

BY THE WAY

The newly opened Adams Building at 61 Broadway, New York, has immediately become a center of importance for mining and metallurgical companies. The entire 28th floor has been taken by the American Metal Co. and associated interests, the Metallurgical Co. of America, American Zinc & Chemical Co., Bartlesville Zinc Co., Lanyon-Starr Smelting Co., Ohio & Colorado Smelting & Refining Co., Cia. Minera de Peñoles, and the Southern Aluminium Co. On the 24th floor, are Beer, Sondheimer & Co. and the Minerals Separation American Syndicate, and in 2404 Philip Lawrence Foster representing the Exploration Co., Ltd. In suite 2318 are the Estate of Marcus Daly, the Daly Mining Co. and the Cinco Minas Co. On the 19th floor, Theodore Gross occupies suite 1920 as headquarters for Oroville Dredging, Ltd., and Pato Mines, Ltd. S. M. Swenson & Sons and the Freeport Sulphur Co. occupy suite 1801 and the rest of the 18th floor is taken by Adolph Lewisohn & Sons and affiliated companies, the General Development Co., Miami Copper Co., Wettlaufer-Lorrain Silver Mines, Ltd., Kerr Lake Mining Co., Naumkeag Copper Co., San Cayetano Mines, Ltd., and the Colorado Gold Dredging Co. On the 14th floor are the St. Joseph Lead Co., Doe Run Lead Co., and the San Vicente Co. As the building was only opened on May 1 and is not yet fully rented, this list of mining tenants will probably be augmented.

We have just finished reading a mining-stock advertisement, and have figured out that the 87c. we have in our pocket is going to make us rich:

This company's ore is gold, silver and lead, and this mine has produced some of the richest ore that has ever been mined in Colorado, tons and tons of it running as high as $5000 to the ton, and a great portion of the ore was so near pure silver that it was malleable and had to be cut out of the mine with a chisel.

While all this fabulously rich ore was being mined and making men rich, there was a large amount of low-grade ore being piled up and forgotten, and now all that is needed is a mill to treat this low-grade and turn it into money.

This mine was allowed to fill up with water and remain in that condition until three years ago, when the shaft was unwatered and these large bodies of low-grade ore exposed.

Here is what we want money for. There is a mill within three-eighths of a mile of the mine that cost at least $20,000 to build that has been sold at sheriff's sale, which we can get for not over $7500, and is specially adapted for our ore. Will you help us get it? We have the ore and over $3000 subscribed for the mill, almost as sure as a mining company can be.

To the first 50 people who answer this advertisement, we are going to make a special proposition. We are going to give them an opportunity to get some of this —— stock at a low price and show them where they have very little chance of losing their money.

The treasury stock of the company is now being offered at 3c. per share, payable either cash less 10% or one-twelfth down and one-twelfth each month.

If the ordinary investor gets his stock for 3c. per share, what will the lucky 50 pay?

We have received a "Manifesto to the Salaried Members of the Engineering Profession by the Technical League of America." Reduced to plain English, this means that engineers working for a salary are to be invited to form a union. It is this same Technical League of America that has been behind the movement for the enactment of state legislation requiring that engineers practicing in New York must have a license. We wonder if we shall ever see the day when Mr. Yeatman, Mr. Channing, Mr. Thayer, and others too numerous to mention, will be able to secure and hold their jobs only by exhibiting their union cards?

To the hazards of falling ground, blasting, etc., that continually threaten the miner, there has been added a new hazard in northern climates. The report of P. L. Ramquist, mine inspector of Itasca County, Minnesota, for the year ended June 30, 1913—an unusually interesting report, by the way, for the number and the detailed descriptions of the minor accidents listed—this report notes that in the Canisteo pit, a chainman, jumping to keep warm, fell and injured his knee so that he was laid up for 23 days. It is hard to see how a safety rule could be framed to prevent a man from falling and hurting his knee while jumping to keep warm.

The United States, Germany and Great Britain will have to retire from their cherished positions as leading producers of iron and steel. A usually careful and well informed contemporary tells us that, "The total deliveries of all kinds of steel and iron of the Russian Prodamet for 1913 amounted to 2,120,222,896 net tons, as compared with 2,034,194,287 in 1912." Competition with a production of more than two billion tons is hopeless.

The General Electric Co. recently announced a reduction in the price of the mazda, or tungsten, incandescent lamp. According to the *Boston News Bureau*, the purpose which General Electric Co. has in mind is to do away as rapidly as possible with carbon lamps. The mazda as perfected at present has the durability of the carbon and is 50% more economical to the consumer, because it gives the same light for 50% less power.

New Mine and Metallurgical Construction

Hermitage Mining & Milling Co., Hereford, Ariz., has completed a two-jig concentrator of 30 tons daily capacity, at a cost of $11,000.

Empire Mines & Investment Co., Grass Valley, Calif., will break ground May 15, for a mill of 240 tons daily capacity, which, it is estimated, will cost $75,000, and be completed by Jan. 1, 1915.

Mineral Hill Ore Reduction & Leasing Co., Cripple Creek, Colo., will break ground May 15, for a cyanide plant of 100 tons daily capacity, which, it is estimated, will cost $30,000 and be completed by Aug. 1.

Western Zinc Mining & Reducing Co., Leadville, Colo., broke ground, Mar. 23, for a zinc-oxide plant of 50 tons daily capacity, which, it is thought, will be completed by Aug. 1.

White Pine Copper Co., Ontanagon, Mich., broke ground, Apr. 15, for a stamp mill of 1000 tons daily capacity, which, it is estimated, will be completed by May 1, 1915.

Anne Lee Mining Co., Spring City, Mo., broke ground Dec. 10, 1913, for a zinc, lead and silicate concentrator of 250 tons capacity per 10 hr., which cost $50,000 and was completed Apr. 20, 1914.

Schoolhouse Mining Co., North Carterville, Mo., broke ground Jan. 20 for a zinc concentrator of 800 tons daily capacity, which cost $20,000 and was completed Apr. 10, 1914.

Lennan Zinc & Lead Co., Miami, Okla., began the erection of a new concentrator in April.

Anaconda Copper Mining Co., Anaconda, Mont., is building, at the Washoe Reduction Works, a leaching plant of 2000 tons daily capacity, to cost $900,000, and a sulphuric-acid plant of 100 tons daily capacity, to cost $350,000.

Barnes King Development Co., Marysville, Mont., is building a cyanide plant of 100 tons daily capacity, all orders for machinery and equipment having been placed.

Northwestern Metals Co., Helena, Mont., is operating a dry chlorination zinc works of 100 tons daily capacity, which cost $375,000.

Boss Gold Mining Co., Goodsprings, Nev., is considering building a cyanide test plant of 25 tons daily capacity, some time this summer.

Legitimate Mines Co., Jarbidge, Nev., is drawing up plans for a small mill.

Metals Recovery Co., Dayton, Nev., has completed a cyanide plant of 200 tons daily capacity, which cost $50,000.

Sunset Mining & Development Co., Rhyolite, Nev., is building a stamp mill and cyanide plant of 2000 tons monthly capacity, which will be completed Aug. 1.

Winnemucca Milling & Ore Purchasing Co., Winnemucca, Nev., is about to begin building a 35-ton mill and sampling plant for custom work.

Field Mining & Milling Co., Benton, Wis., will build a concentrator of 25 tons hourly capacity on its Thompson property; estimated cost, $50,000; to be completed Jan. 1, 1915.

Wisconsin Zinc Co., New Diggings, Wis., broke ground Mar. 15, for a zinc concentrator of 250 tons daily capacity per 10 hr., which, it is estimated, will cost $35,000; to be completed by July 1.

Broken Hill, Lillooet, B. C., is building a large concentrator.

Aguacate Mines, San Mateo, Costa Rica, has completed a cyanide plant of 3000 tons annual capacity.

Braden Copper Co., Rancagua, Chile, is figuring on completing its works of 10,000 tons daily capacity, which will cost $7,000,000, in two and a half years.

Chino Copper Co.

The Chino Copper Co., for the first quarter of 1914, shows a production of 17,288,678 lb. of copper: 6,401,911 lb. in January; 5,319,948 lb. in February; and 5,566,819 lb. in March. Its cost, from milling operations, was 7.44c. per lb., allowing for smelter deductions and without any credit for miscellaneous revenues. Combined cost of copper from milling ore and direct shipping ore was 7.57c. per lb. If miscellaneous earnings are used as a credit, the cost of net copper is brought down to 7.21c.

In addition to the copper in concentrates, shipping ore accounted for 798,450 lb., making the total quarter's production 18,087,128 lb; 582,200 tons were produced, containing 2.18% copper. Average extraction was 68.05%, or 29.69 lb. of copper per ton of ore milled.

Net operating profit for the quarter was $1,177,740; miscellaneous income, $61,242; total, $1,238,982. Dividends paid were $648,615, leaving a net surplus of $590,367. Earnings are based on 14.4227c. per lb. for copper. Copper on hand, sold and unsold, was 23,444,209 lb., the unsold portion inventoried at 14.06c. per lb. During the quarter $112,000 of first-mortgage bonds were retired, leaving only $124,500 outstanding. Remaining bonds have been called for redemption July 1, 1914. During the quarter 938,590 cu.yd. of stripping were removed, and 606,990 tons of ore moved by steam shovels.

Utah Copper Co.

The Utah Copper Co., for the first quarter of 1914, shows a production of 32,846,155 lb. of copper: 10,649,036 lb. in January; 9,492,898 lb. in February; and 12,704,221 lb. in March. After making allowances for smelter deductions, and without crediting miscellaneous income, the cost was 9.423c. per lb. Crediting miscellaneous earnings, including those from the Bingham & Garfield Ry., cost is reduced to 8.423c. per pound.

Total ore treated at both plants was 1,962,100 tons, 94% being mined by steam shovels and 6% from underground. Average grade of ore treated was 1.3411% copper. Net profit from milling operations was $1,553,899; other income, $35,988; income from Nevada Con. Copper Co. dividends, $375,187; total net profit, $1,965,074. Dividends paid were $1,189,440, leaving net surplus for the quarter, $775,634. Earnings are computed on the basis of 14.403c. per lb. for copper. Copper on hand, sold and unsold, was 37,864,504 lb., the unsold portion inventoried at 13.565c. per pound.

Of the tonnage treated, 60% was milled at the Magna plant, and 40% at the Arthur plant. A total of 1,519,940 cu.yd. of capping was removed during the quarter.

The Bingham & Garfield Ry. handled an average of 16,399 tons of ore per day, and 2834 tons of miscellaneous freight daily.

PERSONALS

William C. Madge left London on May 2 for the Altai District in Siberia, to be absent several months.

John T. Reid, Lovelock, Nev., recently examined some mines in the Jarbidge district in Elko County, Nevada.

Howland Bancroft recently returned to New York from Peru, and will leave soon for Colorado on professional work.

Theodore Gross sailed from New York for London, May 11, in connection with important negotiations for mining property in the West.

James A. Barr has been appointed director of congresses of the Panama-Pacific International Exposition to be held at San Francisco next year.

Dr. L. Edelmann, of Berlin, Germany, arrived in New York, May 9, on his way to make an extended trip through the oil regions of the United States.

Morton Webber is conducting examination work in Idaho. His other professional engagements in the West will make his return to New York indefinite.

Ivan E. Goodner has left the Alaska Treadwell Gold Mining Co. and is in the office of Albert Burch, general manager of the Goldfield Consolidated Mines Co., of Nevada.

Captain Robert W. Hunt, of Chicago, was selected as one of the vice-presidents of the International Association for Testing Materials at a meeting of the council lately held at Turin, Italy.

Dwight E. Woodbridge, of Duluth, Minn., who has been in Washington, D. C., the past three months, is now in Duluth and on the Mesabi range, and expects to go into the Georgian Bay region in Canada in a few days.

Col. Samuel Harden Church, treasurer of the Union Steel Casting Co., Pittsburgh, has been elected president of the board of trustees of the Carnegie Institute of Technology, Pittsburgh, succeeding W. N. Frew, who resigned on account of ill health.

Horace L. Haldeman, Philadelphia, has been elected president of the Pulaski Iron Co., Pulaski City, Va., succeeding A. J. Dull, deceased. E. P. Borden has been elected vice-president and secretary-treasurer and Leonard W. Williams, assistant secretary-treasurer.

Dr. Jules de Vargha, for 13 years past the able director of the Central Statistical Office of the Kingdom of Hungary, has been appointed Secretary of State in the Ministry of Commerce. The Statistical Office is now in charge of Dr. Ladislas de Bulay, for some time vice-director.

Edward T. Stotesbury, of Philadelphia, has been elected president of the Reading Company in place of George F. Baer, deceased. He has long been a director and prominent in the management. Theodore Voorhees, for some years vice-president, has been chosen president of the Philadelphia & Reading Ry. Co. W. J. Richards has been elected president of the Philadelphia & Reading Coal & Iron Co. He was recently vice-president and general manager.

Emory Oliver, chief engineer of Natomas Consolidated, of California, for the past three years, has been made general manager, in place of F. L. G. Knox, who has taken a contract from the Federal Government for jetty construction at Eureka, Calif. Mr. Oliver evolved the sand-core levee system adopted by the Natomas Consolidated on the Sacramento River. Prior to his connection with this corporation he built the Western Pacific R.R. from Oroville to Plumas County, through Feather River Cañon.

OBITUARY

A. Sydney Additon died at Berkeley, Calif., May 5. He was born in Massachusetts and educated in the East, but passed nearly all his professional life on the Pacific Coast. He was one of the pioneers in cyanidation work. In 1898 he was connected with the Toronto & Lillooet Gold Reefs, Ltd., at Lillooet, going soon after to Berkeley, which was thereafter his home, except for two years passed as superintendent of the Mayflower Consolidated at Rhyolite, Nev. While living at Berkeley he was for a time connected with the mining machinery business. Later he practiced as a consulting metallurgist and in both capacities he designed and built many mills. He was a frequent contributor to the technical press, chiefly on milling and cyaniding.

Arthur Brown Willmott, well known as a mining engineer, died at Toronto, Ont., May 8, aged 48 years. He received his education at Victoria College and graduated from Toronto University in 1887. For 10 years he was engaged as a geologist by the Lake Superior Corporation under the Clergue management and subsequently was retained by the company as consulting engineer. He wrote largely on technical subjects, and was the author of a work on the mineral wealth of Canada. Mr. Willmott was for some years a professor in natural science at McMaster University, Toronto and during his vacations did much work in exploring Northern Ontario for the Provincial Bureau of Mines. He was a Fellow of the Geological Society of America, a councilor of the Canadian Mining Institute and member of the American Institute of Mining Engineers. He leaves a widow, a son and a daughter.

Albert Williams died at a sanitarium in New York, May 4, after a long illness. He was about 60 years old. He was born in San Francisco, his father having been one of the pioneers of California. He was trained as a mining engineer and practiced his profession on the Pacific Coast for a time. Later he became a member of the U. S. Geological Survey, and reached a prominent position, doing some excellent work there. After leaving the Survey he was for a time assistant editor of the "Engineering and Mining Journal" under R. P. Rothwell. Later he was engaged in organizing the Michigan College of Mines at Houghton, where he was instructor for a time. After retiring from that position he lived chiefly in the East, doing literary and occasionally consulting work. He wrote several articles for the earlier volumes of "The Mineral Industry," and did much work for the "Engineering Magazine" and other technical papers. For some years past he had lived very quietly in New York or its vicinity. Mr. Williams was a man of wide experience, a student of many things, and a writer of marked ability and command of language. As an author he possessed especially the gift of clear and concise statement and explanation.

SOCIETIES

Colorado Scientific Society—The 303rd regular meeting of the society was held in the Boston Building, Denver, May 2. Frank E. Shepard read a paper on the "Efficiency of Ore Crushing Machines."

Texas State School of Mines—This school, a branch of the University of Texas, is to be opened in El Paso, Tex., in the fall. El Paso has fought hard to secure the institution. The school of mines will occupy the buildings formerly belonging to El Paso Military Institute and $15,000 of state money is available for equipment and supplies. El Paso is situated in the center of the mineral-producing area of the Southwest and Mexico, and the school will have access to a field of practically every known method of mining and treating ores.

American Iron & Steel Association—Leopold E. Block, vice-president of the Inland Steel Co., Chicago, was elected a director of the institute for the term ending May, 1917, at the annual meeting held in New York, May 4. Mr. Block succeeds Charles S. Price, formerly president of the Cambria Steel Co., Johnstown, Penn., who has retired from active business. James A. Farrell, Edgar C. Felton, Elbert H. Gary, Robert Hobson, Charles M. Schwab and Powell Stackhouse, whose three-year term expired with this meeting, were re-elected.

American Institute of Mining Engineers—The new committee on safety and sanitation is made up as follows: Arthur Williams, chairman; E. M. Shipp, secretary, 2 Rector St., New York. Other members: W. H. Aldridge, George D. Barron, William L. Bell, Adolph E. Borie, Fred W. Bradley, James L. Bruce, Charles F. Chandler, Roscoe H. Channing, Jr., William L. Clark, George C. Crawford, James S. Douglas, Walter Douglas, T. C. Du Pont, Stanly A. Easton, Howard N. Eavenson, Charles T. Fairbairn, Edgar C. Felton, R. C. Gemmell, C. W. Goodale, Thomas J. Grier, Joseph A. Holmes, Alex. C. Humphreys, Sidney J. Jennings, John Langton, Solomon Le Fevre, James MacNaughton, W. W. Mein, Charles E. Mills, C. P. Neill, R. V. Norris, William J. Olcott, J. D. Pope, William C. Ralston, J. B. Risque, William D. Sargent, Francis R. Sinn, John M. Sully, William D. Thornton, W. R. Walker, C. W. Whitly, Dwight E. Woodbridge.

Editorial Correspondence

SAN FRANCISCO—May 7

A Record Blast in California was fired May 5, when 66 tons of Hercules powder was used at the Riverside Portland Cement Co. quarries, near Riverside. This is the record blast both in quantity of powder used and amount of rock broken down in mining or quarrying in the state. Two shots were fired as one. Both were on the same side of Chino hill and close together. The material, limestone, is similar in the two faces, but one produces rock for the manufacture of cement, the other rock for use in the refining of sugar. Thus one is called the cement face and the other the commercial face. There were 42 tons of powder loaded for the cement shot and 24 tons of powder loaded for the commercial shot. The shots were fired by electric generator and were as near simultaneous as was possible. The powder was loaded in two tunnels, one in each face and from each crosscuts were driven at the inner end and at the center point. The tunnels were driven in 100 ft. and the crosscuts in the larger face were 120 and 100 ft. long. The loading level was 150 ft. below the apex of the hill, and the floor of the larger face extended 100 ft. distant from the portal of the tunnel. The two shots in the one blast broke down 450,000 tons of rock, and it was noticeable that not a piece of the broken rock was thrown beyond the floors of the quarries. There was no loud report, but a muffled roar. No glass or other material was shattered in the vicinity, but there was a noticeable movement of the surface at a distance of 2000 ft., as though there had been a slow-moving earthquake.

DENVER—May 8

Pollution of Streams by Mill Tailings is now a small issue in Colorado. This is the first objection that has been raised on this point for a long time. Several years ago, placer operations were stopped at Granite because the tailings polluted the Arkansas River that furnishes municipal water to Florence and Pueblo. The cyanide plants in the Cripple Creek district have been careful to impound their tails on high ground, but in the older districts of the state where milling has been continuous for several decades, the right of disposal of mill tailings in streams has been un-) questioned and the practice has been upheld by public sentiment upon the ground that mining is the basic industry of the state. The "sportsmen" of Leadville and Glenwood Springs now come forward with complaints against the operation of the Iron Mask mill at Belden, two miles below Red Cliff, on the Eagle River. Their objection is that tailings from this zinc-separating plant will kill trout. State fish commissioner James Shinn, while admitting that the law has been somewhat disregarded, assumed the attitude that mining is more important than fishing and he declined to take action against Hicks and Hanington, owners of the property. It seems ridiculous for men of Leadville who depend exclusively upon mining to raise such a point, but it is still worse when they go to the extent of arousing the ranchmen of Eagle County who have heretofore raised no complaint, but who are now being led to believe that the trifling quantities of tailings that might flow on their lands, through irrigation, will prove detrimental. While suit is being threatened against the mining company, the agitators have not acted, as they are endeavoring to raise a fund through the circulation of subscription blanks. In this particular case there has been a real effort on the part of the operators to prevent polluting the river. The mill is close to the river in a narrow cañon traversed by the main line of the Denver & Rio Grande R.R. A recent flood so moved part of the tailings as to partially bury the track. In removing the débris, laborers threw the tailings into the river; the tailings consist of silica and magnetic oxide of iron. To the credit of the citizens of Red Cliff be it said that they are defending the mining company, but it is not waiting for legal action to begin and has already started the erection of an aërial tramway that will convey the tailings a considerable distance down and across the cañon to a suitable dump.

BUTTE—May 6

Work of Draining Willow Glen Farm, the model farm of the Anaconda company, near Anaconda, has been taken up again where left off last year. A gasoline ditch digger is being used, and in less than one week more than 2000 ft. of ditch has been dug, and the tile used in running the water off has been laid. Three and one-half miles of tile is strung along the ground ready to be laid as fast as the ditch is excavated. During the winter some repairs and improvements were made on the ditch digger with the result that now one-third more excavating can be done in a given time than was possible last summer.

Appointment of Anaconda's Chief Counsel has been announced by C. F. Kelley, vice-president and managing director of the Anaconda company. L. O. Evans is the appointee. In making the announcement, Kelley said that for the last two years Evans has been acting practically as head counsel, as Kelley's time is taken up almost entirely with the directing work of the executive department. Evans came to Butte from Helena in 1895. A year later he became associated with John F. Forbis in the legal department of the Boston & Montana, and Butte & Boston companies, in which capacity he continued until the merger of the companies in the Anaconda, afterward keeping his connection with the larger company. Evans has also been attorney for the Montana Power Co. and the Butte Water Co.

HOUGHTON—May 9

Isle Royale is planning more extensive opening of the Grand Portage lode for the immediate future. The openings in this lode so far have been from No. 2 shaft, in long drifts. This work has been the most successful of any which has been undertaken at this property since the Calumet & Hecla assumed the management. It was based on the explorations which were made following suggestions from the early history of the old Huron mine. Practically every opening that has been made on the Grand Portage has produced a grade of copper a little better than the average of the Isle Royale vein proper. No. 1 shaft is being prepared for reopening. It will be equipped with modern machinery. This will mean, too, that large additions will be made to the working force at the Isle Royale mine and a substantial increase made in tonnage. The three-head stamp mill which now crushes Isle Royale rock cannot be depended upon to do better than 1800 tons daily average, and when No. 1 shaft is in operation the tonnage will run well over 2400 tons daily. This additional rock will be crushed at the Centennial-Allouez mill, at Point Mills. These plans include the resumption of operations at the Tamarack stamp mill; this mill has been completely remodeled.

JOPLIN—May 9

First Serious Mine Fire in the Joplin district was recently experienced when through the decomposition of marcasite sufficient heat was generated to set the timbering on fire in a badly caved portion of Pocahontas ground. The fire spread rapidly until conditions underground became unendurable and the miners were driven out. A. I. Young, in charge of Government rescue car at Pittsburg, Kan., was asked by State Mine Inspector I. L. Burch to send oxygen helmets and a party of men to the mine to attempt fighting the fire and saving the mine. When the party arrived the following morning entrance was forced into the burning mine from the adjoining Sitting Bull through a bulkhead. A fresh-air station was established and an examination made. It was found that the fire had made such progress that most of the passageways had caved in, cutting off any possibility of proceeding far into them. The fire was burning close to the main shaft. It was decided that the only thing possible under the circumstances was to take out whatever machinery was near the shaft and abandon the mine and let the water rise. Drills, motors, pumps and equipment were taken out by the party with oxygen helmets. The closing of this mine and waiting for the water to rise puts out of commission two adjoining properties, the Sitting Bull and Powhattan, both of which were heavy producers of ore up until the last few months. The fire started in an extensive cave-in which cut off the air between two shafts. This caving ground was filled with timbers over which lay some heavy deposits of marcasite, shale and mud. Before the fire broke out an effort was being made to drive an air drift through a portion of this caved ground, but the ground grew hotter in spite of every-

thing done to establish ventilation. The air grew heavy with sulphur dioxide and drove the men out several times, many collapsing. It is the belief of State Mine Inspector I. L. Burch that it will take several weeks for the water to rise sufficiently to put out the timber fire, and he believes that most of the timbering will be burned out and the ground caved before this happens.

PLATTEVILLE, WIS.—May 5

Mining Outlook Is Encouraging for the coming summer in the Wisconsin zinc and lead field. Drilling operations during the winter were light, compared with previous winters, however, the discovery of a new and important zinc field which lies tributary to Platteville was made. The district is called New Diggings, to which several railroad companies are making surveys for the ore-hauling business. The most important discovery made so far was by the Wisconsin Zinc Co., on what is known as the Champion property. The property has been thoroughly drilled and a shaft is now down to the clay bed, where much water has been encountered. Much development work and equipment are planned which include the building of a 300-ton mill, to be operated with electric power. This company has purchased the Campbell separating plant at Cuba City, where its ores will be roasted in the near future, as soon as necessary repairs are made and new machinery installed. This company was practically forced to change its site for roasting because of the complaints from farmers. The old plant is gradually being dismantled. The retorts are to be sent to Tennessee for the drying of hydrate ores. Good drilling results have been obtained on the Thompson property, by the Wisconsin Zinc Co. The Great Western Mining Co., of Galena has contracted its production to the American Metal Co., which is a new buyer in this district. The Mineral Point Zinc Co. has opened up an orebody on the old Peni-Benton property near New Diggings, and it is the intention of the company to build a mill which will be operated by electric power. The Frontier Mining Co., of Benton has made an important discovery on a property adjoining its Calvert mine. This property will be mined by extending the Calvert underground workings and the ore will be hoisted through the Calvert shaft. Many improvements have been made by the Cleveland Mining Co., on its Cleveland and Lawrence mines, which include belt conveyors, concrete shaft, headframes and underground gasoline-motor haulage. The Lawrence mine is in the development stage, and on it the company is building a 150-ton mill. At the Fox mine, which is owned by the Mineral Point Zinc Co., the underground workings extend from 2000 to 2600 ft. from the shaft, and the company is carrying on extensive development work to prove up sufficient ore tonnage to warrant sinking of a shaft and building a new mill at this place. The Vinegar Hill Zinc Co. has secured leases on the Sunset and Senator properties located in the vicinity of Rewey. Drilling is in progress to obtain data on the trend of the ore formation, which lies between the two mines. Considerable drilling has been carried on in the vicinity of Platteville by Harry Stevens, a veteran prospector. Stevens has acquired a lease on the Royal mine, which was formerly operated by the Wisconsin Zinc Co. Drilling results on the Royal property show good ore occurring in two "flats," just back of the old mine workings. Development work at the West Hill mine has shown up a rich deposit of zinc ore and the company is now building a 50-ton mill.

MARQUETTE—May 9

No Marquette Shipments by Steel Corporation will be made for an indefinite period. The reason is not given. The Steel Corporation's shipments from the Marquette range have, however, been light this spring. Only one steamship of the company has loaded at Marquette. It is explained on the Gogebic range that the recent curtailment of the Steel Corporation operations in that region was made necessary because practically all the available stockpile room had been filled and ore was being hoisted at a rate greater than shipments could be made direct from the shafts. The Gogebic mines are operated more extensively than are others on the older ranges for the reason that they are worked on a royalty basis, whereas various properties elsewhere are owned in fee by the corporation and are held in reserve, either being closed entirely or producing much below capacity.

Pioneer Plant is to Go Out of Blast June 1, is the announcement recently made. The plant is in Marquette and the Pioneer Iron Co. is a Cleveland-Cliffs subsidiary. While there is some repair work to be done and while periodic suspensions are to be expected at blast furnaces, the shut down at this time is ascribed particularly to the discouraging condition of the market. The company is carrying 20,000 tons of charcoal pig iron at its yards in Marquette, or half-year's production for the plant. Sales have been slow for several months past, and prices low. The suspension will result in the release of a considerable number of men, but the organization will be maintained and there will be employment for part of the force on the repair work. The Gladstone furnace of the company was put out of blast some time ago for overhauling, and the Newberry furnace of the Lake Superior Iron & Chemical Co. will be closed for a few months for the same purpose.

TORONTO—May 9

Importation of Explosives, the regulation and control of their manufacture, their use, and the construction, licensing and inspection of the premises used for their manufacture and storage are covered in a bill which Louis Coderre, Canadian Minister of Mines, has given notice will be introduced in the Canadian Parliament. Some years ago the former administration took up the question and instituted an investigation by an English expert, as the result of which a bill was drafted. It was never passed, the subject being a difficult one to deal with effectively, owing to questions as to jurisdiction between the Dominion and Provincial governments. The present measure is understood to be practically on the same lines as that formerly proposed with some modifications to safeguard provincial rights.

Porcupine Gold Mines, Ltd., known as the Vipond, will recommence operations, satisfactory arrangements having finally been made. In order to provide the necessary financing, a new company to be known as the Porcupine Vipond Mines, Ltd., with a capital of $1,500,000 has been formed, and this company will issue $750,000 fully paid shares for the properties of the Porcupine Gold Mines, Ltd., which is capitalized at $2,000,000. At the above rate of exchange, three shares of the new company will be given for eight shares in the old company; 300,000 shares of the new company have been underwritten at 30c. per share, leaving 450,000 shares in the treasury. It is estimated that the $90,000 which will be realized from the sale of the stock will be sufficient to pay off the company's indebtedness and provide sufficient funds to build a cyanide plant, and put the mine in working condition.

SUDBURY, ONT.—May 9

There Is Much Activity at the Nickel Mines. Never in the history of the district have inquiries for options and active staking of all probable or prospective nickel areas been carried on at so early dates as this year. Large parties are at present in the field doing prospecting and other preliminary work. The snow is still in the woods. Options are eagerly sought at increased prices over a year ago. It is anticipated that nearly all of the outstanding properties will be optioned and finally purchased by one of the three operating companies or by other strong syndicates now on the ground. The English and German investors have awakened to the prospective richness of the Sudbury field looking at it from an investment, speculative or operating standpoint. There is still an extensive area of virgin mineral ground available for purchase on terms which are reasonable when one considers the prices some properties were optioned at a year ago. For instance the Murray mine formerly owned by the H. H. Vivian company was optioned at $125,000. This property had been optioned on three previous occasions and turned down; $75,000 to $100,000 was spent in diamond drilling during the life of the last option. This resulted in determining a tonnage of over 16,000,000, thus putting this area in the front rank as a future producer with two railroads crossing the property. The Levack group, of 600 acres, locally known as the Tough-Stobie group, was optioned to the Mond Nickel Co. It was previously drilled by the Mond company about 1900, then by the Doctor Pierson syndicate in 1910, by the Canadian Copper Co. about 1912, and again by the Mond company in 1913, at an option price of $650,000. After spending $90,000 in drilling, 4,000,000 tons of ore were proved up. This is the richest ore the Mond company owns. Magnetic surveys have been made of several other areas adjoining the Mond, which have the earmarks of big mines. These properties are now undergoing further preliminary work with the object of diamond drilling them, when they will either be sold on a tonnage basis or mined by independent companies. The old established companies have not been idle; their slogan is progress. The Canadian Copper Co. is determined it will not be superseded in its front-rank position as the largest producer of nickel, and is making preparations to enlarge and improve its present plant. The Mond company is adding 150 ft. to its new smelting works, and will install a plant to smelt a much larger proportion of green ore. The furnaces are now running on three tons of green ore to one of roasted ore. A new treatment in an oil-burning furnace is working satisfactorily, all fines and flue dust being taken care of in this furnace. The British American Nickel Co. has been making surveys and has made plans for the erection of a large smelting and refining plant 3½ miles from Sudbury. It is estimated this plant will cost between $5,000,000 and $7,000,000.

The Mining News

ALASKA

NEWSBOY (Fairbanks)—One man, with a Hardsocg Wonder drill, breaks 8 tons of ore per shift in 2-ft. vein. Good ore has recently been found on 315-ft. level.

QUIGLEY & CO. (Fairbanks)—At this mine, Kantishna district, prospecting has been done on a vein of antimonial silver-lead ore. Picked samples carry $6 to $7 per ton gold and 100 oz. silver.

ALASKA UNITED (Douglas)—Ready Bullion production for March, from 18,872 tons of ore, was $38,880, or $2.08 per ton, net profit $11,571; 700 Claim production was 18,249 tons, yielding $31,115, or $1.72 per ton, net loss being $1770.

AUK BAY—It is reported that a bond has been taken on these properties and 50 men are sampling ore. John Hays Hammond is said to be interested in deal. Auk Bay property bears a resemblance to Alaska-Gastineau, Alaska-Perserverance and Treadwell mines. H. R. Plate has arrived and begun the preparation of a camp at Auk Bay.

BERRY & HAMIL (Circle P. O.)—Hydraulic operations of Berry & Hamil, on Mastodon Creek, will be continued this summer. It was recently stated in San Francisco that a contract had been made for construction of a dredge, but Mr. Hamil reports that this was in error. Possibility of a dredge was seriously considered, but it was decided to continue hydraulicking for at least one more season.

MASTODON HYDRAULIC MINING CO. (Circle P. O.)—Case of Mastodon Hydraulic Mining Co. vs. Circle City Mining & Dredging Co., has been decided in district court of Fairbanks, in favor of plaintiff. Theron E. Fell, representing plaintiff, has purchased at marshal's sale interest of defendant company in claims Nos. 11, 12, 13, 14, 15, 16 and 17, Mastodon Creek, for $1525, which is sufficient to satisfy judgment given by court. This is ground on which Elmer dredge has been working for two seasons with indifferent success. Dredge is said to he unsuitahle for ground. Defendant now has one year to redeem property, which consists of a leasehold interest and a contract to purchase.

ARIZONA

Gila County

MIAMI COPPER CO. (Miami)—During shutdown at Cananea, Miami has been shipping its concentrates to Douglas.

INTERNATIONAL SMELTING & REFINING CO. (Miami)—Foundations for power-plant buildings are being completed as fast as possible so as to allow erection of steel. Most of steel for buildings is already on ground and erection force will soon have everything in readiness for starting work.

IRON CAP (Globe)—Company has purchased ground known as Bird Group, consisting of 11 claims, six of them patented. The claims adjoin United Globe, Arizona Commercial, Iron Cap and Superior & Boston, and are considered desirable ground, the Old Dominion, Superior & Boston and other companies in the Globe district having negotiated for their purchase at different times in past few years. It is probable that property will be held in reserve and later worked.

INSPIRATION CONSOLIDATED (Miami)—Development of main orebody above 600 level was begun last week, 12 vertical raises being started. A total of 48 faces are being worked throughout mine, all in ore, the majority consisting of raises and sublevel laterals which are necessary for blocking out orebody hy Ohio caving system. A 50-ton pocket is being put in at incline shaft to serve 600 level, so that as soon as new haulage drift on this level is in commission all waste will be handled through this shaft. Concreting of main-east-shaft station on 400 level is nearly completed and with this completed shaft work will he resumed, 40 ft. of it already being done. A 6x20-ft. tube mill was installed at test mill and will be started within a few days. A 66-in. Bradley mill also is soon to he tried out at experimental plant for purpose of comparing its efficiency as a fine crusher with the several other types of mills which have already been given exhaustive tests. All machine tools at concentrator shop are now in use, which means that all repair work and new work can be quickly disposed of. Trusses spanning fourth hench of concentrator huilding were swung during week, as were also most of the bin girders on upper end of mill. Bins to be used at concentrator are of suspension type. They will run entire length of mill and will have an available capacity of 12,000 tons, or 2000 tons per mill unit.

Maricopa County

SUNFLOWER CINNABAR MINING CO. (Phœnix)—A foreign syndicate has taken an option on property in Mazatzal mountains.

MONTE CRISTO (Wickenburg)—Construction of an aërial tramway from mine to Hassayampa River, near Wickenburg is under consideration by Ezra W. Thayer, owner.

Mohave County

ECLIPSE (Secret Pass)—New hoist, compressor and drills are being installed.

FAY (Kingman)—Louis Lusk, who has an option on mine, is planning to build a reduction plant. McKesson mill at Holy Moses mine is being used for making tests on Fay ores.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—Arrangements have been made to sink shaft to a depth of 500 ft. Above 200-ft. level property has made a creditable showing which encourages deeper explorations.

GOLD REED MINING & MILLING CO. (Kingman)—A 40-hp. engine has recently been received and will be used to operate the compressor. This is the initial shipment of new and heavier equipment. When it is installed shaft is to be continued an additional 200 ft.

ARABIAN (Union Pass)—A crosscut, recently driven, is reported to have cut 100 ft. of milling ore. Another crosscut from a shaft cut 35 ft. of milling ore, while still another crosscut showed 8 ft. of ore assaying up to $20. Property is being opened up by Mines Co. of America.

Pinal County

LUCKY GOLD & COPPER CO. (Kelvin)—Operations have been suspended. During layoff ground will be surveyed for patent.

KELVIN-SULTANA (Kelvin)—Shaft is nearly 500 ft. deep and preparations are being made to cut station. Ground has been broken for mill.

PALO ALTO (Superior)—High-grade silver ore has been found in bottom of shaft. Work is being held up in shaft on account of water recently encountered. Owners are contemplating driving a tunnel to drain ground.

CALIFORNIA

Amador County

FREMONT (Drytown)—Shaft has reached a depth of 2350 ft. A station will be cut at 2300-ft. level.

PLYMOUTH CONSOLIDATED GOLD MINES, LTD. (Plymouth)—Company is organized to operate Plymouth mines which have been reopened and developed by California Exploration Co., Ltd. New mill building is in progress, and will probably he completed and ready for duty in August. Unwatering and development cost a total of $179,450. Operating company is capitalized at £240,000. C. A. Moreing and W. J. Loring are directors. Burch, Caetani & Hershey, of San Francisco, are California representatives.

Butte County

ZINC ORE IN A VEIN carrying some gold and silver is reported to have been disclosed in a prospect on Magalia ridge.

CHEROKEE (Oroville)—Tailing dump of this old mine, which was a large hydraulic producer, has been leased to O. C. Perry and R. S. Kittrick. Prospecting is reported to have shown that installation of a bucket-elevator dredge is warranted.

Nevada County

BRUNSWICK CONSOLIDATED (Grass Valley)—Three 100-kw., oil-insulated, self-cooled Westinghouse transformers will be installed.

MAJOR GOLD MINING CO. (Nevada City)—It is reported that a crosscut in this channel mine recently disclosed gravel of extraordinary value, which will warrant installation of a stamp mill. Mine is equipped with an electric hoist.

Shasta County

MIDAS (Knob, Harrison Gulch District)—There is no means of controlling fire which started in 1200-ft. level, and as there is no timbering of consequence above that level, fire will be allowed to burn down to 1300-ft. level, bottom of mine. Pumps have stopped and water will he allowed to reach 1200-ft. level before pumping is again attempted. It is prohable a large portion of bottom of mine will he destroyed by caving following burning of timbers and flooding of drifts and stopes.

Siskiyou County

CUB BEAR (Etna Mills)—Work has been resumed. Building of a stamp mill is contemplated.

BIG CLIFF (Etna Mills)—Good showing is made in recent development of medium-grade and some high-grade ore. If continued development warrants a mill will be built.

CARSEN-KRADLE—This mine, in Oro Fino District, is reported yielding good milling ore and mill is in steady operation. Oom Paul mine is also in regular operation.

HOMESTAKE (Etna Mills)—Mining has been resumed at this mine on Taylor Creek. Old wagon road is being repaired to facilitate shipment of supplies. Large tonnage of high-grade ore has been blocked out. Building of a stamp mill is contemplated.

Tuolumne County

GARFIELD VIRGINIA (Buchannan District)—Suit to quiet title has been brought in Superior Court by Charles Segerstrom, manager of Dutch mine.

LOFTUS & GARWOOD have 20,000 ft. of lumber near Oak Bar for construction of a wing dam on Klamath River. Placer gold on a small island in river will be mined.

DREISAM (Sonisbyville)—Mine has been bonded to Black Oak Development Co., which operates Black Oak mine. The 500-ft. shaft will be deepened to 700 ft. before drifting or crosscutting.

HARVARD (Jamestown)—Grade of ore is increasing as depth is gained in shaft, and good ore is being mined in both north and south ends of mine. Shaft is being widened and other improvements are in progress.

COLORADO

Boulder County

UNITED STATES GOLD CORPORATION (Sugar Loaf)—Excavation for an addition to roasting plant is completed. Contracts have been let for steel building. A sampling plant will be built.

RICHMOND (Boulder)—Lease has been obtained by Pierce Bros., of Wisconsin. Frank Pierce will be superintendent. Mine was formerly a producer of gold that occurred in a narrow vein, but ore was rich.

SOUTHERN ILLINOIS (Gold Hill)—Mine and mill that have been idle all winter are being reopened by Dr. Curtis Brown, of Marion, Ill., president of company. Mill contains a ball mill and a Wood flotation unit.

Eagle County

A COPPER DISTRICT AT EAGLE is reported by prospectors named Story and Weiskopf who made their discovery last fall about 15 miles south of the town of Eagle. Formation is lime and shale. First claims are along a vein 6 to 8 ft. wide with 3 ft. of solid ore.

Gilpin County

FIFTY (Black Hawk)—Officials are making plans for unwatering property and erecting an aërial tramway from Cook shaft house to mill. Mill will be put into condition as soon as possible for treatment of custom ores pending unwatering and development of mine.

Lake County

NORTH SIDE (Leadville)—An additional boiler is being installed to provide power for pumping. Rich lead-carbonate has been opened up.

VIRGINIUS (Leadville)—Property, on Sugar Loaf Mountain, is developing good ore, of which little will be stoped until installation of proposed storage-battery locomotive.

BIG FOUR (Leadville)—Mine was closed down several weeks ago through failure to meet pay roll, but George W. Boyce has reorganized as Big Five Operating Co. and resumed work under a new lease. All debts have been canceled and development work has proceeded.

La Plata County

TOM BOY—(Cave Basin, via Ignacio)—Owners are making preparations for development work as soon as supplies can be brought in.

BALTIMORE (Cave Basin, via Ignacio)—This property, but recently discovered is showing up well and some high assays have been obtained.

MARY MURPHY (Cave Basin, via Ignacio)—Ore is being sacked for shipment as soon as trail is opened. It is said that this ore contains 150 oz. silver and 30% copper.

Ouray County

FOURTH OF JULY-NANCY HANKS (Sawpit)—Sawpit Mutual Mining Co. is organizing to work this group under bond and lease. It is proposed to drive Eames adit 300 ft. to tap vein and to afford drainage. Last operations were stopped by excessive water in shaft. Ore is worth $20, for gold, silver and copper.

San Juan County

MEARS-WILFLEY MILL (Silverton)—Plant is finished; it will treat tailing from Silver Lake mine deposited in Silver Lake. These will be conveyed in natural channel and wooden flume down two miles to mill, into settling tanks, thence to tube mills, and to classifier. Coarse material will go to new type of Wilfley tables 47 ft. by 12 ft.; fines to three 24-deck Wilfley slimers, capacity 600 tons.

San Miguel County

BREITUNG MINES CORPORATION (11 Pine St., New York)—Company has optioned Humboldt mine, adjoining Smuggler Union. Humboldt has an 850-ft. shaft and 5220 ft. of drifts and crosscuts. R. E. Cranston will make an examination soon to check reserves estimated at 104,261 tons of a gross value of $1,860,454, distributed as follows: On dump, 16,000 tons; in place, blocked out on four sides, 77,749 tons; ore developed on two sides, 10,512 tons. Humboldt orebody could be tapped at depth through an adit from Smuggler Union workings.

Teller County

DRAINAGE TUNNEL—Work of extending tunnel to eastward has begun, under direction of James F. Burns, chairman of tunnel committee. A flow of 7500 gal. per min. continues from portal.

PORTLAND (Victor)—High-grade ore is being mined on new 1750-ft. level, recently opened.

TRILBY (Cripple Creek)—This property has been sold at a sheriff's sale, to satisfy a judgment of $98,000.

GEORGIA

Lumpkin County

TOLEDO MINING CO. (Dahlonega)—Grading for a mill near Yahoola Creek opposite old Consolidated mill of 120 stamps has commenced. Proposed plant includes 10 stamps and a tube mill, to be driven by a 40-hp. turbine working under 17-ft. head. Company will work Free Jim property, which is a deposit of gold-bearing saprolite, by system of hydraulicking and milling developed in this district. The giant will work under 100-ft. head and opencut, when extended into hillside, will have a face of 100 ft. A flume, 1500 ft. long, provided with riffles will conduct hydraulicked material to mill, where a 4x10-ft. trommel will separate fine and coarse, each of which goes to its respective bin. Coarse ore will be crushed in stamp mill and fine in tube mill. Pulp will flow over 300 sq.ft. of amalgamated plates. Idea of regrinding fine portion of discharge from flume, is new and should add greatly to chances for profit. This work is being financed by people who have been interested in Dahlonega for several years, and in spite of unsatisfactory conditions that have existed there for years, as far as profitable mining is concerned.

IDAHO

Coeur d'Alene District

PRINCIPAL COEUR D'ALENE PRODUCERS IN 1913 yielded net profits of $4,773,287, as against $3,571,002 for same properties in 1912, an increase of $1,202,285. Gross output for period was 2,039,030 tons, greater by 150,786 tons than for previous years, and gross value was $17,670,083, an increase of $2,391,098. Extraction costs were $6,586,784, an average of $3.23 per ton, 73c. higher than in 1912. Transportation and smelter charges were $5,767,412, or $2.83 per gross ton, an increase of 23c., and net profit was $2.61 per ton, a decrease of 44c., due to marked decline in lead prices, while gross value of product increased from $8.15 to $8.67. Improvements and betterments decreased from $900,785 to $655,376. Hercules heads list, taking place of Bunker Hill & Sullivan, which goes to second place, and Greenhill-Cleveland, in producing class for first time, is third. Stewart is fourth. Hecla drops from fourth to six place. Ontario increased its profits $15,424 and Snowstorm $48,677. Hecla's profits decreased $42,916, Last Chance $34,701 and Success $176,746. For eleventh consecutive year Gold Hunter shows a net loss, and Interstate-Callahan, Federal's Standard mine, Sierra Nevada and Alice also report net losses. No report has been filed yet by Marsh or Tyler lease, and Caledonia and Highland-Surprise did not operate. Further details are: Hercules—Tons, 40,816; gross value, $2,846,758; cost of mining, $669,002; cost of transportation, $238,651; cost of reduction, $552,473; betterments, $179,304. Bunker Hill & Sullivan—Tons, 436,060; gross value, $3,889,767; cost of mining, $1,213,859; cost of transportation and reduction, $1,557,647; betterments, $70,004; royalties, $14,256. Greenhill-Cleveland—Tons, 173,846; gross value, $2,083,108; cost of mining, $647,802; cost of transportation and reduction, $515,292; betterments and cost of lease, $81,862. Stewart—Tons, 174,126; gross value, $1,629,474; cost of mining, $488,995; cost of transportation and reduction, $524,489; betterments, $54,556. Federal (Morning mine, Mullan)—Tons, 387,932; gross value, $2,021,395; cost of mining, $858,240; cost of transportation and reduction, $848,274; betterments, $9722. Hecla—Tons, 141,930; gross value, $1,026,754; cost of mining, $402,998; cost of transportation and reduction, $299,060; betterments, $32,000. Ontario—Tons, 72,901; gross value, $592,372; cost of mining, $226,889; cost of transportation and reduction, $181,691. Snowstorm—Tons, 105,674; gross value, $709,577; cost of mining, $309,161; cost of transportation and reduction, $207,847; betterments, $55,112. Federal (Last Chance mine, Wardner)—Tons, 265,200; gross value, $1,217,071; cost of mining, $709,440; cost of transportation and reduction, $385,301; betterments, $949. Tamarack & Custer Consolidated—Tons, 11,808; gross value, $532,206; cost of mining, including milling, $251,631; cost of transportation and reduction, $166,134; betterments, $56,751. Success—Tons, 62,700; gross value, $291,056; cost of mining transportation, reduction and betterments not segregated, $281,866. Federal (Mace mines)—Tons, 2874; gross value, $42,383; cost of mining, $29,678; cost of transportation and reduction, $12,512; betterments, $5682. Sierra Nevada—Tons, 5031; gross value, $19,458; cost of mining and exploration, $31,898; cost of transportation, $5669; cost of reduction, $2242. Alice—Tons, 2319; gross value, $14,912; cost of mining, $13,718; cost of transportation and reduction, $4868. Gold Hunter—Tons, 14,000; gross value, $489,148; cost of mining, $280,000; cost of transportation and reduction, $168,000; betterments, $43,635. Consolidated Interstate-Callahan—Tons, 43,663; gross value, $264,644; cost of mining, including milling, $171,607; cost of transportation and reduction, $97,262; betterments, $67,799.

HERCULES (Burke)—No. 5 tunnel has crosscut 25 ft. of ore. Tunnel crew has been laid off for a few shifts in order that arrangements can be made to handle ore. This tunnel was driven from town of Burke. It is 600 ft. below No. 4 tunnel and is 8000 ft. long. All records for district were broken in driving it; during March 402 ft. advance was made. Ingersoll-Leyner machines were used. Company has a model surface plant ready to put in operation at portal of tunnel and all ore will be handled through this plant. This will eliminate tramway now in use. Width of ore will not be known until crosscut is continued but from what is already exposed it would seem that ore is about as wide as in upper workings. Between new and upper tunnel practically no work has been done which assures a long life. Ore is high-grade and uniform. Mine made a net profit last year of $1,200,000.

MICHIGAN

Copper

AHMEEK (Houghton)—Work of installing two additional heads at mill is progressing satisfactorily and it will be ready for duty this summer. Shafts Nos. 1 and 2 are sending 2000 tons of rock to mill daily and this is being gradually increased. North shaft will be ready to handle additional rock as soon as mill is ready to take care of it.

CALUMET & HECLA (Calumet)—Property is operating at full capacity with exception of No. 21 shaft on Kearsarge lode, and it is likely that this shaft will be opened at an early date. Plans are being worked out toward a more efficient method of rock handling that will materially increase production on Osceola lode. An experiment is being tried at one shaft on this lode, using mules for underground haulage. At stamp mills, site is being arranged for erection of a large leaching plant, necessitating moving a number of dwellings, and excavating will be started in near future. At No. 2 regrinding mill, work of installing machinery is going forward, and one section will be ready in early summer and will take care of tailings from Hecla mill. Work on dredging plant is progressing. The 20-in. dredge is being fitted up and plans are being made to have equipment working on tailings pile before cold weather sets in. First half of company's electrolytic plant is doing regular duty.

Iron

IRON-ORE OUTLOOK—Cut in ore prices of from 60 to 70c. per ton has caused talk throughout iron ranges and many people believe that dull times are coming. Laying off of 700 men by Steel Corporation, at Ironwood, and another 700 at Eveleth, together with 200 discharged by Penn Iron Mining Co., at Norway and Vulcan, has led people to think

that most of the towns will have to suffer. Present prices of ore are entirely too low to allow some operators to derive a fair profit, and as many of them are heavily stocked now, opinion prevails that they will curtail or shut down rather than sacrifice their product. Mining men claim that $3.75 for Bessemer and $3 for non-Bessemer is not a fair price, when operating costs are considered. Mines that have big royalties to pay will be losers, but they would rather work them than sell ores that they hold in fee. Minimum has to be paid.

AMERICAN (Diorite)—This mine has made one boat shipment of iron ore this season to Algoma Steel Co., at Canadian Soo. Just when another cargo will be sent out is not known.

REPUBLIC (Republic)—Cleveland-Cliffs Iron Co. is considering purchase of this property, one of the best hard-ore mines on Marquette range. Mine is owned by Cambria Steel Co., but has been operated for several years by Penn Iron Mining Co. At present Cleveland-Cliffs company is operating only one hard-ore mine, all others being soft hematite.

TRADERS (Iron Mountain)—Three blowers and several pumps are in operation unwatering this open-pit mine from which 100,000 tons will be shipped this year. It is believed that men will be able to start work within a week, when most of the water will be out. Hoose & Person Construction Co. has started its stripping contract at mine and it will not take long to remove overburden on that part of property.

CLEVELAND-CLIFFS (Ishpeming)—Further inquiry in regard to note, lately published in these pages, to the effect that a steel headframe was being introduced on iron range by this company in drilling operations, develops fact that so called "headframe" is no more than usual steel derrick designed by all diamond-drill manufacturers for use by those who prefer steel to timber.

MINNESOTA

Duluth

A CHANGE IN THE LAWFUL LATERAL AND OVERHEAD CLEARANCES, required for ore cars loading from headframes, has been authorized by the state railroad and warehouse commission of Minnesota, upon application of several Mesabi range railroads. State law has heretofore provided (Chap. 307, Laws of 1913) side clearances of not less than 8 ft. from center line of track and overhead clearance of not less than 21 ft. from top of rail. New order requires but 12 ft. 6 in. overhead clearance and 6 ft. side clearance. Arguments in favor of lower overhead clearance are: (1) Impact of ore falling from chute at greater distance would seriously damage the rolling stock; (2) greater danger to employees in endeavoring to remove obstructions in chute when above height of employee. As to the side clearance, it is argued that steel headframes are open, and there is no occasion for an employee to go between supporting posts and car. New clearance is insufficient for locomotives, but this is unnecessary, as ore cars are dropped under chute by gravity.

ALL ORE DOCKS OPENED WEEK OF MAY 2 at western end of Lake Superior. S.S. "Joseph Block," owned by Inland Steel Co., was first ore cargo out of Duluth harbor, being from Great Northern dock at Superior. Missabe dock at Duluth opened several days later, as did Ashland and Two Harbors docks. Operating companies continue to lay off men, under one pretext or another. Fayal, at Eveleth, recently reduced its working force to half normal. This condition prevails in all Michigan and Minnesota iron districts. At Virginia, Minn., large numbers of unemployed are being taken care of nightly by the city. Steel Corporation is concentrating its energies mostly to Great Northern ore properties, from which properties it is obliged to pay for 6,000,000 tons during present season at a royalty of $1.88 per ton, on basis of 59% iron. This price includes freight to Superior docks. Recent establishment of 1914 ore prices has not had anticipated stimulating effect on iron-ore trade. While actual mining operations are being curtailed, reverse is true of exploratory and preliminary work. Steel Corporation's activities in this direction exceed those of any previous time. Following new underground operations have recently been started: Sullivan, Wanless, Minnewas and Prindle, all near Virginia, Graham and Vivian, at Biwabik, Philbin, at Hibbing, and Duncan, at Chisholm. These activities are, of course, necessitated by Great Northern lease cancellation.

MONTANA

Beaverhead County

BIG MUDDY OIL DISTRICT—According to reports of James McKay, prospects of striking oil on Big Muddy, in Sheep Creek basin, are favorable. Specimens of oil shale exhibited by him recently, burnt quite readily when ignited, showing high contents of crude oil. McKay says that development work has not yet reached a stage that permits making positive predictions as to depth at which oil will be encountered.

Missoula County

TARBOX (Saltese)—This mine, which was forced to close down after loss of plant and buildings during forest fires in 1910, is to be developed, and new equipment is to be installed as soon as funds now being raised become available. On each of six levels which have been opened from a shaft 600 ft. deep, shoots of good lead and silver ore have been exposed. It is planned to sink shaft 200 ft. deeper and to explore all ground underlying 200 acres of mineral land owned by company.

Silver Bow County

WORKINGMEN'S WAGE SCALE—Recent efforts of Butte Workingmen's Union to secure from other Butte labor unions an indorsement of a strike for workingmen to help them obtain a raise of wages from $3.50 to $4, have failed. Clerks' union, plumbers and gasfitters, Butte miners' union and others have all decided against a strike at present and most of these unions have instructed their delegates to Silver Bow Trades and Labor Council to so state sentiment of members of their respective unions. So far city of Butte is only employer of labor which has agreed to pay $4 scale.

WASHINGTON-BUTTE MINING CO. (Butte)—U. S. Circuit Court of Appeals, at San Francisco, affirmed decision of the U. S. district court at Butte, in favor of Washington-Butte company. Company is owner of 20 acres of patented placer ground, adjoining Pittsmont mine in eastern part of Butte district. Ground is valued at $300,000. Some years ago five quartz claims were located on ground of Washington-Butte company by Mason and others, who contended that placer patent excluded quartz veins known to exist when patent was issued. By decision of San Francisco court, Washington-Butte company was declared sole owner of both placer and lode rights. Another suit against company, involving eastern portion of placer ground, is pending in state court. It is more than probable that in view of last decision this suit will be dropped.

BUTTE & SUPERIOR COPPER CO. (Butte)—The decision of Federal court of Montana, holding that Minerals Separation Co.'s patent was invalid, practically settles outcome of injunction suit brought by Minerals Separation Co. against Butte & Superior, independent of Hyde case, which has not yet been tried. Circuit Court at Butte refused to grant injunction upon filing of a satisfactory bond by Butte & Superior, and a monthly statement of operations of company's flotation plant. This order has been complied with ever since. There is also pending a decision as to ownership of certain orebodies claimed by this company and adjoining Elm Orlu mine, owned by W. A. Clark. Work necessary to settle this has been carried on for last two years, and has now reached a point where it is hoped engineers in charge will be able to report definitely within a short time.

NEVADA

Esmeralda County

KLONDYKE (Klondyke)—Mill will be built in near future.

JUMBO EXTENSION MINING CO. (Goldfield)—Second payment, amounting to $20,000, has been made on Velvet claim, which has been held under option from Goldfield-Merger Mines Co. Total purchase price is $85,000 and 171,000 shares of stock. Under terms of sale, stoping will now be permitted, and monthly payments of $5000 will be made. Drifting into Velvet claim from 921-ft. level of Poleverda claim has been done and an oreshoot, 4 ft. wide, has been opened.

Lander County

AUSTIN-DAKOTA (Austin)—Oreshoot containing fine specimens of native silver has been discovered in sinking incline shaft. Ore is being sorted for shipment, low-grade ore being stored on dump until mill can be built.

KIMBERLY CONSOLIDATED (Battle Mountain)—Shoot of rich ore has been discovered in raise being lifted to connect with old shaft on south end of property. Considerable high-grade ore was shipped from this shaft when property was first located. It is expected that development work will open a large tonnage of good grade ore. At Washington, or main working shaft, hoisting plant has been installed headframe and ore bins built, and shaft timbered. Sinking will be resumed. In north end, crosscut 131 has cut vein and 8 ft. of milling-grade ore is opened. This crosscut will be advanced to cut downward extension of a parallel vein.

Lincoln County

AMALGAMATED PIOCHE (Pioche)—Crosscutting to Raymond and Ely vein is being continued. Concrete bulkhead has been built in crosscut, and two pumps installed at No. 1 shaft, to handle large flow of water expected when vein is cut. Zinc-sulphide ore, containing gold and silver, is being stoped on 12th level. Shipping ore is sorted out at collar of No. 1 shaft, low-grade being stored on stockpiles for future milling. New bins and sorting tables are being built.

Lyon County

SMITH VALLEY MINES CO. (Smith Valley)—Main office has been moved to Yerington, Nevada.

EMPIRE-NEVADA (Yerington)—Sixth churn drill hole is now being sunk. Several thousand feet of drilling has been done to date, but results have not been made public.

Mineral County

NEVADA CHIEF MINING CO. (Goldyke)—This company is operating on a group of six claims and has installed a 15-hp. hoist. An incline shaft has been sunk to a depth of 230 ft. Vein was crosscut at 150 ft., and where it assayed $20 per ton, and at lower crosscut vein is wider and ore richer, some selected ore running in high figures. Company is planning to sink shaft 100 ft. deeper.

COPPER QUEEN (Luning)—This group, consisting of 64 claims, has recently been bonded by A. C. James and associates. Considerable surface work has been done preparatory to starting development of promising surface showings that were uncovered by Fermina Sarrias, owner. Ore occurs in form of carbonates, oxides, silicates and some sulphides in garnitized limestone along a contact with granitic intrusions.

WAGNER AZURITE COPPER CO. (Luning)—Company owns 16 claims four miles east of Luning adjoining Nevada Champion and Anderson properties. By a system of cuts and shafts, property has been opened for ¾ mile in length and 1500 ft. in width between a monzonite foot wall and quartzite hanging. Oreshoots show strong on surface, giving an average of 2½% copper. Ore carries ¾ oz. silver to 1% of copper and some gold. Working shaft at present is only 100 ft. deep, with crosscuts at 50- and 100-ft. levels and average width of deposit is 30 ft. With present development there is apparently 50,000 tons of commercial ore available. Company has completed a plant for the treatment of these ores. It was designed by John D. Fields, and is to have a capacity of 200 tons daily. It is a departure from usual leaching practice in that ore is ground fine and leached in a specially designed agitator containing an acid-proof filter. Pulp after treatment with sulphuric-acid solution is treated by amalgamation to recover gold and silver. Copper is recovered from solution by precipitation on iron, but it is expected that electric power will be obtained in a short time, which will permit installation of electrical equipment to produce highest grade of electrolytic copper.

Nye County

MacNAMARA MINING CO. (Tonopah)—Special meeting will be held on May 15, to reorganize company on assessment basis.

Storey County

COMSTOCK PUMPING ASSOCIATION (Virginia City))—Settlement of dispute with Mexican company may be accomplished without recourse to law, although Mexican, apparently, has no intention of joining association at present. Friendly feeling now prevails between Pumping Association and Mexican company. Three 75-kw. transformers are being installed on 2200-ft. station of C. & C. shaft. These transformers are for 2310-ft. pumping plant in case of a sudden influx of water. Air lift installed in Consolidated Virginia is working satisfactorily.

White Pine County

GIROUX (Ely)—Production of copper will cease upon expiration of smelting contract, June 5, with Steptoe smelting plant, according to report from Boston. Development work will be hastened on this and other subsidiary properties of Consolidated Copper Mines Co. to determine if construction of concentrating plant is warranted.

STEPTOE VALLEY SMELTING CO. (McGill)—Work on upper stories of new clubhouse for employees has been started. Basement was completed some time ago and contains swimming pool, shower baths and bowling alleys. Three stories, of red and white pressed brick, will be built. On first floor will be lobby, gymnasium, reading room and billiard room, on second and third floors, 35 bedrooms. Membership in club will be optional with employees.

NEW MEXICO

Eddy County

SOUTHWESTERN PETROLEUM CO. (Carlsbad)—J. A. Johnson is statutory agent of this newly incorporated company; capitalization, $50,000.

ANDREWS OIL & GAS CO. (Carlsbad)—Company has filed incorporation papers with commission at Santa Fé; capitalization, $250,000. S. D. Stennis, Jr., is statutory agent.

Grant County

BONNIE MINE CO. (Lordsburg)—It is reported company will make many improvements during year.

85 MINE (Lordsburg)—The 792-ft. tunnel is completed and main shaft is to be sunk deeper and forces increased. Large shipment of machinery is en route.

Sierra County

GOOD LUCK MINING CO. (Mancho)—Property was bid by Phillip G. Simmons, judgment creditor for $7000 at sheriff's sale.

Socorro County

PACIFIC MINES CO. (Mogollon)—Ore bins at North tunnel are to be moved to new working shaft, in center of property, and hoisted, eliminating 500 ft. of tramming. Ore is shipped daily to custom mills.

SOCORRO MINING & MILLING CO. (Mogollon)—Survey has been completed for an aërial wire-rope tramway to properties one mile distant, upon which company holds option to purchase. Mill handled 5000 tons of ore in April and shipped two tons of bullion, in addition to several tons of high-grade concentrate.

OAKS CO. (Mogollon)—Development in both Johnson and Eberle mines is yielding good-grade mill ore. Crosscutting of large vein passing through Eberle is being conducted prior to selection of point for sinking main shaft. Eberle is centrally located, being situated between Ernestine Mining Co. on south and Socorro Mining & Milling Co. on north.

UTAH

Juab County

APRIL SHIPMENTS FROM TINTIC amounted to 539 cars, and total for first four months of 1914 is 2446 cars.

CHIEF CONSOLIDATED (Eureka)—Drift into Eureka City ground on 1400 level is nearing Beck fault, and interesting developments are looked for.

IRON BLOSSOM (Silver City)—Ore has been followed for some distance above 400, in No. 3 workings, where deposits have heretofore been found only between 400- and 500-ft. levels.

GRAND CENTRAL (Mammoth)—A dividend of 5c. per share, or $25,000, has been declared, payable May 19. This makes a total of $50,000 for 1914 thus far. Monthly shipments from 2000 to 3000 tons are being made.

GODIVA (Eureka)—Machinery at this property is being put in order, shaft repaired, etc., by Fairburn Leasing Co., organized for purpose of working here. Operations will be carried on on 700-, 900- and 1200-ft. levels. Most productive territory in past was between 700- and 900-ft. levels, below which little work has been done. Especial attention will be given to 1200 level, lowest level, in search of a continuation of oreshoots. There is stated to be much low-grade ore exposed in various parts of mine.

Salt Lake County

UTAH APEX (Bingham)—The company's first-mortgage bonds have been reduced from $239,000 Jan. 1, 1913, to $105,000. Capacity of mill has recently been doubled.

CARBONATE (Salt Lake City)—Lessees have sent a force of men up to this property in Big Cottonwood, four miles from Maxfield mine.

SELLS MINING (Alta)—Work has been started at this property, which adjoins South Hecla on west. Operations will be carried on through Dwyer tunnel level of that property. Ground to be developed is under lease and bond.

BINGHAM MINES (Bingham)—Satisfactory ventilation has been obtained at this company's Commercial mine through completion of a 550-ft. raise from tunnel level to surface. It will now be possible to adequately develop a large part of the ground, which during summer months could not be operated, owing to bad air in upper stopes. Deepest workings are 1200 ft. on dip of vein.

Summit County

SNAKE CREEK TUNNEL (Park City)—During March this tunnel was extended 298 feet.

SILVER KING COALITION (Park City)—A steel headframe is being installed in underground station on Alliance tunnel level.

MINES OPERATING CO. (Park City)—During March, 4000 to 5000 tons of ore from old stopes on upper levels of Ontario were treated in this company's mill. A high daily average of 188 tons for each day week was recently attained.

DALY-JUDGE (Park City)—Galena ore has been opened in Daly vein by a raise from 1200-ft. level. This is regarded as an important strike, as two other finds similar to this one have been followed from 1200 to above 500. Milling ore has also been developed, and drifting is being done from 300-ft. level to cut oreshoot. Shipments of high-grade ore have been made.

CANADA

British Columbia

UNION (Grand Forks)—Contracts have been let at rate of $13.50 per ton for hauling 2000 tons of ore from Union mine in Franklin Camp to Granby smelting works at Grand Forks.

BLACK PRINCE (Slocan City)—A 6-in. vein of high-grade silver ore has been crosscut in a tunnel being driven from lower workings with object of cutting Two Friends vein. Crosscut had been driven 50 ft. when new vein was struck.

CORK GROUP (Kaslo)—This group comprising six claims, situated on South Fork of Kaslo Creek, has been bonded to Kaslo and Vancouver men. Included with mineral claims is a large acreage of timber, a concentrator having a capacity of 100 to 125 tons per day, a compressor run by water power and a sawmill; 800 tons of concentrates, which it is said will assay 32% zinc, 8% lead and 15 oz. silver will also become property of new company. There are three veins in group, from one of which, French company, formerly operating property, shipped 1206 tons of concentrates, carrying 46,417 oz. silver and 1,396,732 lb. lead in addition to producing zinc concentrates already mentioned.

Ontario

KERR LAKE MINING CO. (Cobalt)—Unwatering lake has again been started.

PETERSON LAKE (Cobalt)—Company has declared a dividend of 1¾% quarterly, or 7% per annum. Issued capital is $2,401,820.

KIRKLAND LAKE (Kirkland Lake)—It is announced that report of Doctor Hatch, English mining engineer, who recently inspected properties, which has been anticipated with much interest in mining circles, will not be made public.

NIPISSING (Cobalt)—Hydraulic prospecting near McKinley-Darragh has been recommended. Later in season work will be confined to area around Peterson Lake. During April estimated net value of production was $225,703. High-grade mill treated 170 tons and shipped 550,150 oz. of bullion. Low-grade mill treated 6663 tons.

CROWN RESERVE (Cobalt)—Long-protracted action brought by John Black and others against this company to decide ownership of 569,950 shares of treasury stock, which plaintiffs claimed to be held in trust for them, has been finally decided by British Privy Council in favor of company. Case was appealed from judgment of Canadian courts for company, and appeal has been dismissed.

MEXICO

Jalisco

FOREIGNERS KILLED AT HOSTOTIPAQUILLO include one American and two British subjects. A Mr. Ransdell, presumably a British subject, and seven Americans are reported cut off by bandits in vicinity. Other Americans are safe. This information came as a result of an inquiry about conditions at Cinco Minas and safety of Americans there. It reads: "Bullion buried. Concentrates stored. Both safe. Americans all safe. One American and two British killed at other mines in Jalisco. All mines shut down completely. Ransdell and seven Americans cut off by bandits at Mascota and Huauchinango. Only 15 Americans in Jalisco." Dispatch did not mention names of men killed.

BRITISH GUIANA

GOLD PRODUCTION for the three months ended Mar. 31 was 9901 fine oz., or $206,516; an increase of $38,557 over 1913. Diamonds reported for the three months were 2098 carats, valued at $19,446; an increase of 1248 carats over last year.

COLOMBIA

PATO MINES, LTD. (Zaragoza)—Manager has cabled to London that rainy season has commenced, and dredge resumed operation Apr. 25.

PERU

CERRO DE PASCO MINING CO. (Cerro de Pasco)—Unsanitary native huts of stone and adobe are being pulled down by company and replaced with modern and hygienic structures.

TRANSVAAL

GOLD PRODUCTION IN THE TRANSVAAL in April is reported by cable at 683,877 oz., which is 2924 oz. less than in March, and 101,097 oz. less than in April, 1913. For the four months ended April 30 the total was 3,098,928 oz. in 1913, and 2,648,692 oz.—or $57,748,464—in 1914; a decrease of 450,236 oz., or 14.5%, this year.

PRODUCTION OF METALS OTHER THAN GOLD in the Transvaal in January included 70,512 oz. silver, 1132 tons copper ore and 373 tons zinc ore. As compared with January, 1913, this shows a decrease of 24,751 oz. silver; increases of 734 tons copper ore and 106 tons tin ore. Coal shipments from the mines were 389,505 tons, a decrease of 28,212 tons from last year.

The Market Report

METAL MARKETS

NEW YORK—May 13

The metal markets are still inclined to be quiet and no changes of importance are to be noted during the week.

MONTHLY INDEX NUMBERS

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

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

Copper, Tin, Lead and Zinc

Copper—The market has been very quiet. Buyers both in this country and abroad are holding back and the inquiry in consequence has been slight. On the other hand, the principal producers have not pressed metal for sale, but second hands have offered at lower figures and these offerings have been facilitated by the fact that on account of the low market for standard copper arbitrage transactions have been profitable. The business has been done at somewhat lower figures.

The London standard market on May 7 was £63 3s. 9d. for spot and £63 10s. for three months. On May 8, spot declined to £62 16s. 3d. and three months to £63 6s. 3d., which figures also prevailed on Monday, May 11. There was some covering of shorts on Tuesday, May 12, in consequence of which the market advanced to £63 3s. 9d. for spot and £63 15s. for three months. On Wednesday, May 13, it closed at £63 2s. 6d. for spot and £63 12s. 6d. for three months.

The average of our copper quotations for the week is 13.9375 cents.

Base price of copper sheets is now 19¾c. per lb. for hot rolled and 20¾c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 15¼ @15½c. per lb., carload lots at mill.

Copper exports from New York for the week were 9491 long tons. Our special correspondent reports exports from Baltimore for the week at 4732 tons.

Tin—Buyers in this market refrained from large purchases in view of the fact that they covered their requirements to a considerable extent at the lower level which was established about a week ago. Notwithstanding the absence of American buyers on the London Metal Exchange, the market there developed a much better tendency. It is reported that Eastern interests have practically withdrawn as sellers. The close is firm at £153 5s. for spot and £155 2s. 6d. for three months; and about 33¾c. for May tin here.

Messrs. Robertson & Bense write that the arrivals of tin ore and concentrates at Hamburg, Germany, in April, were: From Bolivia, 1651 tons; from India, 5; from Southwest Africa, 10; total, 1666 tons.

Lead—There is a good business doing both in the East and in the West, with St. Louis price a shade firmer.

The London market is quiet, Spanish lead being quoted at £18 8s. 9d. and English 7s. 6d. higher.

Spelter—There has been a good demand from day to day, which has been freely met and considerable business has been done, the market closing rather firm.

In London, good ordinaries closed at £21 7s. 6d., specials £21 15s. per ton.

Base price of zinc sheets is now $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount, with the usual extras.

Cadmium—German quotation is 750 marks per 100 kg.—equal to about 81c. per lb.—f.o.b. works in Silesia.

Magnesium—Current quotation for pure metal is $1.50 per lb. for lots of 100 lb. or over, New York.

Selenium—Quotations are $3@3.25 per lb. for lots of 100 lb. or over. For retail lots $5 per lb. is asked.

Exports from Baltimore for the past week included 2205 lb. selenium to Hamburg, Germany.

Foreign Trade of Great Britain in Metals other than iron and steel, three months ended Mar. 31, in long tons:

	Imports		Exports	
Metals:	1913	1914	1913	1914
Copper	32,570	43,263	17,303	16,589
Tin	12,248	13,296	11,508	12,017
Lead	52,878	55,273	14,179	15,644
Zinc	34,235	37,549	2,148	2,822
Quicksilver	438	414	332	188
Minor metals	2,162	2,301	7,484	7,085
Ores, etc.				
Tin ore and concentrates	8,153	9,835	.....	.....
Pyrites	247,438	232,511	.....	.....

Copper includes contents of ore and matte imported. Exports include reëxports of foreign material.

DAILY PRICES OF METALS

NEW YORK

May	Sterling Exchange	Silver, Cts. per Oz.	Copper: Electrolytic, Cts. per Lb.	Tin: Cts. per Lb.	Lead: New York, Cts. per Lb.	Lead: St. Louis, Cts. per Lb.	Zinc: New York, Cts. per Lb.	Zinc: St. Louis, Cts. per Lb.
7	4.8765	58¾	13.90 @14.00	33⅛	3.90	3.80	5.05 @5.10	4.90 @4.95
8	4.8780	58⅞	13.90 @13.95	33⅜	3.90	3.80	5.05 @5.10	4.90 @4.95
9	4.8790	58⅞	13.90 @13.95	33⅜	3.90	3.80	5.05 @5.10	4.90 @4.95
11	4.8805	58¾	13.85 @13.95	33¼	3.90	3.80	5.05 @5.10	4.90 @4.95
12	4.8805	58½	13.90 @14.00	33¼	3.90	3.80	5.07½ @5.10	4.92½ @4.95
13	4.8795	58⅜	13.95 @14.00	33¼	3.90	3.80 @3.82½	5.07½ @5.10	4.92½ @4.95

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

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@ 17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triests, 22c.

LONDON

May	Silver	Copper: Spot £ per Ton	Copper: Spot Cts. per Lb.	Copper: 3 Mos.	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos.	Lead: £ per Ton	Lead: Cts. per Lb.	Zinc: £ per Ton	Zinc: Cts. per Lb.
7	27	63 3/16	13.73	63⅛	67⅛	152	154	18¼	3.96	21⅛	4.64
8	27 1/16	62 13/16	13.65	63 5/16	67⅛	151⅛	153⅜	18⅛	3.99	21⅛	4.64
9	27 1/16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	27	62 13/16	13.65	63 5/16	67⅛	151⅛	153⅛	18¼	3.96	21⅛	4.64
12	26⅞	63 3/16	13.73	63⅜	67⅜	153	155	18⅜	3.99	21⅛	4.64
13	26 15/16	63⅛	13.71	63⅜	67⅜	153¼	155⅛	18 7/16	4.01	21⅛	4.64

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.2 = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21⅞c.

Other Metals

Aluminum—The market remains fairly active, but there is some competition for business, and imported metal has been offered at lower figures. Quotations are 17¾@18¼c. per lb. for No. 1 ingots, New York.

Antimony—The market continues quiet, with little or no change. Cookson's is firmer at 7.40@7.50c. per lb. and Hallett's at 6.90@7.10c.; while 5.75@6c. per lb. is named for Chinese, Hungarian and other outside brands.

Reports have been received from abroad of a meeting held for the purpose of forming a syndicate of European producers. No definite information can be had here, but rumors of some such action have been heard for several weeks.

Quicksilver—Trade continues fair and prices are unchanged. New York quotations are $38 per flask of 75 lb. for large lots and 54c. per lb. for jobbing orders; San Francisco, $38 for domestic orders, and special terms—usually about $2 less—for export. The London price is £7 per flask with £6 17s. 6d. asked from second hands.

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

Gold, Silver and Platinum

Gold—The open market in London is still affected by a strong demand, especially from Russia and France, and a premium was again paid, the price for bars being 77s. 9¼d. per oz. At the end of the week the premium was dropped. In New York $2,000,000 gold was taken for export to France, and $1,000,000 for Berlin, though it is said this consignment was destined to Russia.

Sales of gold bars at the New York Assay Office in April amounted to $2,836,057. For the four months ended April 30 the sales were $11,395,467 in 1913, and $11,550,268 in 1914; an increase of $154,801 this year. This does not include gold for export.

Gold production in the Transvaal in April was 683,877 oz. or 2929 oz. less than in March. For the four months ended April 30, the total was $64,054,842 in 1913, and $54,748,464 in 1914; a decrease of $9,306,378, or 14.5%, this year.

Iridium—With a fair demand prices remain unchanged. Quotations are $75@78 per oz., New York.

Platinum—The market remains rather quiet, but there is a steady demand, and prices are unchanged. Dealers ask $43@44 per oz. for refined platinum, and $46@49 for hard metal, according to grade.

Silver—The market has remained quiet and steady without special feature, closing at 26 1/16d. in London.

Shipments of silver from London to the East, Jan. 1 to Apr. 30, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£2,601,300	£2,686,000	I. £84,700
China	166,000	40,000	D. 126,000
Total	£2,767,300	£2,726,000	D £41,300

Gold production of Rhodesia three months ended Mar. 31, was 185,763 oz., or $3,839,720; an increase of 22,438 oz., or 13.7%, over last year.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—May 9

The base price paid this week for 60% zinc ore was $39@39.50 per ton. The base price paid for 80% lead ore was $48 per ton.

SHIPMENTS WEEK ENDED MAY 9

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,924,130	143,380	494,800
Year	53,898,600	2,223,800	16,650,230

Shipped during week to separating plants, 3,179,770 lb. zinc ore.

JOPLIN, MO.—May 9

Blende sold as high as $43, the assay base being $37@40 and the metal base $35@37.50 per ton of 60% zinc. Calamine sold at $20@22.50 per ton of 40% zinc. The average of all grades of zinc ore is $35.64 per ton. Lead sold up to $48.50 on a base price of $46 per ton of 80% metal content, and the average of all grades is $45.64 per ton.

The blende market was notably stronger, on the rise of spelter, and less talk of closing the mines was heard during the week. The owners of several mines producing high-grade zinc ore have made an open declaration that they will cease operations immediately the price recedes below a $40 base.

SHIPMENTS WEEK ENDED MAY 9

	Blende	Calamine	Lead	Value
This week	11,056,470	868,240	1,975,220	$257,375
Totals 19 weeks	199,888,160	12,824,620	34,156,160	4,907,585

Blende value, the week, $202,765; 19 weeks, $3,932,025.
Calamine value, the week, $9720; 19 weeks, $144,285.
Lead value, the week, $44,890; 19 weeks, $831,275.

MONTANA ZINC ORES

The Butte & Superior report for the month of April shows 32,580 tons of ore milled, producing 10,820 tons of concentrates. The zinc contents were, by assay, 10,648,024 lb., against 5,108,374 lb. in April of last year.

IRON TRADE REVIEW

NEW YORK—May 13

Leading steel manufacturers are somewhat more hopeful in their predictions as to the market, but none expresses an opinion that any great improvement will occur until after midsummer.

Pig iron is stagnant, but has shown no ill effect from the Lake Superior ore reduction announced last week, it being recognized that last year's decline in pig-iron prices discounted the ore reduction.

The United States Steel Corporation reports unfilled orders on its books, May 1, at 4,277,068 tons. This tonnage decreased 376,757 tons in April, comparing with a loss of 372,615 tons in March. As the April shipments were at a slightly decreased rate the bookings were evidently smaller than in March, and were probably the smallest for any month in a long time. For this condition the corporation's price policy was partly responsible.

Pig-Iron Production in April showed a slight decrease from March, though less than was expected. The reports of the blast furnaces, as collected and published by the "Iron Age," show that on May 1 there were 211 coke and anthracite stacks in blast having a total daily capacity of 71,100 tons, a decrease of 5000 tons from Apr. 1. Making allowance for the charcoal furnaces, the total production of pig iron in the United States in April was 2,298,000 long tons; for the four months ended Apr. 30 it was 8,508,000 tons. Of this total, 5,930,760 tons, or 69.7%, were made by the furnaces owned or operated by steel companies.

United States Foreign Trade in Iron and Steel, three months ended Mar. 31, is valued by the Department of Commerce as follows:

	1913	1914	Changes
Exports	$76,451,490	$53,064,233	D. $23,387,257
Imports	8,468,150	7,390,906	D. 1,077,244
Excess, exports	$67,983,340	$45,673,327	D. $22,310,013

The decrease in value of exports this year, as compared with 1913, was 30.6%; while there was also a decrease of 12.7% in imports.

PITTSBURGH—May 12

In no branch of the finished-steel market can there be found any definite improvement this week. In some branches, such as bars, plates and shapes, bookings have undergone no decrease in two or three weeks. In sheets, wire products and tubular goods there has been a slight decrease.

Steel prices show hardly any change, but whenever a noticeable change occurs it is in the downward direction. Bars and structural shapes remain firm at 1.16c., but plates are frequently done at 1.12½c. Black sheets continue quotable at 1.85c. and galvanized at 2.80c., but blue-annealed sheets are off $1 a ton, at 1.35c. for No. 10 gage. Tin-mill sizes of black sheets have sold as low as 1.80c. Tubular goods are fairly steady since the recent reductions. Line pipe continues to be sold practically at cost when important tonnages come up.

Pig Iron—The market is altogether stagnant. Not enough is being done to test prices in the usual way, but sellers insist that prices cannot be cut and that the market is firm as follows: Bessemer, $14; basic, $13; No. 2 foundry, $13.25@13.50; gray forge, $12.75; malleable, $13.25, at Valley furnaces. 90c. higher delivered Pittsburgh.

Ferromanganese—The market continues extremely quiet, and quotable at $38@39, for English or German, prompt or forward, at Baltimore. In the case of single carloads sellers sometimes secure the higher figure quoted.

Steel—The market remains nominally quotable at $20 for billets and $21 for sheet bars, at maker's mill, Pittsburgh or

Youngstown, but it is understood that the sheet-bar price at least could be shaded 50c. on any desirable order. Rods are dull at $26, Pittsburgh.

IRON ORE

Imports and Exports of Iron Ore in the United States, three months ended Mar. 31, in long tons:

	1913	1914	Changes
Imports	529,062	282,927	D. 246,135
Exports	23,857	14,255	D. 9,602

Imports of manganese ore were 142,638 tons in 1913, and 58,647 in 1914; decrease, 83,991 tons.

Imports of Iron Ore Into Germany, three months ended Mar. 31, were 3,020,482 tons; exports, 487,430 tons. Imports of manganese ore were 168,778 tons; exports, 1642 tons.

FOREIGN IRON NOTES

Steel Production in Germany for the two months ended Feb. 28 is reported by the German Iron and Steel Union as below, in metric tons:

	Acid	Basic	Total
Converter	17,600	1,701,196	1,718,796
Openhearth	60,607	1,203,101	1,263,708
Direct castings	17,550	42,018	59,568
Crucible	16,418	.....	16,418
Electric	14,801	.....	14,801
Total	126,976	2,946,315	3,073,291

The total production in January, 26 working days, was 1,586,651 tons; in February, 24 days, 1,486,640 tons. Heretofore the make of steel has not been reported monthly.

COKE

Connellsville Coke—The market is practically stagnant. Nearly all the operating furnaces are covered to July 1 and cannot be interested in second-half delivery. A few did not have contracts extending beyond May 1, but they are only buying prompt lots, apparently being in doubt whether they will remain in blast much longer. The market is $1.85@1.90 for prompt furnace, nominal at $2 for contract furnace, and $2.35@2.50 for foundry, either prompt or contract.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended May 2 at 305,610 tons, a decrease of 8147 tons, and shipments at 299,439 tons, a decrease of 10,770 tons; shipments in the upper Connellsville and Greensburg regions being given at 42,240 tons, a decrease of 395 tons.

Anthracite Shipments in April were 6,072,164 long tons, an increase of 105,975 tons over April, 1913. For the four months ended Apr. 30, the total shipments were 22,886,085 tons in 1913, and 20,534,050 in 1914; a decrease of 2,352,035 tons, or 10.3% this year.

Exports and Imports of Fuel in the United States, three months ended Mar. 31, in long tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite	825,575	567,469	12	123
Bituminous	2,962,696	2,708,681	378,289	351,302
Coke	239,189	207,017	14,161	22,338
Bunker coal	1,759,070	1,794,503	.....	.....
Total	5,786,530	5,277,670	392,452	373,763

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The greater part of the trade, both imports and exports, is with Canada.

German Foreign Trade in Fuel, three months ended Mar. 31, in metric tons:

	Exports	Imports	Excess
Coal	9,031,341	2,125,212	Exp. 6,906,129
Brown coal	20,520	1,527,461	Imp. 1,506,941
Coke	1,356,887	138,031	Exp. 1,218,856
Briquettes	808,891	44,344	Exp. 764,547
Total	11,217,639	3,835,048	Exp. 7,382,591

Of the briquettes exported this year 243,563 tons were made from brown coal or lignite.

CHEMICALS

NEW YORK—May 13

The general market is a little depressed, and there is no special activity in heavy chemicals.

Arsenic—Business is on a moderate scale and demand is small. The prices, however, are held at the same level, $3 per 100 lb. being asked for both spot and futures.

Copper Sulphate—On a fair business there is no change in prices, which remain at $4.80 per 100 lb. for carload lots, and $5.05 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is quiet, as is usual at this season. Quotations are 2.22½c. per lb. for spot; 2.20c. for May; 2.17½c. for June; 2.15c. for deliveries from July forward.

Pyrites—Imports at Baltimore for the past week included 5428 tons of pyrites from Huelva, Spain.

PETROLEUM

Prices of crude oil are still being cut by buyers, both for Pennsylvania grades and for Ohio, Indiana and Oklahoma oils. For Pennsylvania grade oils the prices are now lower than they have been for several years.

NEW CALEDONIA ORES

Exports of ores from New Caledonia two months ended Feb. 28 are reported by the "Bulletin du Commerce" of Noumea, at 15,193 metric tons of nickel ore and 6824 tons chrome ore. Exports of metals were 1096 tons of nickel matte and 24 tons of cobalt matte.

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.

	December	January	February	March	April
Alaska shipments	3,104,155	2,701,258	1,803,579	2,069,960	1,279,537
Anaconda	25,100,000	24,400,000	21,300,000	23,800,000	22,900,000
Arizona, Ltd.	2,920,000	3,474,000	3,062,000	3,286,000	.....
Copper Queen	9,033,459	8,796,358	6,987,366	7,637,042	7,562,723
Calumet & Ariz.	5,230,000	5,975,000	5,596,850	5,875,000	.....
Chino	4,390,018	6,488,220	5,642,426	5,399,814	.....
Detroit	2,021,034	1,590,681	1,814,214	1,973,725	1,790,926
East Butte	1,324,560	1,256,000	1,193,960	1,546,180	.....
Giroux	197,649	148,411	90,017	287,980	.....
Mason Valley	1,372 000	944,000	1,254,000	1,250,000	.....
Mammoth	1,400,000	1,625,000	1,400,000	1,800,000	1,850,000
Nevada Con.	5,343,862	5,791,122	4,588,243	5,218,257	.....
Ohio	722,940	700,728	582,000	597,520	.....
Old Dominion	2,613,039	2,797,000	3,066,000	2,997,000	2,779,000
Ray	5 075,202	5,105,000	5,432,000	6,036,908	.....
Shannon	1,078,000	937,432	903,761	1,082,000	1,012,000
South Utah	242,362	275,569	333,874	406,381	.....
Tennessee	1,700,000	1,474,890	1,232,812	1,262,184	.....
United Verde*	3,000,000	3,000,000	2,700,000	3,100,000	.....
Utah Copper Co.	10,306,646	10,329,564	9,207,111	12,323,493	.....
Lake Superior*	5,600,000	7,400,000	8,500,000	11,000,000	13,000,000
Non-rep. mines*	6,250,000	6,200,000	5.600,000	6,200,000	6,000,000
Total prod.	98,024,926	102,100,233	92,290,213	102,536,667	.....
Imp., bars, etc.	23,578,938	24,504,249	19,918,448	22,676,605	.....
Total blister	121,603,864	126,604,482	112,208,661	125.213,272	.....
Imp. ore & matte	12,205,187	10,893,969	9,713,164	7,029,646	.....
Total Amer.	133,809,053	137,498,451	121,921,825	132,242,918	.....
Miami†	3,210,000	3,258,950	3,316,482	3,361,100	3,130,772
Shattuck-Arizona	1,050,781	1,276,636	1,134,480	1,136,458	.....
Brit. Col. Cos.:					
British Col. Cop.	795,004	607,930	.....	.....	.....
Granby	1,605,382	1,793,840	1,661,212	1,775,852	.....
Mexican Cos.:					
Boleo†	2,315,040	2,369,920	1,984,080	2,535,680	2 204,720
Cananea	3,646,000	3,460,000	2,688,000	4,260,000	.....
Moctezuma	3,139,613	3,024,556	2,642,543	2,882,884	2,654,926
Other Foreign:					
Braden, Chile	2,122,000	2,430,000	2,362,000	1,810,000	2,720,000
Cape Cop., S. Af.	683,200	519,680	459,200	.....	.....
Kyshtim, Russia.	1,742,720	1,559,040	1,534,400	.....	.....
Spassky, Russia.	900,480	902,720	902,720	.....	.....
Exports from					
Chile	10,640,000	5,488,000	6,720,000	6,944,000	9,072,000
Australia	6,720.000	,712,000	7,952,000	8,176,000	7,168,000
Arrivals-Europe‡	13,787,200	8,599,360	18,354,560	17,572,800	17,299,520

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

STATISTICS OF COPPER

Month	United States: U.S.Refin'y Production	United States: Deliveries, Domestic	United States: Deliveries, for Export	Visible Stocks: United States	Visible Stocks: Europe	Visible Stocks: Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
V, '13	141,319,416	81,108,321	68,285,978	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	77,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	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	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr., '13	1,622,450,829	767,261,760	869,062,784	.....	.....	.....
I, 1914	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,405,485
III	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV	151,500,531	63,427,633	82,345,216	64,609,319	46,435,200	111,044,519
V	.....	.....	.....	70,337,001	52,371,200	122.708.201

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

Mining Companies—United States

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt.
Acacia, g.	Colo.	1,438,989	$ 1	$ 122,004	Jan '11	$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	50,000	25	2,200,000	Jan. '14	2.00
Alaska Mexican, g.	Alas.	180,000	5	3,309,381	Feb. '14	0.20
Alaska Treadwell, g.	Alas.	200,000	25	13,985,000	Feb. '14	1.00
Alaska United, g.	Alas.	180,200	5	1,630,800	Feb. '14	0.30
Am. Zinc, Lead & Sm.	U. S.	165,360	25	1,071,420	Jan. '14	0.50
Anaconda, c.	Mont.	4,332,500	25	84,667,500	Jan. '14	0.75
Argonaut, g.	Calif.	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf.	Ariz.	1,426,120	1.20	1,890,621	Oct. '13	.....
Arizona Copper, com.	Ariz.	1,519,896	1.20	16,446,145	Feb. '14	0.30
Bagdad-Chase, g., pf.	Calif.	84,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,950,000	Dec. '13	2.00
Bingham N. H., c.	Utah.	228,690	5	339,957	Nov. '13	0.10
Bonanza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Calif.	200,000	1	821,000	Apr. '14	0.05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	15,056,000	Apr. '14	0.25
Butte-Alex Scott, c.	Mont.	74,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia. l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	596,353	10	19,775,546	Mar. '14	1.25
Calumet & Hecla, c.	Mich.	100,000	25	123,750,000	Mar. '14	5.00
Camp Bird, g.s.	Colo.	1,100,051	5	9,761,377	Jan. '14	0.24
Centen'l-Eur., l.s.g.c.	Utah.	100,000	5	3,900,000	Oct. '13	1.50
Center Creek, l.z.	Mo.	100,000	10	500,000	Apr. '14	0.05
Champion, c.	Mich.	100,000	25	8,400,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	Utah.	876,453	1	218,138	Feb. '14	0.10
Cliff, g.	Utah.	300,000	1	90,000	Jan. '13	0.10
Cliff, g.	Alas.	100,000	1	210,000	Oct. '13	0.01
Colo. Gold Dredging	Colo.	100,000	10	550,000	Jan. '14	2.50
Colorado, l.s.g.	Utah.	1,000,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah.	285,540	5	226,832	Oct. '07	0.20
Commercial Gold	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur, g.	Utah.	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l.	Mo.	22,000	25	308,000	Jan. '14	0.50
Copper Range Con., c.	Mich.	393,445	100	13,986,746	Oct. '13	0.75
Daly Judge, s.l.	Utah.	300,000	1	720,000	Jan. '14	0.15
Daly West, s.l.	Utah.	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g.	Colo.	3,000,000	0.10	45,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,782	100	3,550,969	Dec. '13	0.76
Eagle & Blue Bell, g.s.l.	Utah.	893,146	1	178,629	Nov. '13	0.05
Elkton Con., g.	Colo.	2,500,000	1	3,329,460	Feb. '14	0.02
El Paso, g.	Colo.	490,000	5	1,707,545	Feb. '14	0.10
Ernestine, g.s.	N.M.	300,000	5	165,000	Mar. '13	0.05
Fed. M. & S., com.	Idaho.	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho.	120,000	100	8,567,434	Mar. '14	1.50
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	228,000	Apr. '14	0.02
Frontier, z.	Wis.	1,250	100	146,202	Nov. '13	2.00
Gemini-Key'ne, l.g.s.	Utah.	5,000	100	2,230,000	Dec. '13	10.00
Gold Chain, g.	Utah.	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor.	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	100,000	Dec. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,775,000	Apr. '14	0.03
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	26,330,470	Oct. '13	0.40
Grand Central, g.	Utah.	500,000	1	1,570,750	Jan. '14	0.05
Granite, g.	Colo.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	971,000	Dec. '13	0.01
Heela, l.s.	Idaho.	1,000,000	0.25	3,030,000	Apr. '14	0.02
Hercules, l.s.	Idaho.	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,400	100	34,924,978	Apr. '14	0.65
Horn Silver, l.s.z.	Utah.	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	216,832	July '13	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah.	1,000,000	0.10	1,870,000	Jan. '14	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,850,000	Oct. '13	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	175,000	Aug. '12	0.01
Kendall, g.	Mont.	500,000	5	1,475,000	Nov. '12	0.02
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquette, z.l.	Wis.	20,000	1	187,500	Apr. '13	0.50
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g.	Colo.	130,551	5	1,452,338	Sept. '12	....
Little Bell, l.s.	Utah.	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah.	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g.	Colo.	1,309,252	1	1,116,938	Jan. '14	0.02
May Day, g.s.l.	Utah.	800,000	0.25	132,000	Feb. '13	0.03
Mexican, g.s.	Nev.	201,600	2.50	20,160	Aug. '11	0.10
Miami, c.	Ariz.	664,993	5	2,965,481	Feb. '14	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk, c.	Mich.	100,000	25	3,175,000	Aug. '13	2.00
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	530,000	Dec. '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,524	5	15,477,115	Mar. '14	0.37½
New Century, z.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,730,000	Dec. '13	0.10
North Butte, c.	Mont.	410,000	15	11,480,000	Jan. '14	0.50
North Star, g.	Cal.	250,000	10	4,162,040	Mar. '14	0.30
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,563,000	Jan. '14	1.25
Ophir, s.g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah.	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging	Cal.	700,000	5	1,468,086	Mar. '14	0.12
Osceola, c.	Mich.	96,150	25	11,987,375	Jan. '14	2.00
Parrot, c.	Mont.	229,850	10	7,324,608	Feb. '14	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	2,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Iad.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g	Nev.	2,790,000	1	715,400	Mar. '14	0.02
Portland, g.	Colo.	3,000,000	1	9,517,080	Jan. '14	0.02
Quilp.	Wash.	1,500,000	1	67,500	Feb. '13	0.01
Quincy, c.	Mich.	110,000	25	20,952,500	Dec. '13	1.25
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.z.	Mo.	4,900	100	188,396	Dec. '10	0.50

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt
Round Mountain, g.	Nev.	866,426	$ 1	$ 363,365	Aug. '13	$0.04
Seven Troughs Coal., g.	Nev.	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l.	Mo.	1,000,000	10	9,205,548	Mar. '14	0.10
Shannon, c.	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	1,750,000	Jan. '14	0.50
Silver King Coal., l.s.	Utah.	1,250,000	5	2,346,585	Dec. '13	0.15
Sioux Con., s.l.g.	Utah.	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	275,000	May '12	0.02½
Snowstorm, c.g.	Ida.	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,274,407	Nov. '13	0.25
Stratton's Ind., g.	Colo.	1,000,000	0.60	425,250	May '13	0.06
Success, z.	Ida.	1,500,000	1	925,000	May '13	0.02
Superior & Pitts., c.	Ariz.	1,499,793	10	6,509,106	Mar. '14	0.38
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	4,006,250	Mar. '14	0.75
Tomboy, g.s.	Colo.	300,000	4.85	3,332,245	Dec. '13	0.48
Tom Reed, g.	Ariz.	909,555	1	1,828,300	Apr. '14	0.06
Tonopah Belm't, s.g.	Nev.	1,500,000	1	5,618,000	Feb. '14	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	473,709	Jan. '14	0.05
Tonopah of Nev., s.g.	Nev.	1,000,000	1	11,350,000	Jan. '14	0.25
Tri-Mountain, c.	Mich.	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c.	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l.	Utah.	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	1,702,000	Jan. '14	7.50
United Verde, c.	Ariz.	300,000	10	33,922,000	Apr. '14	0.75
Utah, s.l.	Utah.	100,000	10	281,860	Dec. '10	0.02
Utah, c.	Utah.	2,797,182	10	21,161,369	Mar. '14	0.75
Utah Con., c.	Utah.	300,000	5	8,250,000	Mar. '14	1.00
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah.	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,812,000	Jan. '14	0.03
Wasp No. 2, g.	S. D.	500,000	1	436,965	Oct. '13	0.01
Wellington Mines, g.	Colo.	10,000,000	1	300,000	July '13	0.00½
Wolverine, c.	Mich.	60,000	25	7,740,000	Apr. '13	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Colo.	1,000,000	1	1,757,685	Mar. '14	0.02
Yankee Con., g.s.	Utah.	1,000,000	1	143,500	Jan. '13	0.01
Yellow Aster, g.	Cal.	100,000	10	1,201,789	Mar. '14	0.05
Yellow Pine, l.z.s.	Nev.	1,000,000	1	393,008	Mar. '14	0.02
Yukon Gold, g.	Alas.	3,500,000	5	2,735,500	Mar. '14	0.07½

Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	$100	$83,584,748	Feb. '14	$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	25,833,333	Mar. '14	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	47,333,333	Mar. '14	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	8,385,000	Jan. '14	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	12,732,000	Jan. '14	1.25
Cambria Steel.	Penn.	900,000	50	19,472,500	Feb. '14	0.62½
Greene Cananea.	U. S.	486,302	100	3,877,437	Mar. '14	0.50
Guggenheim Expl.	U. S.	831,732	25	18,937,165	Jan. '14	1.25
Inter'l Nickel, com.	U. S.	115,826	100	11,985,582	Mar. '14	2.50
Inter'l Nickel, pfd.	U. S.	89,126	100	7,823,735	Feb. '14	1.50
Inter'l Sm. & Ref.	U. S.	100,000	100	3,700,000	Mar. '14	2.00
National Lead, com.	N. Y.	206,554	100	7,951,139	Mar. '14	0.75
National Lead, pf.	N. Y.	243,676	100	28,517,373	Mar. '14	1.75
Old Dominion, c.	Ariz.	293,245	25	5,046,991	Jan. '14	1.25
Phelps, Dodge & Co.	U. S.	450,000	100	32,171,527	Mar. '14	4.00
U. S. Steel Corp., com.	U. S.	5,083,025	100	206,915,963	Mar. '14	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	370,574,026	Feb. '14	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,320	50	6,098,852	Apr. '14	0.75
U. S. S., R. & M., pf.	U.S.-Mex.	351,105	50	13,816,321	Apr. '14	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$ 5	$ 212,500	Oct. '12	$0.25
Amparo, g.s.	Mex.	2,000,000	1	1,340,884	Feb. '14	0.05
B. C. Copper	B. C.	591,709	5	615,198	Jan. '13	0.15
Beaver Con., s.	Ont.	1,996,490	1	409,879	Dec. '13	0.03
Buffalo, s.	Ont.	1,000,000	1	2,657,000	Feb. '14	0.03
Canadian Goldfields, g.	B. C.	600,000	0.10	187,099	Jan. '14	0.001½
Chontalpan, g.s.l.z.	Mex.	7,000	25	52,500	Mar. '14	0.75
Cobalt Townsite, s.	Ont.	1,000,000	1	940,000	Feb. '14	0.48
Coniagas, s.	Ont.	800,000	5	6,040,000	Nov. '13	0.70
Con. M. & S. Co. of Can	B. C.	58,052	100	1,364,325	Feb. '14	2.00
Crown Reserve, s.	Ont.	1,768,814	1	5,554,076	Apr. '14	0.02
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dos Estrellas, g.s.	Mex.	300,000	0.50	9,885,000	Sept. '13	1.25
El Oro, g.s.	Mex.	1,147,500	4.85	8,947,261	July '13	0.24
Esperanza, s.g.	Mex.	455,000	4.85	11,996,303	Jan. '14	0.24
Granby, s.l.c.	B.C.	148,496	100	5,310,636	Mar. '14	1.50
Greene Con., c.	Mex.	1,000,000	10	8,544,400	Nov. '13	0.50
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold.	B. C.	120,000	10	1,293,520	Mar. '14	1.50
Hollinger, g.	Ont.	600,000	5	1,800,000	Apr. '14	0.15
Kerr Lake s.	Ont.	600,000	5	5,070,000	Mar. '14	0.25
La Rose Con., s.	Ont.	1,498,407	5	5,312,185	Jan. '14	0.45
Le Roi No. 2, g.	B. C.	120,000	24.30	1,472,580	Jan. '13	0.36
Lucky Tiger Com., g.	Mex.	715,337	10	2,240,460	Apr. '14	0.07
McK.-Dar. Sav. s.	Ont.	2,247,692	1	3,990,887	Jan. '14	0.06
Mines Co. of Am. (new)	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros., g.	C. A.	150,000	10	3,290,000	Jan. '14	0.20
Nipissing, s.	Ont.	1,200,000	5	11,340,000	Jan. '14	0.37½
Peñoles, s.l.g.	Mex.	80,000	25	6,361,688	June '13	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	660,000	Apr. '12	3.00
Right of Way Mns†s.	Ont.	1,685,500	1	202,260	Dec. '11	0.02
Rio Plata, s.	Mex.	373,437	5	345,744	Feb. '13	0.05
San Rafael, g.s.	Mex.	2,400	25	1,441,180	Oct. '13	0.50
San Toy, g.s.	Mex.	5,750,000	1	530,000	July '13	0.01
Sorpresa, g.s.	Mex.	19,200	20	3,979,240	Jan. '11	34.00
Stand'd Silver-Lead.	B. C.	2,000,000	1	1,275,000	Apr. '14	0.05
Timiskaming, s.	Ont.	2,500,000	1	1,534,155	Apr. '13	0.06
Tem. & Hud. Bay, s.	Ont.	7,761	1	1,893,684	Mar. '14	3.00
Trethewey, s.	Ont.	1,000,000	1	1,001,998	Dec. '13	0.10
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	637,465	Oct. '13	0.05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644.

Assessments

Company	Delinq.	Sale	Amt.
Belcher, Nev.	May 4	May 26	$0.10
Booth, Nev.	May 11	June 15	0.02
Bullion Beck & Champion, Utah	Apr. 24	May 25	0.20
Cedar Creek, Ida.	Apr. 27	May 26	0 01
Challenge, Nev.	May 12	June 2	0.05
Chollar, Nev.	Apr. 28	May 21	0.03
Cons. Imperial, Nev.	Apr. 28	May 20	0.01
Davis-Daly, Mont.	.....	June 1	0.25
Ely Gibraltar, Nev.	May 18	June 15	0.0025
Emerald, Utah.	May 15	June 6	0.13
Grutli, Utah.	May 16	June 3	0.002
Hale & Norcross, Nev.	May 19	June 9	0.03
Idaho-Nevada, Ida.	May 7	June 1	0.001
Keweenaw, Mich.	.....	.....	1.00
Nabob, Ida.	May 13	June 8	0.005
Overman, Nev.	May 8	May 28	0.05
Rescue Eula, Nev.	Apr. 21	May 27	0.01
Royal, (formerly Penn.), Ida.	Apr. 23	May 18	0.0015
Samson, Ida. postponed	.....	May 28	0.002
Sierra Nevada, Nev.	May 25	June 15	0.10
Slavonian, Ida.	Apr. 30	May 30	0.002
Snowshoe, Ida.	Apr. 28	May 28	0.005
Snowy Peak, Ida.	Apr. 29	June 6	0.01
Sunset, Ida.	May 12	June 6	0.002
Syndicate, Utah.	May 22	June 13	0.0005
Tar Baby, Utah.	May 1	June 1	0.005
Tintic Standard, Utah.	May 11	June 1	0.005
Victoria, Mich.	Apr. 15	May 24	1.00
Wallace, Ida.	May 15	June 5	0.0025
Wisconsin, Ida. post'd.	.....	June 3	0.003

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26 788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	.....	28.038	27.825	.....
June	61.290	58.990	.....	28.215	27.199	.....
July	60.654	58.721	.....	27.919	27.074	.....
August	61.606	59.293	.....	28.375	27.335	.....
September	63.078	60.640	.....	29.088	27.986	.....
October	63 471	60.793	.....	29.299	28.083	.....
November	62.792	58.995	.....	29.012	27.263	.....
December	63.365	57.760	.....	29.320	26.720	.....
Year	60.835	59.791	.....	28.042	27.576	.....

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			
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	16.767	14.772	71.741	64.304
February	14.971	14.491	15.253	14.929	65.519	65.259
March	14.713	14.131	14.930	14.625	65.329	64.276
April	15.291	14.211	15.565	14.563	68.111	64.775
May	15.436	.....	15.738	.....	68.807	.....
June	14.672	.....	14.871	.....	67.140	.....
July	14.190	.....	14.563	.....	64.166	.....
August	15.400	.....	15.904	.....	69.200	.....
September	16.328	.....	16.799	.....	73.125	.....
October	16.337	.....	16.913	.....	73.383	.....
November	15.182	.....	16.022	.....	68.275	.....
December	14.224	.....	14.904	.....	65.223	.....
Year	15.269	.....	15.686	.....	68.335	.....

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

TIN

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

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

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	16.550	19 606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.687	17.597	18.225
May	4.342	.....	4.226	.....	18.923	.....
June	4.325	.....	4.190	.....	20.226	.....
July	4.353	.....	4.223	.....	20.038	.....
August	4.624	.....	4.550	.....	20.406	.....
September	4.698	.....	4.579	.....	20.648	.....
October	4.402	.....	4.253	.....	20.302	.....
November	4.293	.....	4.146	.....	19.334	.....
December	4.047	.....	3.929	.....	17.798	.....
Year	4.370	.....	4.238	.....	18.743	.....

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

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.583
February	6.239	5.377	6.089	5.227	25.338	21.413
March	6.078	5.250	5.926	5 100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	.....	5.256	.....	24.583	.....
June	5.124	.....	4.974	.....	22.143	.....
July	5.278	.....	5.128	.....	20.592	.....
August	5.658	.....	5.508	.....	20.706	.....
September	5.694	.....	5.444	.....	21.148	.....
October	5.340	.....	5.188	.....	20.614	.....
November	5.229	.....	5.083	.....	20.581	.....
December	5.156	.....	5.004	.....	21.214	.....
Year	5.648	.....	5.504	.....	22.746	.....

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

PIG IRON IN PITTSBURGH

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

STOCK QUOTATIONS

COLO. SPRINGS May 12

Name of Comp.	Bid.
Acacia	‡.02½
Cripple Cr'k Con.	‡.007½
C. K. & N.	‡.07½
Doctor Jack Pot.	.05½
Elkton Con.	.44
El Paso	1.75
Findlay	‡.01½
Gold Dollar	.03½
Gold Sovereign	‡.02½
Golden Cycle	‡1.50
Isabella	.11½
Jack Pot	.06
Jennie Sample	‡.05
Jerry Johnson	‡.03½
Lexington	‡.003
Old Gold	‡.01
Mary McKinney	.47
Pharmacist	‡.01
Portland	1.06
Vindicator	.93

SALT LAKE May 12

Name of Comp.	Bid.
Beck Tunnel	.04
Black Jack	.06
Cedar Talisman	‡.00½
Colorado Mining	.10½
Crown Point	‡.02½
Daly-Judge	5.00
Gold Chain	.14
Grand Central	.61
Iron Blossom	1.32½
Little Bell	.10
Lower Mammoth	.01½
Mason Valley	1.00
May Day	.06½
Nevada Hills	.35
Prince Con.	.20
Silver King Coal'n.	3.17½
Silver King Cons.	2.00
Sioux Con.	.03
Uncle Sam	.04½
Yankee	.00½

TORONTO May 12

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.02	Foley O'Brien	.18
Conlagas	7.30	Hollinger	15.45
Peterson Lake	.43½	Imperial	.01½
Right of Way	.04	Jupiter	.10½
T. & Hudson Bay	75.00	Pearl Lake	.06½
Timiskaming	.17½	Porcu. Gold	.09½
Wettlaufer-Lor.	.05	Preston E. D.	.01½
Big Dome	10.05	Rea	.10
Crown Chartered	‡.00½	Swastika	.01½
Dome Exten.	.09	West Dome	.10

SAN FRANCISCO May 12

Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.00½	Belmont	‡7.25
Belcher	.34	Jim Butler	1.00
Best & Belcher	.04	MacNamara	.03
Caledonia	.52	Midway	.32
Challenge Con.	.02	Mont.-Tonopah	.80
Chollar	.03	North Star	.29
Confidence	.24	West End Con.	.88
Con. Virginia	.07	Atlanta	.21
Crown Point (Nev.)	.29	Booth	.06
Gould & Curry	.01	C.O.D. Con.	.04
Hale & Norcross	.02	Comb. Frac.	.07
Mexican	.85	Jumbo Extension	.24
Occidental	.68	Pitts.-Silver Peak	.33
Ophir	.11	Round Mountain	.28
Overman	.15	Sandstorm Kendall	.19½
Potosi	.01	Silver Pick	.05
Savage	.08	Argonaut	‡2.50
Sierra Nevada	.05	Bunker Hill	‡1.90
Union Con.	.07	Central Eureka	.50
Yellow Jacket	.19	So. Eureka	1.25

N. Y. EXCH. May 12

Name of Comp.	Clg.
Amalgamated	72½
Am.Sm.&Ref.,com	61½
Am. Sm. & Ref., pf.	101
Am. Sm. Sec., pf. B.	80
Anaconda	31½
Batopilas Min.	⅜
Bethlehem Steel, pf.	84
Chino	41½
Colo. Fuel & Iron	27
Federal M. & S., pf.	32
Great Nor., ore., ctf	31
Guggen. Exp.	53½
Homestake	114
Inspiration Con.	16½
Mex. Petroleum	55
Miami Copper	21½
Nat'l Lead, com.	44
National Lead, pf.	108
Nev. Consol.	14
Phelps Dodge	179
Quicksilver, pf.	2½
Ray Con.	21½
Republic I&S, com.	22½
Republic I&S, pf.	85
SlossSheffi'd, com.	27
Sloss Sheffield, pf.	87
Tennessee Copper	34½
Utah Copper	55½
U. S. Steel, con.	59½
U. S. Steel, pf.	108¾

N. Y. CURB May 12

Name of Comp.	Clg.
Barnes King	‡1½
Beaver Con.	.25
Big Four	.06½
Boston Montana	8¾
Braden Copper	8
B. C. Copper	1¼
Buffalo Mines	1½
Can. Cop. Corpn.	2½
Can. G. & S.	.09
Caribou	.67
Chambers Ferland	.15
Con. Ariz. Sm.	.50
Coppermines Cons.	1¼
Davis-Daly	.50
Diam'field-Daisy	.05½
Ely Con.	.03
Florence	.55
Gold Hill Con.	⅛
Goldfield Con.	1 7/16
Greene Cananea	32½
Greenwater	.07
Internat. S. & R.	1.05
Kerr Lake	4½
La Rose	1 7/16
McKinley-Dar-Sa.	.62
Mines of Am.	3
New Utah Bingham	‡.68
Nipissing Mines	6½
Ohio Copper	5/16
Oro	.12
Puebla S. & R.	2½
Stand'd Oil of N.J.	411
Stand'd Silver Lead	1½
Stewart	1 3/16
Stewart Min.T't C.	1 1/16
Tonopah	6½
Tonopah Ex.	2.56½
Tonopah Merger	.58
Tularosa	5/16
West End Ex.	.04
Yukon Gold	2½

LONDON May 1

Name of Comp.	Clg.
Camp Bird	£0 11s 3d
El Oro	0 12 3
Esperanza	0 15 7½
Mexico Mines	4 7 6
Oroville	0 11 0
Santa Gert'dis.	0 13 9
Stratton's	0 0 6
Tomboy	1 1 3

BOSTON EXCH May 12

Name of Comp.	Clg.
Adventure	1
Ahmeek	265
Alaska Gold M.	27
Algomah	.95
Allouez	40
Am. Zinc	16½
Ariz. Com., ctfs.	4 1/16
Bonanza	.51
Butte & Balak.	3
Calumet & Ariz.	64¾
Calumet & Hecla	420
Centennial	15½
Cliff	1
Copper Range	35½
Daly West	2
East Butte	10½
Franklin	4½
Granby	81¾
Hancock	15
Hedley Gold.	‡15
Helvetia	.30
Indiana	3¾
Island Cr'k, com.	48½
Island Cr'k, pfd.	85½
Isle Royale	19¾
Keweenaw	2 1/16
Lake	6¼
La Salle	4¾
Mass	4½
Michigan	.75
Mohawk	43¾
New Arcadian	6
New Idria Quick.	3½
North Butte	25¼
North Lake	1¼
Ojibway	.90
Old Dominion	46½
Osceola	74
Quincy	57½
Shannon	5½
Shattuck-Ariz.	23½
Superior	28½
Superior & Bost.	1¾
Tamarack	34½
Trinity	3¼
Tuolumne	.50
U. S. Smelting	33
U. S. Smelt'g, pf.	44⅞
Utah Apex	1¾
Utah Con.	10½
Victoria	2½
Winona	3
Wolverine	41½
Wyandot	.60

BOSTON CURB May 12

Name of Comp.	Bid
Bingham Mines	.04¾
Boston & Corbin	.26
Boston Ely	.22
Butte & Lon'n Dev.	.40
Cactus	‡.01
Calaveras	1 1/16
Chief Cons.	.85
Contact Copper	‡.05
Corbin	.90
Cortez	.25
Crown Reserve	1¼
Eagle & Blue Bell	1
First Nat. Cop.	1¾
Houghton Copper	2½
Majestic	.20
Mexican Metals	.15
Moneta Porc.	‡.02
Nevada-Douglas	1 1/16
New Baltic	1¼
Oneco	.96
Raven Copper	.13
Smokey Dev.	.25
So. Lake	3¼
S. W. Miami	1
Tonopah Victor	.30
Trethewey	23
United Verde Ext.	.50

‡Last Quotation.