

The Engineering and Mining Journal

VOLUME 98

AUGUST 22, 1914

NUMBER 8

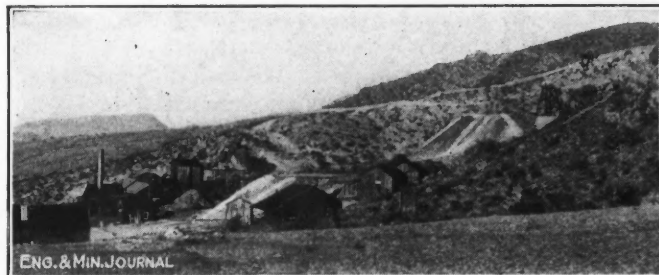
The Organ Mountain District

By NORVAL J. WELSH*

SYNOPSIS—General description of this lead-copper-precious-metal district in South-Central New Mexico. Chief feature of geology is the lime-monzonite contact. Contact-metamorphic deposits, replacement veins in limestone and fissure veins in intrusives are found. The district is an old one, with a probable total production to date of \$3,750,000. Present inactivity does not indicate exhaustion. Principal mines are the Torpedo and the Stephenson-Bennett. There are other properties of promise.

From a point beyond the Rio Grande, in old Mexico, and the extreme west corner of El Paso County, Tex., there extends north through Dona Ana and Sierra Cou-

and other sedimentary rocks, and are generally mineralized. Development of the various known mineral districts, with one exception, has been in great part retarded by the scarcity of water and the remoteness from transportation facilities. Near El Paso, in what are known as the Franklin Mountains, tin occurs in the granite, but attempts to develop the mineral in commercial amount have met with failure. To the north and west of the tin claims, deposits of hematite and magnetite occur. Through the more northerly portion of the range, deposits of copper and lead ores are known, but these have been but little prospected or developed. In that section of the range just north and south of the San Augustine Pass, mines of copper, lead, silver and gold



SURFACE PLANT OF THE STEPHENSON-BENNETT

ties, N. M., a series of mountain peaks and ranges which are links in the long chain of north-south ranges terminating in the Sandia Range of Bernalillo County, N. M. From the river north for about 20 miles, to a broad gap in the chain, extend the Franklin Mountains; thence, another 25 miles or so, to the San Augustine Pass, is covered by the Organ Mountains, known by the Mexicans in early days as *Sierra de los Organos* on account of the conspicuous granite spires along their western front. From the Pass, for 80 miles farther north, lies the San Andres Range. These three ranges form a link in the chain over 130 miles in length and from four to 15 miles wide, rising abruptly from a broad, semi-arid desert plain which slopes south and west to the Rio Grande, and is still mapped in part as the dread *Jornada del Muerto*, approximately translated "Journey of Death." This expanse of plain has an average elevation above the sea of approximately 4500 ft., while Organ Peak has an elevation of 9108 ft.

The three ranges, here considered as one, are composed of pre-Cambrian granites and Paleozoic limestones, shales



VIEW NORTH FROM TORPEDO MINE IN FOREGROUND

have been developed, some of them to the point of success, and these are embraced in what is known as the Organ Mountain mining district, herein described.

FEATURES OF THE DISTRICT

The Organ Mountain district is centered in and around the small settlement and post office of Organ, situated in the east-central part of Dona Ana County, about 14 miles by stage road northeast of Las Cruces, the county seat, and 50 miles, more or less, north of El Paso. The region surrounding is semiarid in character and water is scarce. The climate is extremely healthful and permits of all-year work in the open.

The principal mines of the district are located in the foothills of the steep western slope of the range, at an average elevation of 5000 ft. above sea level and about 1200 ft. above the line of the Atehison, Topeka & Santa Fé, which traverses the valley of the Rio Grande, to the west of the range.

GENERAL GEOLOGY

The predominating rocks of the Organ Mountains are limestones, minor strata of shales and quartzite, and an

*Mining engineer, Organ, N. M.

intrusive, coarsely granitic rock, porphyritic in structure, in the form of a stock. This granite rock has been referred to by Lindgren¹ as "evidently a quartz-monzonite." It forms the great mass of the mountains, and its intrusive origin "is proved by the structural relations at the contacts and by the contact metamorphism of the limestone." The sedimentary rocks are best exposed as a narrow belt along the western base of the range, north and south of Organ settlement, and are prominent as heavy-bedded limestones, dipping west-northwest 40° to 45° from the main contact. Dikes of aplite, syenite porphyry and dark diorite cut both the sedimentary and the intrusive rocks at fairly sharp angles.

The main contact strikes more or less regularly in a north-south direction along the western base of the range, from south of the Modoc mine, which lies six miles south of Organ, to beyond the Merrimac mine, three miles north of Organ, where it turns and swings to the east. It is well exposed on the Modoc, Bennett and Excelsior claims and is particularly well shown on the Memphis claim, where garnet, specularite and other minerals, characteristic of contact metamorphism, are shown, together with oxidized copper and zinc minerals and some residuary calcite. The zone of contact varies in width up to two hundred and more feet. Near the Torpedo mine, the limestones are silicified at the contact, the zone of silicification extending south to the Stephenson-Bennett mine; again, in Torpedo ground, near the contact, which is here poorly exposed, the limestone is almost wholly converted to hornfels.

MINERAL DEPOSITS

The mineral deposits of the district are of several distinct types. Lindgren considers them all as closely related and as having been formed in one epoch of mineralization. Speaking in general terms, copper seems to have been deposited at the contacts, lead in deposits in the limestone, away from the contact, and gold and silver in fissure veins.

The types of deposits are:

(1) *Contact-metamorphic deposits.* These carry chiefly copper and occur for a long distance along the main contact of limestone and quartz monzonite, from the Torpedo mine northward. They form irregular masses roughly following the stratification. The zone of oxidation is irregular in depth and is known in one instance to extend to at least 300 ft.; elsewhere, sulphides may be found at the surface. This type is exemplified by the Torpedo mine.

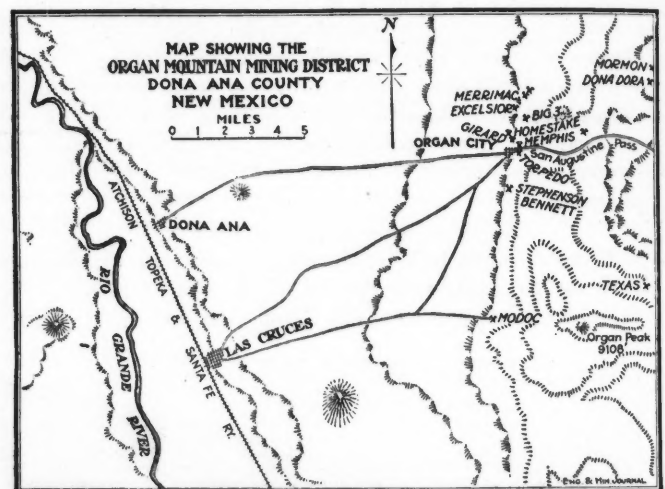
(2) *Replacement veins in limestone.* Deposits of this type follow the stratification planes of the limestone, the latter being but little altered. They carry chiefly lead and are characteristic of the Stephenson-Bennett and Girard properties.

(3) *Fissure veins in intrusive rocks.* These are usually narrow, quartz-filled veins striking east and west. Most of them contain silver, associated with tetrahedrite or galena; others contain gold associated with pyrite. Deposits of this type are found generally on the east side of the range, as the Mormon, Texas and other mines, and of the three types described have so far proved of the least importance in the district, although some of them are considered promising.

¹U. S. Geol. Surv., Prof. Paper No. 68.

HISTORY OF THE DISTRICT

The Organ district has long been known as a center of mining operations. It was first described by Antisell, who traveled through this section of the country in 1854. He makes mention² of the Stephenson mine then operating, the ores of which were smelted in an adobe furnace at Las Cruces, and of the still earlier operation of the Barilla mine, probably that now known as the Modoc, the ores of which were smelted in a furnace at the mine. Subsequently, during the Civil War period and later, the Stephenson property was operated by army officers stationed at old Fort Selden, above Las Cruces, on the highway through to the California coast. Later years witnessed the opening of the Excelsior and Memphis copper mines, the ores of which were in great part smelted in a water-jacketed furnace erected on the latter property in the early '80's. The Torpedo mine, the most spectacular and prominent of the copper-producing mines,



MAP OF THE DISTRICT

was not developed until the late '90's. Located originally as a lead prospect, this property added in no small measure to the total output of the district.

Reliable estimates of total production are difficult to obtain. J. Bond³ estimates a total yield, prior to 1900, of \$2,500,000. No authentic records of the production subsequent to 1900 are obtainable, but renewed activity meanwhile, including development and operation of the Torpedo mine, brings the total estimated yield at this time to more than \$3,750,000 in copper, lead and silver, of which \$1,850,000 came from copper ores, \$1,500,000 from lead ores and \$400,000 from silver ores.

PRESENT CONDITIONS

Those best qualified to speak, account for the state of inactivity that has prevailed in the district for several years past by the bad organization of the larger operating companies and by the incompetent general managements and resultant faulty operations of the several larger mines in the past. Undoubtedly another reason, and perhaps of greater prominence at this day, is the fact that at least three of the larger properties are owned or controlled by persons of large means, who, while making no efforts themselves to develop and operate their holdings, yet refuse to entertain terms covering them that

²Pacific R.R. Surveys, Vol. 7, 1857.

³"Mining World," Mar. 17, 1906.

would make the properties attractive for development to responsible mining men. This attitude stands in the way of progress in the district and makes it a difficult matter for the smaller, but perhaps more enlightened, claim owner to interest the capital that he frequently needs for legitimate work. With the larger mines inactive, for reasons here intimated, no incentive is offered strangers to look into the camp's possibilities.

Another factor that has influenced opinion regarding the camp, to its detriment, is the prevalent idea that the mines with depth encounter such quantities of water as to make their operation unprofitable. This is not the case. Undoubtedly water has caused trouble in the past, particularly in those mines located along the main limestone and quartz monzonite contact, but it did not prove insurmountable. A typical case is that of the Torpedo and the Stephenson-Bennett mines. In the early development and operation of the former, which is a mine of the contact-metamorphic type, large quantities of water, up to 600 gal. per min., were encountered, a condition similar being met with in the Bennett mine. The Stephenson-Bennett company subsequently drove a long drainage adit, tapping the workings at about 400 ft. in depth. Thereafter, continuous draining and pumping of water in both mines so reduced the head and flow that, at 300 ft. of depth in the Torpedo shaft, an ordinary 9-B Cameron sinking pump, having a rated capacity of 200 gal. per min. at regular speed, could, when occasion required, be made to discharge the entire flow of water making in the mine, reliably estimated today at 250 gal. per min.

The district is best known by the results heretofore obtained in development and operation of the Torpedo and the Stephenson-Bennett properties, which, in point of development, are, respectively, the youngest and the oldest mines in the district. They have made by far the greatest production of the district, and each is typical of its respective type.

THE TORPEDO MINE

The Torpedo property is located practically on the main contact, immediately at and east of Organ settlement. Development consists of three shafts, 200 to 307 ft. in depth, and at about 3000 ft. of drifts and crosscuts. The equipment embraces a 210-hp. steam-power plant, a 60-hp. steam hoist at No. 3 shaft, a 15-hp. gasoline hoist at No. 1 shaft, a small electric generator plant, a pumping plant, etc.

Originally located, in 1896, as a lead-silver prospect, the owners early became disheartened at the appearance of "green ore," the value of which they failed to recognize, and later disposed of their property to Chicago interests at a small fraction of its real value. Efforts at systematic development were first exerted about 1900 and continued intermittently until the financial stringency of 1907 caused all work to cease. During the intervening time, for a total operating period of more than three years, the mine was explored and developed to 300 ft. in depth and produced copper ore variously estimated in value up to \$1,000,000.

The mine is notable for the large masses of copper silicate ore, developed and stoped to 235 ft. below the surface, overlying chalcocite pseudomorphic after galena. The deposits of silicate ore were lenticular in form, of varying lengths and up to 25 ft. in thickness, consisting of crysocola, averaging 10% copper and some silver, in

a soft kaolinized lime-iron-manganese gangue partly replaced by lower-grade ore. Native mass copper occurs in considerable amount in the kaolinized material. Oxidation has been noted to a depth of 300 ft.; at this level chalcocite was first encountered in the mine, more than 200 ft. below the level at which water in quantity was met with. It is reliably reported that the mine was closed down at the most promising period of its career, a condition seemingly induced by friction among the owners and by inefficient general management. It is now undergoing examination.

THE STEPHENSON-BENNETT MINE

The Stephenson-Bennett property is located a mile and a half south of Organ settlement. Development consists of a 350-ft. double compartment shaft, two adit levels with lengths of 2000 ft. and 700 ft., respectively, and a number of intermediate levels and crosscuts. The equipment embraces a steam-power plant, a 60-hp. steam hoist, a 100-ton wet concentrating plant of the Joplin type, a compressor plant, etc.

The mine is thought by some to be the oldest developed property in the district, dating from the early '40's of the last century. It has since been operated intermittently and developed to a depth of 400 ft. The mine is credited with a production valued at about \$1,000,000.

The principal product of the property has been lead, carrying some silver and occurring as both carbonate and galena. Isolated bodies of both copper and zinc are occasionally developed in small amount. Masses of smithsonite, the carbonate of zinc, and of wulfenite, the molybdate of lead, remarkable for the form and color of the individual crystals, are frequently encountered. The ore deposits occur in replacement veins in the limestone, away from the contact. Of these veins, which are four in number, the Bennett is the principal one and has been stoped to more than 400 ft. in depth for a distance laterally of from 500 to 600 ft. The old stopes are open and in places show a width of as much as 30 ft. The mine is now being prospected and operated in a small way by lessees. In common with its neighbor, the Torpedo, it warrants new development and has suffered in the past from friction among the owners and from inefficient general management.

OTHER PROPERTIES

Of less prominence in the district as producers, but with good records, are the Memphis and Excelsior copper properties, located north of Organ settlement, and the Modoc lead mine, to the south. The Excelsior group is undergoing new development, with encouraging results. Other properties are the Girard, a claim of more or less promise as a prospective producer of concentrating lead ore, but now idle; the Homestake group of silver-lead claims, from which an occasional shipment is made; the Merrimac and Little Buck copper and silver properties, north of the Excelsior; and the Big 3 group. The last is a copper property of promise, located to include the main contact and a strong east-west fissure; development of the fissure has resulted in the production of considerable high-grade copper and silver ore. The group is being developed by the owners.

On the east side of the range are the Mormon, Dona Dora and Texas properties, located to cover east-west, quartz-filled fissures carrying galena, silver and gold.

The Mormon mine has been the most developed and is equipped with hoist, small stamp mill and concentrator. The Texas mine is located high up in the range. A small amount of development is said to expose a wide vein, with a pay streak of pyrite-bearing quartz running up to \$8 per ton in gold. This section of the district is at present wholly inactive.

The several mines and prospects herein described and referred to, located over a wide area, indicate in a general way the thorough mineralization of the Organ Mountain district. Since it is, furthermore, situated close to smelting and supply points and is easy of access it warrants intelligent investigation.

Colorado Geological Survey

The Colorado Geological Survey has two parties in the field this summer constructing a general topographic and geologic map of the carnotite districts in the western portion of the state. This will not be a contour map; it is an endeavor of the engineers and geologists to produce a reconnaissance map such as will prove of practical value to prospectors, operators and others who may have interests in the country. It is hoped to have this map ready for publication before the end of this year, and when printed it will be for general, gratuitous distribution. A brief gazetteer accompanying the map will locate places, mines, etc., by marginal letters and numerals. Contemporaneously with the map, there will be published a short bulletin giving important facts concerning the region, such as the geology and ore occurrences.

One field party is in charge of Clare Coffin, who has been with the Survey five years. The other party is headed by P. G. Worcester, assistant professor of geology at the University of Colorado. During a temporary leave of absence, Prof. Worcester's duties are assumed by O. E. Smith, formerly assistant professor of geology at the Colorado School of Mines. The stratigraphic work is being directed by Junius Henderson. Dr. R. D. George, state geologist and director of the Survey, is also doing field work in studying ore deposits and working up materials for his report. He plans to look up all the isolated carnotite deposits that are outside of the area covered by the map.

Dr. O. C. Lester, professor of physics in the university, and his assistant, J. H. V. Finney, are visiting all the mineral springs in the state, investigating their radioactivity. Two years ago, they visited the springs and observations were recorded relative to temperature, rate of flow, gases emitted and geological surroundings. Complete analyses of about 200 spring waters were made at the time. All of these data, together with illustrative materials and a general statement as to the therapeutic properties of the waters, will be embodied in a bulletin that Dr. George hopes to issue before long.

The Survey has ready for immediate publication a bibliography of Colorado geology and mining, prepared on the same general plan as the corresponding bulletin issued by the United States Geological Survey. It will contain references to every important bit of literature bearing upon the state's mineral resources. Another bulletin, prepared two years ago by G. M. Butler, then assistant professor of geology at the School of Mines, will be in press very soon. Its title will be "The Clays of Colorado."

Ray Consolidated Copper Co.

Production of copper by the Ray Consolidated Copper Co., for the second quarter of 1914, was 18,748,343 lb. divided into 6,226,373 lb. in April, 6,396,643 lb. in May and 6,125,327 lb. in June. The average monthly production for 6 months of 1914 was 5,997,115 lb., 314,212 lb. additional of copper was produced from ore shipped to smelters.

Total ore milled for the quarter was 764,040 dry tons, averaging 1.786% copper, or a daily tonnage of 8396. Average mill recovery was 68.69% of the copper content.

Milling costs for the quarter were 47.24c. per ton. Mining and coarse crushing cost 65.078c. per ton, of which 3.337 was for coarse crushing. Underground development amounted to 31,515 ft., making the total development to date 438,319 feet.

Average cost of net copper produced from milling ores, after allowing for smelter losses and applying dividends of the Ray & Gila Valley R.R., but no other miscellaneous income, was 8.628c. per lb. Combined cost of copper from both milling and shipping ore was 8.623c. per lb. Those costs include all operating and general charges, as well as 12½c. per ton of ore milled which is applied to the retirement of mine-development costs. Crediting all miscellaneous income, the average cost of net copper for the quarter was 8.541c. per lb. The fifth quarterly dividend, amounting to \$545,364, was paid on June 30. Net surplus over bond interest and dividend requirements was \$414,130.

Earnings for the quarter are based on a price of 13.9198c. per lb. for copper. The total amount of it on hand and in transit, sold and unsold, at the end of the quarter, was 25,819,674 pounds.

Utah Copper Co.

Report of the Utah Copper Co. for the second quarter of 1914 shows a gross production of copper in concentrates of 40,017,562 lb., divided into 13,132,463 lb. in April, 13,616,993 lb. in May and 13,268,106 lb. in June, a monthly average of 13,339,187 lb. Both plants treated a total of 2,006,157 tons of ore, 58% at the Magna plant and 42% at the Arthur plant. Average grade of the ore was 1.4573% copper, and average extraction, 68.44%. Operations were said to be the most satisfactory in the history of the company.

Average cost per pound of net copper was 7.539c. after allowing for smelter deductions and without crediting miscellaneous income. If miscellaneous earnings in Utah, including those from the Bingham & Garfield Ry., were credited, the cost of copper would be reduced to 6.773c. per pound.

Total net profit for the quarter is \$2,819,104; dividends paid, \$1,201,710; net surplus, \$1,617,394. Earnings are computed on a basis of 13.916c. per lb. for copper. Total amount on hand and in transit, sold and unsold, was 46,704,098 lb. The unsold copper is inventoried at 13.511c. per lb. Earnings of the Bingham & Garfield Ry., amounting to about \$100,000 per month, will accrue almost wholly toward increasing the earnings of Utah Copper Co., which owns almost all the stock and bonds. The railroad carried a daily average of 16,596 tons of ore and 3498 tons of other freight.

Amalgamation at Liberty Bell Mill

By C. LEE PECK*

SYNOPSIS—Amalgamation in cyanide solution, often deemed impossible, has been successfully done for eight years at the Liberty Bell mill. Plates are prepared by coating with quicksilver and amalgam, and are maintained wet. Frequent cleaning and dressing are necessary conditions being different from those obtaining in water amalgamation. 50% of the gold and 11% of the silver are saved on the plates.

The evolution of cyanide practice seems to foreshadow the abandonment of the combination of amalgamation with cyanidation. It has formerly been considered good metallurgy to remove by amalgamation particles of gold and silver too coarse to be dissolved in the cyanide treatment to follow. Fine grinding and agitation, and cyanide treatment of concentrates, have narrowed this field. The combination still remains practicable, however, where shipping concentrates are recovered and it is desirable to keep the grade of such concentrate as low as possible, to save shipping and smelting charges and the percentage deducted by the smelters from the value of the gold-silver content. Other considerations may also render advisable the retention of amalgamation with cyanidation. In such cases, the advantages of crushing in solution render important the feasibility of amalgamation in solution.

For eight years the Liberty Bell Gold Mining Co., of Telluride, Colo., has successfully amalgamated in cyanide solution. The flow sheet, so far as it concerns amalgamation, consists of stamp crushing through 12-mesh screens in NaCN solution, strength, 2 lb. per ton, in terms of KCN., with a protective alkalinity of about 2 lb. lime. The ratio of solution to ore at battery discharge is four or five to one. Thence the pulp runs over 16 amalgamating tables having an exposed surface of amalgamated copper of 32 sq.ft. each, and through traps to four Richards 3-spigot, hindered-settling vortex classifiers. The spigot products are concentrated on Wilfley tables. The Wilfley tailings are reground in tube mills, 90% of the discharge passing 80 mesh. The reground ore is diluted with cyanide solution and classifier overflow to six or eight to one and passed over eight plate tables of the same dimensions as the battery tables.

CARE OF PLATES

The plates are of cold-rolled, annealed, electrolytic copper, weighing about 7 lb. per sq.ft., and are prepared for amalgamation as follows: They are bedded on two or more thicknesses of tarred felt, beaten to a plane surface, secured with brass screws, scoured clean with lumps of cyanide, sprinkled with mercury and rubbed with brooms until mirror bright. About ½ oz. per sq.ft. of gold-silver amalgam is then brushed evenly over the surface. The new plate so treated does full duty from the start. If amalgam is not used in the first dressing, the plate becomes dark and hard, requiring several days' careful attention to get into shape. The battery plates are all cleaned with whisk brooms every 8-hr. shift, and the upper half at the fourth hour between, making six clean-ups per day. The description of methods of dressing

which follows is quoted from "suggestions to amalgamators" posted in the pan room.

The object sought in dressing plates is to leave all amalgam remaining on the plates after the clean-up plastic, evenly distributed, with no loose crumbs, and stiff enough to resist the flow of the pulp.

Such results may be obtained by proceeding as follows: After cleaning up, lightly sprinkle the entire plate; then thoroughly rub until the plate is uniformly bright, with no dark or silvered spots. Lightly brush toward the head any loose amalgam. Riffle with your brooms, being careful to smooth down any loose amalgam on edges or corners of plate.

The bottom one-half of the battery plates is scraped once each day. Cabinet makers' scrapers with a 4-in. blade are used for this purpose. The blades are filed square each time used. The principal clean-up occupies about one hour for the 16 tables. A half-hour later the plates are sprinkled with mercury at the lip of the mortar, and at hourly intervals thereafter. The amount of mercury used is, of course, regulated by the rate of amalgamation. The condition sought to be maintained is to keep "points" of mercury hanging to the lower edge of the plate without dropping off; in other words, the exact point of saturation.

TUBE-MILL PLATES

Amalgam deposited on these plates contains a much greater proportion of silver than that on the battery plates. Silver amalgamation in solution seems to offer greater difficulties than gold. Whenever the solution is high in silver the effects of precipitation are apparent. The plates cease to amalgamate. The copper is bared in spots which rapidly enlarge until half or more of the plate is affected. The tube-mill tables have four plates each, arranged in steps, with a 1-in. fall between. The bare spots always appear on the bottom plate first, then on the one next above; never on the two upper plates. When bare spots appear on a plate, the balance become dark and dry and refuse to take mercury. The material removed at the clean-up is a precipitate similar to that obtained in the zinc plant. The mercury used on such a plate which is not mechanically lost, goes into solution to turn up later in the zinc boxes and precipitate melts. Some of it, no doubt, serves a useful purpose in breaking up alkaline sulphides.

The following method of treatment has overcome these difficulties: The tube-mill plates are all scraped with steel each shift. All movable amalgam is removed. The plates are then well wetted with mercury, about 6 to 10 oz. being required for each of the eight tables. This is rubbed in until the amalgam formed is smooth and plastic. This amalgam contains some copper, and rapidly discolors upon exposure to the air, but remains bright under solution. At the four-hour interval between clean-ups, all the plates are dressed. It might be expected that such treatment would result in more copper in the amalgam deposited, and in shorter life for the plates. On the contrary, the retort metal shows no increase in copper and the plates last just as long as when scraped not oftener than once in two weeks.

Unequal dissolution of the plates tends to render them rough. Frequent scraping rectifies this. Alkaline solutions harden amalgam and render plates capable of re-

*Head amalgamator, Liberty Bell Mill, Telluride, Colo.

taining but little surplus mercury. This makes frequent clean-ups, sprinkling and dressing necessary. An excessive amount of mercury has the same effect as too little. The amalgam is loosened, channels are formed, down which the mercury flows, leaving the plate dry and hard. The loosened amalgam in part escapes from the plates, the trap recovery is not perfect, and a portion of the escaped amalgam finds its way into launders, tanks, etc. where recovery is difficult.

The excess of mercury used in dressing and sprinkling, over that used in fresh-water amalgamation, requires closer attention to the traps following the plates. The traps are cylindrical in shape, about the size of a milk pail, and are fed through a pipe from the launder at the foot of each table. All traps are dumped each day. Pulp from tube-mill plates is collected in a launder which discharges into a baffle box. This box is about 8 ft. in length, a foot deep, and 2 ft. wide. It is divided into two compartments by a baffle extending longitudinally. The plate launder discharges into one of the compartments thus formed against the baffle which breaks and distributes the current. On the opposite side of the box are outlets to seven traps similar in shape to the battery-plate traps, but larger, being designed of the maximum size that will induce a current sufficient to free them from the pulp. This baffle box is emptied from beneath, each shift. The traps, baffle box, and riffles which follow, recover practically all mercury and amalgam escaping the plates, with the exception of such mercury as goes into solution. The amount of amalgam and mercury found in other parts of the mill does not exceed a few ounces per year.

Mercury does not flour or become "sick" in cyanide solution. The stock of mercury in use is not treated for removal of impurities, except that portion distilled in retorting. The total loss of mercury from all causes is about 2500 oz. per month or about 0.2 oz. per ton of ore. This is 1000 oz. in excess of the average loss before the temperature of solutions was raised. As less is found through the lower part of the mill than formerly, it is concluded that the increase in loss is chargeable to the greater solubility in warm solution.

EFFECT OF SOLUTION ON THE PLATES

A detailed record is kept of the consumption of copper plates. Before May, 1912, the temperature of the solutions varied with the seasons from about 50° F. in winter to 60° F. in summer. During the summer of 1912, the practice of specially heating was adopted. Since that time solution temperatures at the plates have been maintained at about 70° F. at the battery plates and two degrees lower at the tube-mill plates.

TABLE I—PLATE RECORD
—Factors of Destruction—
Dressing.

Plates	Temp.	Ag. De- posited	per Day	Scrap- ing	Life— Months Days	
Upper half battery to May 31, '12...	55°	Little	6	Rarely	7	18
Upper half battery to May 31, '13...	70°	Little	6	Rarely	4	28
Lower half battery to May 31, '12...	55°	More	3	1 in 3 days	5	16
Lower half battery to May 31, '13...	70°	More	3	1 in 3 days	3	27
Tube mill to May 31, '12.....	56°	Most	5	Rarely	5	14
Tube mill to May 31, '13.....	68°	Most	6	3 per day	3	7

Table I is compiled from the plate record. The average life of the plates replaced during the six months prior to May 31, 1912, and for the same period prior to May 31,

1913, was taken as representative of the temperature factors of plate destruction. There is a marked difference in the life of the plates depending upon their relative position. To make this clear, in the table, they are classified according to position. There are probably other factors of destruction than those given which will occur to the technical mind, but the writer is not certain of them.

The following facts may have some bearing upon the reasons for the wide difference in the life of the three classes of plates. During the first period, 20,000 oz. of silver were recovered by amalgamation; during the second period, 30,000 oz. During the first period the recovery of amalgam per unit of area was greatest on the upper half of the battery plates. During the second period the lower half of the battery plates and the tube-mill plates were in excess per unit of area, with little difference between them. The upper battery plates have always been the only ones which presented the familiar appearance of free-gold amalgamation. The lower half, and the tube-mill plates receive a uniform deposit on every part of their surface, with none of the little spots and ridges of amalgam as seen in water amalgamation.

Silver is precipitated from cyanide solutions by mercury, and probably to a much greater extent by copper or copper amalgam. An amalgamation test of battery-head solutions, free from pulp, shows (1) that silver is amalgamated; (2) that the proportion of silver amalgamated is increased by increasing the temperature; (3) that the actual increase in the percentage of silver recovery by amalgamation corresponds closely with the computed increase due to precipitation from solution.

The tube-mill plates receive a pulp less abrasive than the battery pulp, a solution weaker in cyanide and lime, cooler, and formerly were dressed least often and scraped rarely. Nevertheless they show more rapid destruction than the other plates. Recent change in the practice of dressing and scraping the lower plates from partial to close cleaning, and from occasional scraping to skinning each 8-hr. shift, other factors remaining the same, has not shortened the average life of the plates.

From the above tests and from observation of the effects of varying grade in the ore milled, and other factors noted, the conclusion is formed that precipitation of silver, and other metals and compounds from solution, and their replacement in solution by the copper of the plates (and mercury in the amalgam), is the chief factor in plate destruction, with the increased dissolving power due to higher temperature second.

EFFECT OF PLATES ON SOLUTIONS

So far as investigated, there is no deleterious effect. About 7% of the copper dissolved is accounted for in the zinc plant. It gives no trouble there, nor in refining. Battery-head solution shows but one part copper in 600,000, which might be accounted for from other sources.

The purpose of amalgamation in conjunction with cyanidation is stated above, and it may be considered as an auxiliary, performing a function which the cyanide treatment cannot perform, or cannot perform as well. Methods of crushing, pulp-solution ratios, plate area, etc., are all designed primarily with reference to cyanide treatment. The resulting conditions are rarely ideal for amalgamation, but so long as amalgamation fulfills the requirements, the recovery of the metallic particles not

readily dissolved by cyanide, no matter how small that percentage may be of the total value, or total recovery, it has justified its use.

No metallics occur in the concentrates recovered after amalgamation. Any gold or silver susceptible to amalgamation or cyanidation going into the concentrate tailings and through the tube mills is fine enough for solubility. It is therefore concluded that amalgamation has performed its duty.

From 1898 to 1905 amalgamation in water was practiced. The average percentages of gold and silver contents of the ore recovered during that period were 64.6% of the gold and 4.16% of the silver. From 1905 to 1912 amalgamation in cyanide solution resulted in the recovery of 57.3% of the gold and 8.08% of the silver. During the former period there was no regrind of sands.

Raising the temperature of solutions from 55° F. to 70° F. has resulted in the following change in the percentage of total value recovered by amalgamation.

	Au.	Ag.
Six months prior to April, 1912.....	48.98%	7.12%
Six months subsequently.....	50.20	11.30

Costs of amalgamation for 5 months are given.

TABLE II. COST OF AMALGAMATION

Month	Supplies				Total	Cost per Ton	
	Labor	Mercury	Plates	Brooms Misc.			
January.....	\$640.75	\$54.18	\$346.52	\$44.00	\$33.07	\$477.77	\$0.08158
February.....	589.19	112.28	380.34	42.62	25.53	560.77	0.0793
March.....	548.59	106.83	237.61	33.00	25.87	403.31	0.06449
April.....	621.44	105.78	490.05	34.37	30.32	660.52	0.07952
May.....	643.10	88.20	601.64	42.63	24.18	756.65	0.08077

I wish to acknowledge the assistance of the staff of the Liberty Bell company in the preparation of this article.

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Platinum in Westphalia

A correspondent of the London *Mining Journal* calls attention to a paper read at the last general meeting of the Association of German Metal Smelters & Miners by Professor Krusch, an authority of high international repute. It deals in detail with the geology and petrography of the supposed platiniferous areas in Westphalia, and, shortly summarized, states that according to special surveys of the area, the tectonic formation of which is difficult to determine, platinum does indeed occur in the Silurian and Lower Devonian formation of the Siegen district, where strata of graywacke, quartzite, sandstone, etc., continuously alternate with strata of argillaceous shale. The explorations and experimental investigations of the last few years have been almost exclusively restricted to the graywacke and allied strata, it being believed that the extraction on a large scale of platinum from the argillaceous shale is out of the question.

The graywacke appears to be an ancient alluvial created by the breaking up of elder rocks into fragments, which were subsequently joined by the binding material to a solid mass. The metal association—platinum, chrome, nickel, iron—suggests basic eruptive rocks as the primary deposits; probably they form part of the up to now unknown primeval rock which is now covered by the palaeozoic sediments. The platinum recovered in the Ural and in Colombia from loose alluvials has its origin likewise in basic eruptive rocks.

There is but little prospect that the primary deposits will ever be discovered; but, in view of the fact that the analogous occurrences in the Ural and Colombia are not payable, the conclusion seems to be justified that those in Westphalia will likewise have no practical importance.

Union Miniere du Katanga

Two steam shovels, having a capacity of 200 tons in 10 hr., were placed on the Star of the Congo mine, in January of this year, and at the time of the recent annual meeting were reported to be operating satisfactorily, says the London *Financial Times*. Two more steam shovels have been ordered for the Kambove mine, which are more powerful than those at the Star and will have a capacity of from 500 to 600 tons in 10 hours. General operation at the Kambove mine is expected to begin in 1915; six months' work at this mine in 1913, produced 11,000 tons of smelting ore. The Star of the Congo mine produced 50,000 tons of smelting ore in 1913; the Luushia mine produced 20,000 tons of ore, most of which had to be made into briquettes. The copper production in 1913 amounted to 7245 tons of copper, made at a cost of £32 per ton, at the works. The cost of marketing and refining is about £12, according to Robert Williams. There was much difficulty owing to labor shortage in 1913, which has been somewhat improved by recruiting in neighboring colonies.

In the latter part of June, 1914, the third furnace was blown in and the production for the first six months of this year was 4520 tons of copper bars, averaging 96 to 97% copper, and 100 tons of matte containing 65% copper. Since Archer E. Wheeler's appointment as consulting engineer, four new blast furnaces have been ordered for the smelting plant at Lubumbashi. A 50-ton experimental concentration plant has also been ordered and is on its way to Africa. Development work in the Kambove No. 2 and the Likasye has indicated that these will be among the richest mines owned by the company. It is expected that work will be started soon at the Likasye.

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Chino Copper Co.

Report of the Chino Copper Co. for the second quarter of 1914 shows a production, in concentrates, of 6,109,888 lb. of copper in April, 5,266,881 lb. in May and 5,656,102 lb. in June, a total of 17,032,871 lb. In addition 1,008,580 lb. were produced from ore shipped to smelters.

Total ore treated was 587,900 tons, containing 2.165% copper. Extraction was 66.897%, or 28.972 lb. of copper per ton milled. There were 52,323 dry tons of concentrates produced, containing 16.276% copper.

The cost per pound of net copper from milling operations, after allowing for smelter deductions, but without crediting miscellaneous income, was 7.67c. per lb. From both milling and shipping ores, the cost of copper was 7.78c., but by allowing credit for miscellaneous income, the cost is reduced to 7.49c. These costs include all usual operation, administration and general charges, and 30c. per ton for extinguishment of mine development and stripping cost.

Milling profit was \$1,012,409; crude ore profit, \$39,832; miscellaneous income, \$49,863. Deducting dividends paid of \$652,080, the net surplus is \$450,024. Earnings are based on a price of 13.9191c. per lb. for copper.

Steam shovels moved 1,434,778 cu.yd. of material in place, of which 1,119,805 cu.yd. were stripping, and the remainder equaled 654,176 tons of ore. Average cost of stripping was 30.7c. per cu.yd., and of mining ore 20.4c. per ton.

Ampere Efficiency in Electrolytic Refining

BY KENNETH S. GUITERMAN*

SYNOPSIS—A research to determine what current or ampere efficiency might be expected during the electrolytic refining of copper, and also to ascertain how certain impurities which might be present in the electrolyte would affect this normal, or, under such governing conditions, the maximum efficiency. The impurities which were dealt with in this connection were arsenic and iron, as these are the most common and deleterious foreign elements which are present in copper electrolytes.

Inasmuch as the results from an investigation of this character would likely have not only a theoretical but also a practical value, it was aimed to maintain the various factors entering into the problem at close approximation to those obtaining under actual operating conditions.

In accordance with this plan, the following factors were kept as constant as possible throughout the entire investigation:

- a. Current density, 12 to 14 amperes per sq.ft.
- b. Copper in the electrolyte, 3% to 4%.
- c. Free sulphuric acid (H₂SO₄), 12% to 14%.
- d. Circulation, 6 gal. per min. per each 131 cu.ft. of tank volume.
- e. Temperature of the electrolyte, 135° F., or 57.5° C.

APPARATUS

The apparatus with which the research was carried out consisted of the following: Three lead-lined stoneware

"Blair" pump which delivered the solution from the heating tank to a constant-level overflow tank above. From here the electrolyte passed to the electrolytic tanks under a constant head, thereby maintaining a constant rate of circulation.

In each tank were suspended seven 9 1/2 x 8 1/2-in. cathodes and six 7 1/2 x 8-in. anodes, the latter being 1/2 in. thick. Under the above conditions the effective cathode area per tank was 6.75 sq.ft. The electrodes were spaced one inch apart from surface to surface.

Under a current density of 14 amp. per sq.ft., the above cathode area would necessitate a total current of 94.5 amp., which figure it was endeavored to maintain constant at all times.

The electrodes were carefully insulated from each other by means of glass blocks, and the tanks themselves were raised from the floor by mounting them on glass knobs. As a consequence of these precautions, the loss of current as a result of grounds or other short-circuits was made impossible, and all of the current used passed through the electrodes.

EXPERIMENTAL

In order to obtain a "standard of efficiency" under the best possible conditions, experiments were first made by

TABLE I. AMPERE EFFICIENCY IN ELECTROLYTIC COPPER DEPOSITION

Exp. No.	Av. Total E. Volts	Av. Tank E. Volts	Av. I Amperes	C.D. Amps., Sq.Ft.	Temp. Deg. C.	Sp. Gr.	Glue Added, Grams per Day	NaCl Added, Grams per Day	Free H ₂ SO ₄ -%	Cu-%	As-%	Fe-%	Metered-Amp.-Hr.	Theoretical Deposit, Lb.	Actual Deposit, Lb.			Efficiency, %			Av. Efficiency-%
															1	2	3	1	2	3	
1	1.15	0.38	95	14.0	64	1.14	...	...	8.95	4.15	...	...	4,114	10.75	10.0	10.1	10.1	93.25	94.1	94.1	93.8
2	1.13	0.37	96	14.2	61	1.15	...	...	8.80	4.19	...	...	4,716	12.3	11.75	11.60	11.85	95.5	94.2	96.5	95.4
3	1.20	0.40	92	13.7	62	1.155	...	...	8.70	3.99	...	...	4,478	11.7	11.15	6.75*	11.25	95.4	...	96.3	95.8
4	1.20	0.40	92	13.7	57	1.14	5	5	10.30	3.90	...	...	7,125	18.6	17.75	18.05	18.10	95.5	97.5	97.5	96.6
5	1.08	0.36	94	13.9	55	1.163	5	5	9.15	3.6	0.023	...	4,764	12.5	12.15	12.25	12.15	97.2	98.0	97.2	97.5
6	0.73	0.36	92	13.7	53	1.155	5	5	9.95	3.8	0.065	...	7,448	19.4	18.5	18.7	...	95.5	96.5	...	96.0
7	0.60	0.30	91	13.5	47	1.14	5	5	9.85	2.52	0.270	...	9,435	24.7	23.1	23.1	...	93.6	93.6	...	93.6
8	0.83	0.41	96	14.2	57	1.145	5	5	10.30	2.90	0.705	...	12,221	32.0	30.5	27.75*	...	95.3	86.7*	...	95.3
9	0.88	0.44	93	13.9	63	1.15	5	5	10.55	3.01	1.040	...	11,968	31.3	29.5	29.75	...	94.5	95.2	...	94.8
10	0.60	0.30	94	14.0	62	1.16	5	5	11.10	3.13	1.84	...	12,061	31.6	29.75	29.75	...	94.3	94.3	...	94.3
11	0.99	0.49	93	13.9	57	1.17	5	5	10.5	2.98	1.71	0.43	8,807	23.0	22.6	22.6	...	97.9	97.9	...	97.9
12	0.95	0.47	90	13.4	59	1.18	5	5	8.60	3.05	1.70	0.85	14,085	36.8	34.5	34.4	...	94.0	93.5	...	93.8
13	1.00	0.50	98	14.5	56	1.18	5	5	8.40	3.40	1.66	0.85	2,304	6.03	5.6	5.6	...	93.0	93.0	...	93.0
14	0.73	0.36	95	14.1	66	1.23	5	5	5.90	5.15	1.65	0.98	8,425	22.02	20.31	21.0	...	92.5	94.5	...	93.5

*Result disregarded.

tanks, terraced in order to facilitate the flow of the electrolyte from one to the other. In so far as it was possible, the electrolyte flowed into the tanks at the bottom and was drawn off at the top. These tanks were 24 in. long, 12 in. wide and 10 in. deep. The tanks were connected in series with the electrodes in parallel. Current was carried to the electrodes by means of double triangular busbars giving knife-edge contacts, thus insuring the minimum voltage drops at these points. The current which was used in the investigation was supplied by a small motor-generator set, which insured a current at a fairly constant potential.

The electrolyte was heated by means of steam coils placed in the main reservoir tank. The circulation of the electrolyte was accomplished by means of a small

using pure copper electrodes and a pure copper-sulphate electrolyte containing free sulphuric acid.

After this standard had been established, measured impurities were gradually added to the electrolyte, while the electrodes used during the electrolyses continued to be of pure copper. These experiments were then followed by others in which anodes of commercial blister copper were substituted for those of the refined material. For details of electrolyte analysis, and other conditions affecting individual experiments, reference may be made to Table 1 for all experiments.

Two sets of experiments run under the conditions of wire-bar copper anodes and a pure electrolyte gave efficiencies for the three tanks of 93.8% and 95.4% of the theoretical. This average of these figures is taken as the equivalent of 100% actual efficiency in the subsequent

*Chief chemist, research laboratory, A. S. & R. Co., Perth Amboy, N. J.

investigation. The cathode (No. 6) showed a distinct crystalline structure.

ADDITION AGENTS

Still keeping the pure anodes, glue and salt were tried as addition agents in amounts equivalent to 12 to 16 lb.

per day per 170,000 cu.ft. of electrolyte, giving an efficiency of 95.8%.

By referring to the table, a discrepancy in the weight of the deposited copper will be seen in tank 2. This shortage was accounted for by a short-circuit which occurred between the electrodes of the tank during the

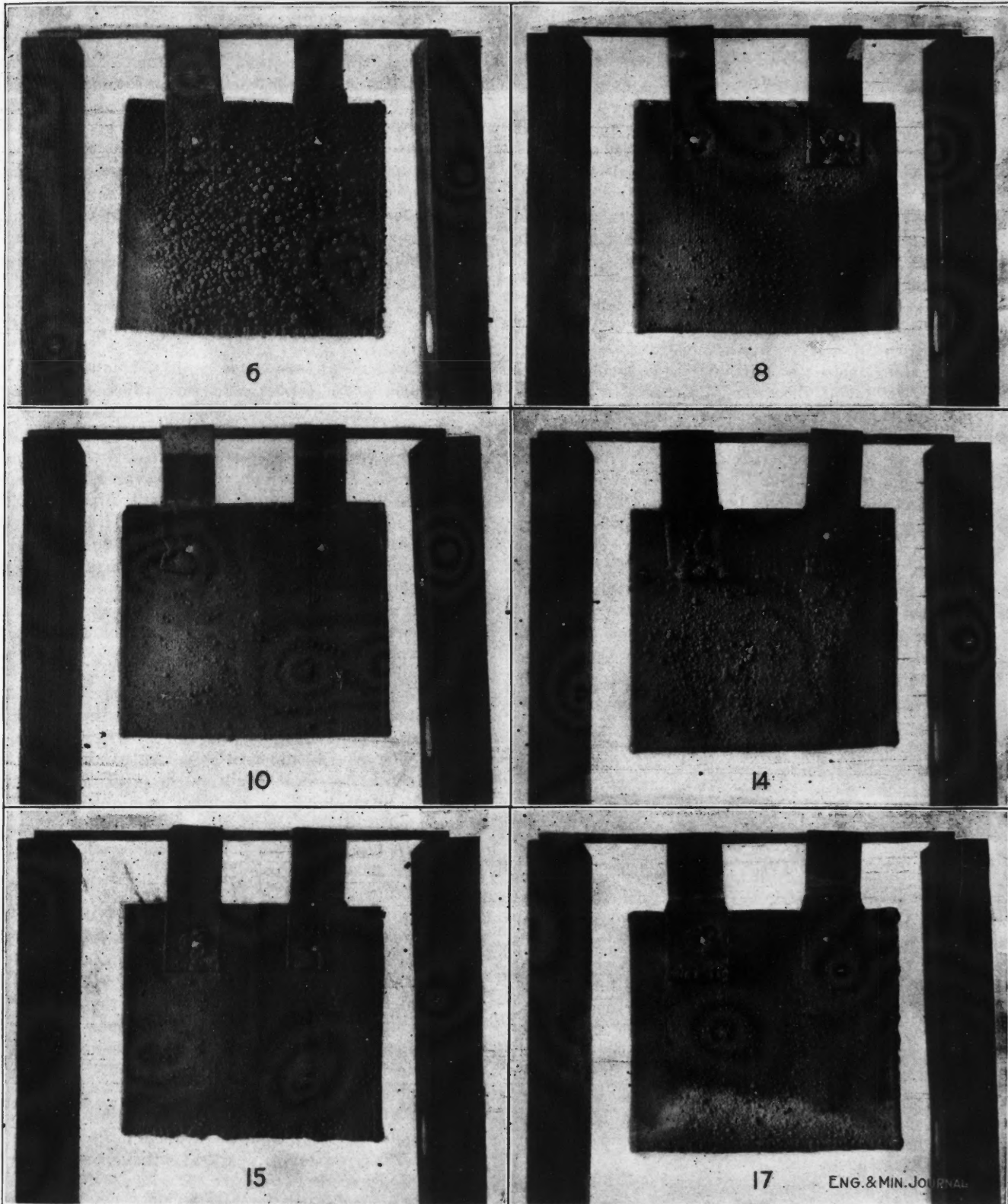


FIG. 6. PURE ELECTROLYTE. NO ADDITION AGENTS
 FIG. 10. ELECTROLYTE CONTAINING 0.023% ARSENIC
 FIG. 15. ARSENIC IN ELECTROLYTE, 1.86%

FIG. 8. PURE ELECTROLYTE, WITH GLUE AND SALT
 FIG. 14. ARSENIC IN ELECTROLYTE, 1%
 FIG. 17. HIGH ARSENIC AND IRON IN ELECTROLYTE

night, when the process was without supervision. From the results obtained in tanks 1 and 3, where the short-circuit was without influence, it is evident that the presence of glue and salt is without deleterious influence upon the current efficiency. A change in the physical structure of the deposited copper is seen, however, by referring to the cut of cathode 8. The extreme tree-like and crystalline formation evident in cathode 6 is no longer apparent. The cathode appears smoother and more rounded. A repetition of this gave 96.6 efficiency, a similar result.

Arsenic (0.023%) was next added. The physical structure of the deposited copper remains about the same, as can be seen by cathode 10. The efficiency was 97.5%.

It will be noticed that so far no substantial effect upon the current efficiency is apparent as a result of the presence of glue, salt or small amounts of arsenic in the electrolyte. Small increases in the efficiency were indicated from time to time, but I believe these to be absolutely inconsequential and inevitable, as such variations would naturally be anticipated under the conditions of the experimentation.

An increase of arsenic in the electrolyte to 0.065%, still continuing the use of pure copper electrodes, had no perceptible effect on character of deposit or efficiency, nor did the further increase of 0.27% of arsenic. (See table.)

The arsenic was then increased to 0.7%. By referring to the accompanying Table I, it will be seen that the current efficiency obtained in tank 2 was low, being only 86.7%. This low value was again the result of a short-circuit which occurred in the tank during the electrolysis. The current efficiency obtained in tank 1, where no short-circuit occurred, remained good and practically constant at 95.3 per cent.

The arsenic was then raised to 1%. Cathode 14 shows the cathode copper produced. This copper, though somewhat nodular, is still very good in appearance. The average current efficiency remains unchanged at about 94.8 per cent.

The arsenic content of the electrolyte was again raised, to a value of 1.86%. The current efficiency obtained was 94.3%, and the character of the copper continued to be excellent, as may be seen from cathode 15.

INFLUENCE OF IRON

At the conclusion of the previous experiment no further additions of arsenic were made to the electrolyte, inasmuch as a content of 1.86% was already in liberal excess of that commonly met with in practice. In subsequent experiments, therefore, iron only was added to the electrolyte. This was introduced in the form of iron filings, which at once dissolved to the ferrous salt, replacing copper in solution. The electrolyte used in the following experiments consequently contained not only arsenic, from the previous experiments, but also the gradually increasing amounts of iron which were added from time to time. The final iron content in the electrolyte was about 1%, which amount is above that ordinarily obtaining in practice.

In the first experiment 0.43% of Fe was present. The deposit appears to become somewhat more crystalline in appearance as the percentage of iron increased in the electrolyte. The current efficiency, however, continues excellent, as may be seen from the records on this and succeeding experiments.

With pure copper electrodes, acidulated copper-sulphate electrolyte, arsenic about 1¾%, and 0.85% of Fe, the efficiency obtained was 93.8%, and the physical structure of the copper was perhaps a trifle more crystalline than in the previous experiment. This may be seen from cathode 17.

In a repeat experiment the total percentage of iron in the electrolyte remained the same. Hydrogen peroxide was added, however, in such an amount as to oxidize about two-thirds of the total iron content. The current was then passed through the electrolyte under the ordinary conditions which had previously obtained. The duration of the experiment was 24 hr., at the end of which period the deposited copper was washed and weighed in the usual manner and the solution analyzed. This analysis showed that all of the iron present in the electrolyte had been completely reduced to the ferrous condition. The current efficiency remained practically unaffected (93%), however, notwithstanding the fact that the experimental errors were greatly magnified as a result of the short time of the electrolysis.

BLISTER COPPER ANODES

This experiment was made with the substitution of commercial blister copper anodes for those of the pure wire bar copper which had hitherto been used.

New starting sheets were hung in the electrolyte in order to minimize the chance of short-circuit and consequent error. All metal contacts were carefully cleaned, which resulted in the much lower tank drop which is recorded in the table. In addition an extra effort was made to keep all of the contacts uniform so that all of the cathodes should have a uniform current density. The direct result of this latter precaution was a much improved appearance of the deposited copper. The current efficiency continued normal at an average of about 93.5 per cent.

SUMMARY

A summary of the results obtained in the foregoing experiments shows:

(1) The average standard or normal current efficiency obtained under ideal conditions of purity of the electrolyte is about 95%, as recorded by the ampere-hour meter used.

(2) *In toto* 14 experiments were made which yielded the results shown in Table 1.

(3) In these 14 experiments the purity of the electrolyte was purposely vitiated by adding: (a) Glue and salt in a measure proportional to the quantities used in practice, *i.e.*, 12 to 14 lb. per day per 170,000 cu.ft. of electrolyte; (b) arsenic in increasing quantities up to a maximum content of between 1.5% and 2% in the electrolyte; (c) iron up to a maximum content of about 1% in the electrolyte; (d) hydrogen peroxide to the already foul electrolyte for the purpose of oxidizing the iron content from the ferrous to the ferric condition.

(4) In all of these experiments the resulting current efficiency did not vary from the average normal efficiency by more than plus or minus 2%, which is well within the limits of experimental error.

(5) Changes in the impressed voltage resulted in the main from impaired metallic contacts and temperature changes.

(6) Changes in the specific gravity of the electrolyte resulted not only from the addition of impurities to the

solution, but also by virtue of the unavoidable concentration of the electrolyte from time to time.

(7) Iron is always present in the electrolyte in the reduced or ferrous condition. If it is oxidized by outside agencies, it is very quickly reduced again during the electrolysis and remains in such condition.

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Selling Mining Property

BY C. LORIMER COLBURN*

It is my belief that never before in the history of mining has there been such a good opportunity for the sale of mining property. A large number of mines are changing hands, and more mines could be sold if it were not for the lack of salesmanship on the part of the owner.

The market is filled with *bona fide* purchasers. The wildcatter is almost extinct. The watchful eye of Uncle Sam and the cutting criticism of the press have ruined his game. The prospective buyer now is the successful operator, who is looking for a mine to work, not a project to float.

Purchasers of mining property may be divided into several classes: (1) Large exploration and ore-purchasing companies; (2) successful mining companies whose orebodies are fully determined; (3) manufacturers who need certain ores for raw material; (4) mining men who have made money and want to make more; (5) promoters who have a satisfied group of clients; (6) individuals and associations who have devised special processes.

Each class has its own needs and wants. The careful mine salesman will consider these wants before he offers his property for sale.

BIG BUSINESS

The first class constitutes those groups of large capitalists who are organized for big business. They are looking for large properties, they have millions of dollars to spend in mining and marketing their products, and to interest them one must show an almost unlimited possibility of ore that can be mined economically on a large scale. They will prospect and prove a territory, provided the territory shows unusual signs of successful development. Men handling millions cannot afford to consider hundred-dollar enterprises.

MINING COMPANIES AND MANUFACTURERS

The second class constitutes mining companies that have made money for their stockholders and are thoroughly organized. They have prudently put a percentage of their earnings into development work. In order to supplement their fast disappearing orebodies, they are in the market for new mines. They are, of course, prejudiced in their choice and prefer a mine similar to the one they are working. If they are mining gold, they are looking for gold mines. If they are dredging, they are looking for new dredging ground. If they are mining zinc, they have their organization ready to handle zinc mines.

Manufacturing concerns are in mining only to insure to themselves an ore that they, as manufacturers, need.

*Allen & Colburn, mining engineers, Ideal Bldg., Denver, Colo.

[Note—This article was put in type before the outbreak of the present war, with its consequent upsetting of business conditions.—Editor.]

They are not in the mining but in the manufacturing business. There are chemical works that need ores in the manufacture of chemicals, and there are electrical concerns that need mica in the manufacture of electrical instruments.

MINING MEN

The fourth class consists of those individuals who have made money in mining through their own efforts. They have bought a property, then developed and sold it, or they may have been fortunate in leasing. These men are open for any kind of a mining venture, but of course prefer a property similar to the one in which they made their money.

PROMOTERS

There are men who have had the mining and business training and have the acquaintance necessary to make them first-class promoters. These make up the fifth class. Many of them have already been successful in mining. Some have been interested in kindred branches of business. Most of these men are willing and ready to promote a promising prospect or mine. They must first be convinced that the venture has a good chance to succeed, and the price and terms must be reasonable. Very often such men have funds of their own to invest and call on their friends for additional help. They must treat their friends fairly, or soon they will be without friends. The day of selling mining stocks with flamboyant advertisements and misleading literature is past.

INVENTORS

Today is a great day for new processes. The inventors and backers of these processes often have to secure a special ore to prove and develop their methods. They are therefore often in the market for a mine capable of producing such an ore. They make up the sixth class.

SELLING IS LEGITIMATE

There are many people who have mines for sale and are prompted by the most honest and upright motives. There is a notion in the mind of the general public that a man wishes to sell a mine only when he finds out that there is nothing in it. This notion is unfair. A man is just as honest in selling a mine, if he thinks he can make a profit by so doing, as a real estate man is in selling a farm. In both cases an honest man will set forth the facts concerning the property and endeavor to interest those who can use it to a profit. The great majority of properties now on the market are raw prospects. Some, of course, are more promising than others. Some are the lost hopes of defunct mining companies. There are partly developed and fully developed mines for sale. Some of these properties are salable and in demand. Others can be made salable. The reason that so many are begging for a purchaser is because the person at the head is either a poor salesman, is poorly informed regarding those who can use his mine to advantage, or is financially unable to place the property in a salable condition.

A grocer who wishes to sell butter makes his butter attractive. He puts it up in pound or quarter-pound packages to suit the customer. The wise man who has a house for sale paints it and puts it in good repair, so as to make it attractive, before he puts it on the market.

The piano salesman arranges the payments on the piano to the satisfaction of his customer. He must be prepared to give extended credit. In all cases the wise salesman is striving, first, to get the attention of his customer; second, to make him want to purchase; and third, to make him purchase at a price so that a profit can be made on the transaction. Anybody can give a valuable article away, but it takes a good salesman to sell it at a profit. To sell a mine for a fair price takes time and hard work. The man who undertakes such a task should recognize the stupendous problem and put forth his best effort. He should first thoroughly familiarize himself with the property. Then he should study his prospective purchaser and attempt to make the property attractive to him. He must also arrange the price and terms so that it is possible for the prospective purchaser to take the property. Then if he can make the purchaser want the property a sale can be made.

REQUISITES FOR A SALE

Three things are necessary to interest a purchaser:

(1) Facts must be presented, not theory. The prospective purchaser demands such facts as amount of development work, equipment, ore blocked out, evidence of additional ore, kind of ore, nature of deposit, topography and location. A little theory might be necessary, but it should occupy only a secondary place. A person should not be compelled to read an extended discussion in order to get at the simple facts. Once a man had a large copper property for sale. He offered it to a mining company that was in the market for a copper property. He claimed that a large body of ore was exposed. He did not know the facts himself, but presented an engineer's report to give the information. This report was 76 pages long, but nowhere did it give a brief and clear estimate of tonnage or tell the character of the ore; consequently, the deal failed. A few facts, simply stated, might have sold the property.

(2) Facts must be given in a clear and attractive manner. A great deal is gained if the first impression is good. If one attempts to interest a large company the reports, maps and other information must attract favorable attention in competition with other reports that have also been submitted. Although the mine may be a desirable purchase, unless the salesman, armed with his information, can attract attention the property may be rejected.

(3) The property must be in such a condition that the facts can be easily verified. No reliable purchaser will take a property on mere hearsay evidence. He must go and see for himself. He is liable to become suspicious if the drifts are impassable and the important workings are under water.

The owner of a mining property can either wait until some live mining man recognizes the value of his property, or, if he has a property of real merit, he can go out and seek a purchaser. To do this he must spend some money, the amount of which will depend on the property he is trying to sell. The average owner is not capable of selling a mine; he should employ a good mine salesman. But he himself should prepare the property for sale and supply the necessary information. It is hardly necessary or wise to prepare elaborate reports and maps, but a little money spent on obtaining fresh, clear information is essential. A gravel bed is worth

little if mere rumor reports it as containing gold, but it is worth a great deal if 10 drill holes have been sunk to bedrock and show the bedrock to be 20 ft. deep with gravel running 40c. per cu.yd. in gold. If the owner has not the money to finance the sale he can often, by putting in good form all the facts he has at his command, interest a friend to finance the sale for him.

PRICE AND TERMS

The proper valuation of mining property calls for the highest skill of the mining engineer. In a developed mine the orebodies can be measured and their value determined with a fair degree of certainty. In a partly developed mine the engineer is aided in his guess at the probability of future orebodies by a careful study and analysis of the ore already exposed. In a prospect the value is almost entirely imaginary and therefore is susceptible of wide variations. A prospector who locates a claim begins at once to count the millions that his claim will produce. Day after day his dream of a great fortune increases until he finds ore; then the value of his property has been so magnified that he places a prohibitive price on it. Often he spends the rest of his natural life rudely working his property, suffering all the privations of poverty and doggedly insisting on his original demands. This man would act with much more wisdom if he would allow a good promoter to take over his property on long-term payments with little or no cash. He should demand references from the promoter and lay more stress on his honesty and ability than upon a short term of payment. It is of great importance that the first promoter make a success of developing the property, and he should be given every assistance. The best mine is hardly ever sold for cash. The payments usually extend over several years, with a royalty on all ore extracted, to apply on the purchase price. In some cases when a company needs a particular parcel of mining property and can get a favorable price, a cash deal is made. These cases are comparatively few.

If the agent for the sale of mining property knows the property, knows the vital facts concerning the property, knows how to present them, knows that the mine will stand examination so that his statement can be verified, and knows that he can give a reasonable price and good terms, and also provided that his property has real merit, he should have no trouble in making a sale.

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Mineral Production of Chile

The mineral production of Chile for the year 1912 has been given in the "Boletin de la Sociedad Nacional de Minería," and was as follows, the items being arranged in order of descending values: Nitrates, 2,585,580 metric tons; copper, 41,647; coal, 1,334,407; borates, 43,356; iodine, 458 tons; silver, 39,467,693 grams; guano, 18,266 tons; gold, 1,100,594 grams; salt, 17,045 tons; sulphur, 4431; iron, 6451; perchlorate, 87; lead, 4½; potash salts, one ton.

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Minerals of California, is the title of Bull. No. 67, issued by the State Mining Bureau and available for distribution July 1. The manuscript was prepared by A. S. Eakle, Ph.D., professor of mineralogy in the University of California. Each chemical group of minerals constitutes a chapter in the book. One chapter is devoted to distribution of minerals by counties. Information is systematically given for each variety, as follows: Chemical composition, crystal form, occurrence, cleavage, fracture, color, streak, luster, hardness, specific gravity, and a description of places in California where it is found, including in most cases individual deposits as well as town and county. There is also an alphabetical index of minerals.

Salt Lake Meeting, A. I. M. E.

SPECIAL CORRESPONDENCE

The Salt Lake meeting of the American Institute of Mining Engineers opened most successfully on Aug. 10. By Wednesday, 320 members had registered with more coming. After registration on Monday morning at the headquarters, Hotel Utah, an organ recital was given at the Tabernacle in the afternoon, followed by a trip around the city by auto. The first technical session was held Monday evening in the ball room of the Hotel Utah, opening with an address of welcome by D. C. Jackling, and a response by B. B. Thayer, president, R. C. Gemmel presiding.

Mr. Jackling's address included a review of Utah's mining industry, and praise for the institute in the advancement of mining and metallurgy. Papers were then read by Laist and Aldrich, Laist and Frick, Austin, Holt, Croasdale, Laist and Wiggin, Bacorn, Goodale, Bancroft, Alling, Butler and McCaskey. The ladies were meanwhile entertained at an informal reception.

On Tuesday morning a special train was run to the Bingham mines, to see the Utah Copper Co.'s steam-shovel operations and mills, and to the Garfield smelting plant. A talk was given by Manager Gemmel on blasting, drilling and other operating costs, and the usual blasts were set off at noon. Luncheon was served on the train during the ride to Magna.

The U. S. Bureau of Mines' mine-rescue car was included in the Magna trip, and a demonstration was given of first-examination and pulmotor work. There were 285 members on this excursion. The technical session in the evening was presided over by William Wraith and papers were read by Howard, Anderson, Addicks, Newhouse, Norton, Hulst, Palmer, Lewis, and Alexander. A smoker was given at the University Club after the session.

On Wednesday a special train, carrying 106 members, was run to the Murray plant of the American Smelting & Refining Co., thence to U. S. Smelting Co.'s smeltery and zinc plant at Midvale, after which lunch was taken on the train *en route* to Tooele. A luncheon was given at the Country Club for the ladies meanwhile. At the technical session Wednesday evening, C. W. Whitley presided. Papers and discussion by Lyon and Arentz, Divine, Wentworth, Bretherton, Bardwell, Demond, Jones, Lyon and Keeney, Kuzell and Wigton, Howard, Kuehs, and Lewis were read.

Thursday morning a Utah branch of the A. I. M. E. was organized, R. C. Gemmel presiding, 40 local engineers present. Bylaws were adopted, and the organization will be perfected in October. An excursion to Park City, participated in by 111 members, visited the Silver King mine, and Mines Operating Co.'s mill. Sidney J. Jennings presided over the technical session on Thursday. Papers by Joralemon, Van Horn, Allen, Ward, Dorr, Clevenger, Hodgson, Bedford and Hague, Livermore, Wise and Strache, Allen, Chance, Raymond and Crowfoot were read. In the discussion T. C. Hoyt, of the Forestry Service, answered a series of questions by Winchell, regarding the Government's attitude toward mining. This ended the business meeting, the remainder of Thursday being devoted to a lunch at the Alta Club, and an excursion to Saltair.

On Friday, 105 members went on an excursion to Provo Cañon, Vivian Park, and the Olmstead power

plant. Friday evening a closing banquet was held in the Hotel Utah, W. L. Saunders acting as toastmaster. Addresses were made by Thayer, Stoughton, Governor Spry, of Utah, and Allison. President Thayer stated that the meeting was the most successful, most representative and largest in attendance of any meeting in the Institute's history.

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Lake Superior Mining Institute

An announcement of the nineteenth annual meeting of the Lake Superior Mining Institute, was made in the JOURNAL, July 4, 1914. It will convene on Monday, Aug. 31, at Ishpeming, Mich. The first-aid contest and rescue exhibition will be held at Union Park, Ishpeming, at 10 o'clock of that day, after which lunch will be served at the Wawonowin Golf Club. During the afternoon, the party will visit the mines in automobiles, and will also inspect points of interest at Marquette. Dinner will be served at the Lake Shore Engine Works, Marquette, and will be followed by an entertainment at the opera house in the evening. By making arrangements with certain of those in charge of affairs, members desiring to go underground in the mines of the district can do so.

On Tuesday, Sept. 1, a special train will carry the members to St. Ignace, Mich., whence the steamer, City of Detroit II, will convey them to Detroit, arriving there Wednesday forenoon, Sept. 2. While in Detroit, the Institute will visit the Solvay Process Co., Detroit Iron & Steel Works, Detroit Copper & Brass Rolling Mills, some of the automobile factories and other industries. Sept. 3 is the day scheduled for adjournment. While on the boat, enroute to Detroit, meetings will be held, at which the following papers will be read:

"Use of Electricity at the Penn and Republic Mines." By William Kelly and F. H. Armstrong, Vulcan, Mich.

"Methods of Stocking Ore on the Marquette Range." By Lucien Eaton, Ishpeming, Mich.

"General Outline of Mining Methods Used in the Copper Queen Mine, Bisbee, Ariz." By Joseph Park Hodgson, Bisbee, Ariz.

"The Sinking of a Vertical Shaft at the Palms Mine of the Newport Mining Co., at Bessemer, Mich." By Frank Blackwell, Ironwood, Mich.

"Mining Methods on the Marquette Range." Report by Committee.

"Steel Stocking Trestle at No. 3 Shaft, Negaunee Mine." By S. R. Elliott, Negaunee, Mich.

"Ventilation in the Iron Mines of the Lake Superior District." By Edwin Higgins, Pittsburgh, Penn.

"Follow-Up System and Method of Recording Injuries in Compliance with the Workmen's Compensation Law." By Herbert J. Fisher, Iron River, Mich.

"Hydro-Electric Plant of the Cleveland-Cliffs Iron Co." By F. C. Stanford, Ishpeming, Mich.

"Biographical Notices." By Committee.

"Brief History of Marquette Ore Docks." By D. H. Merritt.

"A Trip to Lake Superior." By Robert Kelly, in 1853.

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Nevada Consolidated Copper Co.

Report of the Nevada Consolidated Copper Co. for the second quarter of 1914 shows a production of 4,880,043 lb. of copper in April, 4,959,589 lb. in May, and 4,483,175 lb. in June, a total of 14,322,807 lb.; 831,589 dry tons of Nevada Consolidated ore, averaging 1.38% copper, were milled, and 55,879 dry tons of Giroux ore.

Cost per pound of copper produced, including Steptoe plant depreciation, and all charges except ore extinguish-

ment, was 10.73c. Earnings are based on a basis of 14.09c. per lb. Copper on hand and in transit, sold and unsold, at the end of the quarter was 23,276,016 lb.

Low production, high costs and decreased profits for the quarter can be attributed almost entirely to the necessity of mining a large tonnage of 1.1% ore, with resulting lower copper recovery per ton. The price of copper also contributed to lower earnings.

Deficit for the quarter was \$134,978 after payment of the 19th quarterly dividend. In addition, \$139,482 was set aside for Steptoe plant depreciation, \$79,856 for ore extinguishment, and \$9900 for depreciation of Nevada Consolidated equipment, a net charge to undivided profits of \$364,216.

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Chuquicamata and the War

Chuquicamata and the European war seem remote enough at first thought. But when it is recalled that some of the Chuquicamata equipment was "made in Germany," the practical cessation of transportation out of that country means indefinite delay for any material that has not been shipped. Most of the important material has already left Germany, and steps have been taken to re-order in the United States such other equipment as will be required for the initial operation. The Chile Exploration Co. is redoubling its efforts toward bringing this great enterprise to fruition and the officials of the company have great hopes of starting copper production in March, 1915, as originally planned.

Much of the work at Chuquicamata is already completed, or nearly so, and the determining factors now in the inception of copper production are the dechlorinating plant at Chuquicamata and the power plant at Tocopilla on the coast.

It is impracticable to state exactly the condition of all the work or to enumerate all the equipment now at the plant sites, as this is continually being augmented. However, as a result of a visit at New York offices of the company, the following general review of construction progress is presented:

The completed and nearly completed departments are: Ore bins, railroad tracks and assembly yards, machine shop, carpenter shop, warehouse, acid plant, laboratory, offices, store, native quarters and dwellings.

The leaching vats are about 75% finished, and the loading and unloading bridges are on the ground. The solution sumps are about 40% done; all the 16-in. and many of the other sizes of lead-lined pipe have been shipped, as well as all the large acid pumps made by the Henry R. Worthington company in this country. The substation at Chuquicamata is under way and is about half finished.

The completion of the dechlorinating plant on time will not be hindered by the fact that none of the 22 dechlorinating drums has been shipped from Germany. These steel drums are 30 ft. long and weigh about 30 tons each; they are lined with brick and "mastic" and have to be shipped assembled. Steps have already been taken to re-order these in America. The first of the Kelly filter presses for this department has been shipped.

The electrolytic tank house is under roof and the first of the 510 concrete tanks is building; the cranes are installed and are operating. About 55,000 insoluble magnetite anodes—over one-half of the ultimate require-

ments—have been shipped. The steam shovels, cars and other mine equipment are practically all on the ground and there is little chance of delay in the mining operation if only power be delivered. Most of the pipe for the water supply is on the ground and some of the trestles for the water line have been erected.

The crucial factor in the beginning of operations at Chuquicamata is the completion of the power-house units. Two of the four 10,000-kv.a. generators have been shipped by the Siemens-Schuckertwerke, of Germany, which has the contract for the power plant at Tocopilla. One of these generators is now due at the Chilean coast, the second should also arrive soon. Three of these generators are of sufficient size for a 10,000-ton operation and two would enable a start at two-thirds the contemplated initial capacity. All boilers, switchboard fittings and most of the smaller equipment for the first half of the power plant have been shipped. One of the 100,000-volt transformers has been sent forward, and the smaller 5000-volt transformers required for the first half of the power plant have been re-ordered in the United States. All of the 86-mile transmission line has been shipped, erection of towers has begun and some of the wires have been strung. Construction work at the power plant, which was stopped by the contractors at the outbreak of the European war, has since been resumed. At the various operations connected with Chuquicamata, about 2000 men are now reported to be at work, and with favorable delivery of materials at present en route, the officials expect to be able to start operations next March at about half capacity. Consulting Engineer Pope Yeatman sailed this week for Chile, to make an inspection and to expedite work in any departments that may require special attention.

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Refining Practice at Colburn-Ajax Mill

In the JOURNAL of July 25 was published an article under the caption of "Refining Practice at Colburn-Ajax Mill," by R. H. Shaw. We have been informed reliably that the process described in that article was subsequently discarded as a failure. We have no doubt that Mr. Shaw wrote the article in entirely good faith, and believed the process that he described to be a success at the time when he wrote the article. This was in January last. The delay in publishing the article was our own fault, which statement relieves Mr. Shaw from any imputation of contributing an article about what he knew to be a failure.

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Mineral Output of New York

The mineral production of New York in 1913 was as follows, the figures being supplied by David H. Newland, Assistant State Geologist: Cement, portland and natural, 5,340,757 bbl.; petroleum, 916,873; salt, 10,819,521 bbl.; crude clay, 6291 tons; emery, 611; feldspar and quartz, 25,680; garnet, 4665; gypsum, 532,884; metallic paint, 7950; slate pigment, 2200; talc, 75,071 tons; graphite, 1125; iron ore, 1,217,899 long tons; pyrite, 54,903 long tons; mineral waters, 9,448,348 gal. Other mineral substances, including granite, limestone, marble, sandstone, trap, apatite, natural gas, diatomaceous earth, marl and mica, etc., to the value of \$12,016,232 were also produced.

The Baghouse in Lead Smelting

SYNOPSIS—A brief history of bag filtration and its initial application in silver-lead smelting at the Globe Smelting & Refining Co., Denver, Colo. Discussion of filtering media and general baghouse practice.

In the early part of the last century textile fabric was used for the filtration of products of combustion. Lamp-black was obtained by passing smoke through a series of canvas bags; natural draft was used to draw and force the smoke through the bags. About 1850 bag filtration was used for collecting zinc oxide. About 1876 it was introduced for collecting the fume from lead-ore hearth smelting in Missouri. Shortly afterward it was used, first at Portland, Me., and later at Cañon City, Colo., for the collection and production of zinc-lead pigment in treating mixed zinc-lead sulphides.

In 1890, the Globe Smelting & Refining Co., at Denver, Colo., installed a baghouse containing 1458 bags for the recovery of fume from silver-lead blast furnaces; this installation was too small to handle all of the gases and was increased to approximately 2300 bags. In 1900 the number of bags was again increased, making a total of approximately 2800. The usual difficulties incident to new installations were encountered, but they were gradually overcome and the baghouse became accepted as standard practice for this class of smelting. As all of the baghouses built since have followed the general lines of the Globe installation, a short description may be of interest.

THE GLOBE BAGHOUSE

The building is 149 ft. 8 in. long by 67 ft. 4 in. wide and 40 ft. 2 in. high from the basement floor to the eaves of the roof, having brick walls 26 in. thick from the foundation up to the thimble floor, from there an 18-in. wall for 16 ft., and a 13-in. wall from this point to the top, a distance of 14 ft. 2 in. Additional stiffening is given to the walls above the basement by pilasters placed every 16 ft. The end-wall construction is similar to that of the side walls with the exception of the spacing of the pilasters, which is somewhat greater. The roof is made of corrugated iron laid on 1-in. boards and supported by a timber framework spaced 16 ft. apart resting on the basement partition walls. On top is a louver running the length of the building to allow the gas to escape.

The basement is 10 ft. high and divided into compartments by brick walls 13 in. thick spaced 8 ft. apart, made tight to prevent the gases from interfering with the cleaning out of the flume in any one compartment while the others are in operation. These walls also carry the thimble floor above, which is made of No. 10-gage sheet-iron plates riveted together as nearly gas tight as possible, so that all gas entering the basement will be forced through the bags above. On the thimble floor are fastened the thimbles, which are 17 in. in diameter and 10 in. high, made of No. 14-gage sheet iron, with a head at the top to attach the bag and a flange at the bottom for riveting to the floor plate. They are spaced on 2-ft. 1-in. centers.

To these thimbles one end of the bag, which is 31 ft.

long, is fastened by means of a soft-iron or copper wire; the other end is hung by means of a similar wire fastened to the bag and then given several turns around a 2x12-in. plank overhead, which runs parallel with and directly over each row of thimbles. These planks are carried on cross-timbers resting on the framework, which supports the roof. The bags usually begin to deteriorate around the thimbles. As this takes place the lower end of the bag is cut off and the hanging wire at the top, which has been left sufficiently long for this purpose, is lengthened out; in this way the bag may still be used, although slightly decreased in filtering area.

The gas is drawn from the furnaces through the flue by means of a fan and discharged into a flue passing along the side of the baghouse. Short connecting flues 24 in. in diameter, equipped with gas-tight dampers, lead the gas from the main flue into each separate compartment in the basement. The thimble floor being gas-tight, the fumes are forced up into the bags, the gas filtering through the fabric and passing out through the louver on top of the roof. The fume retained in the bags is dislodged, at regular intervals, by shaking, and deposited in the basement, and is removed through the basement doors after first shutting off the gas from that compartment.

FILTERING MEDIA

The ideal filtering material is a thin layer of absorbent cotton, but, owing to the difficulty of cleaning and recovering the fume without destroying the material for filtering purposes, it is impractical. The bags used are either cotton or woolen, and while various other substances have been experimented with, they have not been successful; either on account of excessive cost, or, lacking in nap, the material would act as a screen and fail to abstract the solid particles from the gases. About 20 years ago the writer treated woolen cloth with titanium chloride. This treated material filtered as well as untreated cloth and resisted the corrosive effect of sulphuric acid to a point where the condensed acid fully saturated the bag. The material of the saturated bag then either clogged up and no amount of shaking would dislodge the fume and all filtering ceased, or, if the gases were low in fume and high in acid, the nap of the cloth would fold up on the strands and the fumes would pass through without filtering.

Cotton bags do not offer as great a resistance to the corrosive action of acid and will not stand as high temperatures as woolen. It is difficult to determine from the analysis of the gas which material should be used, as the acid contents and temperatures of the gases, particularly from an oxidizing furnace, are liable to vary greatly. It is better to use woolen bags whenever there is doubt. As woolen bags cost from three to four times as much as cotton, they must last correspondingly longer.

FREE SULPHURIC ACID MUST BE AVOIDED

The writer recalls seeing all the bags in a building destroyed within 30 min. This happened with gases from a converter working on lead-bearing copper mattes and occurred on the finishing blow to blister, when the lead content of the converter charge was low—under 2%. The

Note—Excerpts from a paper read by H. H. Alexander before the Salt Lake meeting of the American Institute of Mining Engineers, August, 1914.

converter delivered the gases into a brick flue, the opening of which made a snug joint with the converter snout. The temperature in the brick flue back of the converter ranged from 800 to 1300° F., and at the discharge end of this brick flue the temperature ranged between 400 and 700° F. In this range, giving the proper temperature, from 800 to 1200° F. for conversion, by contact, of sulphur dioxide to sulphur trioxide, the amount of sulphur trioxide formed was in excess of the lead oxide carried by the gases; the surplus acid rapidly destroyed the bags. This was overcome by enlarging the opening in the flue, also an opening with a damper was made in the side of the flue close to the point where the converter discharged into it; the fan was speeded up, thus diluting and cooling the gases. A recording thermometer was placed in the flue 25 ft. from the converter, and 600° F. was the maximum reading permitted on this thermometer. The dilution of the gas was also regulated by analyses, never allowing the sulphur dioxide content of the gases to get over 4%. It had formerly run as high as 9% on the finishing blow. After these precautions were taken a set of cotton bags lasted over a year.

The same action may occur on concentrating and cupeling furnaces where the only sulphur present comes from the fuel. With the temperature of the flue as noted above, the conversion of sulphur dioxide into sulphur trioxide proceeds rapidly and destroys the bags. Fortunately, in a majority of these cases there is sufficient lead oxide in the gases to combine with the sulphur trioxide formed, rendering it harmless.

Another cause for the corrosion of bags is the presence of selenium. The selenium being volatilized and passing off with the gases as an oxide, upon coming into contact with the sulphur dioxide converts the latter into sulphur trioxide with the production of selenium, and unless there are sufficient bases to combine with the sulphur trioxide produced the bags are attacked.

SPECIFICATIONS FOR FILTERING CLOTH

Exhaustive tests were made to determine the critical temperature of cotton and woolen bags. The test pieces were cut to 3x4 in. and were pulled, always against the warp, in an Olsen testing machine. Other pieces were placed in a Freas electric oven, which was kept at the proper temperature for the desired period of time, at the expiration of which they were removed and broken in the Olsen machine. . . . Each plant has its favorite brand of cloth, which is required to have a definite number of strands; in cotton cloth these vary from 30x30 to 48x48, depending upon the character of the fume to be filtered; with woolen cloth, owing to the longer nap, a coarser weave may be used, and the number of strands is usually in the twenties. The woolen cloth should contain the natural grease, but, as the manufacturers object to this, the wool is usually scoured and manufactured into cloth and the grease added. After numerous working tests, checked by the laboratory, the following specifications were formulated for a satisfactory woolen cloth:

The weight is to average 12 oz. per yard and the tensile strength is to be not less than 21.5 lb. per lineal inch. The test pieces are to be square, 3½ in. on a side, and the pull is to be against the warp. The fabric is to contain not less than 85% wool fiber, estimated by taking the difference between 100 per cent. and the sum of grease, dirt, moisture, burrs, and cotton fiber, and to be practically free from vegetable matter of all kinds. The weave is to be 22 ends by 20 picks per inch.

Yarn is used for sewing woolen material. Linen thread should be used for cotton bags, usually No. 40 Barbour's Irish Linen, with a double-lap seam, and lock stitch is specified.

There is a diversity of opinion as to the necessity of ventilation around the bags, but the consensus of opinion is that good ventilation lengthens the life of a bag. Some plants have gone to the extent of drawing the gases from around the bags with a fan and discharging them into a stack. An iron stack 4 ft. 6 in. in diameter and 68 ft. above the roof has proved satisfactory. This stack takes care of 15,000 cu.ft. of gas per minute and maintains a draft of about 0.05 in. of water. The temperature of the gases entering this stack varies from 110 to 130° F. Diffusion stacks after the Wislicenus type were tried for converter gases. They worked nicely, but the rain beating through the openings caused rapid deterioration and they were abandoned.

The number of bags in a compartment which can be closed off from the main current varies greatly. The original Globe baghouse contained 81 bags. Some smelting works have as many as a thousand bags in a compartment. As most baghouses are run continuously, one or two compartments are usually cut out for cleaning, shaking, etc., and it is therefore better that a unit be of such size as not to have too large a percentage of the filtering area cut out when one or more compartments are closed.

The filtering area or bag surface necessary to handle a given amount of gas is entirely dependent upon conditions, and what is ample in one case may be insufficient in another. The area necessary is not only dependent upon the volume of gases, but upon the amount of solids per cubic foot, the stronger or weaker adhesion of the fume to the filtering material, and the number of times the bags are shaken in 24 hr. Few smelters accurately measure the volume of gases being handled, but use the manufacturer's rating of the fan at the different speeds. As this depends upon character, resistance, temperature, etc., of the flue to the fan, and the same variable factors on the discharge end of the fan, the rated amount is not always delivered. Comparing performances of baghouses with fan rating, one baghouse could be cited in which each bag is filtering 130 cu.ft. of gas per minute and recovering 5 lb. of fume per bag per day, with bags shaken once in 24 hr., and another in which each bag filters 70 cu.ft. of gas per minute and recovers 27 lb. of fume per day, with bags shaken eight times during that period.

SHAKING THE BAGS

In dislodging the adhering fume from the bags, hand shaking, when done properly, gives the best results, but it is a slow and disagreeable task and is being replaced by various mechanical shakers. This mechanical shaking is accomplished by striking the inflated bag lengthwise; quickly jerking the deflated bag up and down; swinging back and forth, or a combination of the two motions. Another method is to reverse the flow of the gas through the bags by means of an individual fan or by a second connection between each compartment and the suction side of the main fan. The best results were obtained with an arrangement having a combination of the up-and-down and the back-and-forth motions. The bags in each row are hung from a 2-in. pipe, which in turn

is supported from above by hangers spaced about 8 ft. apart and 21 in. long. The ends of the pipe pass through cast-iron spools placed in the walls, with holes in them sufficiently large to allow for the up-and-down motion caused by the swinging around the 21-in. radius. On the ends of this pipe are placed collars, one on each side of the cast-iron spool, and set for 8-in. stroke. A lever is fastened to one end of the pipe, which, when pulled quickly back and forth, gives the bags an up-and-down as well as a back-and-forth motion, and on coming up sharp against the collars, also produces a sudden jar which assists in dislodging the fume from the bags. This device when handled properly will lower the pressure in the bags to 0.15 in. of water. Good hand shaking will lower the pressure to 0.10 in. or slightly less.

It is important that the bags are so hung that when inflated they will stand straight; otherwise, upon shaking, the fume will collect around the thimble top, distorting the bottom of the bag and thus obstructing the flow of the gases into the bag, at the same time putting an undue strain upon the bag at this point.

Fume from blast furnaces carries enough sulphides and finely divided carbon to burn. The burned material, after moistening thoroughly, can be handled safely. Shuicing the fume from the compartment promises to be the quickest and most sanitary method, but filter pressing and the large amount of moisture left in the cake are objectionable. In any case, cleanliness should be demanded from all employees and no scattering of fume should be permitted around a baghouse.

Bag filtration, with its high percentage recovery of fume, diffusion of gases, and simplicity of operation, is very satisfactory, and the baghouse has well proved its worth to the lead smelter. Credit for its introduction into this branch of metallurgy is due Dennis Sheedy, manager, and Dr. M. W. Iles, superintendent, of the Globe Smelting & Refining Company.

Daly West

The 1913 report of the Daly West Mining Co., Park City, Utah, shows a production of 60,788 dry tons of ore. Of this 1555 tons were shipping ore and 59,233 tons were treated in the mill. The mill was in operation 319 shifts of eight hours each, thus treating 23.75 tons per hour. The mill produced 8332 dry tons of lead concentrates, 1598 dry tons of zinc concentrates, thus concentrating six tons of crude ore into a ton of concentrate. The crude ore had an assay value of 5% lead, 7.7 oz. of silver and 4.3% zinc; while the lead concentrates assayed 34.54% lead, 40.01 oz. silver; and the zinc concentrates, 4.83% lead, 19.27 oz. silver and 35.37% zinc. The mill made a figured saving of 79.55% of the silver and 99.6% of the lead. Total receipts for the year amounted to \$407,224 and operating expenditures, \$434,296 making a loss of \$27,072. Cash reserves were depleted \$86,220 by the operating loss, payment of \$27,000 in dividends, increasing property holdings \$18,537, increasing inventories \$13,275 and a charge of \$336 to impound account. Cash on hand at the end of the period amounted to \$23,648. There were 6446 ft. of development work done. The total cost of mining based on 60,788 tons was \$5.28 made up of: Exploring, 78c.; development, \$1.65; stoping, \$1.88; tramping, 17c.; engineering, 2c.; hoisting, 29c.; general mine expense, 35c.; transportation, 5c.; tunnel rental, 8c.; sampling

and assaying, 1c. Milling cost, \$1.46 per ton for 59,233 tons as follows: Sorting, 5c.; crushing, 28c.; jigs and tables, 29c.; tailing plant, 20c.; electric plant, 4c.; building and fixtures, 5c.; water system, 4c.; sampling and assaying, 2c.; transportation, 13c.; tunnel rent, 8c.; general mill expense, 18c. General expenses, taxes, insurance, legal and office expenses amounted to 39c. per ton milled. These charges do not include deductions and smelting charges on the ores.

The company lost its main mill and hoist by fire on Dec. 28, 1913. It is expected to have a new plant ready for operation by Sept. 1, 1914. The Daly West has received \$15,464,890 from the smelters for its product since its incorporation and has paid \$6,606,000 in dividends. It is believed that the advantages the company will derive from a new and up-to-date concentrating plant will be ample in a few years to turn the present fire loss into a gain.

Calumet & Hecla Contract Mining*

The contract system has been in force in the Copper Country probably ever since mining there began, drifting and sinking being paid for by the linear foot and stoping by the cubic fathom; the latter curious custom was introduced from Cornwall. The measurements to determine the number of cubic fathoms stoped were made by the mining captain, and on the conglomerate lode of the Calumet & Hecla, since the foot and hanging walls were fairly uniform, it was not difficult to obtain an accurate measurement. The amygdaloids, however, were difficult to measure with accuracy, and fault began to be found with the fathom system as these lodes were more opened up. A great deal of averaging of dimensions was necessary, and the men complained that they did not get fair measurements from the captain. Especially was this true in measuring up to the end of an irregular stope. The custom was therefore gradually done away with, in some of the mines quite a while ago, in others within the last two years.

At present, on the amygdaloid lodes of the Calumet & Hecla mines, measurement is made by the ton. The railroad cars into which the rock is delivered after being broken are weighed, and this weight is divided by the number of underground tram cars, corresponding to the weighed quantity of ore, so that, after a little experience, it is not difficult to obtain the average weight of a tram-car full of ore. This is probably a relatively accurate way of measuring.

Under the fathom system, the miner's supplies were usually charged up to him, although not always. It was thought the men would be more economical in their use of explosives and would lose less steel if they had to pay for it. Under the present system, supplies are not charged. At present, the only charges against the miner's pay are an assignment of his wages or a garnishee from a creditor. Collections for groceries or clothing or similar supplies are not made in that way. In case of a dispute between the mining captain doing the measurement and the miner under contract, the case can be carried to the captain next in authority, and frequently is so, the captain acting as arbitrator.

*From a report of the hearings before the Congressional Committee investigating the recent strike in the Copper Country. Testimony given by Mr. MacNaughton.

In case a man quits his contract at the end of a month, or at any other time, and notifies the management, extra trammers are put in in order to clean out his stope and thus make possible an exact measurement of the contract. If the miner quits without notice and leaves the company's service entirely, he is asked to wait for a settlement until the broken material can be removed and measured; if he is unwilling to do this, he is taken to the stope and a measurement made which is usually satisfactory both to the man and the mining captain, settlement being made on that basis. If the man merely quits his contract and stays with the company, the broken material is trammed out in the regular course of affairs and kept track of, and the miner is paid when the tramping is completed.

Men called "stemmers" have been maintained by the company to take the place of contract miners who might be kept from work or remained home. These substitutes in some of the company mines were paid at straight rates on company account and this charged up to the contractor, and in other mines it was arranged that they should participate in the contract for the shifts put in. These general-utility men would put in about two-thirds of their time substituting for contractors. When not so substituting, they were employed in other ways in the mine.

The contracts originally were let for a period of three months. The reason for this was that a man taking a new contract might have to cut out the bottom of the stope and did not have a chance to make a fair wage the first month; therefore did not want to be paid only what he had earned. He was given an advance on the first month, therefore, which was deducted from the subsequent months' earnings. The effect of this long contract was to average up conditions, good, bad and indifferent, throughout the stope. This fact that the contractor did not receive so much on his second and third months' work as he thought he had earned, led to a good deal of complaint. He would draw so much as an advance after the first month as to leave little on the remaining months. This was particularly true when he worked slowly. For that reason, the three months' contract was gradually eliminated and one for two months was given; and the tendency lately has been to reduce this to one month. The men now get quicker settlements and know better where they stand.

There was complaint made to the committee by the men that a successful contractor would often be cut down when his contract came to be continued; that is, a man who had earned a good deal on a contract would not be allowed to do the same again. Mr. MacNaughton stated emphatically that this was not the policy of the company, and that if it occurred, it was to be charged against individual mine captains who acted without the authority of the management. In fact, the policy of the company was to encourage high earnings and industry on the part of the men, since the man making a large tonnage was more economical to the company. There is only room for a certain amount of stoping and a certain number of men in a mine. Since the overhead or fixed charges remain constant, it is obviously economical to have each of these men produce as large a tonnage as possible. It was admitted that there might be cases where a captain in fixing the price for a contract made it too high or too low and readjusted this when it came time for renewal.

In the amygdaloid mines especially, there is in force a bonus system on stoping work. It has there been ascertained by experience what an average miner or pair of miners will be able to get out in a certain length of time. The base for two men using a one-man drill is 600 to 900 tons per month. If, for any reason not their own fault, the men fail to get this tonnage, they are still paid their rate of \$3.25 a day. If, however, they fail to get this tonnage on account of loafing or for some other reason attributable to themselves, the mining captain is privileged to reduce their pay to \$3 a day. This is the only discretionary power he has in the matter, and this is subject to review by his immediate superior. If, however, the men get over their 900 tons, they are paid at so much a ton, and this amount is added to their day's pay of \$3.25. It is common experience for men to get 1400, 1500 and 1600 tons a month. If the bonus pay in this case were 10c. per ton, which is a common figure, each of the men would then make \$30 apiece over his day's wages. In a normal 24-day month at \$3.25 a day, each would make \$78, and the bonus on the difference between 600 tons and the 1500 which they might get, would bring their total earnings up to \$108 each. If the contractor loafed habitually for some time, it would be indicated to him that he had better look somewhere else for a job.

Even before the bonus system was in force, the terms of the contract were not rigidly adhered to. It was common practice then, as it was put, "to make up a pay" for a man who, because of hard conditions, failed to make a fair wage under the terms of his contract. At that time, contracts were frequently padded up to \$2.75 and \$3 per day.

Power to Lease Company's Property

BY A. L. H. STREET

Recognizing that control of a mining corporation's affairs is vested in its board of directors, the Arizona Supreme Court has just handed down a decision in the case of Franklin vs. Havalena Mining Co., 141 *Pacific Reporter*, 727, holding that a lease of such a company's property made by the president, secretary and general manager without authority from the directors is invalid. And the court goes further by saying that even a majority of the stockholders could not validly ratify a lease and sale of the property at much less than its actual value to the prejudice of minority stockholders.

New Basis of Mine Accident-Rate Computation in Quebec

The 1913 report on mining operations of the Department of Colonization, Mines and Fisheries of the Province of Quebec lists the fatal and nonfatal accidents occurring during the year, and states the figures are now so collected that the rates are calculable to the 300-day basis. This is the basis of calculation recommended and largely followed by the U. S. Bureau of Mines.

On this basis the death rate for the year in mines, clay pits and quarries was 1.86 per 1000 men employed. In the mines proper, asbestos, copper, graphite, mica, etc., the rate was 3.19 per 1000 employed.

Details of Practical Mining

One-Man Hand Ambulance

By A. H. SAWYER*

At the Rainmond mine of the Republic Iron & Steel Co., in the Birmingham district, Ala., an ambulance particularly adapted to quick service, has been recently put into use.

The accompanying photographs show the construction and operation of the ambulance. It consists of four ordinary 28-in. bicycle wheels and front forks, rigidly fastened together with a 1-in. pipe frame, the front wheels being provided with a steering lever. It has a 59½-in. wheel base, 22½-in. tread, is 36 in. high and weighs only 91 lb. A canvas stretcher of the common type is set on top of the ambulance frame, the hand-holes on the sides easily slipping over the extended posts on the frame and thus preventing any movement of the stretcher after it has been once placed in position.

When a man is injured in the mine, he is placed on a stretcher, which is then suspended in the 10-ton ore skip

they are strong enough to permit the removal of the ore after the stope has been carried to the top of the orebody or to the level above. This work is in progress at present in the Lowell mine and promises to show a material reduction in cost, as compared to square setting in the same character of ground. Practically no timber is necessary, and as the ore is kept close to the back, the men work under relatively safe conditions. Care must always be taken that the men bar down and make safe the backs before commencing drilling operations. One disadvantage in the shrinkage system is that should bars of waste occur in the orebody, the waste must necessarily be mined and there is a danger of its becoming mixed with the

Two Rand Automatic Electric-Hoist Controllers

Two controlling devices for electric mine hoists have been attracting attention on the Rand. One, the Philip's, is designed to sound a warning when the shaft convey-



THE FRAME OF THE AMBULANCE



LIFTING A PATIENT IN STRETCHER TO AMBULANCE FRAME

in a horizontal position by light chains hung from the front and rear of the skip. On reaching the surface the stretcher is lifted out of the skip and set on the ambulance, which one man easily steers and pushes to the emergency hospital.

Shrinkage Stopping at Bisbee†

Up to this time, only one place in the Copper Queen mine has been found where, it seemed practicable, to develop a shrinkage stope. This is on the 1100 level of the Lowell mine, upon an orebody approximately 100 ft. long and about 50 ft. wide.

In order to use the shrinkage system successfully, the surrounding character of the walls must first be ascertained, and it must be demonstrated beyond a doubt that

ance becomes subject to dangerous conditions. The other, the Lindberg, actually shuts off power and applies the brakes when an overwind becomes imminent.

The Philip's would appear to be a rather elementary device, such as is applied to even the simplest hoists in this country. A small control switch, of the rotating-drum pattern, is installed on or under the engineer's platform and worked direct from his control lever. Mounted upon the indicator spindle at the back of the dial, is an insulated disk carrying a contact piece, which engages with two spring contact-fingers fixed in any predetermined position to give a warning signal when required. The signal usually used is an electric "hooter," in order that it may be clearly distinguishable from the ordinary bell signals. The apparatus can be worked from any low-voltage system available, such as signal batteries or lighting circuit.

When the skip or cage is in the danger zone, which

*Mining engineer, 412 American Trust Building, Birmingham, Ala.

†From A. I. M. E. "Bulletin," August, 1914.

may be taken as extending from a point a few feet below the collar of the shaft up to the dump, the brass contact on the insulated disk is making contact with the two fingers mentioned. When the engineer's lever is not in the neutral position, but is in such a position as would move the skip or cage upwards, the circuit is completed and the warning signal sounded. The warning is thus given:

(1) When the hoist is standing with the conveyance at the surface or in the dump if the engineer merely moves his lever in the wrong direction, so as to hoist when he should lower.

(2) When the engineer brings his vehicle up past a pre-determined point below the collar of the shaft, without shutting power off.

The Lindberg device automatically shuts the power off and applies the brakes if the conveyance is brought up to a pre-determined point, either above the collar of the shaft when hoisting men or above the dumping point when hoisting ore. To make the device work for either men or ore, a hand controller has to be moved by the engineer according to the signals given from below.

The Lindberg device will not give any warning to the engineer if he should put his lever in the wrong direction until the skip has actually moved, when power is cut off and the brakes applied.

The operation of the apparatus is as follows: Plungers are fixed at given points on the headframe and are electrically connected in series with the main switch. The brakes of the hoist are held in the off position by magnets all controlled by the same main switch. If the wheel of the shaft conveyance strikes any of these plungers it opens the auxiliary circuit holding the main switch in position, breaks the main current and operates the brakes so that the skip or cage comes to a standstill.

The device is electrically controlled by a three-way switch on the engineer's platform marked "Ore," "Men"

The "Men" plungers are placed about 3 ft. above the ordinary level at which men enter and leave the cage, so that should the driver inadvertently start his engine in the wrong direction or attempt to go too high, the engine is brought to a standstill before any damage can be done.

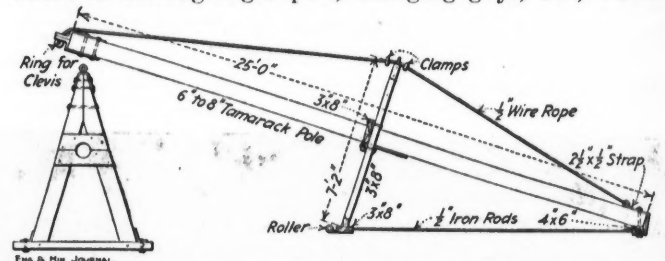
The "Off" position is used when an overwind has taken place; it cuts out the electrical connections on the headframe, allows the main switch to be replaced, and permits the skip to be lowered to its normal position. When in this position a bell is continuously rung, warning the driver that neither device is in action.

As the apparatus is permanently fixed in such a manner that it is impossible for the skip to pass without operating it, it is not affected in any way by the slipping of ropes or by faulty indicators.

Raising Trestle without Gin Pole

BY R. B. WALLACE*

The apparatus here shown was devised to facilitate the erection of a stockpile trestle, by eliminating the operations of moving a gin pole, changing guys, etc., which



MOVABLE TRUSSED POLE FOR RAISING TRESTLE BENTS

consume much time. It consists of a sound tamarack pole 6 or 8 in. in diameter, supported by an A-frame



RAISING THE BENT



THE BENT IN PLACE

and "Off." When the switch is in the "Ore" position the plungers for the dumping position of the skip are automatically thrown forward in order that engagement may take place with the skip wheel in the event of the skip's going up too far. In this position the plungers for the "Men" position are depressed so that no engagement with the wheels can take place. When the switch is in the "Men" position the reverse takes place.

at the center and trussed by a 1/2-in. wire rope attached to both ends and passing over the top of the frame. The base of the frame and the cross-piece at the lower end of the pole are connected by two 1/2-in. rods. A roller made of wood with both ends incased in pipe is attached to the base of the frame and in front of it, so that by raising up the lower end of the pole, the whole apparatus can be

*Mining engineer, Republic, Mich.

easily rolled out to the end of a trestle. With the lower end of the pole lashed to the rails or to a stringer, it is ready for use in hauling up a bent.

After the bent is hauled up, it is held by guy lines while the stringers are raised and fastened in place. Then the frame is rolled out to the new end of the trestle, and is made fast, ready for the next bent. The photographs show the frame in use at the Republic mine where the rock-pile trestle is being extended into the lake in the winter time. An electric winch is used for power.

Double Skip-Changing Carriage

By WILLIAM HAMBLEY* AND ALBERT E. HALL†

One of the most frequent time losses in hoisting, is that due to changing skips for one reason or another,

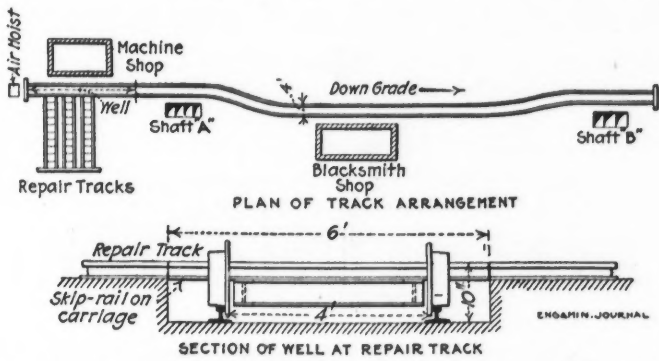


FIG. 1. PLAN OF SURFACE ARRANGEMENTS AND REPAIR WELL

cradle to span the top of the shaft is slow and uneconomical. A time-saving device for this operation is shown in the accompanying drawings. It is a carriage designed to hold two skips, the dimensions given being subject to alteration as the case demands.

In the installation considered, there are two shafts connected by a track, which also runs to the blacksmith shop, the machine shop and the repair yard, Fig. 1. The skip carriage is designed to run on this track, as is also a car to carry drill steel from the blacksmith shop to the shafts. A small, stationary engine, operated by air, pulls the vehicles by means of a light cable. There are two points requiring care in laying the track: First, it must be placed far enough back from the shaft to allow the nose of the skip to clear the timbers supporting the shaft guard-rails; the nose of the skip will, of course, project some distance over the skip carriage if the shaft is inclined. Second, the track at the shaft should be laid flush with the ground to avoid the danger of anyone's tripping on it and plunging down the shaft. The carriage itself, Fig. 2, is made as low as possible, so that the center of gravity will be low, thus reducing the tendency for the carriage to tip up as a skip is loaded on it or taken off.

A skip in good condition is always kept on the carriage. When it is necessary to change skips, the carriage is run to the shaft, the skip is hoisted a short distance above the surface and the spanning rails thrown across the shaft. The skip is lowered and run on the empty half of the carriage. The carriage is then advanced a few feet, the new skip run off and connected to the rope. This opera-

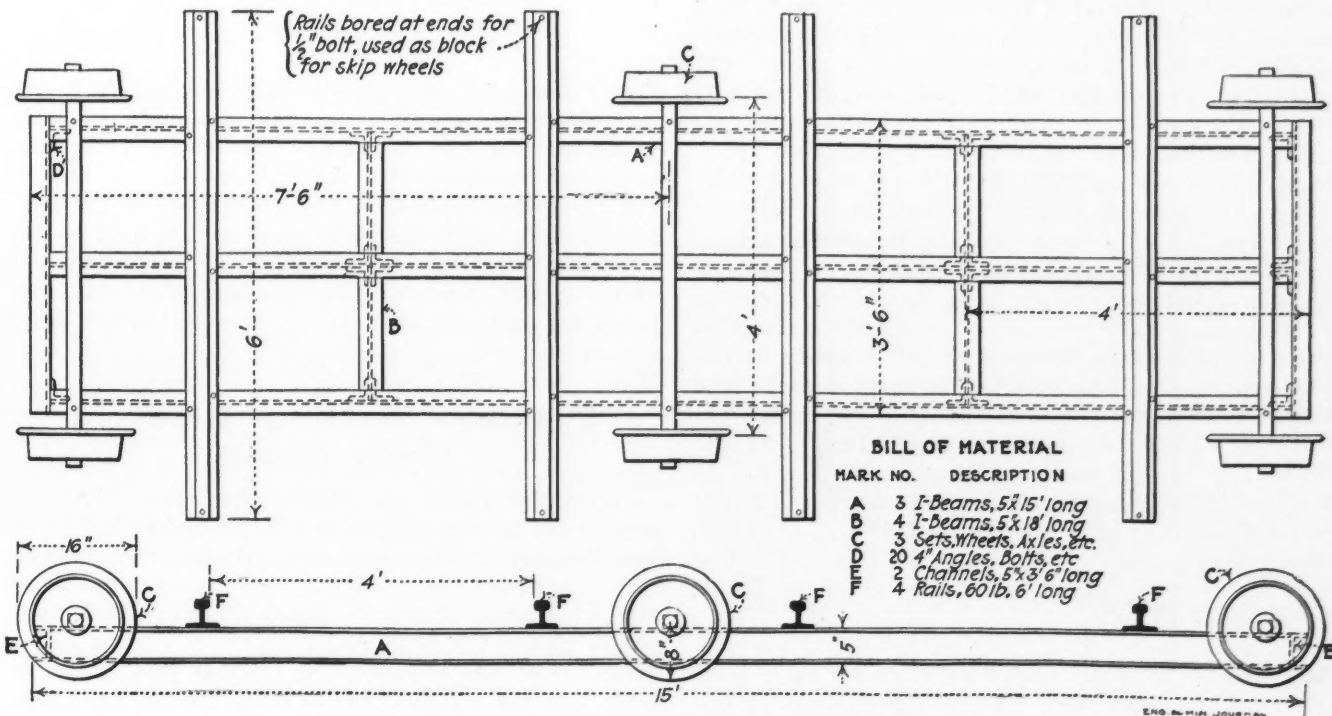


FIG. 2. DESIGN OF THE DOUBLE CARRIAGE

often for repairs to the skip in use. The operation of changing a heavy skip without any device other than a

tion takes but a short time and is much easier than the old method, requiring eight or ten men with bars. When the skips have been changed, the carriage is run to the repair yard, the old skip unloaded and a new one put on ready for another emergency.

*Superintendent, No. 2 Mine, Canadian Copper Co.
 †Mining engineer, Creighton Mine, Canadian Copper Co., Creighton Mine, Ont., Can.

Safety Devices for Electric Hoists

The Penn Iron Mining Co., of Vulean, Mich., operates a series of electric hoists at its various shafts. An ingenious system of safety devices has been worked out and is described in the February *Bulletin* of the A. I. M. E., as well as in the Report of the First Coöperative Safety Congress held in Milwaukee, Sept. 30, 1912. The de-

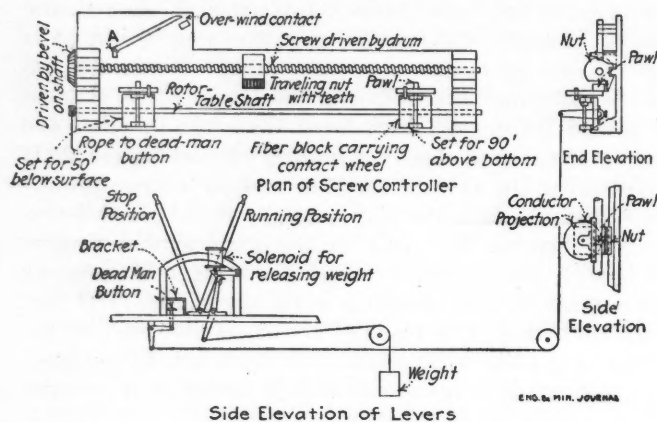


FIG. 1. THE DISTANCE LIMIT DEVICES

vices prevent overwinds, excessive hoisting speeds and dropping of the shaft vehicle on the bottom.

The hoists are equipped with Lane friction clutches thrown in by oil-operated cylinders and released by weights. The band brake is similarly operated. If the oil pressure be lost, the clutch releases and the brake sets automatically. The oil is kept under air pressure by a pump in the basement, and is admitted to the brake cylinders or released by means of a three-way valve. The hand lever operating this valve is connected differentially to the brake lever, so that the brake follows the operator's hand. The use of oil under pressure, as against air or steam, results in a smooth action of the clutch and brake.

By referring to Fig. 1, it will be seen that a weight is kept suspended by a catch engaging the end of a lever and connected to a vertical rod through a solenoid. If the solenoid becomes live and pulls the rod up, the catch is lifted, the weight released and the brake and clutch levers pulled into the stop position. The safety devices then consist of making electrical contacts so as to send current through the solenoid. Contacts are made: (1) To prevent an overwind under all conditions; (2) and (3) to stop at a point 50 ft. below the surface and 90 ft. above the bottom, unless the engineer purposely throws the mechanism out of action and keeps it so; (4) to stop when a certain speed is attained in all cases. The first three contacts are made by the device shown in Fig. 1, the last by that of Fig. 2.

The device for stopping the hoist in the various positions consists of a horizontal screw driven by a bevel gear from the drum shaft. A heavy nut travels on this screw, its position corresponding to the position of the shaft conveyance. Thus, when it reaches the point A, the conveyance having reached the surface, the lever is thrown to make the overwind contact, the current sent through the solenoid, the bar and catch lifted, the weight released, the levers thrown to the stop position and the hoist stopped.

The nut is cut away on one side and equipped with

teeth as shown. Two contact wheels carried by fiber blocks are set on a shaft alongside the screw at points corresponding to positions of the shaft conveyance 50 ft. below surface and 90 ft. above bottom. The teeth of the nut, on passing either of these points, catch a pawl extending downward from the lower part of the wheel and revolve the wheel slightly, so that a projection on its periphery makes contact with a stationary conductor and actuates the solenoid. The pawl of one wheel is beveled in one direction, that of the other in the opposite, so that in hoisting, the pawl on the 90-ft.-point wheel is not caught and similarly in lowering that on the 50-ft.-point wheel.

The fiber blocks carrying the contact wheels are mounted on a shaft, which can be rotated by a rope to the engineer's platform. A "dead man" button in the platform depresses a bell crank and pulls the rope as shown. The engineer's foot must be on the button to keep the

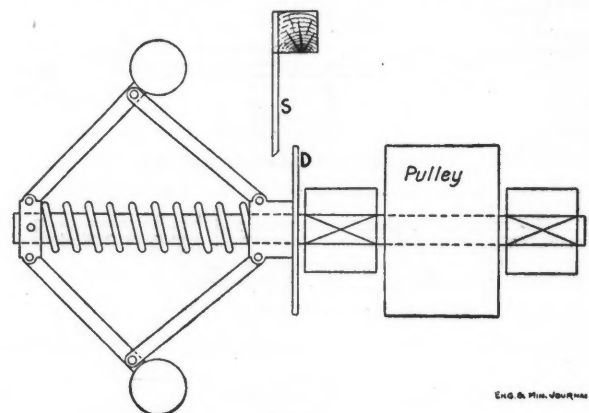


FIG. 2. THE SPEED CONTROLLER

stops out of action and is customarily so when he knows that everything is all right. If he should die suddenly or lose control on account of any other disability, the safety devices automatically come into action. A bracket over the button prevents its being held down by the engineers pulling on it, should he faint or have a fit or die.

The speed control is shown in Fig. 2. It consists of a simple fly-ball governor driven by a belt. When the speed passes a predetermined point, the points D and S make contact and actuate the solenoid.

Primary Battery Electric Mine Lamp

In an abstract by the *Mining Journal* of the compendium of mining practice in 1913, issued by the Prussian Minister for Commerce and Industry, a nonstorage-battery mine lamp is described. It is known as the Mann type and showed up well in some trials at the Hildesheim potash mine.

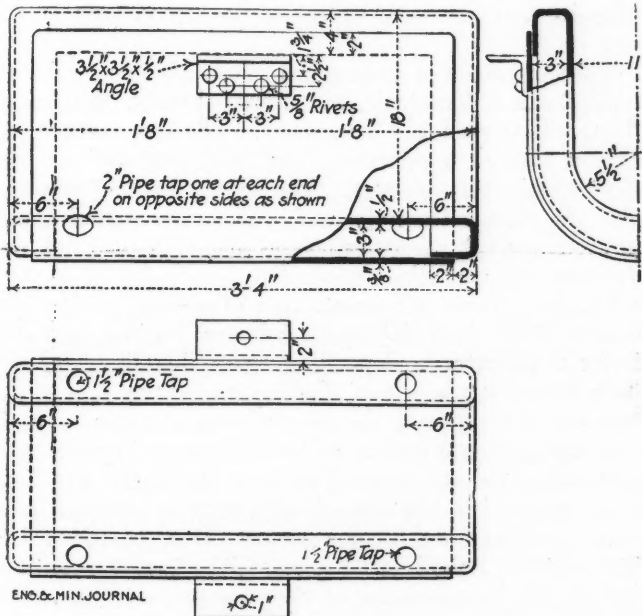
One great advantage of this lamp is that it can be filled in a few minutes, and is ready for use practically at any time.

This would apparently make it especially suitable for rescue work. Its light is distinguished by uniformity and steadiness. The element is a Bunsen element of zinc and carbon. The electrolyte consists of bichromate of sodium with a small quantity of sulphate of mercury. The weight of the lamp is considerably less than that of the usual storage-battery types.

Details of Milling and Smelting

The Trough Spout

When water-jacketed spouts first came in vogue, they were made with a sloping bottom to trap the blast, following the construction of the old cast-iron water-cooled spouts used in Montana and Utah. The sloping water-jacketed spout has now been superseded to a great extent by the water-jacketed trough spout, particularly in the Southwestern smelting plants. The accompanying drawings show the trough spout used on the new furnace of the Detroit Copper Mining Co., at Morenci, Ariz. The inside plate is of 1/2-in. steel and the outside plate is 3/8 in. thick. There are pipe taps at each end on top of the spout and two washout connections on the bottom. These spouts have the advantage that either end may be fitted against the furnace breast and are much simpler to manu-



TROUGH SPOUT USED AT MORENCI, ARIZ.

facture. No nose piece is used with these spouts. The blast is trapped by making a clay dam at the end of the spout, and in emergency the dam may be torn away and the furnace connection freed much more readily than with the old spout which involved the tapping out of the furnace in case the blast was off for any considerable length of time.

Leaching Copper Products at the Steptoe Works*

A small copper-leaching annex is in operation at the Steptoe metallurgical plant, to treat dust from the roasting-furnace dust-chambers, together with siliceous oxidized ore. This leaching plant was designed to obviate smelting low-grade siliceous flue dust, which blankets the reverberatory charges.

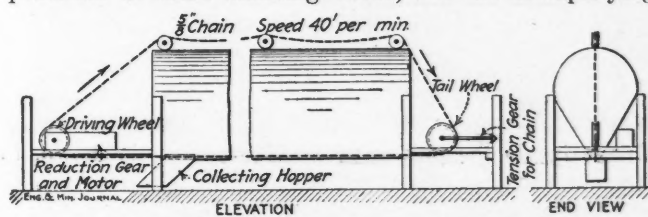
*Abstract of a paper by W. L. Austin, presented at the Salt Lake meeting of the A. I. M. E.

The flue dust carries about 2.56% water-soluble copper and 0.44% water-insoluble copper, with 19.94% free sulphuric acid. Sufficient acid can be obtained by mixing this material with water to provide a lixiviant for a local siliceous ore which carries 3.47% total and 3.23% acid-soluble copper. The copper is probably present as silicates.

The piles of flue dust are hydraulicked and the stream allowed to settle in tanks or behind dams. The clear solution is then drawn off to a wooden leaching tank fitted with a filter bottom, 40 ft. in diameter by 10 ft. deep, filled with 1/4-in. ore to a depth of 7 feet. If the filtrate from this ore-leaching tank contains much free acid it is pumped back and passed through the ore bed a second time. Otherwise it goes through a filter of the ore and thence over iron scrap. About 85% the acid is utilized in leaching the ore, and about 2 lb. of scrap iron is consumed per pound of copper recovered. The total cost is about 8c. per lb. of copper.

Collecting Flue Dust with Chain Conveyor

Erle Huntley, general manager of the Hampden Cloncurry Copper Mines, Ltd., described before the Institution of Mining and Metallurgy the method used for collecting flue dust at the copper-smelting works in North Queensland. The use of chain conveyors for delivering flue dust from the bottom of balloon flues has long been practiced at small smelting works, but the accompanying



DUST FLUE WITH CHAIN CONVEYOR

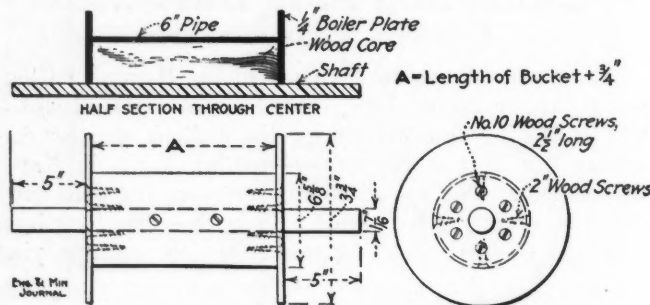
illustration of the Hampden Cloncurry arrangement may interest some readers. The gases from the company's smelting works in North Queensland pass through a preliminary collecting flue, 9 ft. high and 7 ft. wide, and a main settling flue, 27 ft. high and 18 ft. wide, where the increased area reduces the speed of the furnace gases to about 4 ft. per sec. No baffle-plates are used, as with this slow speed practically all the dust settles to the bottom of the flue, along which a 3/4-in. endless chain is drawn by means of a sprocket wheel operated by an electric motor. The chain is moved at a rate of about 40 ft. per min. but is only used for about six hours per day, or two hours per shift, delivering about 12 tons of flue dust, daily, into a collecting hopper. The dust is run through a pug-mill, together with fine kaolinized ore and about 20% of water, and while still wet is returned to the blast furnaces. Practically all the dust is used up in this way, notwithstanding that a fairly high blast, 30 to 40 oz., is maintained.

Excessive wear on the chain or flue bottom is avoided by having the tension side of the chain on the bottom. This prevents the full weight of the chain from bearing on the flue bottom. During 15 months' operation only one chain has been replaced, while the flue bottom showed no sign of wear. The return or slack side of the chain is run over small guide wheels outside and above the flue, and returns to a loose pulley at the other end. This return pulley runs in a guide connected to the frame of the flue by tension screws, so that by moving the loose pulley backwards and forwards, the correct tension can be kept on the chain. A continual stream of flue dust is delivered to the collecting hopper during the time that the chain is in operation, and, of course, dust could be delivered at a faster rate if the speed of the chain were increased.

Elevator Guide Idler

By T. SWIFT*

A cheap, flanged idler for light duty, such as guiding bucket-elevator belts may be constructed as is shown in the accompanying sketch. Standard pipe, in this case 6-in. diameter, is filled with well dried wood and is bored for a tight-fitting shaft; 1 1/4-in. boiler plate being cut to form the flanges as deep as may be needed. These are fastened to the wood-filled pipe with good-



GUIDE IDLER MADE OF PIPE WITH WOOD FILLING

sized wood-screws. It is also well to fasten the wood firmly inside the pipe with wood-screws, as is shown, to prevent the pipe from turning on the wood in case of shrinkage.

Emergency Crusher Drive

Due to the sudden failure of one of the crushers at the McKinley-Darragh mill at Cobalt, Ontario, a stock machine had to be ordered and installed in the shortest possible time. A 13x24-in. Buchanan Blake crusher was ordered by telegraph, and since this had no loose pulley, some means of driving it had to be devised. There was no time to order a clutch, which would have been costly besides, and no room for a countershaft. The difficulty was surmounted by adding a loose pulley on a short independent shaft in line with the crusher shaft, and belting the motor directly to it. After getting the motor up to speed, the power was applied to the crusher pulley by shifting the motor sideways on a set of I-beam rails, using a handwheel operating a pinion which engaged a rack on the under side of the motor base. The device was simple and cheap, and works satisfactorily.

*Mineville, N. Y.

Cooling Furnace Gases before Filtration

The cooling of furnace gases is an important factor in the operation of the baghouse system of filtration. Many efforts have been made to produce filtering fabrics which would withstand both heat and acidity, such as the use of asbestos, chemically treating cotton and wool, etc. These efforts are to some extent misdirected, says L. D. Anderson, in the July bulletin of the American Institute of Mining Engineers. Effectual filtering of gases cannot be accomplished until the gases are cooled sufficiently to get the fumes into a condition more nearly approximating what is considered solid matter, nor can the gases be so cold that condensation of moisture occurs to destroy the filtering fabrics. Any attempt to filter hot gases will be disappointing, resulting in visible clouds of smoke as the gases passing through the bag meet the outer air, become cooled, and precipitate the fumes which escape the bags in a fine state of division. As long as the gases are hot, the minute particles of fume seem to repel each other and exist in a sort of smoky cloud. Cooled, however, they tend to coalesce and thereby reach a state wherein they are easily retained in the meshes of the bag.

Three methods of cooling are commonly in use: by dilution with external air, by passing through thin metal flues, and by spraying with water. The first method has only a limited application, lest the quantity of gas handled become excessive. The second method is probably the most extensively used. The rate of heat transmission through sheet-steel plates about 1/8 in. thick under normal conditions appears to be about 0.02 to 0.04 B.t.u. per minute per square foot of cooling surface per degree Fahrenheit difference between interior and exterior temperatures, depending upon cleanliness of the flues, convection by winds, shading from direct rays of the sun, etc. In computing the required area of a flue for cooling, it is not sufficient to assume the mean interior temperature as the arithmetical mean of the initial and final temperatures, for the drop in temperature proceeds more slowly as the gases become cooler. If t_1 be the initial temperature of the interior gases, t_2 the final temperature and t_x the temperature of the external air, the mean temperature difference θ_m between inside and outside will be

$$\theta_m = \frac{t_1 - t_2}{\log \frac{t_x - t_2}{t_x - t_1}}$$

In the use of sheet-metal flues it has been found by experiment that the cooling within certain limits, is proportional to the square root of the velocity. For this reason it is advisable to keep the velocity high in such flues, which also tends to avoid too heavy a deposition of the heat-insulating dust.

Cooling by water sprays has been used to some extent and will undoubtedly be extended now that efficient atomizing nozzles are obtainable. Care must be used, however, that too much water be not used and the saturation point of the gases be not too closely approached, as any dampness of bags is fatal to their life. It is an interesting fact that by full utilization of the latent heat of evaporation gases can be cooled by warm water below the temperature of the water itself.

Company Reports

Alaska Treadwell

The 1913 report of the Alaska Treadwell Gold Mining Co., Douglas Island, Alaska, shows a net operating profit for the year of \$1,223,438 from 886,057 tons of ore, yielding an average of \$2.6617, or a total of \$2,358,423, and miscellaneous profits of \$62,592. This profit is exclusive of depreciation of property and plant charged off, amounting to \$400,207. Dividends amounting to \$1,000,000 were paid. The following table gives details of costs under the main headings of expenses:

	Per ton milled
Mining	\$0.8271
Milling	0.2476
Sulphuret expense.....	0.0880
Offices	0.0207
Legal expense	0.0053
Taxes	0.0098
Bullion charges	0.0113
Total operating charges.....	\$1.2098
Construction	0.0435
Sundry losses, boarding houses, etc.....	0.0982
Total	\$1.3515
Operating profit per ton ore.....	1.3808
Total	\$2.7323
Less miscellaneous profits.....	0.0706
Actual yield per ton ore.....	\$2.6617

Depreciation of about 45c. per ton of ore is not included in these charges.

Development work totaled 5980 ft. and 707,477 tons of ore came from stopes. The average cost of development work was \$13.799 per ft.; stoping per ton of ore stoped, 63.8c.; tramping per ton of ore tramped, 11.5c.; hoisting per ton of ore hoisted, 9.9c., and pumping per ton of ore milled, 10c. The total mining costs consisted of: Labor, 41.2c.; supplies, 24.1c.; subsidiary accounts, 17.4c.; total, 82.7c. per ton milled. The central shaft was sunk 330 ft. through waste, giving it a total depth of 2271 ft. Ore reserves are estimated to contain 6,093,308 tons, averaging \$2.67 per ton, of this amount 1,114,549 tons are broken in stopes.

In the 240-stamp mill, 1 lb. of chrome steel in the shoes crushed 2.92 tons of ore, and in the 300-stamp mill 2.72 tons. In the 250-stamp mill, 1 lb. of iron in the dies crushed 5.14 tons of ore, and in the 300-stamp mill 4.75 tons. There were 3815 samples taken from the mines and 5928 from the mills. This is equivalent to 1 sample at the mine for every 232 tons of ore, 1 sample at the mills for every 149 tons of ore, or a total of 1 sample at the mines and mills for every 91 tons of ore treated. The average number of men employed per day during the year was 719, and the average wage was \$3.51 per day. According to this, about 1230 tons are mined and milled per year per man employed.

Mention is made in the report of the efficiency of the fire department of the company. At 2:55 a.m., on the morning of Oct. 11, a fire was discovered in the headframe and crusher house at the No. 2 shaft. On account of No. 2 being an up-cast shaft, the entire building was in flames in a few seconds. Within two minutes after the alarm the department had two streams of water playing on the fire from the stationary giants and within 10 min. the

contents of 11 streams of water through 2½-in. hose under 200 lb. pressure were brought to bear on the fire. The framing sheds and compressor building, which form a part of the headframe, were saved.

Seoul Mining Co.

The table given herewith is a four-year record of the Seoul Mining Co., Hwang-Hai Province, Chosen. The company was incorporated in Connecticut in 1908 and has an authorized capital of 20,000 shares of \$25 each. The company owns a lease on the Suan concession which it secured from the Korean syndicate for the payment of a 20% stock interest in the company and an 8% royalty based on the actual profits derived from the concession, which embraces an area of about 260 sq.mi.



SEOUL MINING CO.'S REDUCTION WORKS

Within this area the company has the right to stake as many mineral claims as it pleases until the end of Jan., 1916. After this date all areas retained by the company are subject to an annual tax of about 30c. per acre. There is also an additional tax in the form of a 1% royalty on the gross value of the output. The concession includes a granite-limestone contact roughly in the shape of an oval 8x6 miles or about 20 miles of contact. The Suan mine is situated on this contact, at Holkol, formerly a small Korean village but now a place of considerable importance owing to the opening of the mines.

The mine is at the head of a narrow gorge about one mile from the main valley. It is entered by means of an adit level which is about 200 ft. below the highest workings, an incline shaft has also been sunk from this adit to a depth of about 400 ft. and levels opened at intervals of 100 ft. The greater part of the gold is recovered by amalgamation, and the remaining contents by concentration. The concentrates are shipped to England for treatment.

POSITION OF COMPANY AT END OF YEAR				
	1910	1911	1912	1913
Mining and milling:				
Ore treated, tons.....	33,500	70,229	74,489	71,535
Gross recovery from ore	368,405	551,470	620,055	671,879
Mineral yield per ton.....	10.98	7.85	8.25	9.39
Operating costs per ton.....	4.58	3.01	3.52	4.12
Operating profit per ton	6.40	4.84	4.73	5.27
Ore reserves, tons.....	190,100	211,400	421,310	633,338
Ore reserves, value.....	\$3,353,400	\$3,499,000	\$6,082,530	\$7,642,296
Number of stamps operated	20	40	40	40
Financial record:				
Net profits	\$122,082	\$242,581	\$287,088	\$289,595
Dividends	100,000	200,000	200,000	215,000
Depreciation written off		20,000	20,000	20,000
Cash on hand and in bank	67,156	104,507	79,701	307,168
Sundry creditors	30,317	68,395	58,475	53,641
Sundry debtors	1,545	4,619	37,259	1,294
Concentrates in transit	27,159	41,688	70,312	44,503
Supplies on hand.....	31,603	41,310	66,288	79,937
Royalty on land taxes	20,871	29,892	31,102	36,077
U. S. corporation tax.....	1,079	2,191	2,578	2,440
Mines and plant, book value	400,000	380,000	360,000	340,000
Issued stock	400,000	400,000	400,000	500,000

The following are items of mining and milling costs taken from the annual report for 1912:

	Per ton	Per ton	
Mining:		General expenses:	
Maintenance of mine employees	\$0.08	Management and office	\$0.16
Mining supplies.....	0.65	President and secretary	0.09
Mining assays.....	0.02	Agency expense.....	0.09
Mining payrolls.....	0.93	Prepaid insurance.....	0.02
Total mining costs.....	\$1.68	Freight and transportation	0.02
Ore transportation to mill	0.04	Messengers and police	0.04
Milling:		Live stock.....	0.03
Maintenance of mill employees	0.03	Surveying	0.03
Mill fuel and supplies	0.43	Hospital	0.10
Mill assays.....	0.02	Unclassified expense.....	0.01
Mill payrolls.....	0.26	General repairs.....	0.01
Total milling costs.....	\$0.74	Other expenses.....	0.16
Concentrate expense.....	0.31	Total mining and milling	\$3.52

Alaska Gold Mines

The 1913 report of the Alaska Gold Mines Co., Juneau, Alaska, shows that it now owns \$3,267,500 par value of Alaska Gastineau Mining Co. bonds out of a total issue of \$3,500,000 and \$11,299,845 par value of its stock out of a total issue of \$12,000,000. This is the operating company of the Alaska Gold Mines Co. The Alaska Gold Mines Co. has a capitalization of 750,000 shares of \$10 each, all of which is issued. The balance sheet shows \$1,740,750 cash on hand at the end of 1913. Development and construction were continued throughout the year. The Sheep Creek tunnel was advanced 6431 ft. during the year. At the time the report was written, Apr. 1, 1914, this tunnel had been driven its full length of 10,000 ft. and connected with the bottom of the Perseverance shaft. The average rate of advance during 1913 was 536 ft. per month, but in some months over 600 ft. was driven. The height of the vein measured on its dip above the Sheep Creek tunnel and for the length of the zone developed on the No. 10 level is nearly 2000 ft., and the length of the zone so developed is about 5000 ft. The thickness of the main vein used for estimating tonnages is 70 ft. A solid block of ore with these dimensions would contain more than 50,000,-

000 tons. It is not claimed that an orebody of this size has been fully developed, but it is claimed that underground work, sampling, drilling, etc., indicates a uniformly increased thickness of commercially valuable orebodies as compared with that used in previous estimates. A new orebody has also been opened to the north of the main Perseverance vein on No. 5 level. At the time of writing the report this development had extended for several hundred feet and showing a thickness well over 100 ft. No. 2 vein developed by the Alexander tunnel has been prospected for a length of over 600 ft.; its thickness is over 100 ft. and several hundred tons taken from across the full width and put through the test mill gave a gross value of about \$1.60 per ton. Parts of the vein on No. 5 level average about \$3 per ton and on No. 10 level, well in excess of \$2 per ton. Total development work totaled 22,137 ft. for the year. A new compressor plant including two 3000-cu.ft. electrically driven compressors was started. One of these compressors has been installed. All other surface improvements of consequence required at the mine have been completed.

The Salmon Creek water power contemplates a continuous year-round production of 6000 electric horsepower. In order to get the maximum benefit from the total amount of water available it is necessary to build two power plants. A concrete dam 165 ft. high and 700 ft. long is being constructed which will make a reservoir for storage of flood waters in summer to be used during water shortage in winter. One of these plants is located about a mile from this dam and operated under a 600-ft. head. The water discharged from this plant, together with other drainage water collected from a lower area, is conveyed through a flume for about 10,000 ft. and is to be used under a 500-ft. head at the second plant which will be situated on the shore of Gastineau Channel. Preparations are also being made to install a 2000-hp. plant on Granite Creek.

Construction on the 6000-ton mill is under way. Practically all grading has been completed. The concrete foundations for the crushing plant have been completed. Steel for this plant is on the ground and shipments of steel for the concentrating plant have begun. The railroad from the mine to the mill is nearing completion and living quarters for men, wharves, roads, storehouses, shops, etc., have been completed.

Tonopah Extension Mining Co.

The report of the Tonopah Extension Mining Co., Tonopah, Nev., for the year ended March 31, 1914, shows that 58,022 dry tons of ore were mined and milled, the average content being 14.86 oz. silver and 0.156 oz. gold per ton. The average price received for silver was \$0.59041 per oz., and for gold, \$20.6718.

Receipts from sale of bullion were \$615,780; marketing costs, \$11,043; mining cost, \$335,585, and milling cost, \$172,873, leaving an excess of \$96,279. Adding to this the miscellaneous income amounting to \$1560 gives a total of \$97,839. After setting aside \$17,440 as depreciation reserve, the net realization is \$80,399.

Gross value of the ore milled was \$12.008 per ton. Costs were, for mining, \$5.784; milling, \$2.979; metal losses in milling, \$1.395; marketing, \$0.19; total, \$10.348. This leaves a per ton profit of \$1.660. Development amounted to a total of 16,091 ft. in drifts, crosscuts, winzes, raises and shaft.

Operations of the Marysville Dredging Co.

By W. H. WRIGHT*

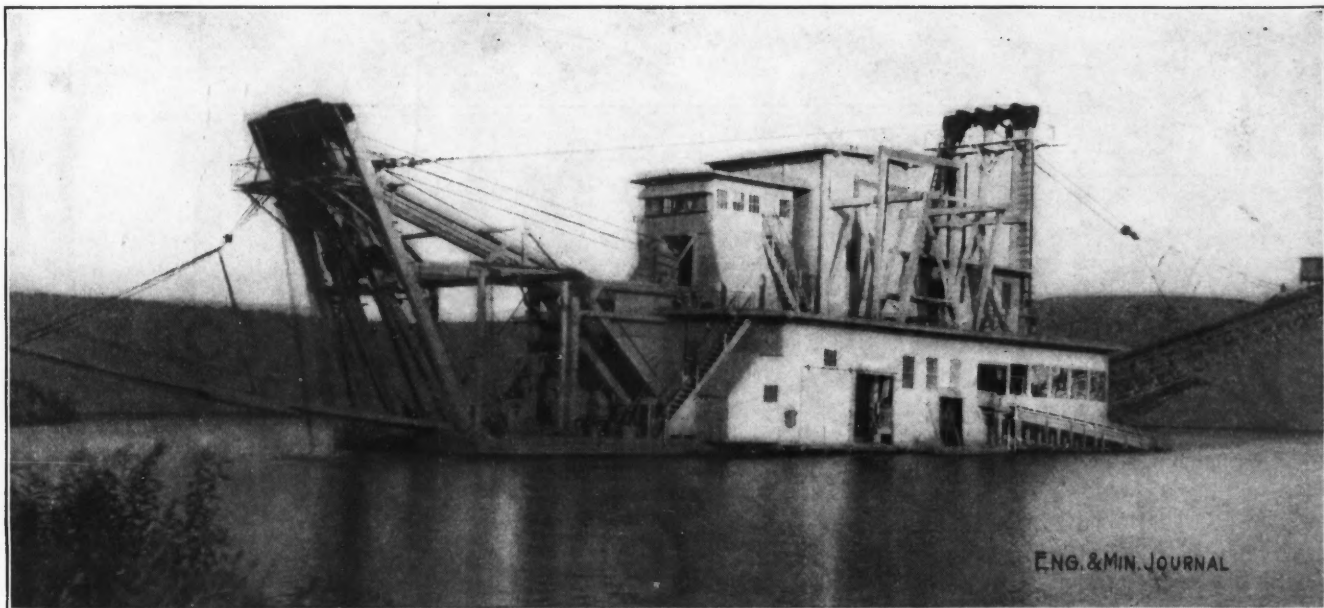
SYNOPSIS—A review of the work of a California dredging company digging deep gravel. Its later dredges have the winchroom over the well-hole, giving the winchman a view of the bucket line, hopper and stacker; the buckets have corners more rounded than in earlier dredges, as it was found that the high corners typical of the early California practice were not required in the Marigold field.

The Marysville Dredging Co.'s property adjoins that of the Yuba Consolidated Gold Fields in Yuba River basin, Calif., and up to June 1, 1914, the company had dredged an area of 207 acres of gravel, averaging 62 ft. deep. This represents a total of 20,705,520 cu.yd. of gravel dug in about nine years with two dredges. An area of 1092 acres remains to be dredged. Four dredges have been installed and operated. Two were dismantled,

in 1911, No. 4, a duplicate of No. 3, was finished. No. 1 and No. 2 had been dredging in conformity with the plans made for the government settling basin, and it was not always possible to operate in the most profitable manner. Both dredges were worn out on this work, and being of too small capacity for low-grade gravel, it was decided to dismantle them. No. 2 dredge was shut down on Feb. 1, 1910. No. 1 dredge, which had been giving better results than No. 2, was not shut down until Aug. 2, 1911, some time after No. 4 had been completed.

CHANGES IN LATER DREDGES

No. 3 and No. 4 dredges were designed and built by the Marysville Dredging Co. under the supervision of Robert E. Cranston. A number of improvements were introduced, and besides increasing the capacity of the buckets from 7.5 cu.ft. to 8.5 cu.ft., the boats were built



MARIGOLD DREDGE NO. 3, MARYSVILLE DREDGING CO.

The bucket line is almost down to its limit of 65 ft.

and two 9-cu.ft. bucket-elevator dredges are now operating.

Sacramento men first became interested in this ground, which has since been known as the Marigold field. Under the direction of Robert E. Cranston, considerable prospecting was done. The results induced the organization by San Francisco men of the Marysville Gold Dredging Co. This company in 1905 installed two 7.5-cu.ft. dredges. These were of the close-connected, single-lift, California type, and were built by the Marion Steam Shovel Co., of Marion, Ohio.

In 1906 the Marysville Gold Dredging Co. sold its interests to the Marysville Dredging Co., of which Bulkeley Wells is president and managing director. This company has operated steadily since that time. In 1909, dredge No. 3, an 8.5-cu.ft. boat, was constructed, and

much stronger than No. 1 and No. 2. About the time these new boats were in operation, T. D. Harris, of Telluride, Colo., became superintendent of operations. Mr. Harris has made a careful study of the field and of the mechanical operations of the boats. He has introduced a number of improvements, the chief feature of which has been in the type of bucket, which has not only been increased to 9 cu.ft. capacity, but the three-piece type of bucket has been entirely discarded and the two-piece type substituted. The corners of the buckets are more rounded and the projections on the corners, which were typical of most of the early dredge buckets in California, are no longer a part of the bucket design. There are some fields in California which require the extra digging strength of a high-cornered bucket. But in the Marigold field the high corner is not essential to the efficiency of the bucket.

*Mining engineer, 325 Clunie Building, San Francisco.

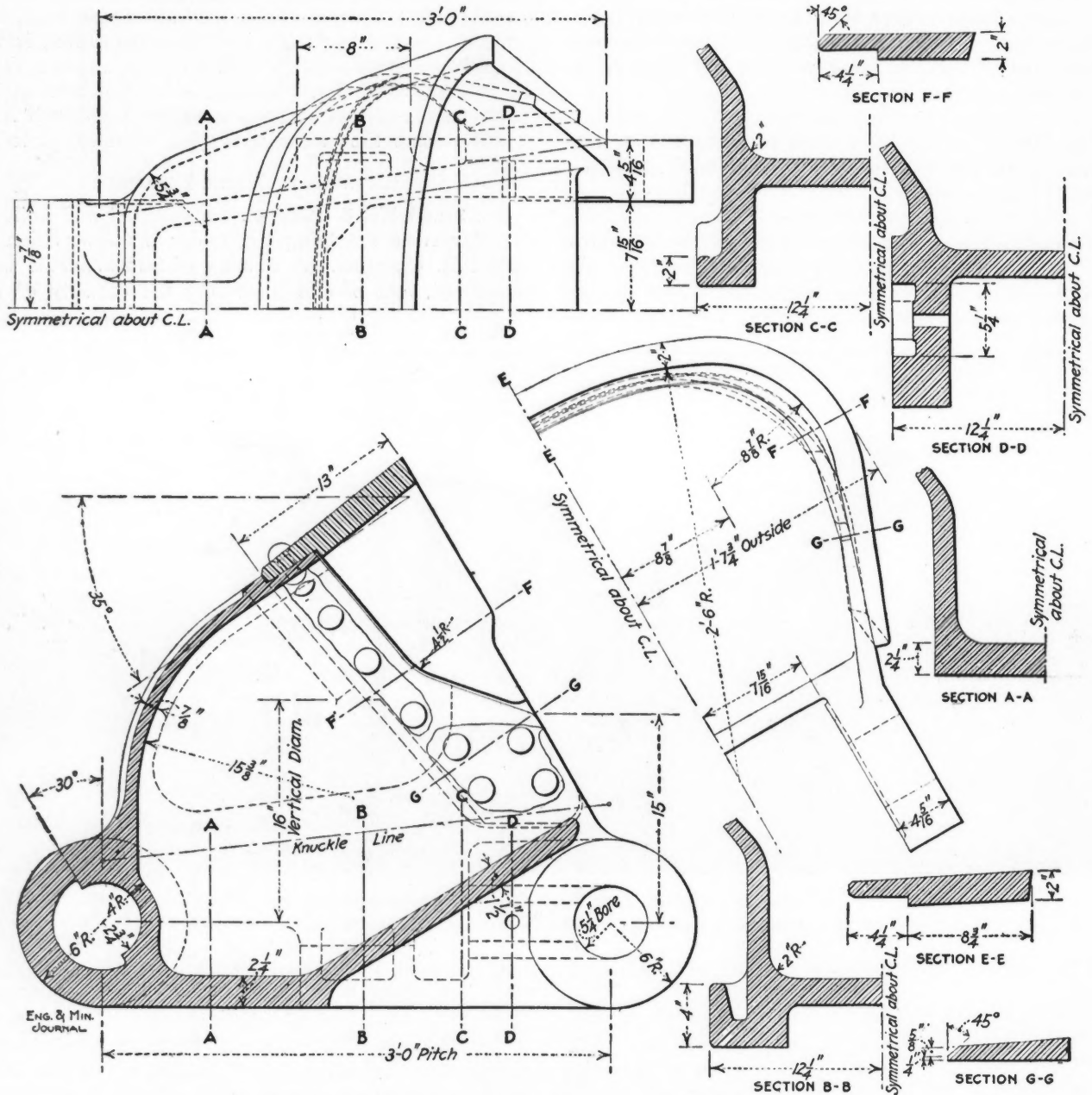
In the construction of these dredges, the designers departed from the customary style in placing the winch-room over the well-hole instead of on the side. This has much in its favor. The winchman has an unobstructed view of the bucket line and digging ladder, the upper tumbler and hopper, both spuds, stacker and conveyor belt and both bow swinging lines. One objection to this arrangement is that it does not permit the winchman much of a view of the main winch. This objection does not bear much weight as the deckman, or

once adjusted it cannot easily be changed without the knowledge of the dredgemaster.

As the dredges are alike in design and construction, the following description applies to both. The dredges can dig to a depth of 65 ft. below water line and to a height of 10 ft. above water line.

DETAILS OF CONSTRUCTION

The dimensions of the hull are as follows: Total displacement, 6 ft. 2 in.; length of hull, 115 ft.; width,



DREDGE-BUCKET DETAILS, MARYSVILLE DREDGING CO.

oilers look after the proper winding of the lines, while it is a great advantage for the winchman to be able to see when the stacker belt is stalled or the hopper is blocked.

An electro-magnet clutch is used on the bucket drive and on the main winch. It possesses the advantage of simplicity of operation, is positive, and will always slip at the same pull. The grip of the clutch is regulated by the amount of current passing through the coil. This

50 ft.; overhang on each side, 4 ft.; depth, 8 ft. 6 in.; length of well, 63 ft.; freeboard, 2 ft. 4 in.; thickness of side planking, 6 in.; thickness of bottom planking, 4 in.; height of bow gantry above deck, 37 ft.; height of main gantry, 22 ft.; height of stern gantry, 58 ft.; total amount of lumber in hull, housings, gantrys, decks, etc., 400,000 ft. b.m. The lumber used was Douglas fir.

The digging ladder is of the plate-girder type; weight, 94,000 lb.; length between centers, 115 ft.; extension

beyond bow, 38 ft. The stacker ladder is of the lattice-girder type; length, 139 ft.; weight, 24,000 lb.; width, 4 ft. 4 in.; width of conveyor belt, 32 in.; power on drive, 35 horsepower.

The buckets are of 9 cu.ft. capacity, cast in two pieces of manganese steel. The bucket line is close connected; number of buckets in line, 84; weight of each bucket complete, 2268 lb.; size of bucket pins, $5\frac{1}{4}$ by $2\frac{7}{8}$ in. The ladder rollers are of chrome steel and are 14 in. diameter, 17 being used.

The upper tumbler is six sided; size of shaft, 17 in.; span between bearings, 9 ft. $3\frac{3}{8}$ in.; weight of tumbler, shaft and plates complete, 21,310 lb. The lower tumbler is six sided, has a 12-in. shaft; weight, including shaft and plates, 12,758 pounds.

The ladder-hoist drums are 3 ft. 6 in. diameter. The maximum winding speed is 100 ft. per min. The lines are $1\frac{1}{8}$ -in. wire rope and travel over 42-in. sheaves. The main winch is driven by a 25-hp. motor. The maximum side-swing speed at the end of the digging ladder is 38 ft. per min.; the minimum being 11 ft. per min. The spuds are hoisted at the rate of 9 ft. 6 in. per min. The bucket drive is driven by a 200-hp. motor, giving a maximum speed of 3 r.p.m. to the tumbler shaft. The bull-wheels have a pitch diameter of 143.55 in., 10-in. face and weigh 10,200 lb. each. The spuds are of steel, center-web construction, having a cross section of $24 \times 36\frac{7}{8}$ in. They are 61 ft. long and weigh 36,000 lb. each.

The revolving screen is 36 ft. 3 in. long, 6 ft. diameter, driven by a 50-hp. motor at 8 r.p.m.; holes in screen plates, $\frac{1}{2}$ in. diameter; grade, 2 in. per ft. Total area of gold-saving tables is 2400 sq.ft.; the grade is $1\frac{3}{8}$ in. per ft. The riffles are constructed of $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{3}{8}$ -in. angle iron. The water for washing the gravel is furnished by a 10-in., 68-ft. head, high-pressure pump and also by a 12-in., 25-ft. head, low-pressure pump; both are centrifugal pumps made by Abner Doble Co., of San Francisco. The capacity of the pumps is 3200 gal. and 3800 gal., respectively; the high-pressure pump is driven by a 100-hp. motor and the low-pressure pump by a 35-hp. motor. A 2-in., 100-ft. head pump, driven by a 10-hp. motor, is used for priming the larger pumps and for fire protection.

The accompanying drawing shows one of the new 9-cu.ft. buckets used by the Marysville Dredging Co., which is typical of the later design in the California type of bucket.

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Wolverine Copper Mining Co.

Report of the operations of the Wolverine Copper Mining Co., Michigan, for the year ended June 30, 1914, shows a production of 3,435,459 lb. of copper. Price received was 14.09c. per lb., a total of \$484,061. All operating expenses were \$388,708, leaving a gross profit of \$95,353. Construction expense was \$3433, and strike expense \$10,844, leaving net profit of \$81,075.

Rock hoisted was 188,147 tons; stamped, 182,127 tons; yield of the rock was 18.86 lb. per ton, and the cost per ton of ore milled, \$1.92. Cost of refined copper at the mine was 9.85c. per lb., while with smelting, marketing and all costs, including strike expense, the cost was 11.72c. per lb. Drifting and shaft sinking amounted to 625 ft. Production at present is approximately 400 tons of mineral per month, yielding 74% copper.

Economical Ore Transportation

Mining in India seems to be generally governed by conditions, which make primitive and laborious methods of operation cheaper than modern machines and processes. At the Kolar Gold Fields, Mysore, ore transporta-



ORE TRANSPORTATION IN INDIA

tion by bullocks is cheaper than by the use of the aerial cableway. A cable system was installed to supplant natives and bullocks, but after a thorough trial was retired from service since it cost more than the former method.

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Flotation in Southeast Missouri

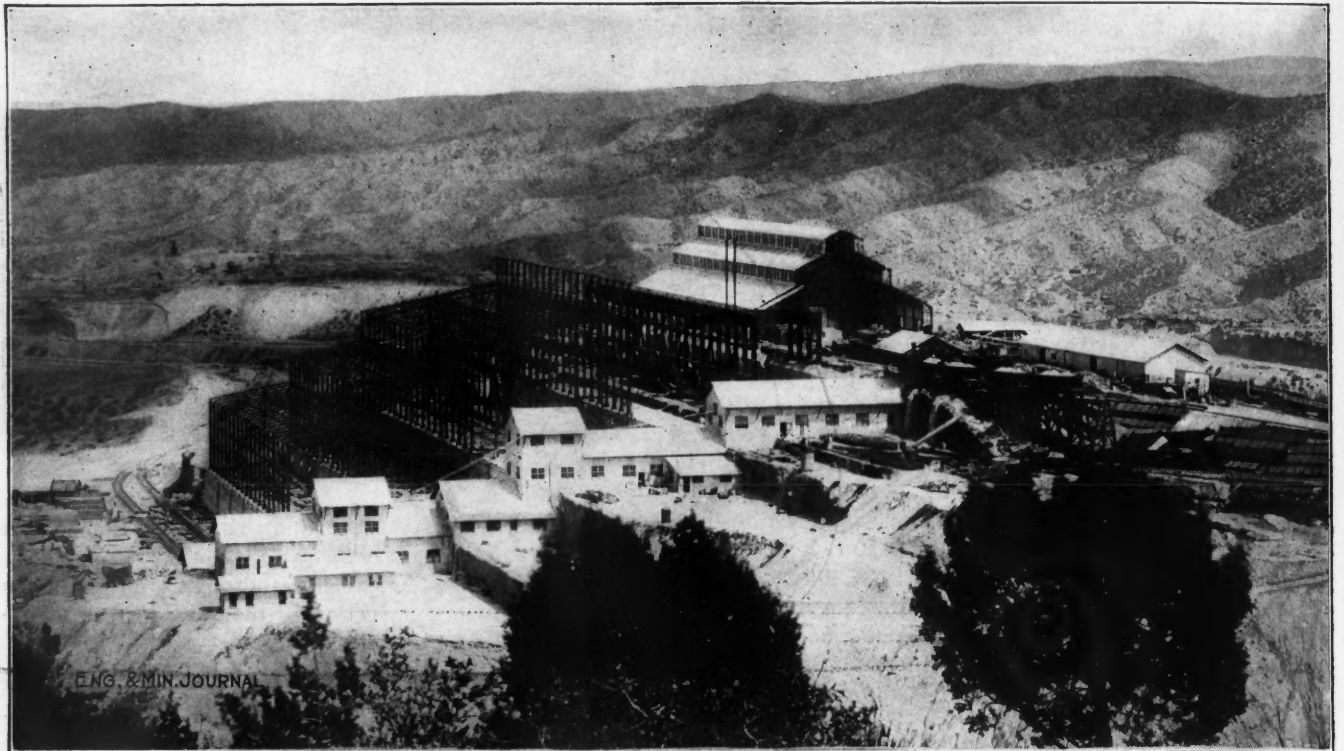
The flotation process has been adopted by the St. Joseph Lead Co. for the recovery of lead in the slimes from its mills in southeastern Missouri. The dry slimes carry about 3% lead and contain water in the proportion of about 40:1. The water ratio is reduced in thickening tanks to about 4:1 and the thickened product is then treated in the flotation apparatus. The flotation plant at the Bonne Terre mill was estimated, in the company's annual report, to cost \$16,100, that at the Leadwood mill \$22,000, and at the Doe Run mill, about \$14,200. The Leadwood flotation plant began operation in March of this year and the other two were placed in commission in May. The process used is the same as that developed by H. A. Guess at Flat River, Mo., where it is in operation at the mill of the Federal Lead Co. The total extraction has been increased about 7 per cent.

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The Calumet & Hecla Tailings Dredge

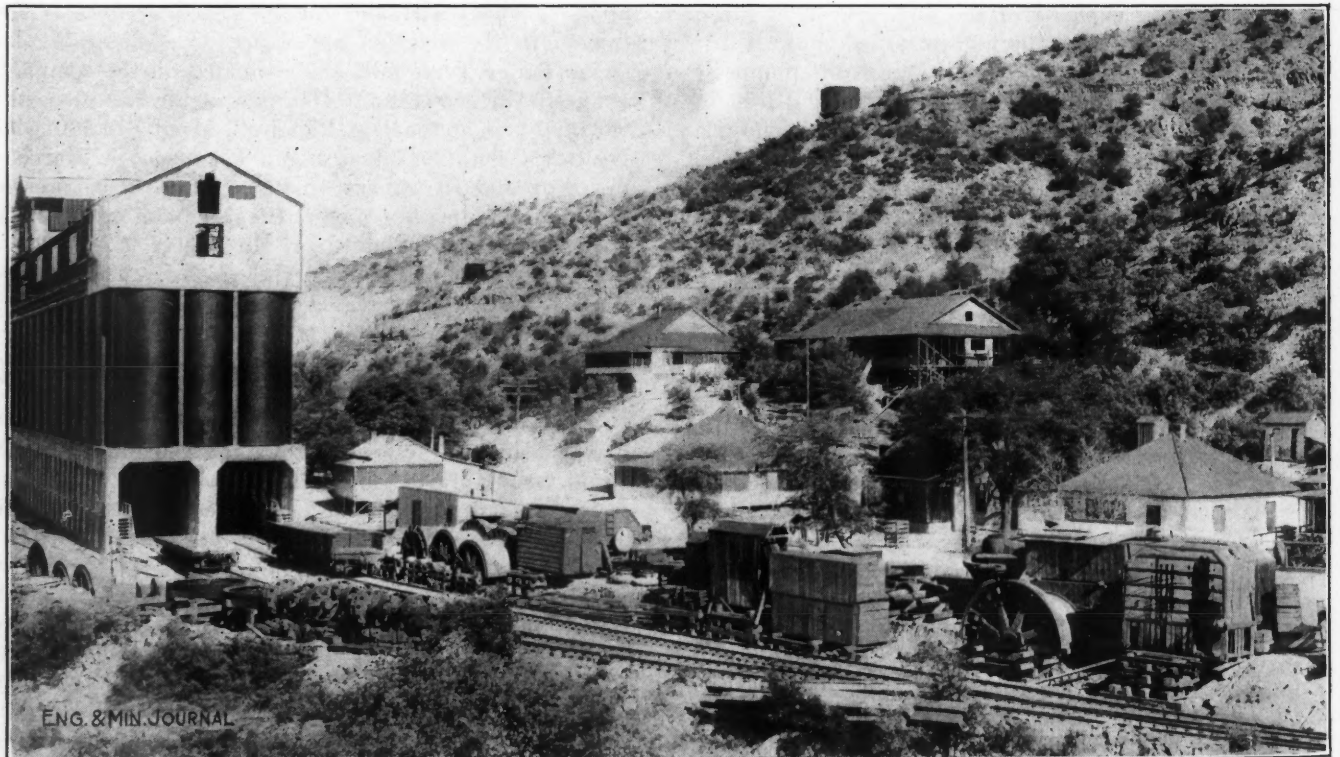
In an article by a Houghton correspondent in the JOURNAL of July 18, describing the plans of the Calumet & Hecla to dredge and leach its accumulation of mill tailings, it was stated that the accompanying photograph showed the suction pipe leading to "the large Morris centrifugal pump on the dredge." Our correspondent in Houghton inadvertently fell into error, as we have learned. This dredge is being built by the Bucyrus Co., of South Milwaukee, Wis., as was stated, and that company is furnishing the entire dredge, including the pump, from its own designs. This dredge is designed to dig to a depth of 100 ft., which is considerably beyond anything that has ever been attempted before.

Inspiration Consolidated Mill



TEST MILL, 7500-TON CONCENTRATOR AND SHOPS

The test mill has a capacity of 600 tons daily and in it are tried out various machines and processes under working conditions



MACHINERY IN STORAGE AND END OF 30,000-TON BINS
Flotation will be a step in the concentration of Inspiration ore

Correspondence and Discussion

Heating a Powder House by Electricity

I was interested in E. P. Kennedy's description of a combined electric and hot-water heating device for a primer house, published in the JOURNAL of Aug. 15. The same arrangement could, of course, be applied to a thawer. I cannot agree with Mr. Kennedy, however, that from the point of view of safety it is above criticism. In this case apparently the powder is not kept near the radiators, but in the case of a thawer, it probably would be and it is well recognized that electric circuits near explosives constitute a distinct hazard. If the scheme were to be applied to a thawing house, I should recommend that the bayonet heater be installed 10 ft. or more from the point where the powder is stored and that no combustible material be allowed between the heater and the powder, at least over a space of several feet. The hot water could be conveyed to the thawing point in well jacketed pipes.

ROBERT OLDS.

New York, Aug. 18, 1914.

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Ore Treatment at the Argo Mill

In the JOURNAL of Aug. 1, the criticism of Jackson A. Pearce, on my article on the Argo mill in the issue of July 4, is not in keeping with facts. I made no claim that the use of ammonium salts or the electric cell were new to the metallurgical fraternity. That Mr. Pearce is operating the mill without these features, using others to get the same effect, is quite possible, but it does not at all detract from the fact that the ammonium salts and electric cell gave the results I submitted in my article.

In regard to Mr. Pearce's statement that during the period between Apr. 1, 1913 (starting of mill operations) to Nov. 1, the plant did not pay expenses, which is true, he either did not know conditions or did not give them consideration. In April, 1913, the directors of the company saw fit to start the plant in an uncompleted condition, with \$10,000 in construction debts hanging over it and less than \$400 in cash in the bank with which to pay these and start purchasing custom ores at the rate of several thousand dollars per month. The company furnished no more money for months. We were unable to pay the shipper for his ore until we had milled it and sold our products, which was in from three to four weeks. The consequence was that we received only the very low grades and unsatisfactory ores, and part of the time no ore. Furthermore, with no money for necessary equipment we did not get a completed plant until in November.

I am sure that mill operators will appreciate that adding the above conditions to the ordinary troubles of starting a new plant, it was a wonder that we operated at all, much less paid expenses. I state again, due to a

knowledge from personal observation, and the word of metallurgists familiar with conditions and employees of the plant, that there have been no radical changes in the plant as turned over to the new management in November, 1913, unless they have occurred within the last 90 days.

Mr. Pearce should truthfully have stated that the shutdown in November, 1913, which lasted nearly 60 days, was because there was hardly a ton of ore in the bins, the shippers having refused to supply ore until the company furnished funds for cash settlements.

The present management should be willing to give those who preceded them the credit for having knocked off the rough edges of the proposition even if we did not have the chance to enjoy a working capital and add the refinements.

ARTHUR H. ROLLER.

Denver, Colo., Aug. 12, 1914.

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Single-Track Cable-Way in Sardinia

The JOURNAL of Nov. 29, 1913, contained an article describing an aerial cableway in Sardinia, on which the buckets passed each other on a single line. I remembered that my friend, A. Monticolo, an Italian engineer, had erected a similar line at Massa Carrara, which he has described in *l'Industria Chimica Mineraria e Metallurgica*, Vol. 1, No. 4, and which he patented in Italy on Dec. 12, 1895, pat. 442/40168. This line ran for eight years until the increasing demand on it necessitated a double line.

HERBERT K. SCOTT.

London, July 28, 1914.

✽

What Is a Prospector?

Misther Editor,

I obsarve that ye've gotten the goat av a rayspictable prospector in Colorahdo, *y parece que él se ha puesto lentes rojos.*

If he'd only kape his shirt on like me old frind Dick on Sunset Peak, he might see that ye're only thryin' to hilp us silf-ilicted Jay-sons nail the grubstake fleece down to the sluice-box av common sinse, so that whin the long delayed flood av prosperity washes agin the gravel banks av Hopes Deferred we kin ketch the foine gold av wisdom along wid the coarse lumps that anny fool cud pick up wid his toes. I'm a strong belaver in raysonable timperance, but I've noticed that too much grape juice makes the bow'ls wake.

BILL MCGINTY.

Ong root,

Burro & Shanks' Mare Limited,

El Paso to Kelvin, Arizona, Aug. 8, 1914.

Editorials

Copper Quotations

We are so used to attacks upon our recording of the copper market by a certain Chicago paper that a resumption of them is never a surprise to us. We know, moreover, that any reply is futile, insofar as that paper is concerned, inasmuch as it will disregard simple facts or twist them maliciously, and after a while will go over the same ground again. However, for the benefit of our readers, we will give attention to its last scurrilous tirade, supplementing our remarks of Oct. 25, 1913, and Nov. 20, 1913.

The burden of this tirade is that because there is a difference between its quotations of the copper market and ours, we are wrong and low for some malign purpose. Of course, it would occur to a logical mind that the Chicago paper first ought to establish that it is right and not too high. We must confess that we have never thought it important to examine its quotations in recent years, but we recollect that some years previous there was a charge against it that it copied our figures, making trifling alterations, and a recent examination excited our suspicion that it made similar use of some daily paper. In fact, its quotations for the week ending Aug. 5, 1914, were specifically credited to a daily paper, although this was a week during which there was no market, as we said on the authority of six agencies which sell about all the electrolytic copper that there is in this country, and since then the paper in question has suspended its own quotations, following our initial action.

Now, the fact that we base our record of the market chiefly upon the sales reported by the producers, smelters or agencies, whichever term one may please, is something that we freely admit. We say it every week. Also, that the editor of the JOURNAL calls upon producers, smelters and agencies in order to learn of their business, is something that we have repeatedly told our readers. Inasmuch as we request them to give us their information, we cannot expect them to come to see us, so naturally we have to go to see them. The summary that we report is, of course, our own judgment of the data obtained from all quarters. In reporting the market, we accept information from whatever quarters are reliable, both sellers and buyers, and such as are regularly consulted are willing to show documentary evidence of transactions whenever requested. We confess that we do not know of any other way of reporting the market.

However, the proof of the pudding is in the eating. We have said time and again that we do not pay any attention to the small business of jobbers and dealers, or to the operations of minor speculators, who not infrequently have to pay a premium; or to the New York Metal Exchange, where no business worth mentioning is done and where the big interests are not even represented; or to the scraggy and commonly inaccurate notes of reporters for daily newspapers, etc.; but we aim to summarize what the producers get in merchandizing the whole of their output; in other words, what is the commodity

price of copper. In 1913, eleven companies officially reported that they had sold 658,533,402 lb. of copper for an aggregate sum which averaged 15.222c. per lb. Our quotational average was 15.269c. In 1912, the same companies officially reported the sale of 552,155,308 lb., averaging 15.841c. per lb. Our quotational average was 16.341c. Manifestly, those producers who sold on quotational averages got all there was. And similarly in previous years.

Our inability to quote the market on any day is often vexatious to some persons—whether subscribers, readers or what, we do not always know—but it is a fact that the editor of the JOURNAL, who has other duties than market reporting to perform, cannot, except for incidental attention, devote more than one day to this, at which time the day-to-day transactions of the previous week are reviewed; and, moreover, if he could, the producers, etc., would refuse out of fear of indicating their operations to competitors. In recording what is old history there is no such objection, except with regard to the last day, and we have had some complaint about that. This may lead us to discontinue the advance communication of quotations at 4 p.m., Wednesday, the time when we go to press, which we have done heretofore at the request of subscribers, wholly as a matter of courtesy to them and at a good deal of trouble to ourselves.

Now, it is necessary that there be quotations for the conduction of business. Everybody found that out a few days ago, if they did not previously know it, when quotations for silver and copper were suspended and business stopped. The quotations of the JOURNAL have come to be used as a basis of settlement for the reason that they have been recognized to be accurate and disinterested. As to the nature of all the contracts that are based upon them, we do not know. Often are we surprised to learn of some new way of their use, both as basis of buying and of selling.

This use of quotations is, of course, entirely optional. Large producers do not have to base their contracts upon them if they do not want to. The largest sales of copper on quotations are those of big companies, who periodically enter into contracts with the buyers. If they choose, they can sell on commission or can have their copper refined on toll and handed back to them to sell themselves. Some people like to sell their output right along at the average price; others like to speculate in the hope that they may sell when the price is high, which sometimes they do and sometimes they do not. In the long run, however, things seem to turn out about the same, probably because of the law of general average. The great bulk of all of our copper is produced by a relatively few mines. The copper in the ores of small miners is of trifling quantity. It comes in such small lots that it would be inconvenient to smelt it on toll or settle for it in any other way than on some recognized quotations. In so settling, the small miner is doing simply what is done by many big miners who are amply able to satisfy themselves respecting the reliability of what they are using. Smelt-

ers who take in ores on quotations often sell their own products on the same quotations.

It is high time to call a halt upon these reckless charges that smelters are dishonest, just because they are smelters, and this fomenting of suspicion, which is done out of ignorance and maliciousness. The smelters conduct their business upon principles that are just as honest as the principles of miners, and of most people. During recent years, they have effected great economies in their methods and the derivative advantage thereof has gone to a large extent to the producers of ore, who have progressively got more and more for the same grade of ore. In the trying days of late, when our whole commercial and financial structure has been shaken to the foundations, the smelters have shown their patriotism in working for the common weal just as have the bankers, brokers, statesmen, and even editors. It developed suddenly that there was no market for either silver or copper, our biggest customer—Europe—having been suddenly cut off. There being no market, properly speaking, there could be no quotations, and settlements for metal and ores could not be made, of course to the disaster of many producers. We have been criticized for suspending our quotations for copper. A few days after the first shock, there were some purchases of copper at about the last prices, and anybody who needs copper today can get all he needs, but while the buyer is free to buy, the seller is not free to sell, and in that condition there is no market, as we consider it, or as persons who see broadly consider it. If smelters had had to take in copper and silver, they would have had to sell it, and in trying to sell it with the principal customers gone, what would have happened to prices may be left to the imagination. The situation was precisely analogous to the situation in the securities market which led to the summary closure of the stock exchange. There were those who objected to that, eager to profit from the misfortunes of others, but a continuance of the stock market would not have been to the interest of owners of securities or to the public welfare; and a continuance of the copper market would not have been to the interest of either the miners or smelters of copper.

In this juncture the smelters came generously to the assistance of the miners, with whom they had contracts for metals and ores. By agreement with the Mint, which took 1,175,000 oz. of silver at 52c., they undertook to take in all silver to be settled for up to the close of business on Aug. 11 at the same price, although the quantity was far in excess of what the Mint was taking off their hands, and they have to carry it through the uncertainties of these evil days. And furthermore, the smelters volunteered to their consignors of ore, etc., to take in copper and silver under their contracts until further notice, advancing 10c. per lb. on copper and 25c. per oz. on silver, and to make final adjustment of the difference when there should again be an open market for those metals. We do not know what could have been more square or more generous in their assistance in a trying situation. But the same spirit has animated most men since the calamity fell upon us.

The Salt Lake Meeting

The Salt Lake meeting of the American Institute of Mining Engineers, which was held last week, was from all accounts a highly successful meeting, being in all

respects a successful emulation of the red-letter meeting at Butte last year. Salt Lake City is a great mining center and was an eminently suitable place for the holding of such a meeting, having a great variety of mining and metallurgical enterprises with which to interest professional visitors. Indeed, there is scarcely any other mining center in the United States where there are operations of such great magnitude and such diverse character.

The technical papers presented at the Salt Lake meeting were of a high order of merit, and will add greatly to the important file of technical records that the Institute is accumulating in its transactions. The excellent attendance at its meetings, the constant flow of technical literature that is coming into its office, and the steady increase in membership, are evidences of the esteem in which the rejuvenated Institute is now held among mining men.

The Situation in Spelter

The war has so upset the commercial conditions of the world, that statistics of so recent date as the mid-year are about as valuable as statistics unearthed in Babylon. However, there is a certain interest in the last mid-yearly statement of the production of spelter as reported a few days ago by the U. S. Geological Survey.

A few weeks ago, we reported the guesses of four large smelting interests respecting the unsold stock of spelter on hand, these guesses ranging from 40,000 to 60,000 tons, and ourselves made the guess of 50,000. It appears from the government statistics that the stock was actually about 64,000 tons, being an increase of upward of 23,000 tons since Jan. 1, 1914, and being the largest stock ever known in the history of zinc in this country. The production of spelter from domestic ore was 171,496 tons, which was an increase of about 5500 tons over the previous six months, and was, in fact, the largest domestic production of spelter ever reported in any single semester. Can there any longer be doubt as to why spelter was persistently pressed for sale during the first part of 1914, and why the generally prevailing price was low?

The Government report reckons an "apparent consumption" of about 149,000 tons, or about 17,000 tons more than in the previous semester. Bearing in mind the well known stagnation in industry during the last six months, this figure as indicative of consumption is, of course, ridiculous. Deliveries may have been such, the explanation being that manufacturers were laying in stocks at low prices, but not using them up. Also, deliveries may have been made to other quarters than the manufacturing.

The statistical position in Europe at the mid-year was about as bad, the stock over there being unofficially reported as about 100,000 short tons; yet in spite of the adverse statistical position, both in Europe and America, we have witnessed here a rise of about 1c. per lb. in the value of spelter since the end of July. The explanation of this is that Great Britain's supply of spelter has been cut off by the war on the Continent, wherefore, that country may look only to the United States for what she needs. The large European stock of spelter was understood to be held chiefly on the Continent, relatively little being in Great Britain. In 1913, Great Britain consumed about 194,000 metric tons of spelter, but produced only about 69,000. Consequently, her probable re-

quirements from the United States will be large, and our producing interests seeing a prospect of the rapid diminution of their stocks, have become stiffer and stiffer in the price at which they are willing to sell. Export sales at high figures have already been made to Europe. Thus, the war has unexpectedly lifted the American zinc smelters out of a very awkward predicament.

On the other hand the zinc miners of Broken Hill, in Australia, have been put in a bad fix, the European market for their ore having been entirely cut off. Efforts are now being made to sell the Australian ore to zinc smelters in this country, but no arrangements have yet been made.

Manufacturers' Mines

Mr. Colburn, in this issue, sets forth some optimistic and common-sense ideas upon the selling of mining properties. He seems to take little stock in the gloomy tales that are circulated regarding stagnation in the industry. The facts in the case seem difficult to ascertain, and the answer to the question whether mining is thriving or languishing depends largely on one's point of view. But nobody can take issue with Mr. Colburn's brief instructions on how to sell a mine; they are admirably to the point. Selling a mine is a business in itself and requires special aptitude and training. The art of salesmanship is one not widely diffused. To sell goods is about the most difficult thing in the world; the salesman for a machinery house gets three times the salary of the designer or the plant superintendent. With this fact in mind, the profits that the successful mine promoter makes do not seem so outrageous.

Mr. Colburn's classification of possible purchasers is interesting. He makes up a group of manufacturers who are seeking raw material and cites certain examples. We suppose that his residence in Denver may account for his failure to include the most prominent example in this class, namely, the iron and steel companies. It is a feature in our mining industry rarely commented upon that the steel and iron business is conducted in reverse order from most other mining. Here the furnace is the thing and the mine is an accessory. The manufacturing plant producing pig iron and finished product buys iron ores and iron mines to furnish it with raw material. A gold-silver miner or a lead-silver miner, or a copper miner, after proving his property—or before—builds him a treatment plant, a mill or smelting works, or both. Here the mine is the thing and the works are dependent on it.

We believe that at one time the General Electric decided to get its raw materials direct and attempted to find and make a copper mine. The result was a flat failure. But conditions somewhat similar to those of the iron industry exist also in the aluminum and to a less extent in the zinc industry. The reason for these radical differences in business methods and organizations is probably to a large extent inherent in the nature of things. For iron, aluminum and zinc production, questions of fuel, markets and power are paramount. Broadly speaking, too, the metallurgy of these metals adds more to their value than the metallurgy of copper, gold, silver or lead. But on top of this, the difference is undoubtedly due largely to the fact that things got started that way.

This subservience of iron mine to iron furnace works out unfortunately for the iron-mine employee. From his

point of view, iron mining is the most uncertain, erratic and unsatisfactory in the whole field of mining industry. Just now the country is passing through a period of business depression and no line of business suffers more than the iron and steel trades. This bad effect is reflected back with double force on the mines. Shipments from Lake Superior are little more than half what they were at this time a year ago. Many properties have shut down, and in many others the force has been cut in half. No other metal mining is thus adversely affected by business depression to the same extent, except it be that carried on in the Joplin district. With the copper mines, it is quite different; no considerable property had closed down or even reduced its force, until the European disaster forced a radical curtailment; and on gold mining, the state of the market has no effect at all, except that a depression is actually beneficent in reducing costs.

The facts of the case are that gold mining, popularly conceived of as the greatest gamble in the world, represents stability itself in comparison with iron mining. For steady-going reliability, there is nothing to equal a big, low-grade, producing gold mine. On Thursday, July 30, when industrial, railway and copper stocks were tumbling 10 and 20 points, Homestake, on the New York exchange, made a small but real advance.

We have had no reports of great distress among the Lake miners because of the curtailment of production; nor of reduction in the salaried forces. But these features are likely to develop. The mine ordered by its furnace master to curtail production and cut expenses cannot be expected to keep its surveyors and superintendents employed. It seems not unlikely that a great many young engineers from the iron ranges may be added to the still greater number now up from Mexico who are looking for some profitable employment in mining or out of it.

Secretary Lane on the Mining Industry

The Secretary of the Interior, in an interview this week, extended a word of cheer to the American mining industry in its present troubled condition. The substance of his talk was that we have in this country about all the mineral resources that we need, and where we have not heretofore been making use of them, we ought to get busy and do so. Thus, we ought to obtain potash from California, we ought to make nitrate of lime at Niagara Falls, and we ought to develop our known resources of manganese ore, antimony ore, and numerous other minor mineral substances.

Remote is it from our intention or wish to be a carping critic in these days of adversity, when it is needful that everybody cooperate for the common welfare. However, it may be pointed out that many of the things that Secretary Lane suggests require a great deal of money and a great deal of time for their development. Thus, it would trouble the most optimistic promoter to begin the production of nitrate of lime at Niagara Falls within any brief time. Also, the utilization of some of our resources, which Secretary Lane mentions, was abandoned in the past for the reason of being unprofitable. There is an antimony smelting works right on the water front of New York's harbor, which has been idle for many years

through inability to obtain ore supply on terms permitting it to be operated profitably. However, the high prices now prevailing for antimony may alter that condition.

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American Potash Not Yet a Reality

No important quantity of potash salts will be available this year from the American Trona Corporation's operation in California. The experimental unit at Searles Lake is nearing completion and should be ready for full operation in September or October.

As the process is a new one, the usual adjustments will have to be made before the building of the commercial plant will be undertaken, so that regular production on an important scale cannot be expected for another year at least.

In the experimental plant some of the first precipitations have already been tried and sodium carbonate, chloride and sulphate have been separated, though some features have required perfecting for commercial-scale production. Potassium chloride, being the most soluble, is the last salt to be recovered. In view of the improbability of getting any potash salts from Germany this year, prices have risen abruptly and the American Trona Corporation may subordinate its production of other salts for the present and recover only potassium chloride. If this policy be adopted, the potassium-chloride output of the experimental unit would much exceed the daily capacity of five tons, the estimated potassium-chloride production when the other salts were being separated.

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Copper

While the prices of some metals are soaring and those of other metals are at least holding their own, the position of copper is unknown, not even the most experienced participants in its business venturing to offer any positive prophecy respecting its prospects. A few months ago we were congratulating ourselves that while iron, spelter and other metals might be suffering from the domestic depression in business, copper was secure for the reason that it had an international market. That very condition proved to be its weakness. It may help to form ideas by reviewing some of the statistics for 1913.

In that year our refineries delivered 348,068 metric tons for domestic consumption and 394,201 for export. The Government report of exports is, however, 420,200 tons, of which Germany and Holland took 220,500 tons and Austria 15,700 tons. Germany reports imports of only 197,353 tons from the United States. The discrepancy between the producers' and the government figures need not here be explained. It is evident that Germany has been our largest customer.

Germany, however, did not keep all the copper she took in. Besides copper bars, etc., she imported 17,913 tons of copper manufactures, but exported 78,957 tons, an export surplus of 61,000 tons, which was largely in the form of brass, sheets, wire and cables.

So long as the war lasts we cannot expect to sell any wire bars, cakes or ingots to Germany. Probably she laid in a comfortable supply when she made her large purchases last spring. We may, however, expect to sell copper to Great Britain, France, Italy and Canada when

commerce is resumed and the cessation of Germany's large exports of copper manufactures must leave a void to be filled by somebody, perhaps to some extent by American manufacturers.

In the meanwhile, American production has been curtailed from *nil* to 100% in the case of individual mines. Perhaps the curtailment in the aggregate is about 50%, reducing production to about the estimated domestic requirement, although for the moment there is not even any of that worth mentioning. Soon, no doubt, there will be, however. But there was a large supply of crude copper at the refineries and in transit thereto which, of course, could not be curtailed and has swollen the unsold stock, although, of course, copper is still leaving the refineries on old contracts, some going even to Great Britain.

We have but little information respecting copper production in other parts of the world. Some producers in South America have been obliged to suspend owing to inability to dispose of their product either through the disruption of international exchange or inability to secure transportation, or otherwise. From Spain and Portugal, we have had no news. The whole situation is very complex.

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The bearing of the war upon the export trade of the United States is shown by the following values of our exports of crude commodities in the last fiscal year: Cotton, \$630,000,000; breadstuffs, \$166,000,000; provisions, including livestock, \$153,000,000; copper, \$150,000,000; petroleum products, \$141,000,000; tobacco, \$55,000,000; fruits, \$33,000,000; hides and leather, \$22,700,000; phosphate rock and fertilizers, \$11,800,000.

BY THE WAY

An interesting political, but nonpartisan, movement is that of the National Voters' League, of Washington, D. C., which is a development of the "follow-up" system. Its activities consist largely in printing an easily followed chart, showing the votes on all important bills, together with a discussion of the most noteworthy matters. It is interesting to note the tribute in its Bulletin No. 3, to Congressman MacDonald, of Michigan, lately in the mining eye by reason of the strike investigation.

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The "Cousin Jack" stands high with Mr. MacNaughton, manager of the Calumet & Hecla. Testifying before the Congressional Committee investigating the recent strike of copper miners in Michigan, Mr. MacNaughton explained why so many of his bosses were Cornishmen. The Cornishman, he said, inherited mining from generations of ancestors. Furthermore, when he came to this country, aside from being a good miner, he spoke English and had thus an advantage over a great many of the other foreigners, such as the Austrians, the Italians and the Finns, who were handicapped by reason of their inability to speak and understand English readily for some time after arriving. Aside from that, the natural ability of the Cornishman as a miner, he assumed, worked to his benefit, with the result that the charge to the effect that the majority of underground bosses and captains were Cornish probably was right.

PERSONALS

Roscoe H. Channing sailed for Genoa last week to bring home his family, who are at Lucerne, Switzerland.

Frederick P. Burrall sailed from New York for Cartagena, Colombia, Aug. 12, on professional business.

J. C. Hoffman is the newly appointed manager for the Arizona Southwestern Copper Co., in place of Lawrence Hoffman, resigned.

L. G. Huntley, formerly of the Associated Geological Engineers, has left for Colombia, South America, for examination of oil properties.

Anton and Karl Eilers, with their families, were at Munich when the war began. Since then their friends have had no word from them.

Lloyd B. Smith, of the Associated Geological Engineers, sailed Aug. 12 for Colombia, where he will be engaged in the examination of oil territory for a couple of months.

Sir George Paish, the eminent financial writer, has resigned as editor of the London "Statist," to become financial adviser to the Chancellor of the Exchequer, in London.

At a meeting of the board of directors of the Vinton Colliery Co., held at Vintondale, Penn., on July 28, Clarence M. Schwerin was elected president of the company and Warren Delano, chairman of the executive committee.

T. H. Edwards has been appointed superintendent of the steel department of the Wheeling Steel & Iron Co., Wheeling, W. Va. He was formerly superintendent of the bessemer department of the Colorado Fuel & Iron Co., Pueblo.

William B. Thompson, head of the Stock Exchange house of Thompson, Towle & Co., and the prime spirit in the Inspiration Copper Co., was elected a member of the board of directors of the New York bank of the Federal Reserve system.

D. M. Riordan sailed upon six hours' notice on the U. S. cruiser "Tennessee" as one of the commissioners representing the government in the distribution of aid to the Americans stranded in Europe. Mr. Riordan made a great record in rendering help at the time of the San Francisco earthquake, and Washington was quick to avail itself of his services in the present emergency.

R. N. Dickman, of Chicago, has completed examination of the plant and properties of the Birmingham Ore Milling Co., of Birmingham, Ala., and sailed Aug. 16 from Seattle for a two months' trip to Alaska to examine tin and copper properties north of Nome. While continuing his own office at 1010 Mallers Bldg., Chicago, Mr. Dickman can be reached through any of the offices of Robert W. Hunt & Co., with whom he is connected as consulting mining engineer.

A. L. Queneau has been at Jemeppe, on the Meuse in Belgium, during the last year, engaged in some experimental work in zinc smelting. The editor of the "Journal" received a personal letter from him, dated Aug. 3, which will be of interest to all his friends, and surely Mr. Queneau will not mind the communication of some of his news. After telling about his experimental work and rejoicing over some promising results lately obtained, he continues: "But, alas! I have now to start to rejoin my old regiment, Germany having declared war on France, and everyone and everything must be abandoned. I leave Mrs. Queneau with the children here, as it is probable that Belgium will maintain her territory free from the invasion of Germany. Belgium has now some 250,000 men in the field, a force sufficient to make Germany think twice before violating her neutrality. M. de Sincay has promised to look after my family during the war." M. de Sincay is the director-general of the Vieille Montagne company. How little did Mr. Queneau foresee what was shortly going to happen in Belgium!

OBITUARY

B. C. Wolfram, manager of the West Dome mine at Porcupine, was found dead in his room at a hotel at North Bay, Ont., July 30. It is believed that he committed suicide, though no reason for such action is known. He had been in the Cobalt camp for seven years as prospector and manager for Morgan R. Cartwright in the Temiskaming and other mines. He was unmarried.

Harry J. Hubbard died on the U. S. battleship "California," off Mazatlan, Mexico, July 31, after an operation for appen-

dititis. He had just reached Mazatlan from Bosario, Sinaloa, where he was superintendent of the Minas del Tajo. He was 32 years old, was born at Vermilion, S. D., and went to Texas when a boy, his parents settling at Marfa. He graduated from the New Mexico School of Mines at Socorro. He was for several years at Divisadero, Salvador, returning to Texas three years ago. Soon after, he accepted the position at the Minas del Tajo, which he held until his death. He leaves a widow and two young sons.

Jacob Langeloth died at his country residence at Riverside, Conn., Aug. 14, aged 62 years. He was born in Mannheim, Germany, and came to the United States about 30 years ago. He was one of the best known men in the metal trade in New York and was for many years a leader in the trade. He was long president of the American Metal Co., retiring a few years ago and becoming chairman of the board. Mr. Langeloth was vice-president of the Balbach Smelting Co., and a director in the Corn Exchange Bank, the General Development Co., Metallurgical Co. of America, Mexican Bank of Commerce and Industry, Miami Copper Co. and Wetherill Separating Co. He was a member of the New York Chamber of Commerce, the Downtown Association, the New York Yacht Club, the New York Zoological Society, the Metropolitan Museum of Art, the American Institute of Mechanical Engineers and the Deutscher Verein. We hope to publish a fuller obituary in our next issue.

SOCIETIES

American Chemical Society—The general meeting appointed to be held at Montreal, Sept. 14-18, has been indefinitely postponed. In consequence of the war, it was impossible to carry out the program arranged for the meeting. As it will be difficult or impossible to arrange for a meeting later in the fall, it is probable that the next meeting of the society will be held in New Orleans, early in next April.

Teknik Club—This club, organized a few years ago as the immediate successor of the Western Association of Technical Chemists & Metallurgists, has issued its program for the season of 1914-15. This club meets monthly at the Shirley Hotel, Denver, for an informal dinner, after which two members present technical or popular papers that are freely discussed by all members. The program follows: Oct. 13, addresses by M. S. MacCarthy and R. W. Gordon; Nov. 10, W. G. Swart and S. C. Lind; Dec. 8, C. F. Whittemore and J. C. Morgan; Jan. 12, R. K. Allen and J. B. Ekeley; Feb. 9, Walter E. Burlingame and A. R. Schroeder; March 9, John A. Davis and E. J. Dittus; April 13, G. W. Stiles, Jr. and R. S. Hiltner; May 11, J. C. Roberts and H. P. MacGregor. Guests are always welcome at these dinners.

Iron Country M. C. M. Club—This club is composed of the graduates and former students of the Michigan College of Mines who are located in the Michigan and Wisconsin iron ranges. It has at present 65 members, with local branches on the Marquette, Menominee and Gogebic ranges, the range branches meeting three times a year and the entire club once a year. The members in the Iron River Stambaugh District hold a dinner once a month. E. S. Dickinson is president; E. L. Laing, secretary, both of Iron River, Mich. F. C. Roberts, of Crystal Falls, Mich., is treasurer. W. B. Pattison, Negaunee, Mich., is secretary on the Marquette range. The positions held by members of this club vary from shift boss and mine captain to general superintendent. The third annual meeting will be held in Iron County, Mich., Aug. 22. It will include visits to Crystal Falls and the principal mines of the Iron River and Stambaugh districts, ending with the annual dinner at Iron River.

INDUSTRIAL NEWS

The John Simmons Co., manufacturers of the Baldwin Carbide Lamp, has issued for the use of engineers using Baldwin lamps a table of natural sines and cosines, on heavy celluloid of a size that can be conveniently carried in the note book.

The Westinghouse Electric & Manufacturing Co. reports the following recent orders from the metal-mining industry: An aggregate of 2713 hp. of electric motors, four storage-battery locomotives, two motor-generator sets, 1403 kv.-a. of transformers, one lighting arrester, one switchboard transformer, and one three-phase induction regulator.

Editorial Correspondence

SAN FRANCISCO—Aug. 12

Forest Fires in Siskiyou County during the latter part of July and the first of August destroyed a large amount of timber. One fire started five miles from Sissons near Black Butte, and burned over an area of 5000 acres. Most of this was cut-over ground. From 500 to 1000 men were employed fighting fire at a cost of \$35,000. Another fire started from the Shasta County side of the line in heavy and valuable timber, burning over an area of 600 acres. At the head of Bogus Creek, near Yreka, 100 acres of timber were destroyed. Cut-over land at Hilt, amounting to 100 acres was burned. Two fires in the Salmon River district started in heavy timber, but were controlled without large damage. There were several fires during this period in Sissons, Dunsmuir, Yreka and Hornbrook, some of which resulted from the forest fires. It is stated on good authority that most of the forest fires were incendiary. The Forest Reserve men were active in fighting these fires and were assisted by volunteers in every instance.

Yukon Gold Co. Has Increased Its Holdings, the Guggenheim interests having added to the dredging land owned by the company and operated by its subsidiary, the Pacific Gold Dredging Co., by the recent purchase of 300 acres on Yuba River lying north of the holdings of the Yuba Consolidated Gold Fields at Hammonton. The ground has been sufficiently prospected to satisfy the purchasers to the extent of making the first payment on the purchase price. No time has been definitely set for the installation of a dredge on the new holdings, owing to the installation now in progress of a dredge on Butte Creek, near Chico. It is probable that the Yuba River installation will await the completion and commission of the Butte Creek dredge. Whether the money depression resulting from the European war will cause further delay is not at present known, though it is probable the work will proceed as speedily as convenience will permit. That the Pacific Gold Dredging Co. will also operate this new holding is quite probable, as it is the subsidiary that operates all of the Guggenheim dredging interests in California. The other operations are at Oroville, Chico and Auburn.

Mountain Copper Co. Smeltery has closed and the extraction of ore at the Iron Mountain mines in Shasta County has been discontinued. Construction of the new concentrator has temporarily ceased, but will probably be resumed before resumption of work at the mines. The reason for the closing down of the copper mines and smeltery at Martinez is that copper is absolutely unsaleable. The directors in London cabled to Manager Ketts on Aug. 4 that owing to financial conditions in London caused by the war it is desirable to discontinue the mining and smelting of copper until there is some settled market for the production. Ketts immediately proceeded to the closing down of the smeltery and after putting the mine in order discontinued the extraction of ore. There were 350 men at work in the mines and 150 at the smeltery, all of whom are now out of employment. Mountain Copper Co., Ltd., is entirely financed in London and the operation of mines and smeltery is wholly dependent upon London capital in the absence of a market for copper. The company will allow married men to retain the cottages at the mine free of rent, and will extend credit to them at the company store if necessary, and will make a reduction in prices of goods to the actual cost to the company.

The Mammoth Copper Co. announced on Aug. 11 that instead of closing down the entire plant, two of the three furnaces will be kept in operation. The same number of men will be employed as has been necessary in the operation of three furnaces. The work will be divided so that each man will be able to work five or five and one-half days. This plan was the result of a visit to Kennett of Frederick Lyon, managing director. Mr. Lyon, with Manager Metcalf, took up the matter with the smelter workmen. There were 350 employees present at the conference. They were invited to suggest an improvement upon the plan offered, but no suggestions were made. Robert E. Henley, superintendent of the mines, made a similar proposition to the 400 men employed. There will be no Sunday work at the mines. The order to suspend all development work has been modified and development at the

Stowell mine will continue with 60 men employed. There will be no reduction in wages and no increase in working hours, and no men will be laid off during the period this plan is enforced. Men who are contemplating vacations are asked to do so, as early as possible, and they are assured that they may return to their work at any time without prejudice. Heads of families who go on a vacation will not be charged rent for company houses, occupied by their families during their absence.

BUTTE—Aug. 17

The Industrial Commission in Butte, appointed by President Wilson to secure information in all parts of the country upon the underlying causes of unrest in the labor world and to make recommendations for action by Congress, has been in session from Aug. 6 to 8. The commission consisted of Prof. John R. Commons of Wisconsin University, Austin B. Garretson, president of the order of railroad conductors, James O'Connell, third vice-president and John B. Lennon, treasurer of the American Federation of Labor. Prominent mining men, laboring men, and men active in political and official life of state, county and city were summoned before this board to give their views on the mining, industrial, political, civic and moral conditions of Butte in particular and of the state in general. The statements of the men called before the board did not reveal the existence of conditions which are not fully known to everybody throughout the country and which have been freely discussed by the press and magazines. C. F. Kelley, vice-president of the Anaconda Copper Mining Co., was among the first to be called before the board. He outlined the history of the Anaconda company, the extent of its operations, of its holdings, salaries of its officers and employees, expenditures and earnings, methods of mining and dealing with labor organization, regulations and means employed in and about the mines for safety, sanitation, etc. All this has time and again been made public by the company in official and semi-official reports and by accounts of innumerable visitors from all parts of the world to the mines, shops and reduction works of the company, where they are always welcomed and courteously shown about by the company's employees. John Gillie, general manager for the Anaconda company, E. P. Mathewson, general manager of the Washoe works and managers and superintendents of other Butte companies who were called before the board, all corroborated Mr. Kelley's statements regarding conditions in Butte mines and had nothing to say beyond the facts already known to the general public, through the company's policy of issuing monthly, quarterly and yearly reports in which all the phases of mining and the company's relations to labor organizations are freely and impartially discussed. During the sitting of the commission the miners' view of the labor situation was also discussed and the officers of labor organizations were given opportunity to present their views. Among those called before the board were Dan. D. Sullivan, Butte's street superintendent and former president of the Miners' Union, Daniel Shovlin of the new Butte Mine Workers' Union, W. Daly and others. They gave testimony regarding the company's dealings with the labor unions, the methods in vogue of hiring and discharging men; they also expressed opinions as to the causes that brought about dissatisfaction with the old and the organization of the new union, all of which had been discussed at the meeting of the labor organizations and reported in detail by the daily papers. Governor Stewart of Montana, testified regarding the state; means for maintaining order, for protecting property and enforcing the law. He favors arbitration between capital and labor by a Federal board of arbitration rather than a state board. Says that laboring men in Montana are law abiding and that recent disorders in Butte were due to outside influences. Various physicians discussed the methods of taking care of diseased and injured miners in private hospitals and other institutions. Tuberculosis, its causes and treatment were gone into in detail. The only startling incident of the session was a broad attack by the former city attorney, Maury, upon state, and county courts, judges, jury and lawyers who, he says, were all dependant on the good graces of the mining companies and that therefore no justice could be obtained in

Montana courts in damage or other suits against said companies. These charges were all refuted by L. O. Evans, chief counsel for the Anaconda company who reviewed individual cases and recited facts to show that the statements of Maury were wholly unwarranted. Altogether the inquiries of the commission brought to light nothing that was new to the general public nor anything that would point to the necessity of Congressional interference. The companies are fully able to deal intelligently with the difficult problems incident to the great industry of mining. The fact that for a period extending over many years no serious troubles arose between the companies and their employees, goes to show that the great majority of miners are satisfied with the conditions existing in Butte mines as well as with the constant efforts of the companies to render work in and about mines and smelters as comfortable and safe and healthful as natural conditions permit. The closing session of the commission was marked by an eloquent address by Mr. Kelley in which he replied to some of the statements that had been made against the Anaconda company. In the address he set forth the following facts: "I deny that the Anaconda company has ever, directly or indirectly, attempted to assert any dominion over the Butte Miners' Union in its internal affairs. We are in competition with the copper producers all over the world. We are in competition with the copper that comes from the labor of the Mexican peon who gets from 50 to 75 centavos per day. We are in competition with the Peruvian, the Spanish and the Japanese miner. With a greatly added expenditure in the production of copper, it would cease to be produced here at all. A shorter work-day would mean an increased cost of production that could not be maintained. Out of every dollar taken out of these mines, more than 50c. goes directly to the man in the mine and at the smelter. If the grog shops upon this hill were shut up, the accident record would be closed. The man who comes up to the collar of the shaft with a half dozen drinks under his belt and goes underground is the one who, many times, falls into the chute, loses his hold upon a lever or misses a loose piece of ground over his head. The high rate of wages among the local crafts downtown is one of the factors that has made living very high."

CALUMET—Aug. 15

All Small Mines are Closed and the Lake Superior copper district of Michigan is facing a serious condition. These smaller properties are closing down indefinitely and the producing properties are curtailing. This condition coming right upon the heels of the strike will, if it continues for any length of time, cause considerable hardships upon some of the people. The Tamarack Mining Co. has discontinued all work with the exception of pumping and the Hancock has also shut down affecting 200 men. The Copper Range, starting with today has put all work in half time, closing down entirely until Sept. 1, when the full force will work until Sept. 15, when another shut down will be effective. A reduction in wages of 10% has also been announced at this property. The Calumet & Hecla Mining Co. has curtailed slightly on its underground force but is maintaining production at present. Some of the shops have gone on half time owing to the stoppage of all construction work. It is not likely that any further reduction will be made at the present, for the management of the several properties are hoping that developments will be such that they can continue with the present forces. The Wolverine and Mohawk companies have not made any announcement as to what course they will pursue, and the Quincy is operating full force. About 1000 men have been affected up to the present time.

MARQUETTE—Aug. 15

Further Curtailment Among the Ore Producing Properties have been made. These have been offset by accessions to the region's output elsewhere. Yet with the close of the shipping season still more than three months distant the fact that any slackening at all has taken place is regarded with significance. It is taken to indicate that the decision of the men in touch with the market is that convalescence from the present unhealthy condition will be slow. On the Gogebic range, the Windsor shaft of the Cary mine has been shut down for an indefinite period. Approximately 100 men are affected. The stockpile at the Windsor is filled almost to overflowing, only one cargo of this ore having been sent out to date this year. The Cary mine proper is shipping steadily. The property is a Wisconsin possession of Pickands, Mather & Co., of Cleveland. On the Menominee range, the Florence Iron Co. has put its Ernst mine on half-time. The property is at Commonwealth, Wis., and of late has been

wrought on a small scale, employing only 40 or 50 men. Hereafter it will be operated but three days a week; 40,000 tons of ore now in stock will, however, be sent out. At its nearby Florence mine, which has been idle most of the year, the company has placed its central shops on half-time. In the Iron River field, in Michigan, the Florence interests have laid off one shift of men at the Bates property and hereafter will operate the mine only in the daytime. Under orders from President Clergue, at Montreal, the Millie at Iron Mountain, Menominee range, has been added to the idle list. As only development work was in progress a force of but a score of men was concerned. The order to suspend came unexpectedly. The lease to the Millie expires within a few years and it has been the belief that operations soon would be prosecuted vigorously. The trammers at the Republic Iron & Steel Co.'s Traders mine at Iron Mountain recently walked out. An 8-hr. day was demanded. The move was ill-advised. Those of the men who refused to return were discharged. Operations were retarded only a day or two. A full force was recruited from among the idle labor of the district. Some ore has gone forward lately from Oglebay, Norton & Co.'s Bristol mine, last year the largest shipper from the Crystal Falls district of the Menominee. An order for 19,000 tons has been filled from stock. While not idle, the Bristol is not producing at present. The stockpile is a big one. Shipments are being made from M. A. Hanna & Co.'s Ravenna mine, but these are small also. Operations at Crystal Falls have been at low ebb throughout the season. The principal producer is Corrigan, McKinney & Co., of Cleveland, and most of this big firm's Menominee range mines are closed.

FLAT RIVER, MO.—Aug. 12

The Labor Contract signed for a year with the miners has expired, but no trouble is anticipated this year, as the different companies have posted notices that they are willing to continue the present high scale of wages that were the result of compromising last summer's strike. Although notices were sent to the Hungarians and other Balkan states laborers from the home government to return to take part in the present war, few have thus far left the mining camps and most of them seem disposed to remain at work, even if transportation to Europe could be secured. All the mills in the disseminated lead belt have adopted the flotation process for reworking the tailings from the slime tables. The Federal Lead Co. was the pioneer in working out and developing the details of the process and about two-thirds of the lead in the slime tailings is now recovered as a 50% lead product, at a good profit.

TORONTO—Aug. 15

Extensive Forest Fires, owing to the dry season, have done considerable damage to mining properties in the Porcupine and Elk Lake areas. The buildings of the Little Pet and Foley mines, South Porcupine, were burned, and at Elk Lake the plants of the Otisse and Fleur-de-Lis were destroyed, and some losses sustained by the North American and Mapes-Johnston companies.

Many Miners at Cobalt Have Enlisted for service in the Canadian contingent that will shortly leave for the seat of war. The Ontario government has granted an extension of time for the performance of assessment work on claims held by volunteers. A general extension of three months on all assessment work on account of the prevailing financial stringency is being asked for, and will in all probability be granted.

The Effects of the War are severely felt by the iron and steel industry, and many plants both in basic and secondary lines are being closed down, or are greatly curtailing production. The Dominion Steel Corporation of Sydney, N. S., has closed down its openhearth furnaces and two blast furnaces, as it cannot fill orders for shipment by water. The Nova Scotia Steel & Coal Co will limit its iron ore mining operations at Wabana, Newfoundland, shutting down a portion of its plant there, and has closed its openhearth and blast furnaces at Sydney Mines, N. S.

Toronto Mining Exchange was recently granted a charter by the Ontario government and one has been applied for by the Toronto Oil Exchange, just organized. A strong protest is made by brokers and financiers on the ground that the similarity of names to that of the Toronto Stock Exchange may lead to confusion. It is felt also that the creation of new exchanges at a time of financial stress is a mistake. It is understood that the new Mining Exchange will not be allowed to operate unless it selects another name, and the issue of the Oil Exchange charter has been held up indefinitely.

The Mining News

ALASKA

SNOWSTORM—This group of claims in the Port Wells district has been bonded by F. S. Sinnicks, of Boston, who plans to put a force at work on the property at once.

RAMSAY-RUTHERFORD—This company has the foundations under way for a five-stamp mill on its property near Valdez, and expects to begin operations in a short time.

GRANBY CONSOLIDATED—This company is making some very extensive improvements on its property, 5½ miles from Valdez. A tramway is being built to the dock on Solomon Gulch, where ore bins having a capacity of 3000 tons of ore are being erected.

ELLAMAR—This company is planning some new work on its property on Virgin Bay. Some fine ore has recently been encountered. A tramway has been installed and will be ready for operation within a few weeks, greatly increasing the output of the mine.

ARIZONA

Cochise County

COPPER QUEEN (Bishee)—Practically all operations in the Czar and Holbrook shafts were suspended Aug. 14, when officials issued an order dismissing 400 men. This was the second reduction since the European war began, the first consisting of 500 men. The reduction means a curtailment of approximately 85% in ore from the local mines to the smelter at Douglas.

Mohave County

TENNESSEE (Chloride)—Large amounts of ore are being shipped to Needles from the 900 level. Sinking is to be resumed.

GOLDEN GEM (Cerbat)—Water has been taken out of the Golden Gem as far as the 350-ft. level. Timbering below the 300 is in had shape.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—New rolls and a dry concentrator have been ordered. Recent experiments with a dry concentrator gave high recovery.

Pinal County

CHRISTMAS (Christmas)—Sjoldan & Grosjean have taken a lease on parts of the old Christmas mine and have a small force at work taking out high-grade copper ores.

KELVIN-SULTANA (Kelvin)—Work in mine has been suspended temporarily. Pumps are kept running on day shift. Work on new concentrator is going on uninterruptedly, a large force being employed. Lessees working in the carbonate zone in No. 3 mine are taking out large quantities of good ore.

Yavapai County

MIRABLE (Prescott)—A cyanide plant is to be built soon.

UNION (Chaparral)—Development work continues and large reserves have been broken in the stopes. Milling began Aug. 10.

SANTA MARIA (Prescott)—This company has leased the Big Stick mill and is treating a large tonnage from the Thorne group.

SWASTIKA—This company, which has been developing the old Silver Prince mine, near the Peck, has begun to ship ore to Noodles. The ore is loaded at Peck siding.

NELSON (Crown King)—A new orebody has been opened up on a vein parallel to one which has been under development some months. The new ore assays 10% copper and is reported to be 20 ft. wide. It carries no other metals.

MONTEZUMA (Crown King)—A new orebody has been opened up in the lower tunnel at a point 420 ft. from the portal. It is 4 ft. wide and is regarded as the continuation of the shoot in the upper tunnel. Pack trains are bringing the ore to Crown King for shipment to the Needles smelter.

CALIFORNIA

Calaveras County

MELONES (Melones)—A miner fell 1200 ft. to the bottom of an open shoot on Carson Hill, July 29. The accident resulted from barring down a large rock when the man slipped and fell.

Eldorado County

BIG CANYON (Placerville)—Mine has been unwatered to the bottom of the shaft. Crosscutting and drifting will be started to determine the extent at the 600- and 700-ft. levels.

MT. PLEASANT (Grizzly Flats)—Large amount of ore has been developed, which is reported to assay from \$4 to \$10 per ton. The installation of a cyanide plant is contemplated.

JUNIPER MINING CO.—Brush fire destroyed the mill, rock crusher and other buildings of the Griffith mine in July. The mine was idle, but in early days was a profitable producer.

PLACERVILLE GOLD MINING CO. (Placerville)—It is reported that development of Pacific mine has been abandoned on account of effects of the European war. The operating company is controlled by the Alexander Baring interests in London.

Modoc County

HESS (Alturas)—Mill has been started. Abundance of water has been secured for all purposes. Mine is developed to the 300-ft. level.

Placer County

HERMAN (Westville)—Electric power is being installed. Pole line is being extended from Towle to Westville. This will aid in the reopening of the small mines.

SPANISH (Forest Hill)—Property is bonded to Brown, De Cou & Co., of San Diego. Road building and repair is in progress. A mill for prospecting work will be installed. Mine will be developed by tunnel.

CRANDALL (Auburn)—Mine is being cleaned up and air compressor and drills ordered. Mine is equipped with a five-stamp mill. Property has been idle for several months, owing to the death of the former superintendent.

PLACER COUNTY PROPERTIES CO. (Iowa Hill)—It is reported that the asbestos plants owned by the company have been sold to London men, and that the closing of the deal awaits the arrival of Martinez Thompson and Charles Page.

Shasta County

GOLINSKY (Redding)—It is reported that George Bayha, representing German investors, reported from New York that the recent negotiation for sale of the copper mine had been declared off on account of the European war.

MAMMOTH (Kennett)—June output of copper approximated 1,725,000 lb. July output probably about the same. Recent improvements to baghouse have increased the efficiency. An additional bank of cooling pipes has been installed. The working force at the Spread Eagle mine is increased and development is progressing at the Stowell, Summit and other properties. At main Mammoth, a large amount of work is in progress. There are 1000 men on the payroll at smelter and mines. The number of miners employed at development of recently acquired properties is likely to be reduced since the closing of the copper market. The springs at the mine camp have gradually failed with the draining into the mined-out stopes. A new supply of water has been found at the head of Little Backbone Creek. Right-of-way was purchased of the Summit Mining Co., over whose land a 4-in. pipe had been laid a distance of 1½ miles. The Mammoth has also bought right-of-way for a tramline, crossing Summit ground to convey ore from the Suro mine, one of the Mammoth holdings which is now producing. The ore is transferred from the tramline to the electric railway.

Sierra County

ANDY FITZ MINING & MILLING CO. (Fruitvale)—Company has concluded financial arrangements for resuming underground development and constructing a new surface plant, which has been long in contemplation.

GOLD KING (Alleghany)—A strike has been made in this mine on Kanaka Creek, of typical arsenical sulphides yielding \$67.50 per lb. gold. This property was located 35 years ago and worked until the payshoot was lost. Recent prospecting again uncovered the vein, which measures 2 to 4 ft. in width and is considered a south extension of the Kate Hardy mine.

Tuolumne County

BLACK OAK (Soulsbyville)—An electric pump was installed at 1700-ft. level. Another electric pump will be placed on the 1000-ft. level. Ledge in north drift 1700-ft. level is making good showing.

DUTCH (Jamestown)—A miner was killed Aug. 2 by falling down a shaft from the 1000-ft. level to the 1650-ft. level. He had just made ready to begin work and was turning on the air with a wrench. The wrench slipped and he lost his footing.

COLORADO

Clear Creek County

NEW ERA (Idaho Springs)—The mill is being remodeled and will be ready for operation within 30 days.

PIONEER (Empire)—This property is being developed by lessees, who are driving a crosscut with machine drills.

CALUMET-CORBIN MINING CO. (Idaho Springs)—This company, often spoken of as the New Era Mining Co., is remodeling its mill at Freeland.

ONEIDA (Idaho Springs)—Development and equipment of the Oneida and Stag properties have been resumed. A 50-ton cyanide mill is under construction. The mill will be built by Hendrie & Bolthoff, of Denver.

GOLD FISSURE (Empire)—The dump is being worked by lessees. The material is passed over a concentrating table which is operated by a gasoline engine. A car of concentrates has been shipped to the smelter.

STANLEY (Idaho Springs)—Lessees have decided to unwater the property to the third level and do extensive development in this level, and also in the road adit. The compressor plant, hoist and pumps are in operation.

Montrose County

CARNOTITE MINING IS AT STANDSTILL owing to curtailed market resulting from European war.

Ouray County

LEGAL TENDER MINES EXPLORATION CO. (Ouray)—Company is advertising for bids on contract to extend present adit until it reaches known ore-bearing contact, a distance of probably 100 ft.

Park County

HILL TOP (Fairplay)—Water prevents work through No. 1 winze, one of the best portions of mine, but steady shipments of lead-silver ore have been maintained from other workings.

San Juan County

BROOKLYN (Silverton)—Mine is being cleaned out preparatory to new development. This mine formerly produced ore running well in lead, copper, silver and gold.

LACKAWANNA (Silverton)—This property on Kendall Mountain was recently purchased by the Wagner brothers, who own and operate the Alta mine in San Miguel County. The new owners contemplate considerable development work in the near future.

San Miguel County

COLORADO MINING & POWER CO. (Telluride)—Company intends to erect a 25-ton amalgamation and concentration mill.

JUNTA (Telluride)—Aerial tramway on Mayflower property has been purchased and is to be moved up on Ballard Mountain to form an extension to present Junta tram. It will extend 3700 ft. up mountain from Jim Crow terminal.

Summit County

REILING PLACER (Breckenridge)—Experiment is being tried of saving and shipping non-amalgamable gold.

BOLIVAR (Montezuma)—Concrete running well in zinc is being made from low-grade ore in new mill and is hauled to Keystone for railroad shipment.

FRENCH GULCH DREDGING CO. (Breckenridge)—Boat is working in 40-ft. gravel and cutting 400 ft. across stream-bed. Cleanup for second half of July amounted to \$17,520.

MEKKA (Breckenridge)—Ben Hall's lease of the bench placer portion of property on slope of Nigger Hill is operating two plants and has averaged a recovery of \$100 in gold per day for three weeks.

TONOPAH PLACERS (Breckenridge)—Boats are said to be doing well. Operations are occasionally interrupted by electrical storm disturbances in the power-lines. July's output is said to be the greatest monthly production thus far.

IDAHO**Coeur d'Alene District**

FLOTATION IN THE COEUR D'ALENE MILLS is being satisfactorily tried out. The Callow system is the one generally favored. At the Hunter mine at Mullan two Callow machines have been in operation for some time, one a rougher and the other a cleaner. The savings on Hunter ore by ordinary concentration have been from 50 to 60%, while with the same ore the Callow flotation is said to make a recovery of practically 90%, and with only 6% silica. At the first experiment, an attempt was made to treat only the tailings, but it soon developed that better results could be obtained by treating the ordinary feed, and the two machines in operation have taken the place of seven vanners. They are now handling 35 tons per 24 hr., and can handle up to 50 tons. The ore is first reduced to 80 mesh, after which it is passed through a mixer, where a small percentage of creosote and pine oil are mixed thoroughly with the ore. From the mixer the ore passes to the roughing machine, and then directly to the cleaning machine, after which it is ready for shipment. The machines are so constructed as to leave several small air compartments in the bottom, into which air is forced at 8 lb. pressure, and comes into the water-and-oil mixture through a coarse blanket in the bottom of the machine, causing a bubbling agitation, which forces the mineral in the feed to the top, where it rolls over the side into ore troughs. The process uses $\frac{1}{2}$ lb. of oil per ton of ore. The Hunter company plans the installation of at least four machines. At the Federal company's Morning mine, operations are nearing completion for the installation of 18 machines. An addition is being placed on the west end of the Morning mill, which is 48x70 ft., and a large Dorr thickener plant is being built in a new building 50 ft. square. The plant will be of 350 tons daily capacity.

FEDERAL (Mullan)—Between Mullan and Mace, company recently completed an important piece of work in the development of the ore zone by finishing the raise from the No. 5 level of the Morning mine to the Star mine, which was recently taken under bond by the Federal from Finch & Campbell interests of Spokane. The Federal company has been developing the Star for some time with a crew of 20 or 30 men, drifting from the west end Morning mine workings on No. 5 level. Nothing of importance was found in the drift, and as a last resort, the company determined to connect with the old Star workings, with the result that the ore shoot developed in the Star ground was encountered near the top of the raise, where it shows a width of 14 ft. of good milling ore. The raise is 435 ft. from the Morning to the Star workings. Where encountered, the ore shoot shows a rake away from the drift development on No. 5 level, and it will be some time before the ore is found on that level. The present development is important, as it means almost the certain purchase of the Star group by the Federal under the option and increased life for the Morning mine. By the addition of the Star group, the Morning mine will become one of the greatest lead-silver properties in the Coeur d'Alene district, with practically an unlimited ore reserve from which to draw. The successful development of the Star also means that more persistent efforts will be made to develop the belt farther west to the Frisco mine, all of which chain of ground, with the single exception of the Ivanhoe ground, the Federal company holds under option.

NATIONAL COPPER MINING CO. (Wallace)—Stockholders' meeting has been called for Aug. 22, to ratify a decision of the directors to increase the capitalization of the company from \$2,000,000 to \$2,500,000. Proposed increase is for the purpose of providing funds or stock for the purchase of the Nellie claim, on which the bulk of the present National orebody has been developed, and which is owned by individuals, most of whom are stockholders in the National company. Reports have been in circulation that the National mill was closed some time ago because of a lack of ore to feed the

mill. This was not the case. The National mine has plenty of ore developed and ready for stoping to last the mill an indefinite period, but the trouble has been that most of the stopes opened have been on the Nellie claim, which did not belong to the National company, but to individual stockholders, who purchased their interests in the claim before the orebody was found in the National lower tunnel. The National company had a verbal agreement with some of the owners regarding a deal for the property, with the result that development work was completed and milling operations started, but when it came to signing an agreement for the ground one of the owners, who controls $\frac{1}{4}$ interest, refused to agree to the terms offered, but agreed to allow the company to develop the ground in question and pay for it according to the grade of ore found therein, before any milling operations were attempted. This has been the work in progress since the mill was closed several months ago, and a deal for the property seems to be definitely arranged. The mine work was one year behind the mill, and so far as the company is concerned, the closing of the plant for a few months has been a benefit. When operations are resumed, it will be possible to continue mining and milling at full capacity for an indefinite period of time. The company has recently started working west, driving a drift on the vein, and so far as this work has progressed it shows fully as important an orebody as that developed in the east drift.

MINNESOTA**Cuyuna Range**

FERROMANGANESE AND SPIEGEL are the principal topics being discussed on the Cuyuna range, due to the advance in price because of the closing off of the European supply. Of the various Cuyuna properties said to contain manganese, only the Cuyuna-Mille Lacs is in shape to take advantage of the sudden advance in price. About 150 tons daily are being hoisted from this shaft, and the company has some ore stocked. Management has announced that the working force there is being greatly increased and production would be rushed. A recent statement given out from the company's office says that the Duluth-Brainerd Iron Co.'s crosscut on the 150, and only level is in ore analyzing 44.74% manganese, 0.089% phosphorus and 3.97% silica. However, the total width of ore thus far encountered averages but 20% manganese. The company is still in the development stage. Another so called manganese property is that of the Iron Mountain Mining Co., $1\frac{1}{2}$ miles northwest of Cuyuna-Mille Lacs. It was recently announced that this property had been turned over to a new organization, and the deal was stated to include a cash advance royalty payment of \$50,000. The property has a three-compartment shaft and a small shaft, but both have been boarded up for some time. In connection with this property, it might be added that one of the officials of the company recently appeared before the Crow Wing County board of equalization and opposed a valuation, for taxation purposes, of \$25,000 on this property, stating that he believed \$5000 was a fair value. Several other properties on the north range contain considerable tonnages of manganese iron ore, but only those adjacent to the Cuyuna-Mille Lacs property give promise of being of value for the manganese content. Of these properties, none has been opened as yet. The Cuyuna-Mille Lacs ore runs from 8% to 23% in manganese, and no considerable tonnage of 40% manganese ore is claimed for the property. The manganese iron-ore deposits to the northward from this property suffer from high silica and high phosphorous content, making them undesirable from a metallurgical standpoint, at least so far as present furnace practice goes. Along these lines, the Dell Development Co. is at present erecting in Duluth a furnace designed to reduce the Cuyuna range low-iron high-manganese ores, with the idea of enriching the manganese product. The furnace is an adaptation of the Jones step process of former days.

CUYUNA RANGE RAILROAD CONSTRUCTION—At Cedar Lake, the Soo Line and Northern Pacific are being connected by a spur, McCullough & Cheney doing the construction work. At the Croft mine, north of Crosby, the Northern Pacific will handle the tonnage but will do so over Soo Line tracks.

BRAINERD CUYUNA (Brainerd)—After two unsuccessful attempts to sink a lath shaft, this company announces that a timber drop shaft will now be sunk. Shaft will be similar to the one at the Wilcox mine, east of Brainerd, and will be put down under the supervision of the same engineer, D. C. Peacock.

Mesabi Range

ON THE MESABI RANGE the Quinn and Harrison mines, west of Nashwauk, are now employing upwards of 200 men, making daily shipments. La Rue is shipping but 700 tons per shift from the concentrating plant and has 50 men working at Chisholm, actual stripping operations have been inaugurated for the Great Northern Ore interests at the Leonard mine. Johnson & Hoy, St. Paul, Minn., are doing the work, it being their first stripping contract on the range. A spur is now building to the Dunwoody mine at Chisholm and machinery is arriving. Work will start in the near future. Thus far Mesabi range operators report no loss of labor due to the European war, the majority of the foreign born employees preferring to retain their jobs. At Virginia, the Duluth, Missabe & Northern Ry. has a large force working on the spur to new Prindle mine. Geo. A. St. Clair, a well known operator, has started work on two shafts in the district east of the Spring mine, as the result of extensive exploratory work there some months ago.

HAWKINS (Nashwauk)—Work was resumed on Aug. 11, giving employment to 115 men. Two shovels are working, one in ore and one in overburden.

DUNCAN (Chisholm)—This newly opened property of the Oliver Iron Mining Co. has just started to ship. Depth of shaft 210 ft., being 25 ft. below the orebody. Estimated to contain 7,000,000 tons.

HILL ANNEX (Marble)—Preparations are under way for inauguration of stripping operations; 33 carloads of supplies, machinery, etc., are now on siding, and camp construction is well under way. Steam shovels will be at work within two weeks.

PITT IRON MINING CO. (Mountain Iron)—The company has won its contention against the village for lower taxes, which will result in a net reduction of \$40,000 in the tax levy for the ensuing year, of which amount practically all would have been paid by iron mines within the village limits. The current year's per capita tax was \$80.

Vermillion Range

SUDAN (Tower)—No. 1 crusher is now completed and ready for operation; No. 2 crusher was scheduled to be ready by Aug. 20.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT CO. (Butte)—At a meeting of stockholders, officers were authorized to issue \$3,000,000 worth of convertible bonds. These bonds were to have been sold to a London syndicate and the money used in construction of proposed road from Divide to Jackson in Beaverhead County. The road was primarily planned to connect the company's Elkhorn mines at head of Wise River with Butte. War conditions make sale impossible and will delay matters indefinitely in respect to company's operations.

Broadwater County

OHIO-KEATING GOLD MINING CO. (Radersburg)—Aug. 5, a special meeting was held to consider question of ordering an assessment to provide funds for operating properties of company on a profitable basis. Less than three-quarters of the stockholders, the number required by law, being present, an adjournment was taken until Oct. 14 when the matter will again be considered.

Silver Bow County

FURTHER CURTAILMENT IN BUTTE MINES, in addition to the closing of seven mines of the Anaconda company, announced last week, consists in decreasing the output of the remaining mines by suspending, for the present, work on each Sunday and Monday. Most of the development work in these mines has also been stopped. The East Butte company, operating the Pittsmtont mine and smelter has ordered operations stopped for an indefinite period. At the North Butte a curtailment of 40% in the output went into effect Aug. 8. Butte-Ballaklava, Rainbow Development and Butte-Alex Scott have suspended operations. At the Butte-Duluth all construction work was discontinued.

BULLWHACKER COPPER CO. (Butte)—P. W. Clark, James B. Clark and Allen Chase Klein, of Spokane, Wash., have brought suit against this company to recover \$150,000, including \$24,000 attorney fees. The money, it is claimed, was advanced to keep the mine going and construct the leaching plant. Mine and mill are at present shut down, due to unsatisfactory technical results from the present plant and to dissatisfaction among the stockholders with the present management.

NEVADA

Esmeralda County

YELLOW TIGER (Goldfield)—Development work is under way on 700-ft. level; level being repaired and raise started in 6-ft. shoot of \$8 ore. A four-drill compressor may be installed.

PALMETTO (Palmetto)—This placer property has been bonded to Tonopah men; work will commence at once. Gold is coarse, being found in nuggets from a few cents to 50c. in value. Lode discoveries have also been made in this district.

GOLDFIELD CONSOLIDATED (Goldfield)—General clean-up of mill is under way. Old precipitate pipe lines are being replaced by new. Estimated recovery of \$100,000 from this source in next three months. Lidgerwood cableway with clam shell bucket will be installed to transport tailings from pond to mill; two steel towers will be necessary.

Humboldt County

BIG FOUR LEASE (Rochester)—A one-year extension has been granted and new development is under way.

HUMBOLDT KING—This mine in Spring Valley is being pumped out preparatory to working. Dredging and ground sluicing is also being done in Spring Valley.

Lander County

AUSTIN-DAKOTA (Austin)—Capacity of ore bins is being increased. A store house and stable are being built. Work in main tunnel is being continued.

RUBY SILVER (Battle Mountain)—Repairs to mill have been made and mill is again operating. Concentrate from first run assayed \$455 per ton, it is stated. Isbell concentrator is doing satisfactory work.

Lyon County

METALS RECOVERY CO. (Dayton)—The 200-ton plant to treat old Douglas tailings, near Sutro, is finished.

MASON VALLEY MINES (Thompson)—Decision in case against Nevada Copper Belt R.R. has been rendered by railroad commission. Switching charges from Wabuska to Thompson are to be reduced from \$5 to \$3.50 per car; to go into effect Aug. 10. There will be no curtailment in production on account of present market conditions.

Mineral County

NEW MILL AT CANDELARIA will be built below mines, and tramway from main tunnel will be built. Capacity of mill will be 200 tons daily it is stated. Its construction is result of successful tests on ores of district by 10-stamp mill and cyanide plant.

Nye County

SILVER BULLION IS BEING STORED AT TONOPAH, it is stated, rather than sell at present prices. Some bullion is being shipped to refining plants where held subject to future market price. Tonopah production is 1,100,000 oz. monthly. No shortage in cyanide will result on account of war in Europe, as first announced.

WHITE CAPS (Manhattan)—Old incline shaft is being repaired.

TONOPAH-MIDWAY (Tonopah)—Old workings have been leased for three years to Montana-Tonopah.

HALIFAX (Tonopah)—Shipment of 50 tons per day to West End mill has been resumed. Ore is hauled by motor trucks.

ROUND MOUNTAIN MINING CO. (Round Mountain)—Consolidation with Round Mountain Sphinx Mining Co. has been effected, ending many years of litigation over extralateral rights of Los Gazabos claim. Sphinx Co. is paid \$20,000 cash and 175,000 shares of Round Mountain stock; capital stock of latter increased from 1,000,000 to 1,500,000. Company now owns 800 acres of mineral land. Drifts on 700-, 800-, and 900-ft. levels will be driven on Los Gazabos vein into Gold Leaf claim of Sphinx group. Placer ground will also be worked; survey for pipe line carrying 400 miners' inches from Jett Creek has been made.

Ormsby County

DIVERTING OF CARSON RIVER will be attempted at low water; a ditch being dug for this purpose. River will be diverted from its bed for a distance of 100 yds. below old Santiago mill where, it is thought, large quantities of quicksilver, amalgam and concentrate have lodged.

Storey County

WORK AT OPHIR AND CONSOLIDATED VIRGINIA has temporarily ceased. Pumps at C. & C. shaft will operate as usual.

White Pine County

ESMERALDA (Ely)—Small mill recently built in Irwin Cañon is operating successfully on Esmeralda No. 1 ore and ore from Shepard claim. Stopping is under way in Esmeralda mine.

NEVADA CONSOLIDATED (Ely)—Operations were curtailed to six days per week and on Aug. 10 to half time. Ruth orebody is being thoroughly examined in order to decide between steam shovel and caving mining. Tonnage developed in this body, 8,000,000 of 2½% copper ore.

NEW JERSEY

Morris County

RICHARD (Wharton)—The new vein lately struck in this mine has been prospected by drifting for 140 ft. It is from 21 to 25 ft. wide. This orebody is beyond the fault which cuts across the eastern part of the old mine, and which was supposed to mark the end of the available ore. The ore was found on No. 5 slope, which is 780 ft. from the surface. Assays made of samples taken all across the vein average 60% iron, with traces of titanium and vanadium. The mine is owned by the Thomas Iron Co. and the ore is shipped to Hokendauqua, Penn., for its furnaces there.

NEW MEXICO

Grant County

BURRO MOUNTAIN COPPER CO. (Tyrone)—Mill construction work has been suspended. Mine development continues as usual. Work on power plant is unaffected.

CANADA

Ontario

JULY SHIPMENTS FROM COBALT WERE: Beaver Consolidated, 32.25; Chambers Ferland, 30.02; City of Cobalt, 42.88; Cobalt Lake, 123.65; Cobalt Townsite, 210.05; Coniagas, 64.46; Crown Reserve, 110.67; Hudson Bay, 119.37; Kerr Lake, 61.40; La Rose, 131.49; McKinley Darragh, 168.39; Nipissing, 130.26; O'Brien, 62.24; Peterson Lake (Seneca Superior), 64.71; Penn Canadian, 24.96; Timiskaming, 95.69; Trethewey, 61.80; total, 1,534.29 tons.

KERR LAKE (Cobalt)—This mine has closed down on account of the war.

McINTYRE (Porcupine)—The Nipissing of Cobalt is negotiating to secure a controlling interest in this mine.

REA (Porcupine)—This company has undergone a complete re-organization and will be known as Porcupine Aurum Mines with an authorized capital of \$1,000,000. It has \$40,000 cash in the treasury and 50,000 shares of the par value of \$1 per share.

HOLLINGER (Timmins)—The regular four-weekly report for the period ending July 15 shows gross profits of \$132,712 from the treatment of 16,343 tons of ore of the average value of \$13.62 per ton. The approximate extraction was 91% and the working cost per ton milled \$4.32.

MEXICO

Sonora

THE EXPORTS FROM SONORA FOR JULY through the port of Agua Prieta are smaller than they have been for a long time. The following is the report of the collector of customs: Nacozari, 9528 tons; El Tigre, 76; Monte Cristo, 3; Rosales, 10; Archipelago, 92; Santa Rosa, 93; Estrella, 33; San Francisco, 6; La Prietati, 2; Esperanza, 22; San Jacinto, 10; La Ventana, 14; La Aurora, 16; San José, 38; Agua Prieta, 15; total, 9958 tons. The El Tigre also shipped 99 bars of gold and silver bullion weighing 12,675 lbs. The estimated value of ores in Mexican currency is: Copper, 1,395,700 pesos; silver, 491,800, and gold 278,900, a total of 2,166,400 pesos.

EL TIGRE MINING CO. (Esqueda)—The cyanide plant treated 800 tons of ore last month. A new vein has been cut on the fourth level of the Kelley shaft showing excellent ore. At present there is \$500,000 of ore blocked out.

GREENE-CANANEA (Cananea)—The fires in the Oversight and Veta Grande have been put out. Two stopes in the Veta Grande and two stopes in the Oversight were burned besides 200 ft. of timbered drifts and No. 11 shaft of the Oversight. Water is being pumped into the mines to cool them.

The Market Report

METAL MARKETS

NEW YORK—Aug. 19

The chief feature of the markets has been the further advance in spelter. The situation in lead continues to be uncertain. In copper, the producers continue to hold aloof, hoping to conserve their business by not trying to make a market, pending some settlement of conditions.

Copper, Tin, Lead and Zinc

Copper—The situation remains the same as we reported last week. A little encouragement is to be found in the resumption of exports to England, but what is going out is chiefly on the filling of old contracts, and what is not that, is the shipment of copper on consignment.

The Raritan refinery is reported operating on only half time. Phelps, Dodge & Co. have now curtailed their production by 50%. Cerro de Pasco has curtailed 50%. Calumet & Hecla is expected to make some curtailment.

The Braden Copper Co. reports production of its mines in Chile in July at 1,332,000 lb. copper; for the seven months ended July 31 at 13,783,000 lb. This shows increases over last year of 286,000 lb. in July and 5,309,000 lb. for the seven months.

The Shattuck Arizona Copper Co. reports July production at 1,348,069 lb. copper, 24,523 oz. silver and 290 oz. gold.

Exports of copper from New York for the week were 1846 long tons. Our special correspondent gives the exports from Baltimore at 106 tons.

Base price of copper sheets is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14¼ @ 14½c. per lb., carload lots at mill.

Tin—The situation remains unchanged.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in June at 1762 tons; 1756 tons being from Bolivia and 6 tons from Southwest Africa.

Messrs. H. A. Watson & Co. report receipts of Bolivian tin at Liverpool in June at 20 tons bars and 2021 tons concentrates, equal to a total of 1233 tons metallic tin.

The Banka sale set for July 30, at which about 2300 tons of tin were offered was postponed.

Tin exports from the Straits, according to the corrected official statement for the five months ended May 31, were: United States, 8401; Great Britain, 14,662; other Europe, 4723; China and India, 963; total, 28,749 long tons, an increase of 2164 tons over last year.

Lead—This market has been a little stronger, although it continued to exhibit the peculiar character that we noted last week. There were differences of five points in the prices realized by the same producer on the same day, and similar differences among the sales of different producers and on different days. There is still much difference of opinion respecting the immediate future of this market. An interesting feature of the last few days has been inquiry for lead from European, Asiatic and African countries. If export sales develop from these inquiries, they will probably be in the main of bonded lead. A rumor today was that the Federal Mining & Smelting Co. had closed its mines. The fact is that the directors have authorized the closing of the Morning mine, leaving the decision to the local management, which has not yet reported. The other mines are working as usual.

Exports from Baltimore for the week included 596,497 lb. lead to Glasgow, Scotland.

Spelter—The export sales that were impending at date of our last report began immediately and aggregated a rather large tonnage at sharply advancing prices. As early as Saturday, a round lot was sold at 5.60c. However, there was at all times a considerable variation in prices accepted as well as in terms of the transactions. The average realized on a very large tonnage was about 5.50c. There were some sales to domestic consumers, but in the aggregate these were far less than the export sales. During the last two or three days, business was quieter than in the previous days.

An interesting feature of the week was inquiry for spelter, not only from England, but also from some more remote countries, including Russia.

The base price of zinc sheets was advanced ¼c. per lb. on Aug. 11 to \$7.25 per cwt.; and again on Aug. 20 to \$7.50 per cwt., f.o.b. cars Peru, Ill., less 8% discount.

Other Metals

Aluminum—Business is quiet, and new transactions are scarce. The market is inclined to be uncertain. Quotations are nominal at 19@20c. per lb for No. 1 ingots.

Antimony—The market has settled down after the excitement of last week, and only a moderate business has been done. Quotations for Chinese, Hungarian and other ordinary brands are easier, at 14@16c. per lb.; but 20@22c. is still named for Cookson's.

Quicksilver—The price remains unchanged at \$90@100 per flask. No London quotations can be obtained.

Gold, Silver and Platinum

Silver—Messrs. Handy & Harman make the following statement regarding the situation in the silver market: London cables quote the spot price for silver since the opening of business after the bank holidays, as follows: Aug. 7, 26d.; Aug. 8, 27d.; Aug. 10, 27½d.; Aug. 11, 26½d.; Aug. 12, 26½d.; Aug. 13, 26½d.; Aug. 14, 27d.; Aug. 15, 27d.; Aug. 17, 27½d.; Aug. 18, 26½d.; Aug. 19, 26½d.

With the improvement in the situation as regards shipments and foreign exchange on account of lower war risks and easier transactions in selling exchange, producers of silver are now making large shipments of silver bullion to London, over one million ounces being shipped on the S. S. "New York," sailing Aug. 15. Spot silver has been sold in London by large producers on the basis of the prevailing quotations for spot silver in London, namely, 27d., thus netting the seller the equivalent here of over 58½ c. per oz.

DAILY PRICES OF METALS

NEW YORK

Aug.	Sterling Exchange	Silver, Cts. per Oz.	Copper		Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
13	*	*	*	*	3.85	3.70	5.50	5.35
					@3.90	@3.75	@5.55	@5.40
14	*	*	*	*	3.85	3.70	5.60	5.45
					@3.90	@3.75	@5.70	@5.55
15	*	*	*	*	3.85	3.70	5.70	5.55
					@3.90	@3.75	@5.80	@5.65
17	*	*	*	*	3.85	3.70	5.70	5.55
					@3.90	@3.75	@5.80	@5.65
18	*	*	*	*	3.85	3.70	5.70	5.55
					@3.90	@3.75	@5.80	@5.65
19	*	*	*	*	3.85	3.70	5.75	5.60
					@3.90	@3.75	@5.80	@5.65

*No market.

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, 15¼c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12¼c.; Chicago-Baltimore, 10¼c.; Chicago-New York, 13¼c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17¼c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.

The effect of these high quotations for spot silver in London has naturally been to raise the price at which silver could be bought in the New York market, and sellers are cautious in selling silver below what they hope to secure in London. On the other hand, as the English Mint seems to be the only buyer, and the London market is so uncertain, buyers here are cautious in bidding for silver, and it has not as yet been possible to establish any New York official quotation on which transactions could be based.

Cables from London on Aug. 19 quote the market 26½d., which would yield the shipper from this market approximately 58c., depending on the rate paid for war insurance and rate of sterling exchange. We understand that the chief buyer in the London market during the past week has been the English Mint, for coinage purposes. London has not been making bids for shipment, but only buying for spot delivery. Business with India and the Far East is at present at a standstill in London.

Gold—The open market for gold in London is still closed, and is likely to remain so. Every financial center is holding tightly to its gold supply and exchange is still impossible.

The gold from the "Kronprinzessin Cecille" has finally found a resting place, having been transferred from New York to Ottawa, Canada, where it is held subject to the order of the Bank of England.

Platinum—The market has been disturbed owing to the uncertainty as to supplies. Dealers are unwilling to quote except to regular customers. A fair price today seems to be \$50 per oz. for refined platinum and \$58@59 per oz. for hard metal, 15% iridium. A sharp advance is possible at any time.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 15

The base price paid this week for 60% zinc ore jumped from \$38 last week to \$43@44 per ton for this week. The base price paid for 80% lead ore was \$45 per ton.

SHIPMENTS WEEK ENDED AUG. 15

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,870,900		512,300
Year	95,461,850	3,520,500	23,674,970

Shipped during week to separating plants, 3,949,460 lb. zinc ore.

JOPLIN, MO.—Aug. 15

The high price of blende is \$44, best ores selling on a case of \$42, which was advanced Thursday to \$43 and Friday to \$45 per ton of 60% zinc. Some ore sold on Tuesday as low as \$40 assay base, and the metal base ranges \$40@41. Calamine sold \$22@23.50 base per ton of 40% zinc. The average all grades zinc is \$38.90 per ton. Lead is unchanged at \$46 per ton of 80% metal content; the highest price was \$46.50 and the average of all grades \$45.92 per ton.

One company got through on a base of \$42, but did not cover full orders. Among all other buyers there never was a more pronounced scramble for ore, and they bid and overbid each other for two days, and tonight are wondering why they did it, as the jump in spelter was not as pronounced as first reported. Producers were generally firm for a \$44@45 base, and got it.

SHIPMENTS WEEK ENDED AUG. 15

	Blende ore, lb.	Calamine ore, lb.	Lead ore, lb.	Values
Totals this week..	8,900,600	660,640	1,373,250	\$213,580
Totals this year..	336,493,220	24,441,820	57,244,030	8,211,380
Blende value, the week,	\$174,040; 33 weeks, \$6,470,480.			
Calamine value, the week,	\$8010; 33 weeks, \$276,805.			
Lead value, the week,	\$31,530; 33 weeks, \$1,364,095.			

IRON TRADE REVIEW

NEW YORK—Aug. 19

The situation is still uncertain, and opinion as to the consequences of the war is divided. For the present, the markets have been rather slack, chiefly owing to the unsettled financial conditions.

For this reason, new business has been rather slack, and there is not much forward business being done. The general belief, however, is that there will be a great improvement as soon as matters become more settled.

PITTSBURGH—Aug. 18

Domestic buying of pig iron and steel products has been greatly reduced, and on the whole inquiry is light, with prospects that the market will be decidedly quiet for a few weeks at least. The condition is inevitable when the war has so completely upset financial and commercial movements, and the decreased interest on the part of buyers is merely the result of a natural conservatism.

The export trade continues to be at practically a standstill, and this affects the steel trade, not only through the direct exports it had, but also through the cessation of exports by many of its customers, the agricultural implement industry being the one involving the largest tonnage.

Fears of a serious shortage of ferromanganese are greatly reduced, though the alloy will undoubtedly be high in price for a long time.

As far as can be ascertained, the steel mills have not reduced their production from the rate of between 65 and 70% of capacity that prevailed in July. They are helped at this juncture by the fairly good buying movement of June and July, and have definite shipping orders to cover operations for 30 days or more.

The steel trade realizes much more fully than a week or two ago how difficult it will be to restore the export movement, seeing that making arrangements for payment may prove a more serious problem even than the restoration of vessel movement. The expected demand from Canada is now developing rapidly, as war conditions practically prevail in that country.

Pig Iron—The market has been extremely quiet, though with prices holding steadily. Shipments are at about the former rate, but all consumers are conservative as to fresh commitments. We continue to quote: Bessemer, \$14; basic, \$13; malleable, \$13@13.25; No. 2 foundry, \$13@13.25; forge, \$12.50@12.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—A sale of 300 tons at \$140 is reported as having been made a few days ago, but the market on resale lots is hardly quotable at that figure. Prospects of a partial resumption of shipments from England on old contracts are now regarded as a matter of only a few weeks, and some consumers who have been carrying relatively large stocks would probably be willing to sell at less than \$140, so that the market may have already passed its high point.

Steel—The market has continued very quiet as to open transactions, and remains quotable at \$20 for billets and \$21 for sheet bars, at maker's mill, Pittsburgh or Youngstown. Predictions are made in some quarters that within a month or two there will be additional advances, but the occasion for such advances is not explained.

The Production of All Forms of Finished Rolled Products in the United States in 1913 is reported by the American Iron & Steel Association as follows: Iron, 1,678,257; steel, 23,112,986; total, 24,791,243 tons, an increase of 134,402 tons, or 0.5%, over the preceding year.

The production of hammered iron blooms, billets, etc., made in charcoal bloomeries from pig iron and scrap in 1913 was 59,393 tons, a decrease of 6414 tons from the preceding year.

COKE

Connellsville Coke—The market is entirely stagnant, with shipments continued on old contracts and no buying or inquiry to speak of. The market stands approximately as follows: Prompt furnace, \$1.75; contract furnace, \$1.75@1.90; prompt foundry, \$2.25@2.35; contract foundry, \$2.35@2.50, per ton at ovens.

Coke production in the Connellsville region for the week is reported by the "Courier" at 264,070 tons; shipments, 269,968 tons. Production in the Greensburg and Upper Connellsville districts was 37,697 tons.

IRON ORE

Of the total shipments of 5,784,514 tons of ore from Lake Superior ports in July, a total of 4,468,788 tons, or 77.3%, went to Lake Erie ports. Three ports—Conneaut, Ashtabula and Cleveland—received over a million tons each.

The American Manganese Co. has some 40,000 tons manganese iron ore stocked at Dunbar Furnace, Penn., and purposes turning out spiegeleisen as soon as the furnace repairs are completed.

It is stated that no more ore will be shipped from Wabana Island, Newfoundland, this season.

Imports at Baltimore for the week included 1449 tons ferromanganese from Liverpool; also 5700 tons manganese ore from Bombay, India.

