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## Silver Lake Basin, Colorado

BY WARREN C. PROSSER\*

*SYNOPSIS—Silver Lake Basin near Silverton in San Juan County, Colo., at one time scene of great activity. Brief description of geology. Three main lodes. Early developments; history of Silver Lake, Aspen, Iowa and North Star properties. An interesting experiment in re-treating tailings being undertaken.*

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Silver Lake basin and its surrounding mountains lie to the east and in close proximity to the town of Silverton, San Juan County, Colo. This was formerly the scene of the greatest mining activity in San Juan County, beginning with the year 1872 when the Little Giant Mining Co. built a small stamp mill in Arrastra Gulch to treat the gold ores of the Little Giant mine.

date. These three lodes, the Titusville, Silver Lake and North Star-Lookout, taken together with their ramifications and resulting fracturings, constitute a network of fissures, varying in size from mere seams to lodes 30 ft. in width. The walls have been chemically altered by mineralizing solutions with slight impregnation of ore minerals, the effect of which is distinguishable for lateral distances of 20 ft. or more.

### DEVELOPMENT OF THE SECTION

The first attempt at extensive development of the section was made by Robert Innes, previous to 1885. He owned the Highland Mary and Lookout lodes, and several mines in Silver Lake basin, including the Royal Tiger,



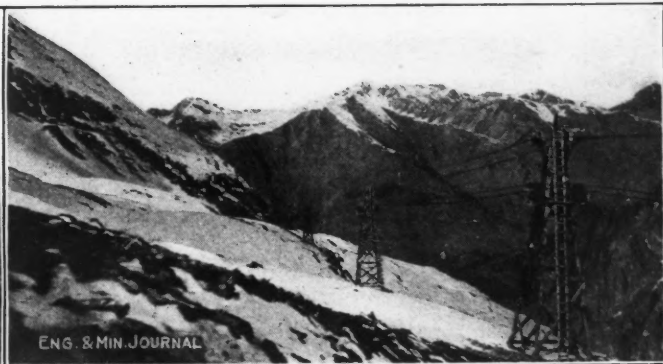
KENDALL MOUNTAIN

Taken from top of carboniferous limestone beds west of Animas Cañon. Schist floor covered by dense forest passes under volcanics.

The mountains of the group are composed of andesite and rhyolite flows, breccias and porphyries, laid down upon a sloping floor of pre-Cambrian schists, from which they are separated by relatively small and thin remnants of Cambrian quartzite and Devonian and Carboniferous limestones.

The master lodes of the section are three in number and are radially disposed around the junction of Mountaineer and Cunningham Creeks. They may be considered a part of a more extensive system radiating around a sharp bend of the Continental Divide to the southeast of this section. They are prominent and their outcrops in ridge depressions are often visible for great distances and consequently they were discovered and worked at an early

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IOWA TRAMWAY IN SILVER LAKE BASIN

Above Arrastra Gulch. The Mayflower mine is in the cliffs to the right.

now part of the Iowa-Tiger Consolidated property. From the Highland Mary lode in Cunningham Gulch Innes drove a tunnel for 3700 ft. toward Silver Lake, through the schist. His dream of opening up the tremendous silver mine which he supposed underlay Silver Lake has not yet materialized.

E. G. and G. H. Stoiber operated a custom sampler at Silverton previous to 1890 and became interested in Silver Lake basin. They later separated.

A 50-stamp mill was built in Silver Lake by E. G. Stoiber to treat the ores of the Silver Lake lode and this operated for many years, the tailings being run into Silver Lake. A Bleichert-system aerial tramway was then built to the Animas River where storage bins were erected on the railroad and in 1899, a new mill was built there and the old mill abandoned.

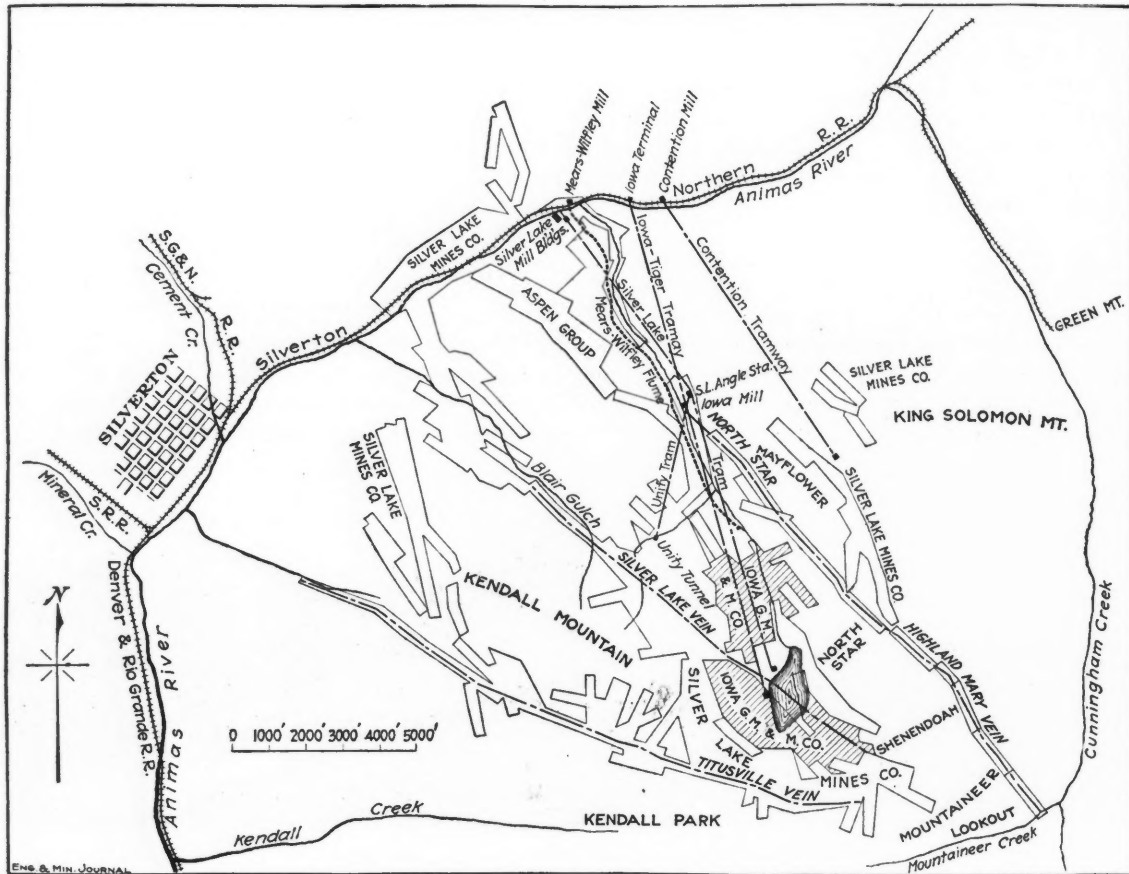
The progress of the Silver Lake property was steady. Unity tunnel was driven from Arastra Gulch to cut under Silver Lake basin 600 ft. deeper and from this tunnel a short tramway was built connecting with the main tramway from the upper basin.

E. G. Stoiber and Lena Allen Stoiber, his wife, had finally accumulated over 150 lode claims and 20 placer and mill sites, amounting in all to over 1700 acres, had constructed an excellent electrical power plant, fluming the water of the Animas River for three miles for generating purposes, had built machine shop and planing mill and had constructed a magnificent 30-room brick residence and office building.

On Mar. 27, 1901, they sold the property to the Guggenheims for \$1,135,000, receiving largely in exchange, it is supposed, American Smelting & Refining Co. stock,

flume line connects this mill with the creek at the head of Arastra Gulch. The mill will consist of Hardinge mills, classifiers, two Wilfley tables 8 to 12 ft. wide and 48 ft. long, and possibly one of the new 24-deck Wilfley slimers. The building inclosing the plant is small, possibly 40x60 ft., but, it is claimed, will have a capacity of 500 to 600 tons per 24 hr. The tailings, said to amount to about 500,000 tons and to average \$2.35 according to the Silver Lake records, will be pumped from the lake and forced down the creek and over the cliffs into Arastra Gulch. From the foot of the cliffs they are to be carried by the flume to the mill on 6% and 9% grades.

One of the new 24-deck slimers, installed at the Iowa Mill by Mr. Wilfley, has been operating but a short time and although it is rather early to expect results, its success so far would seem to be only nominal.



MAP OF SILVER LAKE BASIN AND REGION ABOUT SILVERTON

which was then quoted at a low figure compared with more recent years. The transaction covered approximately the Titusville and the greater portion of the Silver Lake lodes as shown on the accompanying map.

The Aspen mine was worked as early as 1870 and in 1872 was the center of operations in the section. In 1905, the Silver Lake mill was destroyed by fire and in 1907 a new mill was constructed in conjunction with the Garfield Smelting Co. holding the Aspen mine; this mill consisted of two similar units to treat the ores of the two mines and had a total capacity of 350 tons.

#### NEW MILL FOR TAILINGS

To treat the tailings in Silver Lake, the product of the first Stoiber mill, a company organized by A. R. Wilfley and Otto Mears is constructing a mill on the west bank of the Animas River near the Silver Lake plant. A

The Silver Lake property has now been leased to J. H. Slattery and associates who have organized a company with \$10,000 capital to develop the Titusville lode from the Zanoni shaft, where good ore was said to have been opened and never worked.

#### THE IOWA AND NORTH STAR

G. H. Stoiber, together with J. H. Robin, organized the Iowa Gold Mining & Milling Co. and after accumulating property in Silver Lake Basin built a 150-ton mill in Arastra Gulch connected to the mine with a Bleichert tramway. Later, when the consolidation with the Royal Tiger Mining Co. was effected, another tramway was built connecting the mill with a terminal building on the railroad. The two tramways together constitute the longest straight tramway in the San Juan and one of the most spectacular. The property worked for many

years producing an excellent grade of lead concentrates but was eventually closed down, not being able to meet dividends, due largely to overhead expense.

The North Star mine began operating in 1883 on a large scale and produced over \$1,250,000 in gray copper ore. This ore carried on an average 250 oz. of silver and 3 to 4% of copper, with little lead and no gold. Under the direction of the Contention Mining Co., a mill was built on the railroad and a tramway connected to the



IOWA MINE BUILDINGS IN SILVER LAKE BASIN  
Lake itself covered with ice and snow.

west portal of the mine; the mill was never successful and was soon closed.

Other operations on a smaller scale have met with varying success.

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### Injury to Employee in Performing Contract Work

By A. L. H. STREET\*

When a shaft is being sunk, or other work is being done, by a contractor, the question frequently arises as to whether the mineowner is responsible for injury negligently inflicted upon an employee engaged in the work. The test of responsibility in such cases is declared by the courts to be whether the contractor is a mere repre-

sentative of the owner in employing and discharging men, or whether he is an "independent contractor," that is, not accountable to the owner for the means used in doing the work. If the first mentioned relationship exists, the owner is liable, otherwise, he is not. In a case of this kind which has just been before the Washington Supreme Court (*Watson vs. Hecla Mining Co.*, 140 *Pacific Reporter*, p. 317), the court upheld a finding of the jury that defendant company was liable for injury to an employee who had been previously employed by the company and who was directed by the shift boss to go to work in the shaft. The contract in this case required the contractor to sink the shaft at a specified price per foot, but the company agreed to furnish the necessary power, tools, etc., and to pay the men engaged in the work. These circumstances were regarded by the court as warranting a finding that the injured man was the employee of the company and not of the contractor.

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### Johannesburg Notes

JOHANNESBURG CORRESPONDENCE

A promising discovery of gold in alluvial and in flat reefs in the dolomite series, is reported from Mt. Anderson, in the Lydenberg district.

The annual report of the East Rand Proprietary mines shows that the payable-ore reserves have been reduced to 5,600,000 tons, valued at 6.7 dwt. over 54 in.; 1,936,000 tons were crushed and 1,530,000 tons developed; of this, only 59% was payable. The accumulation of unpayable ore in the mines is now 8½ million tons, of a value under 4.3 dwt. Development in the richer western section of the mine has been hindered by the need of providing a pumping plant to lift two to three million gallons of water from 3000 to 4000 ft. This water is expected from the Witwatersrand Deep mine when a large dike is pierced.

The Randfontein Central mine crushed 2,533,000 tons for a recovery of 24s. 6d. per ton, or £3,103,116, with an expenditure of 17s. 2d. per ton, or £2,182,000, and a working profit of £921,134. The ore reserves have been increased to 6,818,909 tons, valued at 6.5 dwt., while 1,816,680 tons are at present unpayable, valued at 3.1 dwt. Both these mines have been hampered by shortage of native labor and strike stoppage. It is of interest to note that the Randfontein Central power station generated 87,700,000 units at a cost of only 0.2339d. per unit. A 6000-hp. turbogenerator is to be added. As the Victoria Falls Power Co. generates 10 times this quantity and as its lowest contract rate of sale is 0.52d. per unit, its profit must be great.

The City Deep mine is still in a mess, but conditions are improving. No real progress can be made, however, until the vertical circular shaft is sunk to the required depth to provide proper ventilation. The mine is a rich one, the ore reserves being 2,167,680 tons, valued at 10 dwt. Working costs, however, on an output of 468,000 tons varied from 25s. 7d. to 23s. 7d., from 8s. to 5s. per ton more than they should be.

The copper output of the Transvaal has increased from £49,142 in 1912 to £138,328 in 1913. This is solely from the Messina mine, which has now rail communications and is increasing its output. The ore occurs in pipe-like shoots in schistose granite and averages about 10% in value.

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# Precipitation From Cyanide Solutions\*

BY HERBERT A. MEGRAW

*SYNOPSIS*—There are four methods available for precipitating metals from cyanide solutions. These are electrolysis, charcoal, zinc and aluminum. The first two are not much used now, but zinc is the predominant precipitant, having much the widest use. Aluminum is necessary in case of some complicated ores, and has the advantage of forming no cyanogen compound.

Solutions from cyanide treatment of ores have been made to give up their precious-metal content by several processes, the principal one of which has been the use of zinc, in some form to replace the precious metal in solution. Generally speaking, there has been little difficulty with the zinc method. There used to be some complaint about what was called "white precipitates" in zinc boxes, but little is heard of it now. Better methods of solution handling and a clearer understanding of chemical facts have removed most of the difficulties, while the replacement of zinc shavings by zinc dust as precipitant has also had a marked effect in reducing difficulties.

With the solving of old problems, however, new ones keep coming to light. New methods of treatment, bringing rebellious ores within the range of economical treatment, are tending to produce solutions containing many elements and compounds not met with in the earlier practice. These have necessitated modifications of practice, and in some cases entire changes of method. At some mills even a combination of two different methods is required to secure satisfactory results. On the whole, however, precipitation gives little trouble, less perhaps than any other step in cyaniding, which depends so completely upon a purely chemical condition.

## BASIS OF PRECIPITATION

Precipitation on zinc is based upon the fact that gold and silver are electro-negative to zinc in cyanide solution. In solutions of cyanide, which contain gold and silver only, and no other metals, precipitation is clean, prompt and complete. It is quite clear, however, that no solution found in actual practice can be so clean as to contain nothing but the precious metals, in addition to the cyanide itself. It is clear that precipitation only takes place in the presence of sufficient free cyanide. The low limit under which precipitation will proceed satisfactorily is not altogether fixed, but varies at different places, according to the character of the ore treated and the general content of the solutions. The metal content itself has a good deal to do with it. Satisfactory precipitation is always accompanied by the evolution of hydrogen and by an increase of alkalinity of the solution. This is thoroughly explained by the well known reaction covering the precipitation of gold and silver by zinc, whereby potassium or sodium hydrate is formed, depend-

ing upon which cyanide salt is used, and hydrogen liberated, while the gold or silver is precipitated and an alkaline zinc cyanide is formed.

## GENERAL SYSTEMS OF PRECIPITATION

To return to general principles, it may be said that there are four different systems by means of which gold and silver may be practically precipitated from solutions of cyanide. These are: First, by the use of an electric current; second, by the use of charcoal; third, by the use of metallic zinc in one form or another, while the fourth is the use of metallic aluminum. At the present time, the use of metallic zinc is by far the most common of methods and has been developed to give extremely satisfactory results when well installed and properly managed. The other forms, however, are really in use in different places, and seem to be suited to particular cases, although not recommended for general use.

Probably, one of the most important requirements of a solution for precipitation is that it shall be absolutely clear. Many difficulties of precipitation have gone on record which are really nothing more than the result of carelessness or incomplete installations whereby clear solutions either could not or would not be secured. It is perfectly evident that a solution containing an appreciable proportion of fine colloid slime will deposit this material upon the zinc, whether the latter be in filiform or dust condition, and prevent further precipitation, beside insuring a waste of zinc, together with a decided lowering in the grade of the precipitate. Whatever method of precipitation follows, the solution must inevitably be crystal clear in order that good results may be secured. A clarifying filter of some kind is a prime requisite. If it is not possible to acquire one of the standard clarifying machines manufactured for the purpose, an ordinary sand tank with a filter bottom containing about a foot or two of fine sand, will act as an efficient filter, provided the sand bed is changed from time to time, when it becomes charged with colloid slime.

## ELECTROLYTIC PRECIPITATION

Electrical precipitation was devised by Dr. Siemens, of Germany, and is usually known as the Siemens-Halske process. It was first put into practice in South Africa rather early in the history of the cyanide process. It was used there for a good many years, but did not spread widely to other countries, although it has been used in some cases. It is understood now that, even in South Africa, zinc has practically displaced the electrolytic method. It is, however, an important process and is practical in operation and results, although the other processes are now considered better.

Electrical precipitation is by the use of a direct current of low voltage. Iron anodes and lead cathodes are used. One of the advantages of the process is that the strength of the cyanide solution has little to do with the precipitation efficiency, so that when solution contains sufficient cyanide to dissolve the metal, no particular attention to precipitation requirements need be considered.

\*This is the eleventh of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvement. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, Jan. 31, Mar. 7, Mar. 21, Apr. 25 and May 23. The next article will deal with "Cyaniding a Furnace Product," and will appear in the issue of July 25, 1914.

It was probably for this reason that the process appealed particularly to operators treating low-grade gold deposits, where the cyanide in solution was required to be only a small quantity, in many cases so small that precipitation upon zinc was somewhat difficult. Where gold occurs in finely divided form, and in low-grade ores, extremely minute quantities of cyanide only are required. A solution of even as low as 0.02% KCN has been known to be quite sufficient to dissolve all the gold in slimes under agitation in about 12 hr. This was with an ore containing about \$5 per ton in gold.

The original idea of Doctor Siemens was that the gold and silver would be plated upon the cathode, from which it could be stripped from time to time as convenient. It was also found that when the cathode was sufficiently worn so as to be of no further practical use, it could be melted and cupeled to recover whatever precious metal might be contained in it.

#### MODIFICATION OF SIEMENS-HALSKE PROCESS

The modification of electrical precipitation devised by the staff of Charles Butters & Co., and used in several of its plants, consisted in raising the current density to 0.3 to 0.5 amp. per sq.ft. of cathode surface. When this is done, the metal is not precipitated as an adhering deposit upon the cathodes, but comes down upon it as a sludge or slime, much like the black precipitate formed when using zinc. This sludge or slime could be wiped from the cathode surface from time to time, so that cleaning up entails no great amount of labor. The Butters plants used cathodes of lead foil, collecting them when worn out and cupeling them in an English cupel furnace when the quantity became sufficient to justify that course. Later these lead cathodes were replaced by tinned iron sheets. Such sheets are considerably cheaper than the lead, last longer, and are generally more economical and do the work quite as well.

Electrical precipitation is carried on in a box very similar to that used for zinc shavings. It contains the same type of compartments, but the space occupied by the zinc shavings, in zinc precipitation, is replaced by alternate anodes and cathodes, hung more or less close together in the box. The current is carried in copper leads about the edge of the box and enters the poles through wires soldered to the leads.

One of the real advantages of electrical precipitation is that by its use foul solutions are avoided and an appreciable quantity of cyanide is regenerated for further use. Regeneration is accomplished to a certain degree when using zinc as a precipitant, but not to so great an extent as when the electric current is used. Foul solutions are avoided because the electric current precipitates practically everything in the solution; all the metals, at any rate, and also some of the lime. This fact, however, while proving an advantage to the solution, is a decided disadvantage in the precipitate itself, because it lowers its grade, requiring much more flux to melt it, and makes a combination which is neither fluxed nor melted with any degree of comfort. The precipitate from the electrical boxes is exceedingly hard to melt and is likely to be rather base on account of the presence of many other metals, precipitated along with the gold and silver, which get into the bullion, and from which there is no escape. The principal disadvantages of the process are its high costs of installation and attendance and the general care

necessary, together with the low grade of resulting bullion and the expense of melting the precipitate. The process is still in use at some plants and some advantage is claimed through its use.

#### COMBINED DISSOLUTION AND PRECIPITATION PROCESS

An old process, which is merely a modification of electrical precipitation, is that known as the Pelatan-Clerici process, which was intended to be a single-stage agitation and precipitation process. The slimed pulp was agitated in cyanide solution in a tank which contained plates covered with mercury in the bottom. The amalgamated plates were connected to act as a cathode, while an anode was connected with the solution itself. The idea was that solution and precipitation would take place simultaneously. It is not possible to say that this process was satisfactorily used anywhere. It is probable that the scouring effect of any sand contained in the pulp would loosen particles of amalgam from the plate, and these particles would probably be lost in the tailings. Installations and operation of the process would be costly, and the results have probably not justified its wide use. It seems to have disappeared altogether from practice.

#### CHARCOAL AS A PRECIPITANT

Charcoal has been used as a precipitant for cyanide solutions containing precious metals, although its use does not attain to wide proportions. According to Gaze ("Practical Cyanide Operations," 1898), the first experiments in its use were made by W. Aitken, at Reefton, N. Z. He states that no very encouraging results were obtained from its use, and the idea was temporarily abandoned, but that in 1894, W. D. Johnston, of San Francisco, applied for and was granted a patent on the developed process which was used later to some extent in Australia.

Apparatus for the use of charcoal as a precipitant is identical with the box used for zinc shavings. A cage or box of fine screen wire is made to fit into the zinc space. The cage is filled with charcoal and a cover of the same screen placed over the compartment to prevent the precipitant floating away. According to the best recognized authorities, the charcoal itself should be that made from soft wood, as hard-wood charcoals have not the same effect. It is best used when broken up into small sizes, not larger than about  $\frac{3}{8}$ -in. cubes, and packed rather tightly in the cages.

The reason for the precipitation of gold and silver by charcoal is somewhat obscure. Some authorities claim that it is due to the action of a galvanic couple, the carbon and the potassium cyanide forming the poles. Others maintain that it is due to the occlusion of certain gases in the pores of the charcoal itself, while still others maintain that the effect is chemical and that carbon in this particular form will precipitate from cyanide solution. A direct conclusion may not be arrived at without further data, because the matter has never yet been decided. In opposition to the proposed theories, it is somewhat difficult to see how a useful galvanic couple can be thus formed, and it is also true that any gases which may be contained in the charcoal, if applied in a free state to cyanide solutions direct, have no precipitating effect. Nor has carbon in any other form the ability to precipitate with any efficiency gold and silver from cyanide solutions. The fact remains that precipitation does result,

and that while the charcoal is fresh, precipitation is efficient.

After having been used for a time, the precipitating effect of charcoal ceases. This may be due to the filling of the pores of the charcoal with precipitated metal, or it may be due to the exhaustion of the hydrogen or carbon gases within the porous mass. Of course, the presence of mineral slimes, from the ore itself, will effectually shut off any precipitating action. The effect of the charcoal may be revived by heating it to a redness in a closed chamber, avoiding any entrance of air. This probably causes the precipitate to shrink, opening the pores and permitting further filtration, and also permitting a replacement of exhausted hydrogen or other gases. Such reburning may be performed once or twice on each lot of charcoal, but thereafter even reburning will not return the precipitating effect, and the charcoal must be discarded and a new lot used.

The quantity of metal which a stated amount of charcoal will precipitate with efficiency has not yet been accurately determined, but 100 lb. of charcoal, twice returned, will carry approximately 30 to 40 oz. of metal. At its first use, however, it will not carry more than 10 to 20 oz.

Charcoal precipitation has the advantage of precipitating metal from very dilute solutions, that is, dilute both as to metal and as to cyanide. The resulting ash is also easily melted into bullion form. The low installation cost of the system and its low operation costs also are much in its favor. Charcoal will precipitate base metals, when they occur in solutions, as well as gold and silver, but there will be no cyanide regeneration. On the contrary, there is a definite consumption of cyanide in the passage through the charcoal box. For this reason, only extremely dilute solutions should be precipitated by that process.

As a matter of fact, it is hardly worth while to caution against the use of charcoal as a precipitant, as its use is extremely restricted. I can call to mind no large plant which systematically uses charcoal as a precipitant. It may be reasonably recommended in cases where a limited quantity of tailings have to be treated which contain base metals, such as copper, zinc, etc.

#### ZINC THE UNIVERSAL PRECIPITANT

At the present time, therefore, zinc may be called the universal precipitant. There are two forms in general use, zinc shavings, or filiform zinc, and zinc dust, or fume. Only a short time ago, the zinc shavings were much preferred as precipitants, and most of the metal in cyanide solution was precipitated upon them. At this time, however, the use of shavings is diminishing and dust is taking its place to a large extent.

The usual form of box in which zinc shavings are used is known to everyone familiar with the rudiments of the process. The general idea is that solution should pass upward through the mass of zinc, and the boxes have been designed to facilitate that movement, but passage of solution downward through the zinc pile is not to be called objectionable. In fact, after much experiment and comparison of notes with other operators, I have been altogether unable to find any particular advantage about the upward passage of solutions. When boxes are properly packed and cared for, precipitation by either system is not likely to give trouble.

It is generally recognized that chemically pure zinc is not a first-class precipitant. A small percentage of lead in the zinc assists materially in precipitation, probably serving to give rise to a zinc-lead galvanic couple. Most commercial zinc contains lead as an impurity, so that defective precipitation on account of chemically pure zinc is not likely to be encountered in ordinary practice. Zinc shavings are packed into the compartments of the zinc box in such a way as to completely fill it fairly tightly, but not so as to impede a free flow of solution through it. It must be so packed that there shall be no channels or holes through which solution may pass without coming into contact with zinc at all. There is no definite rule as to the quantity of zinc to be packed in a given space, but with shavings of the ordinary thickness, about 20 lb. of shavings per cu. ft. of compartment space is considered to be about the average. For special cases, of course, variation may be advisable.

#### PRECIPITATION RATE OF VARIOUS METALS

The first compartments of an extractor box usually do most of the work. In the ordinary mill, it is usually found that the first compartments contain more precipitate than all the rest put together. Certainly, the first two would contain much more than the rest of them. There is often a selective action shown in the zinc box, for head compartments are likely to recover a great percentage of the gold and silver, leaving other metals to be precipitated later or in the lower compartments of the box. The action does not seem to be at all regular but varies according to the strength of the cyanide solution and its content in metal. There is no regular rule about the order of precipitation on the shavings. More often gold precipitates almost completely in the first one or two compartments, but I have seen conditions such that a portion of the gold passed through the greater part of the box and precipitated as a brilliant plating on the zinc shavings in the last compartment of an extractor box.

#### ACTION OF VARIOUS METALS ON ZINC

The action of various metals upon zinc is the same whether shavings are used or whether zinc dust is used. In the case of the latter process, however, some difference is made by the zinc and precipitates being entirely out of contact with the air and therefore avoiding oxidation. It is for this reason that many difficulties found with zinc shavings are not encountered in the zinc dust process. Another reason for the same thing is that the precipitate is entirely covered, and the result is not to be seen until a clean-up is made. Solution of zinc goes on, during zinc precipitation, altogether without reference to the actual deposition of metal in the solution. While the reaction is apparently an interchange between zinc and the metals to be precipitated, there are many conditions under which a great excess of zinc will be dissolved. Clennell ("Cyanide Handbook") mentions that it would appear that the electric couples Zn: Pb and Zn: Au, etc., give rise to local currents which electrolyze water, the oxygen at the moment of formation attacking the zinc to form hydroxide. Under usual working conditions, this redissolves in excess of cyanide, forming an alkali-zinc cyanide and hydroxide. An insufficiency of free cyanide, however, may lead to its deposition in the form of a white precipitate on the surface of the shavings.

White precipitate is one of the bugbears which has worried the cyanide operator during the entire existence of the zinc-shavings system. It is caused, as has already been mentioned, by an insufficiency of free cyanide which precipitates hydroxide on the zinc itself, or may also be caused by lime troubles. An excess of lime will cause it to deposit upon the zinc in a hard, adhesive layer, preventing further precipitation. A similar difficulty is caused by an extremely minute percentage of lime less than is necessary to protect solutions. The deposit is not exactly the same, but forms in balls and knots, generally binding the shavings together in little bundles. A sufficiency of free cyanide, together with the proper proportion of lime in solution will altogether avoid trouble from white precipitate.

#### EFFECT OF COPPER ON PRECIPITATION

Copper has usually a decidedly prejudicial effect upon precipitation. It deposits as a plating upon the shavings in the box and precludes further work by the zinc. This difficulty may be avoided to a large extent by dipping the zinc shavings into lead acetate before putting them in the precipitator box. In this way, a light precipitate of lead is formed on the surface of the zinc, so that when the copper is deposited, it falls first upon the precipitated lead, which may be at intervals shaken off the zinc. As a matter of fact, this effect does not last particularly long, and the zinc must be changed at frequent intervals in order that precipitation may be satisfactory. This results in a considerable waste of zinc. When zinc dust is used, the copper does not have such a bad effect, because even if copper does plate upon the metallic zinc, the latter is in such small particles that much zinc cannot be wasted. In addition, the precipitate, whether it be of precious or base metal, is removed from solution immediately in a filter press, and is not allowed to affect the working solutions any further.

#### MERCURY DESTROYS ZINC

Mercury is often encountered when cyaniding old tailings, particularly from pan mills or the old Mexican patio process. The metal is almost entirely recovered in the first compartment of precipitation boxes. The effect of mercury upon the zinc shavings is to form a sort of an amalgam, making the zinc extremely brittle and causing great waste. A huge quantity of precipitate is thrown down, but it is of extremely low grade and hard to handle. The mercury precipitated and the great amount of zinc thrown into the precipitate causes the low grade of the material.

Mercury is to a large extent dissolved by cyanide solutions. Some writers have claimed that mercury in a metallic state is not readily soluble in cyanide solutions, and that the quantity of mercury which does go into solution is in the form of chloride, result of the pan or patio processes. While it is undoubtedly true that the chlorides of mercury are soluble in cyanide, it is not altogether true that metallic mercury is not soluble. The question of solubility seems to depend on several factors. Pure cyanide solution, containing no other metal, does not seem to have much effect upon mercury in agglomerated masses, but solutions containing other metals will rather readily dissolve mercury in an atomized or floured condition. I am by no means sure what the factors are nor just how they affect the dissolution rates.

Mercury in precipitates is by no means lost, as it may be retorted and recovered. The most common way of recovering quicksilver of this sort is to retort the precipitate in an ordinary tubular retort, such as is used for recovering mercury from gold-silver amalgam. A great deal of mercury has been thus recovered from old mill tailings, and the Comstock tailings of Nevada have furnished a large quantity to the Western markets.

#### EFFECT OF ARSENIC AND ANTIMONY

Arsenic and antimony, when present in ores, are very likely to be dissolved and precipitated on the zinc. The precipitate is not always particularly adhesive, and if the current through the zinc boxes is strong, it is likely to be carried through and left in the sump. These precipitates do not seem to be really dissolved, and, in ores containing quantities of arsenic and antimony, together with other rebellious elements, quantities of the precipitate may be found in the sump tank. Where the quantities are small, the precipitate is more likely to stay in the zinc box, but may seem to be distributed more evenly throughout the whole surface of the zinc, and it is probable that precipitation is not altogether complete. Arsenic at times forms a rather closer amalgamation with zinc than other elements, and, due to this fact, it is well to be careful when acid treatment of zinc-shorts is resorted to. The operator is likely to become poisoned by arsine, a highly poisonous gas, which may form under such circumstances.

Base metals or rebellious compounds in ores were formerly supposed to be prejudicial to good results both in extraction and precipitation, but within the past two years a new light has been thrown upon the matter by the operation of the precipitation plant at the high-grade mill of the Nipissing Mining Co., at Cobalt, Ont. These ores contain arsenic, antimony, nickel, cobalt, some mercury and, perhaps, a few other elements. Precipitation, however, in the ordinary zinc box, goes on as usual. The matter has already been referred to in a former article,<sup>1</sup> which gives a good idea of the conditions and results.

Soluble sulphides may occasionally interfere with satisfactory precipitation by giving the zinc shavings a filmy coating of zinc sulphide. The condition may be remedied by the prompt addition of lead salts to the treatment tanks, for a successful extraction cannot take place in the presence of soluble sulphide. The lead salts remove the sulphide from solution and prevent its effect either there or in the zinc boxes.

#### ALUMINA AND SILICA

Alumina and silica sometimes make a good deal of trouble in a zinc box by filling it with a jellylike mass which clings to the zinc and usually short circuits the solution around it. The trouble may be readily removed, if caused by silica, by raising the alkalinity percentage; adding lime to solution. If alumina is the cause, the only remedy is to remove the zinc shavings from the box and entirely clean or wash the colloidal matter off of the zinc shavings.

Troubles of this kind usually do not occur when zinc dust is used instead of zinc shavings. As has been already mentioned, the entire isolation of the precipitant and precipitate from the atmosphere prevents oxidation

<sup>1</sup>"Eng. and Min. Journ.," Dec. 14, 1912.

and precludes the formation of many of these objectionable compounds. Some of the compounds may be formed, and undoubtedly are, but because they are immediately removed from solution they do not do any particular harm, aside from reducing the grade of the precipitate itself.

#### ZINC DUST AS A PRECIPITANT

The zinc-dust form of precipitation was proposed first by H. L. Sulman. The process was not successful at first, due to the imperfect knowledge of the requirements necessary for its successful use. The original practice was to add a calculated amount of zinc dust, that required to precipitate the metal in solution, to a tank full of solution. The tank was then agitated, either by compressed air or by mechanical means. The zinc and precipitate were then allowed to settle, the solutions decanted, and the deposit filtered, if filtering conveniences were at hand. The decanting losses were comparatively high, and when the zinc was added in just sufficient quantities to precipitate the contained metal, re-solution invariably occurred. If the zinc was in excess, its consumption was abnormally high. In addition, it is now recognized that any chance for oxidation of the zinc, either before or while in the solution, is prejudicial to good results and induces a wasteful consumption of zinc. It remained for C. W. Merrill to realize that the critical requirement was that zinc and precipitate should be removed from the solution immediately on completion of precipitation, and that, as far as possible, there should be no contact between the zinc dust, in solution or out of it, with the air, in order to avoid oxidation. In the Merrill process, all this is accomplished by adding the zinc powder, mixed with solution containing the precious metals, into the suction of a solution pump, and passing it through a filter press before delivering into the solution-storage tanks. The pipe line from pump to storage is usually quite long enough to permit of the required time for thorough precipitation. Another system devised by B. A. Bosqui, now owned by the Merrill Metallurgical Co., was to mix the zinc dust with a measured quantity of solution in a tank, agitate by mechanical means for the required time to secure perfect precipitation, and then pump the mixture immediately through a filter press. In this way, little oxidation is undergone, and the time for precipitation can be regulated to suit all conditions. In solutions containing large quantities of metal, such as those resulting from the treatment of medium or high-grade silver ore, a longer time for precipitation is required than when gold ores of medium or low grade are being handled.

#### ESTIMATION OF QUANTITY OF ZINC DUST REQUIRED

The amount of zinc necessary for precipitation may be readily calculated from the known content of the solution in the tank. A quick method for estimating the silver in solution has been devised by G. H. Clevenger<sup>2</sup> and published in the *JOURNAL*. The required quantity of zinc may be placed in a feeder, of which there are of several types, and added to the solution continuously as the tank is emptied. Some care has to be taken to prevent the zinc dust in the feeder from becoming wet, as oxidation takes place rapidly and with the liberation of

much heat, so much so that if the feeder contains inflammable material, such as belting, etc., rather serious results may occur.

The advantages of the Merrill zinc-dust process are that the expense of the zinc-room care, packing of zinc-extractor boxes, cutting of zinc, and continual watchings are done away with practically entirely. The presses are simply locked up and left until the time of cleaning up comes, when the presses are opened, precipitates dumped into pans or cars, dried to the required extent, fluxed and melted. The clean-up always represents the entire production of bullion, and there is not, as in the case of the zinc shavings, anything left over in combination with zinc. Lastly, there is little danger of loss through theft or accident. The presses are closed except when the clean-up is in progress, and safety from accident is illustrated by the serious fire at the mill of the Goldfield Consolidated Co., at which time no precipitate was lost, although the presses were heated so hot as to burn the zinc in them almost completely.

Zinc dust is the "blue powder" of commerce, which is unavoidably formed during the smelting of spelter. Its preparation consists merely in collecting the blue powder from the prolongs, as free as possible from admixture of foreign elements, and sifting it. As its value depends upon the percentage of metallic zinc, it is essential, in preparing it for this market, to regulate the distillation and condensation of the zinc so that there will be the least possible formation of oxide. The market standard is a tenor of at least 90% metallic zinc, but it is seldom as pure as this, the percentage of oxide being usually considerably higher. Zinc dust is usually susceptible to oxidation, so much so as to be explosive, and on that account great care is necessary in its transportation and storage. Owing to its inflammable nature, and the liability to spontaneous combustion, it is rated by fire underwriters as a specially hazardous risk. A ruling of the Interstate Commerce Commission lists the product as inflammable product, requires a special label and special packing in order to avoid breaking of the package. Especially careful and complete methods of examining, analyzing and testing zinc dust for practical purposes have been published by Clennell<sup>3</sup> and Sharwood,<sup>4</sup> to whose articles reference should be had when experiments or examinations are to be carried out.

#### METALLIC ALUMINUM AS PRECIPITANT

The aluminum method of precipitation, which is the fourth one to be mentioned, and the last one of general application, is of comparatively recent date in its practical application. It has been in use in the past two or three years in a few mills, but not many, and even in these its advantages were only imperfectly recognized. It has been well known that aluminum will precipitate gold and silver quite as well as zinc, but attempts to use aluminum in the form of shavings, as zinc was previously used, developed the fact that a tightly adherent coating of the metal was formed on the aluminum shavings, so that precipitation was stopped and a large amount of aluminum went to waste. Probably the first practical application of aluminum was in the dust form and was applied by Professor Kirkpatrick, at the Deloro smeltery, Ontario,

<sup>2</sup>"Eng. and Min. Journ.," May 3, 1913.

<sup>3</sup>"Eng. and Min. Journ.," Apr. 19, 1913.

<sup>4</sup>"Eng. and Min. Journ.," May 11, 1912.



where it was used in dust form for precipitating the precious metals from rich cyanide solutions resulting from the treatment of some special product. Julian had previously attempted the use of aluminum shavings, but the result was failure on account of the cause already mentioned. Conditions at the mill of the Nipissing Mining Co., at Cobalt, required the use of some other precipitant than zinc, and E. M. Hamilton applied aluminum with entire success. His experiments and results have already been published in the JOURNAL.<sup>5</sup>

The use of aluminum as a precipitant was originally patented by Carl Moldenhauer in 1893. He says in his specifications: "Zinc has heretofore been applied in practice by preference in precipitating gold from the cyanide solutions obtained by leaching auriferous ores. The employment of zinc for this purpose is found, however, to be attended with serious disadvantages." One of the disadvantages of the use of zinc is that it forms a combination with the free cyanogen and alkalis contained in cyanide solutions, while aluminum separates the gold or silver from solution without entering into combination with the cyanogen, but reacting with caustic soda, which is present at the same time, and thus regenerates a certain quantity of cyanide which may be used for further dissolving. Theoretically, all the cyanide used for dissolving metal may be returned to the solution, but, practically, there is, naturally, some loss. In addition, the cyanide consumption in the treatment of any ore is not by any means for dissolving the gold and silver. If this were true, a much smaller quantity of cyanide would be required than is now consumed in ore treatment. Base metals, which go into solution, cyanogen, and other chemical factors, enter into the combination of destroying cyanide. These combinations cannot be returned by any possible means.

In his article describing the use of aluminum dust for precipitation at Deloro, Ontario, Professor Kirkpatrick<sup>6</sup> remarked that aside from the Nipissing bullion, over 14,000,000 oz. of silver has been precipitated by aluminum from cyanide solution. Most of this has been recovered by the Deloro Mining & Reduction Co., through the cyanidation of Cobalt high-grade ores or speiss produced from these ores, and in minor portions by the O'Brien mill treating low-grade Cobalt ores.

#### CLEANING UP PRECIPITATES

The cleaning up of precipitates is essentially a rather simple process, but may be complicated by the magnitude of the operation in large plants whereby the mechanical arrangements are required to be elaborate. When cleaning up electrical precipitation boxes, the whole mass of precipitate is pumped through a filter press. This is by all means the simplest way, and as there are no coarse particles, such as occur in zinc boxes, there is little or no difficulty in filter pressing the whole quantity of precipitate. The bulk of this precipitate is always large and is consequently low grade in precious metals, and is, as has formerly been mentioned, rather difficult to melt. The clean-up of charcoal precipitation boxes is also simple and without many complications. The screen-wire cages containing the charcoal are lifted out of solution in the boxes, allowed to drain until nothing more runs off of

them. The screen boxes are then emptied into iron drums or retorts, which are heated to redness with gradual admission of air, and the carbon is consumed. Rapid combustion at high temperature is to be avoided, due to the possibility of volatilizing some of the metals. The ash remaining from the combustion contains all the gold and silver, and some few of the base metals. This is melted with an appropriate flux, and a bar may be formed immediately from the material.

#### SCREENING ZINC-SHAVING PRECIPITATE

In cleaning up zinc-shaving boxes, the mechanical complications are greater than in any of the other processes. This is due to the fact that a lot of the zinc shavings are broken up into shorts or granulations which are not to be economically melted. This is on account of both of the loss of zinc and the extra flux required to melt it. The precipitate in such cases is usually passed through a series of screens. The first screens may be comparatively coarse, about 20 or 30 mesh. This removes the coarsest of the zinc, which can be returned to the extractor boxes for use in further precipitation. As this material is likely to be rather fine, it is usually either mixed with a new lot of zinc shavings, or placed in screen trays, in shallow beds. These trays may be set in the head compartment of zinc boxes, one above another, a compartment containing as many as six or eight of these trays. In this way, the short zinc is all used up and is effective throughout its entire life.

The precipitate after passing through the 20- or 30-mesh screen, which takes out the shorts for further use, may then be passed through about a 60- or 80-mesh screen, which will take out fine zinc, which is too small to be used for further precipitation in zinc extractor boxes, but may be used as zinc dust if provision is made for such use. Generally, however, this material is acid-treated, and the results added to the high-grade precipitate which passes through the finer screens. The latter is then passed through a filter press which thoroughly washes it, and is often blown with compressed air to induce a certain amount of oxidation. The filter press may be opened and the precipitates dropped directly into cars which are steam jacketed, as in the case of the Goldfield Consolidated mill, or in drying pans which are placed in drying ovens of various sorts, such as are used at a number of mills in different places.

Zinc-dust precipitate is cleaned up automatically, the only step being the passage to the filter press, thereafter the process being a duplicate of that followed in the zinc-shaving system, after the clean precipitate has been passed through the filter press. Aluminum clean-up is carried out exactly as with zinc. The fluxing and melting are somewhat different, as very often aluminum precipitate may be melted without any flux at all, and a bar made at once from the first melting.

In a paper read by John S. MacArthur before the Chemical & Metallurgical Society of South Africa, the use of zinc wafers was proposed as an improved method for precipitation. It was pointed out that all attempts to displace zinc by the use of charcoal or electricity had failed, and that as an active chemical agent, filiform zinc had shown itself hard to beat, although the zinc-dust process had been successfully introduced by Merrill. It is suggested that probably high chemical activity of the zinc shavings influenced its success, for if a shaving is

<sup>5</sup>"Eng. and Min. Journ.," May 10, 1913.

<sup>6</sup>"Eng. and Min. Journ.," June 28, 1913.

examined under a microscope it will be seen that, while one side is polished by the cutting tool, the other side has a velvety pile exposing a large surface to the auriferous solution, which accounts for the prompt responsive action of this form of zinc. The velvety pile seems to encourage the liberation of free hydrogen in the precipitation of gold. The disadvantages of the shavings are in the structural and mechanical consideration in its use. Then again the shavings are weak, the fiber structure having been destroyed by the tool in cutting, the velvety surface being only an indication of the thread having been strained beyond the breaking point of the original fiber. The solution soon penetrates the pile, and spongy zinc thread collapses into a mushy mass before it is fully used up. MacArthur has aimed to overcome these drawbacks by using sheet zinc cut into wafers of convenient size, 2 or 3 in. long by  $\frac{1}{4}$  of an inch wide. Oblong wafers hang better and are more conveniently handled than when square. The wafers are made by cutting ordinary sheet zinc of a convenient gage, say No. 11, into  $1\frac{1}{2}$ -in. strips, in a bookbinder's guillotine, and then cutting these strips crosswise so as to produce wafers approximately  $1\frac{1}{2} \times \frac{1}{4}$  in. When these wafers fall into the cell of the zinc box they arrange themselves irregularly, more or less overlapping in slate fashion. The corners of each wafer are somewhat distorted by the guillotine, which prevents any sticking, providing, at the same time, channels for the uniform passage of the cyanide solution, insuring an equal opportunity of precipitation in all parts of the mass.

The resistance to the flow of the solution is much greater with wafers than with filiform zinc, making it necessary for the extractor boxes to have at least twice the usual fall, while the cells and the boxes may be made with only half the usual depth. This method of precipitation was introduced at the Caveira mine, in Portugal, in 1907, where the ore contains about  $2\frac{1}{2}$  grams of gold and 120 grams of silver per ton. With coarse crushing, the average extraction is about 80% of the gold and 75% of the silver. The cyanide plant was equipped with the usual clean-up plant, but as the precipitates only contained 3% of zinc and 12% of other foreign matter, it was found that no acid treatment was necessary. Careful observations show that when in use the zinc wafers become thinner and thinner, until at the end of three weeks or so they disappear altogether without the structural strength having been impaired or leaving distinguishable debris. This new method of treatment has proved itself economical in the consumption of zinc, has simplified its clean-up and thus saved time and trouble.



### White Paint for Underground

The painting of underground timbering is recommended by the H. W. Johns-Manville Co., in main drifts and in stations. The company makes a white paint called "cold-water paint," which is much more durable and little more expensive than ordinary whitewash. The principal advantage of such painting is the increased illumination obtained. In addition to this, the timbering is made less combustible and is probably also protected somewhat against decay.

The paint is equally serviceable also for both the exteriors and interiors of surface buildings.

### Oil-Land Withdrawal Cases

The oil-land withdrawal order of President Taft issued Sept. 27, 1909, embracing 2,871,000 acres of California oil land, has been declared invalid by Judge Dooling, in the United States District Court at Los Angeles. Judge Dooling sat in the place of Judge Wellborn, who considered himself disqualified, on account of his relation to some of the officials of oil companies involved.

The Court held that there is no general power of withdrawal, and while withdrawal orders have been frequently upheld, he could find no case broad enough to cover the withdrawal of nearly 3,000,000 acres of land. Whatever the purpose of this withdrawal order, the effect would be practically to suspend the operation of the mineral law as applied to the petroleum deposits of the public domains. Judge Dooling said that if such power exists, the plaintiff should be able to point to some clear legislative or constitutional provision upon which it rests, as he was "not content to seek for it in the dicta of decisions, or in some shadowy twilight zone lying between the powers expressly granted to the Congress and the powers expressly granted to the President."

The most important clauses of the decision follow:

The power to dispose of the public lands has been given to the Congress by the Constitution, and I find no conflicting power granted the President by that instrument derogatory to the power given the Congress in this regard. The Congressional will as to these lands is clearly expressed in the law cited in this decision, and the right to nullify this will is not lodged in either the executive or the judicial department. On the contrary, it is equally the duty of the executive as of the judicial department to see this will is carried into effect.

The promulgation of the order in question I believe to be but one manifestation of a growing tendency to concentrate in the executive more of power than can be traced to any specific constitutional or legislative provision. As this tendency in the present instance leads to an encroachment upon the domain of the Congress, I am not willing to further it by any decree of this court, and for this reason it is ordered that the application for an injunction and receiver be denied, and the bill itself dismissed.

The court stated that while the bill declared the purpose of the withdrawal to have been to secure for the Navy a supply of fuel oil,

the order itself makes no such declaration, but states the purpose to be "in aid of proposed legislation affecting the use of the petroleum deposits of the public domain." The bill as originally filed contained no reference to the use of the oil by the Navy, but this averment was added by an amendment made on the very day the motion to dismiss was called for argument, although the bill itself had been filed more than a year before.

It is now predicted by those familiar with the situation that there will arise a new mass of litigation as to whether certain locations were made prior to July 2, 1910, when the President issued an order of withdrawal of the same lands as in the previous September, but this time, with the authority of Congress, voted to him a few days before. The Midway Northern Oil Co. says it entered the field subsequent to Mar. 1, 1910, and discovered petroleum in paying quantities on June 6.

The government will appeal one of the cases to the United States Supreme Court, in order to get a final decision, which will affect the several defendants alike. The question of the validity of President Taft's withdrawal order is already pending in the United States Supreme Court in the case of the Midwest Oil Company of Wyoming. In that case 170,000 acres of oil land was withdrawn in Wyoming. That case was taken to the Circuit Court of Appeals for the Eighth Circuit. No decision was handed down but the case certified to the Supreme Court.

# Reconnaissance of Remote Magnetic Iron Deposits

By W. L. CUMINGS\*

*SYNOPSIS—Advantages of pacing, dial compass and aneroid surveying for rapid examination work. Description of instruments and difficulties of adjustment. Methods of performing survey.*

In isolated districts where facilities for the accurate survey of undeveloped properties are lacking, it becomes necessary to devise some method for their rapid examination. Speed is generally an important factor, on account of the daily cost of the expedition and, in many districts, on account of the difficulty of carrying in sufficient supplies and camp equipment to last over the time necessary for accurate surveying and mapping.

A method used in examining an undeveloped iron property in the state of Guerrero may be of interest. In this case, the greatest speed possible consistent with satisfactory results was necessary on account of the bad weather conditions during August, the time of survey, and on account of the necessity of examining a large number of properties in a certain limited time.

## INSTRUMENTS USED

The only surveying instrument employed was an aluminum dial compass, with an hour circle graduated for the proper latitude,  $19^{\circ}$ . This was always used on a jacob staff instead of being held in the hand, as is sometimes done in the Lake Superior district. The instrument has a movable graduated circle above the compass box, by which horizontal angles can be measured to an accuracy of about  $\frac{1}{2}^{\circ}$ . By using this, courses can be read in any quadrant, and either recorded or, what is better, plotted directly in the field book. This jacob staff is jointed so that the two parts can be unscrewed and packed in a suit case, or tied firmly together and lashed to the saddle when one is traveling on horseback.

Besides the dial compass to give the horizontal deflection of the needle due to local conditions, there was also used a dip needle which, when observations are made, is hung on a brass arm projecting from the staff, as shown in the photograph. This arm is bent to fill loosely a groove in the staff, so that it can revolve freely and the plane of the dip needle can be made to coincide approxi-

mately with the plane of the horizontal needle above. The two instruments thus practically form a magnetometer, with the added advantage of being more portable. The dial compass, furthermore, is a surveying instrument, while the magnetometer is not.

## ASCERTAINING ACCURATE SOLAR TIME

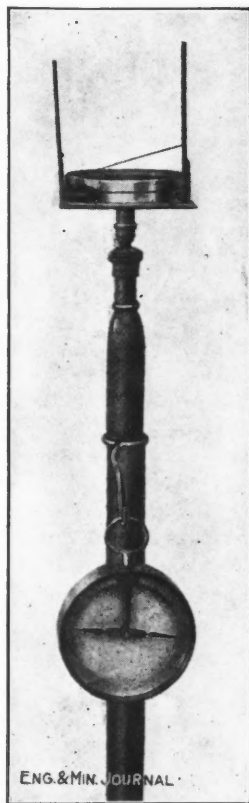
As the deposit in question was supposed to be magnetic and as all the magnetic data was desired, it was, of course, necessary to get accurate local solar time. This can sometimes be done by getting the telegraphic time for the district and correcting for the longitude change between the time station and the property to be examined. It is generally better, however, to select a point unaffected by local attraction, and to establish the meridian by a rough observation on Polaris, using the two-string method. Or one may use the dial compass for a back-sight and a suspended string for a fore-sight, the string being lined in between the compass and the star. This latter method was used in the case under consideration. After the meridian is determined, the compass is set on it while the sun is shining and the shadow of the thread gives the true local solar time for the immediate locality. With the observer's watch set to this time, the instrument is ready for use. The change in local time is so slight that for two or three days no change in watch time is necessary to get true north, but it is generally best to set the compass on the meridian each morning and see if any correction should be made. When watch time is correct, we have true north shown by the line between the thread and the upright standard whenever the shadow on the hour circle is made to correspond with watch time.

If neither of these methods for ascertaining correct time can be used, it is generally possible to approximate a meridian by getting the best data available on the magnetic declination for the district. This is always published on the U. S. Hydrographic Charts and, in the present case, our meridian was roughly checked by the declination there given.

## ADJUSTMENT OF INSTRUMENTS FOR LATITUDE

It never seems to occur to American instrument makers that compass needles, adjusted to come to rest horizontally at the factory, will not come to rest horizontally when used north or south of that point. In Mexico, the diminution in the vertical component of the magnetic pull is so great that the north end of the needle is constantly touching the glass cover, and observations with the needle in this condition are useless. Similarly, a dip needle balanced to read zero at Troy, N. Y., will show a negative dip of  $30^{\circ}$  or  $40^{\circ}$  when taken to a nonmagnetic area in Guerrero, or conversely a positive dip of  $30^{\circ}$  or  $40^{\circ}$  if used as far north as Newfoundland.

Consequently, it is always necessary to balance the needles for each district before use. To do this, it is necessary to select a spot removed from any ore deposit, or, in other words, a spot as free as possible from local attraction. The adjustment is made in case of the dial compass, by moving the copper-wire counterweight, which



DIAL COMPASS AND  
DIP NEEDLE

Mounted on Jacob staff. The thread makes an angle of  $18^{\circ}$  with the horizontal; the dip needle shows a positive reading of  $8^{\circ}$ .

\*Mining engineer, South Bethlehem, Penn.

is always on the south end of the needle. In the case of the dip needle, a small counterweight of fine copper wire must be made and attached to the needle, to the north end if used south of the factory, to the south end if used north of the factory. The adjustment can be easily performed by winding on a little more wire than is necessary and then gradually snipping off small pieces with a fine pair of scissors until the desired weight is attained.

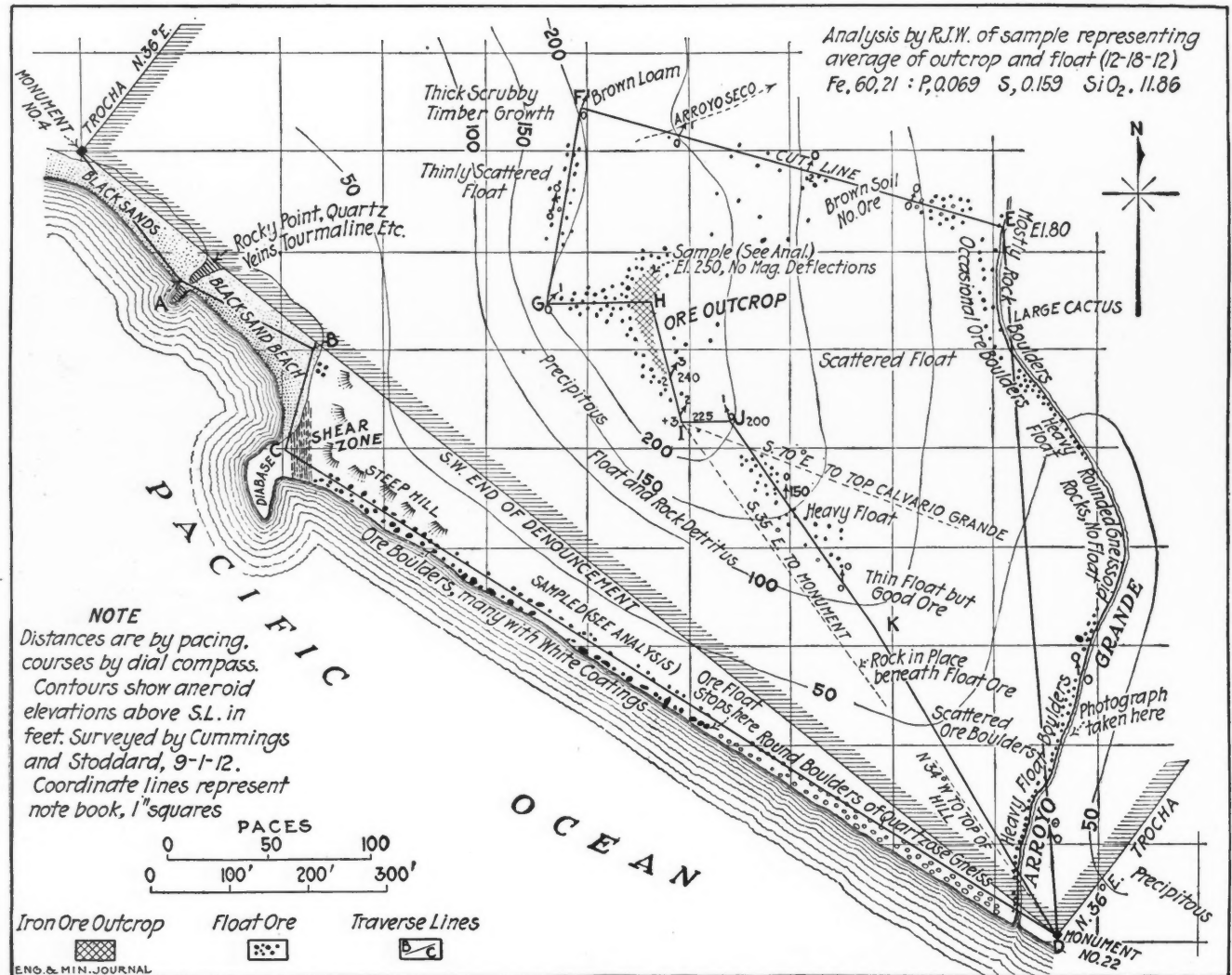
The actual adjustment of the needles is simple, but as a general thing the opening of the compass boxes is productive of profanity and loss of time. Both dial com-

passes and dip needles are plentiful and familiar. Plenty of mosquitoes and a temperature of 96° in the shade help some too, but, of course, one doesn't have to stay in the shade.

Incidentally, these remarks on compass needles apply to nearly all surveyors' compasses and transit compasses, but there is one American maker who now supplies a transit with the glass cover over the compass box easily removable and yet water-tight.

#### METHOD OF SURVEY

In the present case our instruments were finally adjusted by 3 p.m., and as the property to be mapped was



THE MAP OF THE DEPOSIT

A large amount of detailed information is thus succinctly presented.

passes and dip needles come from the maker with the glass covers firmly sealed with putty to keep out moisture, although, as stated, they are absolutely useless until adjusted. Since the average person neglects to open the instrument for adjustment until he is ready to go to work, he generally has to perform the task under the most unfavorable conditions. The pleasure of working two or three hours down in Guerrero, trying with a penknife to remove putty from a space about  $\frac{1}{64}$  in. thick, must be experienced to be appreciated. The pleasure is heightened when the operator is seated on an army cot in a native house, while the family pig, the family dogs, the family chickens, in fact, the entire family, are getting inquisi-

about one mile from the camp, we spent the rest of the afternoon taking a general view of conditions. The undergrowth was too dense to allow running lines without cutting; so we directed two natives to start cutting a straight line from a point in the arroyo, marked E on the map, to the top of the hill. One of them happened to know how to line up sight poles and to cut a line approximately straight, so that they were started cutting this line without any supervision and we continued our general observations.

The next morning we started in on the survey, commencing at monument 4 and running a pacing traverse to point A, thence to B, C and to monument D. The

compass-man selected the courses, observed horizontal and dip-needle readings and did the pacing, while the observer or geologist with a cross-section book and a small rectangular protractor and scale plotted the results directly on a scale of 100 paces to the inch. When one page was filled, the sketch was continued on the next. It is the Lake Superior practice to employ woodsmen for compassmen, but if an engineer can do accurate pacing, he can also find time to help out the recorder by observing rocks, ores and in general by coöperating in the rapid securing of data.

At the point *D*, a sight was taken to the large cactus in the arroyo, as shown on the map, and since it was impossible to pace in a straight line, the distance along the bed of the arroyo was paced, and an allowance was made for the increased distance. After reaching the cactus, the same means of pacing was used to reach the point *E*, whence the cut line was followed to *F*, the workmen having nearly completed the cutting. Aneroid

and one, the aneroid, in the pocket; the jacob staff is an aid in walking rather than an encumbrance.

(5) The map could contain sufficient data to show the lines of equal magnetic intensity, but the attractions were slight and the magnetic lines are not drawn, as the magnetic area is too small; the readings are shown, however, in the usual manner, the figure at the arrow-head representing horizontal deflection from the normal and the figure below showing the dip-needle readings. The arrow shows by its direction whether the horizontal variation was to the east or west of the normal.

(6) Evidence was gathered as to the probable continuity of the deposit by the magnetic readings taken every 100 steps; and also by the general scouting of the geologist who was generally observing conditions on either side of the compass-man and at some distance from him.

The main feature is the map, which to my mind is of more value than any amount of written description. If one is reporting to a person who can read a map intel-



ARROYO GRANDE

Point indicated on map. Note size of float ore.

readings were now being taken and recorded directly, in feet above sea level.

At *F*, it was necessary to have line *FG* cut ahead to reach the main outcrop. When this was reached at *H*, some time was spent by both engineers taking samples and noting conditions. From *H*, the traverse was continued to *I*, *J* and *K* and finally back to *D*. The error in closure was 30 steps, about 80 ft., which, considering the character of the country, and the total distance traversed, about 2000 steps or 5280 ft., was sufficiently close.

#### SUMMARY OF WORK ACCOMPLISHED

The main results may be summarized as follows:

(1) The time taken was that of two engineers for three hours.

(2) A map was obtained sufficiently accurate for all practical purposes, certainly with not more than 5% error.

(3) This map was completed in the field, so that probable errors could be detected before leaving the ground; the contours were sketched in as the work progressed; the only data added were the analysis and the title, the finished map being simply a tracing of the notebook map.

(4) The map was made with three instruments, two of which are carried in leather cases attached to the belt,



THE BEACH

Note float ore and character of vegetation.

ligently, the text of the report accompanying such a map of the property in question need not exceed 150 words.

#### VARIATIONS

The same general method can be used with a number of variations. In some cases it may be better to lay out a base line, preferably due north and south, or due east and west, and collect data by pacing lines at right angles. This base line can be measured, if thought necessary, and stakes set every 264 ft., which is the equal of 100 steps of the average compass-man.

In case of nonmagnetic deposits, the dip needle is not used, but the dial compass is just as practicable. In densely wooded districts, I believe it preferable to a prismatic compass or a Brunton.

#### IMPORTANCE OF METHOD

It may be thought by many that the foregoing method is too simple to merit a description. To those who have had geological experience in the Lake regions, it is, of course, an old story. I am inclined to believe, however, that many engineers who report on prospects are at a loss to know how to make a satisfactory map with equipment reduced to a minimum. In this case, for instance, a party in which were included at least three graduates of as many prominent American mining schools

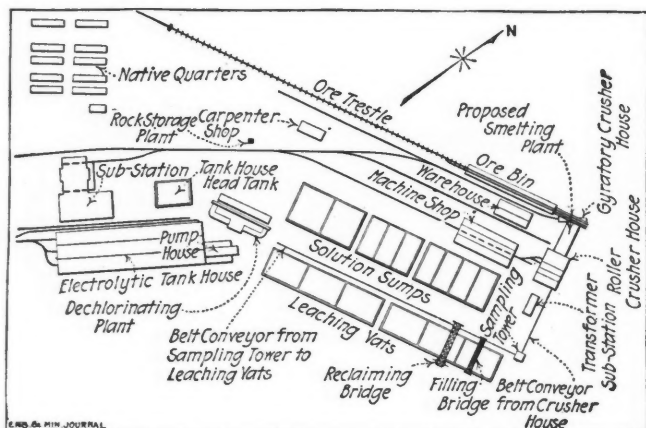
had just finished a reconnaissance trip through the region. Although they camped within one mile of the property described for two weeks and must have spent on it at least one day, their elaborate report contained no map by which one could get an idea of actual conditions. Their report describes at length a large hill, with a large central outcrop and enormous amounts of float, and ends by giving an estimate of "ore in sight, probable ore and possible ore." I have forgotten the figure for the last, but it was well up in the millions of tons.

So far as I know, there is only one mining school in the United States that emphasizes the value of pacing in the examination of certain types of undeveloped properties. The mining school is that of Michigan, where the six weeks' course in field geology is mainly practice in making geological maps by such simple methods. It is, of course, in the Lake district that the timber cruisers have developed such marvelous accuracy in pacing. Many of them use the dial compass in ordinary timber estimat-

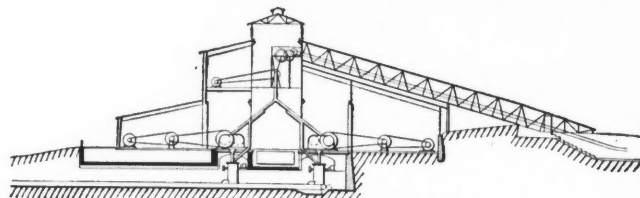
head of 1402 ft.; electrical power input, 242½ hp.; work done on water, 146½ hp.; plant efficiency, 60½%; motor efficiency (statement by General Electric Co.), probably 89½%; pump efficiency, 67½%.

### Chuquicamata Leaching Plant

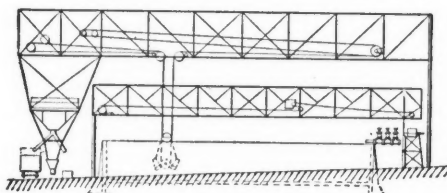
During E. A. Cappelen Smith's lecture before the American Electrochemical Society, reported in the JOURNAL of April 25, 1914, he showed some drawings of the



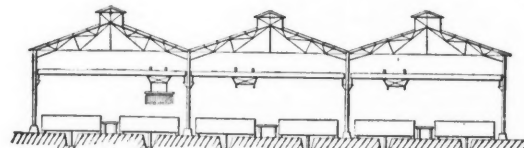
MAP OF THE CHUQUICAMATA LEACHING PLANT



CROSS-SECTION OF CRUSHER HOUSE

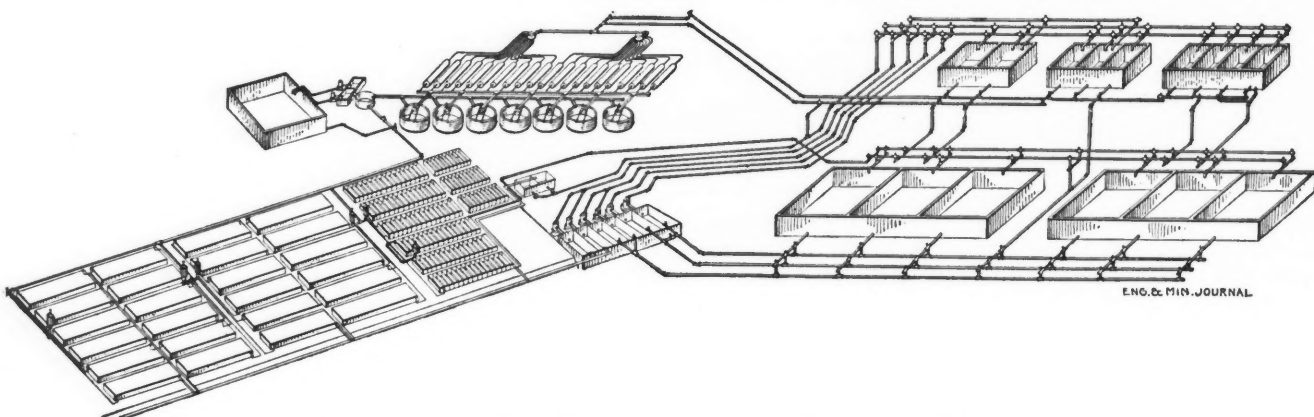


CROSS-SECTION OF BRIDGE



CROSS-SECTION OF ELECTROLYTIC TANK HOUSE

CROSS-SECTIONS OF CHUQUICAMATA PLANT



DIAGRAMMATIC VIEW OF CHUQUICAMATA LEACHING PLANT

ing on account of the strong attractions prevalent on such ranges as the Menominee and the Vermilion, where, in many places, an ordinary compass is absolutely useless.

### Test on 10-Stage Turbine Pump

Within the last few months, a 10-stage turbine pump, electrically driven, and made by the Alberger Pump Co., 90 West St., New York, was installed at the North Star Mines, Grass Valley, Calif. The following interesting figures were obtained as the result of a test run on this pump: Gallons pumped per minute, 413, against a total

Chuquicamata plant, which we are now enabled, through his courtesy, to reproduce.

They are: A map of the plant; cross-sections of the crusher house, reclaiming bridge, and tank house; and a diagrammatic view of the apparatus.

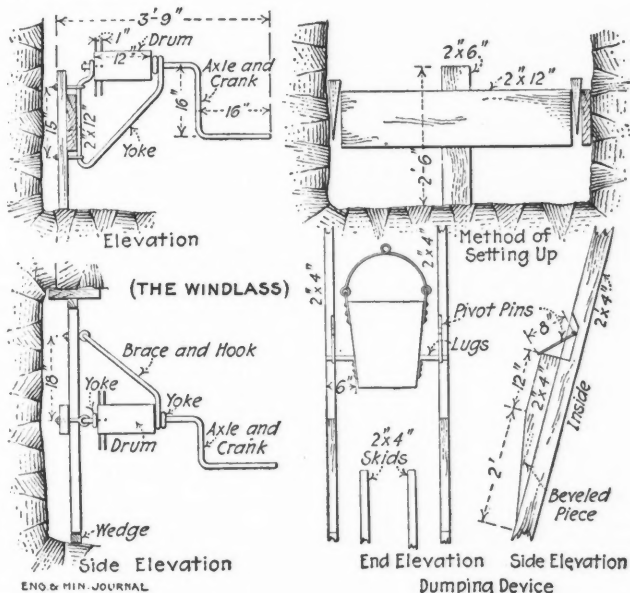
The various parts of the installation are shown in the same relative positions in the diagrammatic view and the map, so that the two are almost self-explanatory, except that perhaps attention should be called to the dechlorinating cylinders in the upper left-hand corner of the diagram. On pp. 1255, 1256 and 1257 we present some views, showing progress on the Chiquicamata plant.

# Details of Practical Mining

## Windlass for Single-Hand Sinking

BY ALBERT G. WOLF\*

The accompanying illustrations show a windlass and a self-dumping mechanism with which a prospector can sink a shaft alone, while saving the labor of climbing in and out of the shaft to hoist each bucket. The windlass is small enough to be placed at the bottom of a shaft and light enough to be installed, operated and removed by one man.



ONE-MAN SINKING LAYOUT

The windlass, as shown in plan and elevations, consists of a wooden drum, 1 ft. long by 6 in. in diameter, an axle and crank made of a single piece of round iron, and a yoke of round iron, which supports the drum and crank. The yoke is held by two eye-bolts fastened through a piece of 2x6-in. plank. The windlass is braced and prevented from swinging in the eye-bolts by a third piece of round iron, one end of which is bent around the axle at the crank end of the drum, and the other, hook-shaped, passed through a third eye-bolt in a horizontal piece of 2x12-in. plank. The two planks are spiked securely together. When the windlass is to be set up, the vertical piece is placed at the center of one end of the shaft and the horizontal piece is wedged firmly between the two walls, just as a stull would be. The length of the horizontal piece will be varied according to the size of the shaft being sunk.

The framework of the dumping device is made entirely of 2x4-in. lumber. The bucket slides on two skids to the top of the shaft. Here, two lugs, riveted to the bucket below its center of gravity, engage two outer skids, to

which are fastened two beveled pieces; the bucket travels up these as on an incline plane. When the top is reached, the lugs strike two pivoted pins and drop over the ends of the planks. By slacking the rope at this point, the bucket is allowed to turn over on its lugs and dump its contents into a chute properly placed. The bucket is then hoisted a few inches over the pins, which fall into place, and the lugs guide the bucket over them to the skids again.

As the drum is small, space for extra cable is made by driving two rows of pins, about an inch apart, around the drum near one end. These pins are large nails which have the heads cut off.

When it is desired to remove the windlass and protect it from blasts, enough muck is placed in the bucket to balance the windlass, and the bucket is hoisted to twice the height that it is desired to raise the windlass. The hook brace is then loosened, the drum is swung against the frame and fastened, the wedges are knocked out and the machine ascends without much effort on the part of the operator. This machine was devised by W. J. Finney, of Luning, Nevada.

## Conveyors and Safety\*

Accidents are not uncommon in connection with the operation of conveyors of all kinds. They are mainly due, perhaps, to the neglect of proper precautions when working or moving about the machinery while it is in motion. So far as possible, the oiling should be done after the machinery has been stopped, and no adjustments or repairs of any kind should be made while the conveyor is in motion. Employees should be forbidden to step over or across moving conveyors, or to ride upon any of them except those that are intended for use in this way. Scuffling and other forms of disorderly conduct in the vicinity of conveyors should be prohibited. Persons who are employed about conveyors should avoid loosely fitting or ragged garments, and they should keep their coats or jumpers closely buttoned so that no part of their clothing can become caught in the machinery.

All conveyors should be guarded by substantial railings, wherever it is possible for persons to come in contact with them. Where walks parallel to the conveyors are provided, these should also have substantial railings and toe-boards. At points where conveyors pass from one floor to another special care should be exercised to see that the openings in the floors are adequately protected by railings and toe-boards. The floors at both the loading and discharging ends of conveyors should be kept in good condition, and it is advisable to cover them at such points with rubber matting or some other non-slipping material. If this is done the covering should be kept in good condition and free from holes, and it should not be allowed to roll up at the corners or edges.

\*An abstract of an article appearing in the "Travelers Standard," May, 1914.

\*Mason, Nev.

Many accidents are caused by starting conveyors without giving warning to men who may be repairing them or working about them. The repair men themselves are sometimes responsible for such accidents, as they often neglect to notify the person in charge of the machinery of their intention to make the repairs or adjustments. Repair men should take special care to give the necessary notification in every case, and as a further precaution a sign should be placed on the starting lever, warning persons against setting the machinery in motion. When such a sign is used it should be removed only by the person who placed it in position.

Conveyors that are situated outside of buildings should be protected from the weather, so far as possible, and should be provided with substantial runways having stout railings. If the runways become covered with snow or ice they should be cleaned off promptly and as thoroughly as possible, and then sprinkled with sand or ashes to prevent the workmen from slipping.

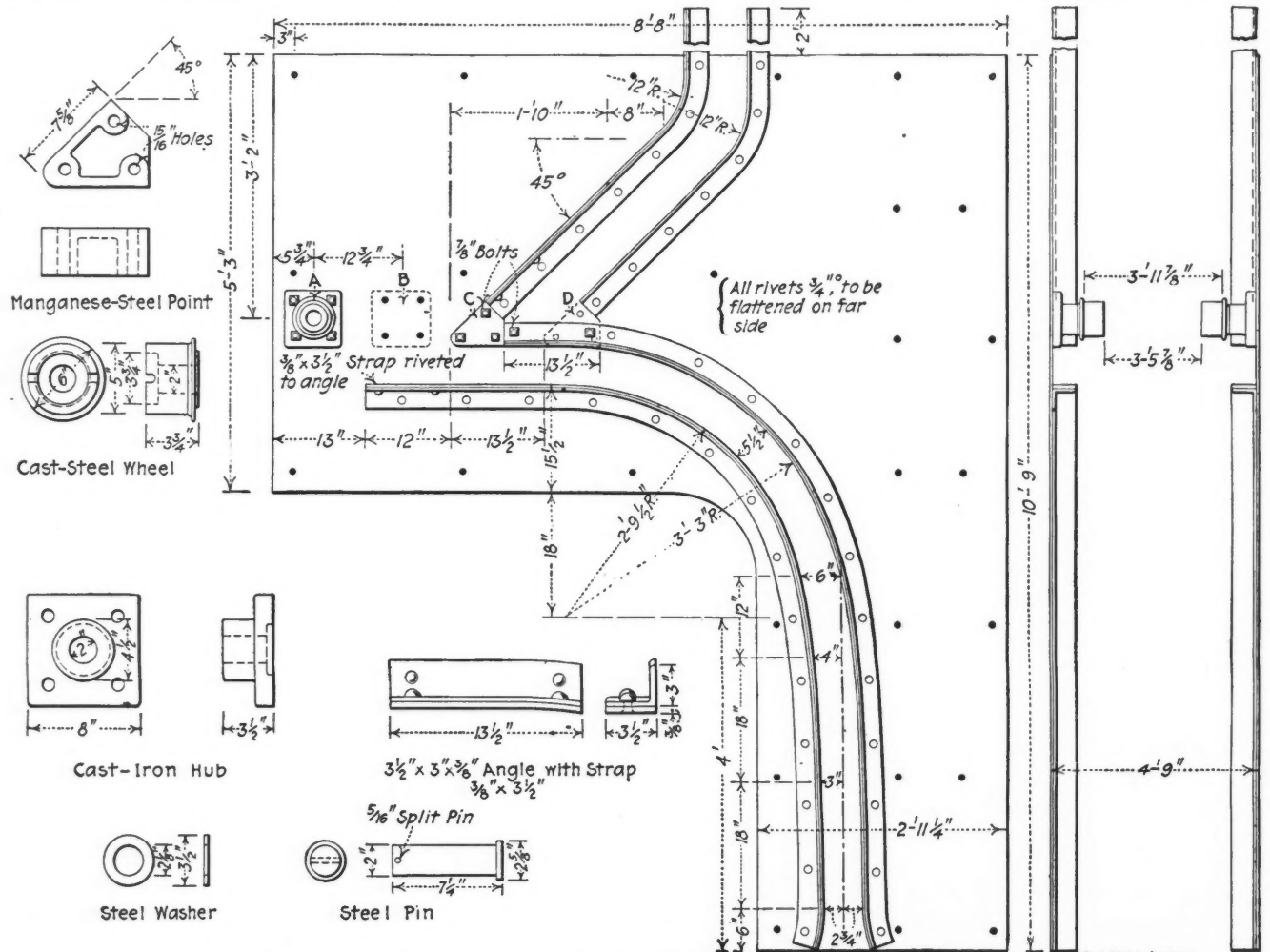
shafting should be cut off or effectively covered over. Adjustable take-up boxes should be used to regulate the tension on the belts of belt conveyors, and the use of the type in which the adjusting screws are protected is recommended.

Frequent and thorough inspections should be made of all parts of conveyors, and of the mechanism connected with them; and whenever any worn or otherwise defective parts are discovered they should be renewed immediately. Care should also be taken to see that all parts of the mechanism are kept well lubricated and in the best of condition in every respect.

### Adjustable Skip-Dump Plate

By W. C. HART\*

At the Wakefield mine in a vertical shaft it was found desirable to start operations with 3-ton skips, these being most suitable for the initial hoisting equipment and be-



ARRANGEMENT OF SKIP DUMP TO ACCOMODATE EITHER 3-TON OR 5-TON SKIP

Devices should be installed, at numerous convenient places, for stopping the conveyor machinery quickly in case of accident. All belts, pulleys and rope drives, when located within 7 ft. of the floor level, should be effectively guarded; all exposed gears should also be effectively guarded; all setscrews with projecting heads should be replaced by others of the countersunk type, or be covered over in a safe manner; all chains and sprocket wheels should be inclosed; and all projecting ends of

ing large enough to handle the development production. There was, however, a possibility of 5-ton skips being used at a future stage of operations and it was decided for this reason to design dump plates which would allow changing from the 3-ton to the 5-ton skips with a minimum of delay and labor. The cut shows a pair of combination plates.

\*Superintendent, Wakefield mine, Wakefield, Mich.



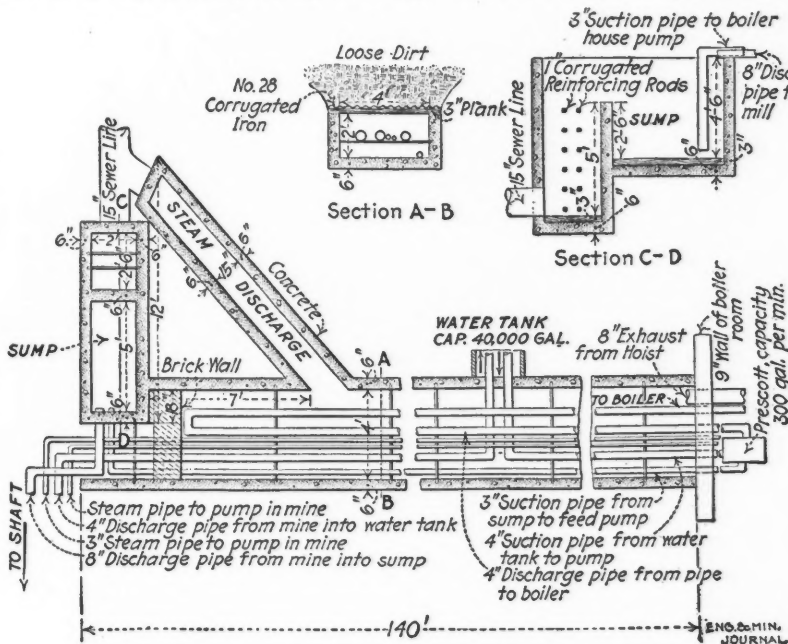
The plates, as shown, are made up for 5-ton skips. To get them ready for 3-ton skips it is only necessary to unbolt the roller hub *A*, and bolt it into position shown by dotted lines *B*; unbolt the 13½-in. length of angle between *C* and *D*; unbolt the manganese point *C* and bolt it in position shown by dotted lines at *D*. The change can easily be made in an hour, between shifts.

The design was worked out graphically on a large scale, so that there is perfect coordination between the 3-ton skips now in use and the plates.

The guide angles at the tops of the plates provide for overwinding at the angle of discharge of the skip, and there is no possibility of the ore dropping back into the shaft. Runners are built in the headframe at the upper end of the plates, as a continuation of the guide angles of the plates, so that the skip will remain at the angle of discharge for an overwind of 10 feet.

### Trench and Pipe Feed-Water Heater

A simple, yet successful method of utilizing the exhaust steam from hoisting engines to heat feed water, is shown in the accompanying drawing. It was designed



ARRANGEMENT OF WATER AND STEAM PIPES IN CONCRETE-LINED TRENCH

for a Mesabi mine, where before its introduction the steam from the hoist, as is usual in many plants, exhausted into the air through a small boiler used as a pre-heater, a method that proved most unsatisfactory.

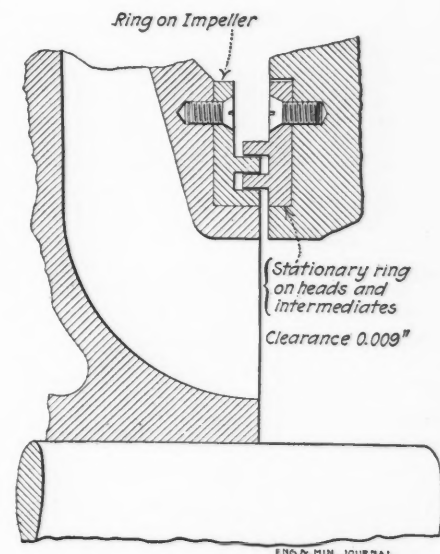
A trench was dug from the shaft to the boiler house, a distance of 140 ft., open to the atmosphere at the shaft end through a *Y*. The ditch was lined with concrete and covered with 3-in. planking, 28-gage corrugated iron and 1 ft. of dirt.

The exhaust steam from the hoist discharges into the conduit at the engine house against atmospheric pressure and passes through it into the air at the other end. The water from the mine in a 3-in. pipe passes from a sump at the shaft through the conduit to a 300-gal. per min. Prescott feed-water pump in the boiler house. It is picked up by this pump and forced through a 4-in. pipe

to the shaft and back into the boiler. The temperature of the water entering the boiler is about 180° F. in contrast with 110° when the old method was used. In case of accident to the underground pumps, water can be drawn from the storage tank through the connections shown. The conduit also carries a 2-in. and a 3-in. steam pipe to the mine pumps. The company using this method figures that it has saved about 10% of its coal consumption without adding any upkeep cost.

### Points in Centrifugal Pump Design

The three centrifugal pumps first installed by the Penn Iron Mining Co. were made with a solid casing and the impellers and the diffusion rings are drawn out through the end of the casing. In the pumps installed since, there is no casing, but the stationary parts of each stage are held together by large through bolts. (*Bull. A. I. M. E.*, February, 1914.) None of the pumps have casings divided horizontally, a plan which introduces unfavorable joints and necessitates disconnecting and lifting out the shaft and impellers. Without the horizontal joint, the diffusion rings and impellers are easily drawn



LABYRINTH RINGS TO DECREASE LEAKAGE

out endways without disturbing the shaft. It takes about four hours to take apart a four-stage pump and put it together again.

The point of principal wear, the occasion of the greatest loss in efficiency, is between the impellers and the diffusion rings. Originally, the contact faces were narrow, only 7/8 in. They have since been made 1 7/8 in. and the tendency to leak has been decreased by using labyrinth rings, as shown in the accompanying drawing.

### Mine Fire Prevention\*

- Do not use candles for lighting underground.
- Do away with timber construction around shaft.
- Keep timbered shafts moist.

\*From U. S. Bureau of Mines Technical Paper 59.

Break continuity of timbering from pump house to shaft.

Do not allow combustible rubbish to collect underground.

Do not allow smoking in any timbered place.

Use care in electric wiring and guard against short-circuiting by frequent inspection.

Do not use kerosene in lanterns or torches.

Do not allow the building of fires underground.

Cover steam pipes laid near timber.

Do not store lubricating or illuminating oils in great quantity underground, especially in timbered places.

### Rivetless Connection for Steel Sets

A socket connection for steel I-beams has been devised by Wesley Wait, Newburgh, N. Y. (*Eng. News*, May 28, 1914.) Fig. 1 shows the principle of construction of the

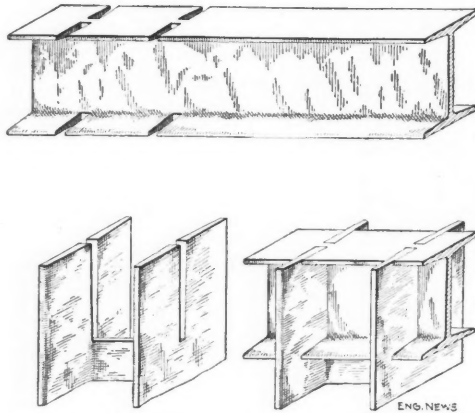


FIG. 1. MANNER OF MAKING WAIT JOINT

joint. The horizontal member or cap has its flanges slotted to fit a tapered notch so cut in the top of the post and in the plane of the web as to remove a length of the web; the joint is made by slipping the cap into the notch

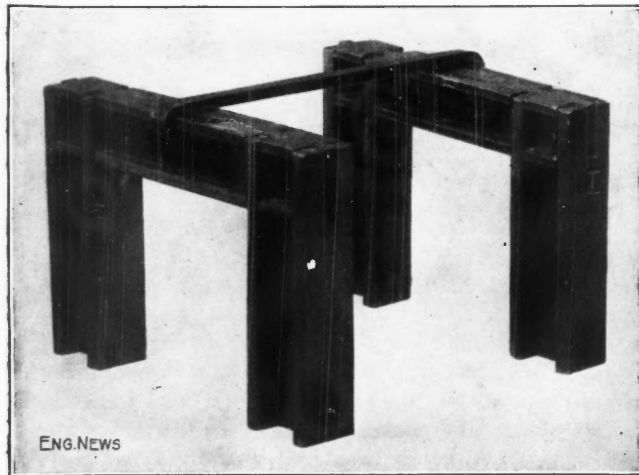


FIG. 2. ASSEMBLED SETS

in the post. The type of set tested is shown by Fig. 2. It was rather crudely made. Loads up to 45,000 lb. were applied by loading blocks at the quarter-points of the cap, and no weakness of the connection was evident, although the yield-point of the caps was passed.

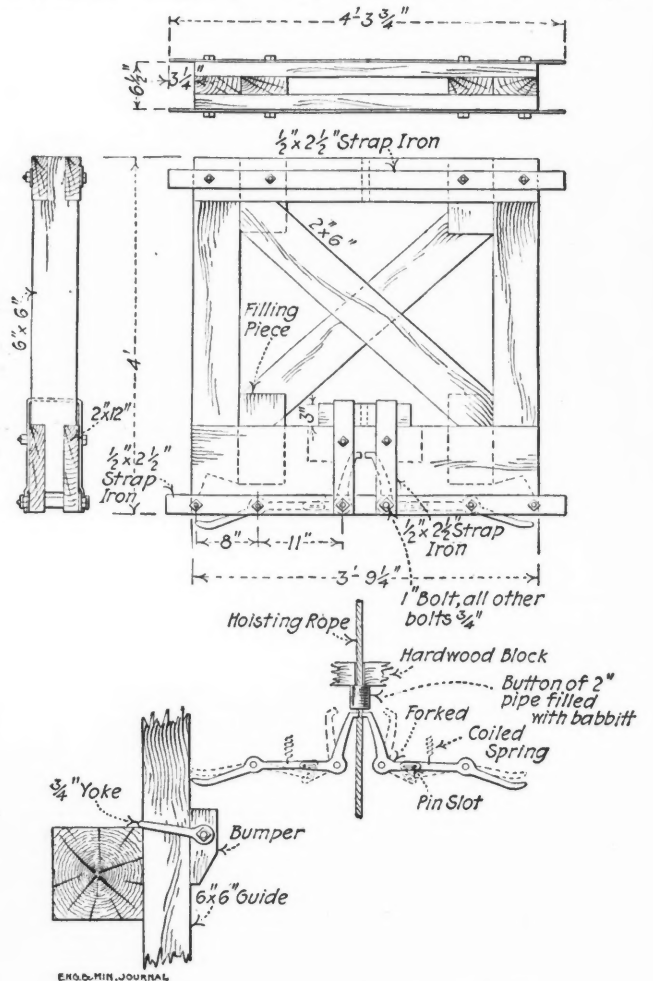
The joint is thought to have possibilities for use in steel mine sets, particularly on account of the quickness and ease of connecting up.

### Home-Made Safety Crosshead

BY LOWE WHITING\*

Accidents during shaft sinking, due to the hanging up, and subsequent dropping of the crosshead, have been so numerous that it may be considered almost criminal negligence to sink a shaft without the use of some safety device.

The accompanying drawing illustrates a homemade crosshead that was used in the Iron River district of Michigan, during the sinking of a small shaft to a depth



SAFETY CROSSHEAD WITH AUTOMATIC RELEASE

of 450 ft. A "button," made of a piece of 2-in. pipe, 3 in. long, was fastened to the rope. This was slipped over the rope where the strands had been slightly separated, a small pin put through two holes in the pipe and through the loosened strands, and the whole filled with babbitt.

In descending, the crosshead strikes the bumpers, releasing the claws, allowing the "button" to pass between them and the bucket to continue to the bottom of the shaft.

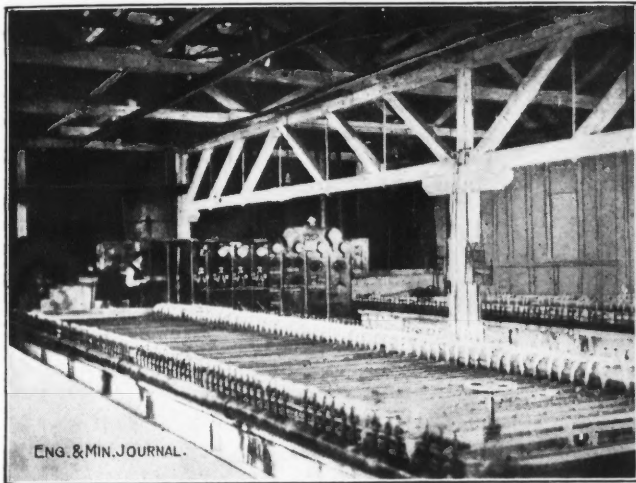
On hoisting, the button strikes the 3-in. piece of hardwood, lifting the crosshead, which allows the coiled springs to again bring the claws into action.

\*Manager, Whiting Eng. Co., Iron River, Mich.

# Details of Milling and Smelting

## Desulphurizing Complex Minerals

A strong deterring factor in the treatment of complex ores of both gold and silver, has been the reluctance of these minerals to allow the precious metals contained to combine with mercury, in amalgamation processes, or to dissolve in cyanide or other commercial treatment solutions. A most frequent result of this tendency has been to separate these particular minerals from ores by concentration and recover their precious metal by smelting. It has always been desirable, however, to avoid multipli-

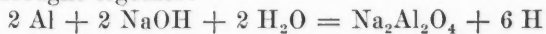


THE NIPISSING FILTER INSTALLATION

cation of processes and to produce, from a milling plant, bullion instead of a complex mineral which has to undergo further reduction at additional expense.

The complexity of the ores of the Cobalt district of Ontario, and the desire to produce bullion exclusively, instead of bullion and concentrates, has led to some extremely original methods of securing the desired end. One in particular, that of desulphurizing the minerals with caustic-soda solutions and aluminum, as developed by J. J. Denny, at the Nipissing low-grade mill, is of exceptional interest.

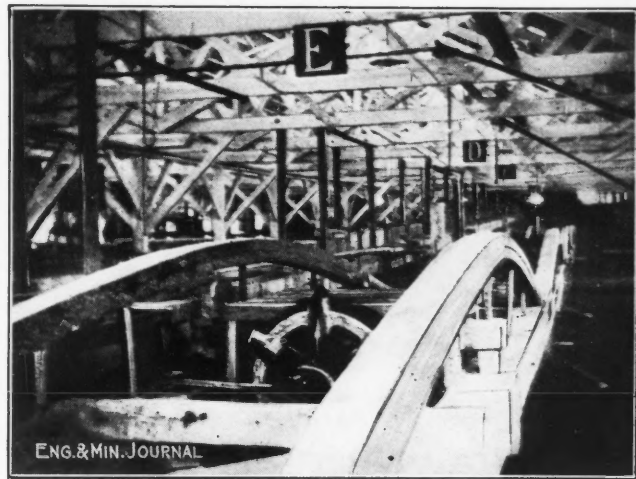
This process is based upon the reducing action of nascent hydrogen, formed when aluminum and caustic soda are brought together:



The nascent hydrogen acts upon the sulphides of silver, producing sodium sulphide and metallic silver. Its action upon the arsenic and antimony compounds is similar, the arsenic and antimony probably, after being reduced to metallic form, reacting again to form arsenides, antimonides, which, however, exercise no objectionable influence as regards the essential metallurgy. Extremely fine grinding is found to be necessary, all the pulp being passed through a 200-mesh screen. The silver comes down in spongy form, easily soluble in cyanide solutions.

As outlined by James Johnston,<sup>1</sup> the procedure is: grinding through 200 mesh, thickening the pulp, all in caustic-soda solution, and then passing it through a 4x25-ft. tube mill, containing aluminum blocks. The rate of feed through the mill is 14 dry tons per hour, and the dilution, 1.5 to 1. The pulp is then taken to a mechanical agitation tank, 34x13 ft., lined with aluminum plates. Here agitation is continued for 24 to 36 hr., after which it is filtered through a Butters filter preparatory to undergoing cyanidation.

To maintain a balance of mill solutions, it is an object to remove as much of the caustic-soda solution as possible.



MECHANICAL SLIME AGITATORS AT THE NIPISSING MILL

In practice, the Butters filter delivers to the cyanide plant a pulp containing about 26% moisture.

This process has proved a practical necessity at the Nipissing mill, facilitating the treatment of a highly complex ore. It may be found of service in other localities where refractory ores, both of gold and silver, have to be handled.

## Converter Output at Great Falls

In the article on the Old Dominion smelting works, at Globe, Ariz., in the JOURNAL of June 6, attention is directed to the large daily output obtained in the Great Falls type converter used at this plant. The statement is made that this daily copper output, i.e., 60 tons, is about double that reported last year by Messrs. Wheeler and Krejci for shells of the same size at Great Falls, Montana.

COPPER OUTPUT OF CONVERTERS AT GREAT FALLS

Period	Tons Copper Produced per Converter Day	Per Cent. Cu In. Matte	Min. per Ton of Copper	Tons of Iron and Sulphur Oxidized per Converter Day	Tons of Ore Used per Converter Day
Feb., 1914	95.20	36.4	15.13	176	65.3
Mar., 1914	89.27	33.8	16.13	186	71.4

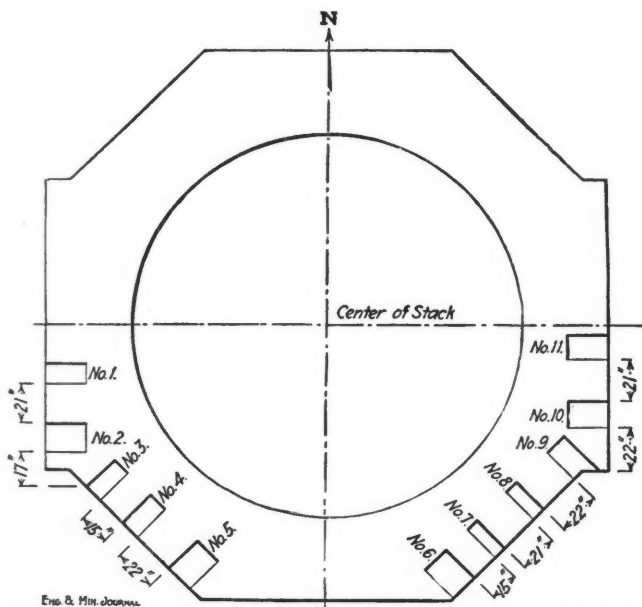
<sup>1</sup>"Bull.," A. I. M. E., Feb., 1914.

While this is probably a record figure for upright shells, 12 ft. in diameter, it does not approximate the output obtained from the Class V or 20-ft. converters now in use at Great Falls. In the 20-ft. converters the average output of copper was over 95 tons per day in February, and nearly 90 tons in March when converting a 34% matte. In addition, from 25 to 30 tons of cold matte and cleanings are treated per converter day, and operations during the months cited were handicapped on account of reconstruction work; it is expected that the output will be increased when normal running conditions are restored. In the article "Great Falls Converter Practice,"<sup>1</sup> Messrs. Wheeler and Krejci reported that the 20-ft. converter produced at the rate of 4.31 and 4.77 tons of copper per converter hour when in operation, or at the rate of 103.4 and 114.5 tons of copper per day, respectively; this was when converting a 38 to 39% matte.

### Destroying Old Stack with Dynamite

BY D. BOYD SMITH, JR.\*

After a new stack had been built for the Steptoe Valley smelting plant, it became necessary to raze the old defective stack. This was of brick, 190 ft. high at the time, and was estimated to weigh about 1000 tons. The



SECTION OF STACK BASE, SHOWING LOCATION OF HOLES

inside diameter at the base was 18 ft., and the thickness of the wall was about 4 1/2 ft., the outside being octagonal. Eleven holes were put in 7 1/2 ft. above the concrete foundation distributed as shown in the figure, with the

#### DIMENSIONS AND CHARGES IN HOLES

Hole No.	Width, In.	Height, In.	Length, In.	Powder, Lb.
1.....	11	9	23 1/2	14.0
2.....	13	9	24	16.3
3.....	12	8 1/2	24	13.3
4.....	12	8 1/2	24	13.8
5.....	24	6 1/2	24	26.2
6.....	14	9 1/2	25	34.5
7.....	9 1/2	9 1/2	22 1/2	8.5
8.....	9 1/2	9 1/2	23	12.9
9.....	12	9 1/2	23	23.7
10.....	12	7	22	13.8
11.....	12	6 3/4	23 1/2	13.1

<sup>1</sup>Bull. A. I. M. E., August, 1913.  
\*East Ely, Nev.

dimensions given in the accompanying table. These holes were loaded with 190 lb. of Hercules E. L. F. 40%, distributed in the various holes, as shown in the table. In the middle of each charge was a primer containing an electric detonator with a 35-ft. lead. The holes were closely tamped with black plastic converter mud. The 11 detonators were connected in series to a 500-ft. connection with the 110-volt lighting circuit.

The charge on firing seemed to blow out the entire base for about 30 ft. above the foundation, allowing the top of the stack to drop and telescope on itself. Almost all the debris fell in a pile 50 ft. in diameter. The work was done under the direction of J. D. Watson, civil engineer, and R. E. Middagh, chief electrician of the company.

### Mercury Losses in Metallurgy

Metallurgical processes which make use of mercury are objectionable for many reasons, but perhaps the principal one is the extreme care necessary to prevent loss of the metal, and the unavoidable small losses, even after all possible care has been taken. Contrary to the impression existing among most people, it is a matter of great difficulty to avoid serious losses. When it is spilled, the whole quantity is never recovered. Mercury has the property of insinuating itself into extremely small interstices, even penetrating through porous stone, sand, small cracks in retaining vessels, etc., so that its entire recovery is not possible. The facility with which it breaks up into tiny particles, sometimes microscopic, materially promotes the facility for loss.

When amalgam is retorted, there is always a proportion of the mercury that remains with the sponge, refusing to be separated. When the sponge is finally melted into bullion, the remaining traces are volatilized, and in spite of dust chambers, condensers, or even passing the gas through cold water, a part of this mercury will unavoidably be lost.

An interesting illustration of mercury handling is shown at the high-grade mill of the Nipissing Mining Co., Cobalt, Ontario. The rich silver ore is ground up in a tube mill together with mercury and cyanide solution. A current of compressed air is passed through the mill, in at one trunnion and out at the other. The issuing air is led, in an iron pipe, up through the mill and out into the atmosphere. At the low temperature, about 90° F., generated within the mill by the grinding, some of the mercury is volatilized. A piece of gold leaf placed over the exhaust will become amalgamated in a short time, showing that some of the mercury volatilizes at the temperature already mentioned.

Most mills make use of mercury in small quantities, so that the loss, although amounting to an appreciable percentage, is not important, when calculated per ton of ore, but when it is employed on the extensive scale required at the Nipissing, in the treatment of 5 tons per day of 2500-oz. silver ore, great care, continual checking and weighing of the mercury is necessary.

The Consolidated Mining & Smelting Co., of Canada has about completed the installation of an experimental hydrometallurgical plant for zinc extraction at Trail, B. C. The ore is roasted sulphatizingly in a Wedge furnace, leached, and the zinc precipitated from the solution by electrolysis. It is reported that satisfactory cathode deposits have been obtained.

# The Assayer and Chemist

## The Assay of Crude Platinum

By MARTIN SCHWITZER\*

Crude platinum is on the market in the shape of small nuggets, ranging in weight from 100 mg. down. It may be divided roughly into two portions, the insoluble and the soluble in *aqua regia*. The insoluble includes osmiridium as its only valuable constituent, while the soluble includes platinum, iridium, palladium, rhodium and gold. It is desired to determine each of the above metals with accuracy.

This original method is now in use by a large buyer of crude platinum and has been checked up by results obtained in refining the purchased lots of crude.

### THE METHOD

Weigh 25 grams of the sample into a 300-c.c. beaker. Add 200 c.c. of *aqua regia* (1 part nitric to 3 parts hydrochloric acid, by volume) and place on the water bath for about one hour, then place on a thin piece of asbestos on the hot plate and boil gently for two hours. Remove from the hot plate and allow to settle for 15 min. Decant the solution into another 300-c.c. beaker and again boil for about an hour to dissolve any finely divided metal, which may have decanted over. Remove from the hot plate and fill up the beaker with water. Stir well, then settle over night. Immediately after decanting the *aqua regia* from the original beaker, add another 200 c.c. of *aqua regia* to the residue therein and repeat the warming and boiling of the acid. Finally remove from the plate, fill with water, stir, and let settle over night. Unless the ore is in unusually large pieces, the solution of the soluble minerals will be complete with this treatment, which is planned to take one day.

Decant the clear solutions from both the beakers into a 1000-c.c. volumetric flask, being careful not to allow any of the insoluble to be carried over. Wash the contents of one of the beakers into the other so as to have everything in one beaker and to dilute the acid before filtering. Filter through a 9-c.m. paper into the 1000-c.c. flask. Wash the insoluble from the beaker onto the paper and then wash on the paper till the solution which runs through is perfectly colorless.

### DETERMINATION OF OSMIRIDIUM

Transfer the filter paper and its contents to a 2½-in. scorifier, add 10 to 15 grams of test lead, fill the scorifier level full with litharge and fuse in the muffle for ½ hour. Allow the scorifier to cool, break it, and remove the lead button. Clean the lead button thoroughly with as little hammering as possible, place it in a 150-c.c. beaker and dissolve out the lead with dilute nitric acid (1 vol. nitric acid to 3 vol. water). Place on the water bath to assist solution. When the lead has been all dissolved, filter

through an ashless filter and wash the residue of osmiridium on the filter till free from lead. Dry the filter, separate the osmiridium from it as completely as possible, and burn the filter paper. Add the osmiridium to the residue from the paper, dry thoroughly on the hot plate and weigh as osmiridium.

The scorification with lead is for the purpose of cleaning the osmiridium from sand, heavy oxides, etc. The osmiridium is collected by the lead and the impurities are slagged off. Some care is required in igniting the residue, as osmiridium will lose osmium if heated to redness in the air. For this reason, the paper is burnt after separating from the osmiridium.

### DETERMINATION OF PLATINUM

Fill the 1000-c.c. flask containing the solution of the ore to the mark. Mix thoroughly by pouring into a dry beaker and back into the flask four times. Taking a 25-c.c. pipette, which has been carefully standardized against the 1000-c.c. flask, rinse it out with a portion of the solution and then pipette two portions to 75-c.c. beakers. Evaporate these portions just to dryness on the water bath. Add to each 5 c.c. of dilute hydrochloric acid (1 acid : 9 water) and warm for five or 10 min. Allow to cool and unless perfectly clear filter through 5½-cm. papers into similar beakers. Wash with water till the filter papers are perfectly colorless. This can be done easily with less than 20 c.c. of water.

Make up each portion so that it contains about 25 c.c. Add to each 8 grams of c.p. ammonium chloride and heat on the water bath for one hour with occasional stirring. Remove from the bath and let stand at least three hours, or over night if convenient. Decant the clear solutions through a 9-cm. ashless filter into 150-c.c. beakers. Allow all the solution to run through and then wash the precipitates of ammonium chlorplatinite,  $(\text{NH}_4)_2\text{PtCl}_6$ , onto the filters with a 20% solution of ammonium chloride. Allow all the solution to run through and then wash repeatedly around the edge of the papers with small quantities of the ammonium-chloride solution, till the filtrate is colorless and the papers are white. Finally rinse around the edge of the papers with alcohol. After all the solution has run through place the filters with their points down into size B Battersea annealing cups. Carefully fold over the edges of the papers so as completely to inclose the precipitate in an envelope of paper. Cover the crucibles and bring to a good red heat by very slowly increasing the temperature. Finally remove the covers from the crucibles till the papers are burnt off. After cooling, transfer the platinum to the pan of the assay balance and weigh. (The duplicate should not vary more than two milligrams. The average is taken as correct.)

The precipitation of  $(\text{NH}_4)_2\text{PtCl}_6$  is usually made with the addition of alcohol to reduce the supposed solubility of the precipitate. I am sure that by the above method I can take 0.0004 gram of platinum in the given size solution, 25 c.c., precipitate it, wash with the usual quan-

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Note—This paper won the Widmann medal in the Pratt Institute Chemical Alumni competition.

tity of wash solution, and get back more than half of the original platinum. The solubility under the conditions given is negligible for this assay.

The solutions are heated on the water bath for two reasons: First, to get all the ammonium chloride rapidly into solution and second, to change the precipitate from an amorphous to a sandy, crystalline precipitate, which is easily filtered and washed.

The precipitate of platinum usually contains iridium as  $(\text{NH}_4)_2\text{IrCl}_6$ . Iridium alloyed with platinum in small quantities, less than 10%, dissolves with the platinum in *aqua regia*. It precipitates with the platinum, but not quite so completely. The traces which pass the precipitation are afterward estimated with rhodium.

Pure  $(\text{NH}_4)_2\text{PtCl}_6$  is a pure yellow. The iridium compound has an intense red color. If  $\frac{2}{10}\%$  of iridium is present it gives a decided red tint to the platinum precipitate. The quantity of iridium present, if not more than 5%, can be judged by the color of the precipitate quite accurately enough for setting a value on the ore.

There is a slight loss in igniting the platinum precipitate. This loss is lessened by keeping inclosed in the filter paper and by slow heating.

#### DETERMINATION OF GOLD

Combine the filtrate from the platinum precipitation, and add 5 grams of ferrous sulphate in water solution plus HCl. Allow to stand till the gold has settled. Filter and wash on the filter, transfer to an annealing cup and burn off the paper in front of the muffle. When cool, wrap in lead foil and cupel as usual for gold.

#### DETERMINATION OF PALLADIUM

Add to the filtrate from the gold about  $\frac{1}{5}$  its volume of hydrochloric acid. Add a 10% solution of potassium iodide five drops at a time till no further precipitation of black palladous iodide ( $\text{PdI}_2$ ) takes place. Heat on the hot plate nearly to boiling. Cool, filter and wash with dilute hydrochloric acid (1 acid : 4 water). Wash free from iron. Transfer to a porcelain crucible and ignite in the muffle at a good red heat. Cool, moisten with a few drops of dilute formic acid to reduce oxide and dry thoroughly on the hot plate. Transfer to the pan of the assay balance and weigh the palladium.

Textbooks usually describe palladous iodide as easily soluble in excess of KI. This is true, but the presence of a large amount of HCl probably prevents any excess of KI being present, hydriodic acid and potassium chloride being formed. This precipitation is complete. The strong hydrochloric-acid solution also prevents the precipitation of lead and copper iodides if only a slight excess of KI is used.

Dilute formic acid reduces palladium oxides to metal.

#### DETERMINATION OF RHODIUM

To the filtrate from  $\text{PdI}_2$  add c.p. zinc till the solution is colorless, heating the solution while doing so. Allow all zinc to dissolve and the precipitate to settle. Decant the solution and wash the precipitate three times by decantation with 100-c.c. portions of hot water. Add 25 c.c. of dilute nitric acid (1 acid : 3 water) and place on top of the water both for 10 min. Filter through an ashless filter, wash two or three times with water, ignite, reduce in hydrogen, and weigh as rhodium plus traces of iridium.

Zinc reduces all the platinum metals from solution. In this case only rhodium and traces of iridium are present. The nitric acid dissolves any base metals which may be present, but as freshly precipitated rhodium is slowly soluble in nitric acid, the treatment must not be too much prolonged.

A representative assay of crude metal would be the following: Osmiridium, 20 fine; Pt (containing 3% Ir), 830; Pd, 5; Au, 30; Rh, 20 fine.

The strongly colored solutions furnished by all of the platinum metals, platinum giving the least color, is a good guide for washing, zinc precipitation, etc.

✽

The following outline of the method used in the laboratory of Ledoux & Co., for the separation of gold, platinum and palladium was dictated by A. M. Smoot, and should be considered as supplementary to his "Suggestions on the Platinum-Palladium Assay," in the JOURNAL of Dec. 20, 1913. The subject is of great present interest, as practically every electrolytic copper refiner is now turning out crude palladium, to be sold on assay.—EDITOR.

In a solution containing gold, platinum and palladium, determine the gold by precipitation with oxalic acid. For this precipitation the solution should have been evaporated with hydrochloric acid to get rid of nitric acid, should be only slightly acid with HCl, and should be hot. After adding the oxalic acid, the solution should be allowed to simmer for about one-half hour, then allowed to stand over night. Oxalic acid should be present in excess. Filter off the gold. It will be necessary to dissolve the gold and reprecipitate if any great amount of palladium is present, adding the second filtrate to the first.

Throw down the metals in the filtrate with sulphuretted hydrogen and ignite the sulphides cautiously. Dissolve the ignited sulphides in *aqua regia* and evaporate three times with hydrochloric acid. This not only gets rid of the nitric acid, but reduces all the  $\text{Pd}^{+++}$  to  $\text{Pd}^{++}$ . If a little black residue remains, filter it off, ignite, treat with a little strong formic acid to reduce any palladium oxides to palladium, dissolve in *aqua regia* and treat to remove nitric acid, then add to main solution.

Add saturated solution of ammonium chloride, Pt comes down as  $(\text{NH}_4)_2\text{PtCl}_6$ . Allow to stand over night and filter off. If much palladium is present, redissolve and reprecipitate. If only a little palladium is present, dissolve the precipitate in hot water, add a little sulphuric acid, and pass in sulphuretted hydrogen. Filter off, ignite and weigh as platinum.

The palladium in the filtrate from the platinum may be determined directly by the method of Wunder and Thuringer (*Zeits. für anorg. Chem.*, Vol. 52, p. 101). To the solution made up to about 150 c.c., add 1 gram dimethylglyoxime in 5 c.c. hydrochloric acid. Dilute to 300 c.c., allow to stand one-half hour on water bath, and then settle over night. Filter on a tared porcelain gooch, wash with hot water, then with alcohol and weigh.

The precipitate is  $(\text{C}_8\text{H}_{14}\text{N}_4\text{O}_4)_3$  Pd, containing 31.686% palladium. The separation seems to be quantitative from all metals except nickel, and this will have been eliminated, either in a sulphuretted-hydrogen precipitation, or in cupellation. If a large excess of silver be present, there is little loss in the cupellation of any of the platinum metals.

# Tungsten in Bolivia

By G. W. WEPFER\*

*SYNOPSIS*—The increasing demand for tungsten for filaments for electric incandescent lamps, and in the manufacture of steel may soon stimulate the search for and opening of tungsten mines, and as many prospects of promise have been opened and worked on a small scale in Bolivia, it seems opportune to call attention to the existence of those deposits, what promise they hold out, where they are, and by whom owned. As is usual, capital is needed to develop these small properties into steady producers, but even under present conditions, tungsten is becoming an important product of Bolivia.

There are three principal tungstates, all of which are found along the eastern cordillera in Bolivia: Wolframite, an iron-manganese tungstate,  $(Fe, Mn) O.WO_3$ , sp.gr. 7.1 to 7.5; scheelite, calcium tungstate,  $CaWO_3$  sp.gr. 5.9 to 6.0; and hübnerite, manganese tungstate:  $MnO.WO_3$ , sp.gr. 7.14. The tungstate ores, as far as found, carry from 20 to 50% metallic tungsten. From such ores, it is not usually difficult to produce concentrate carrying 65% tungsten, which is sold for \$425 to \$450 per ton in San Francisco. To encourage the mining of tungsten ores, the Bolivian government charges no export tax. The Bolivian exports in 1911 were \$89,932 and in 1912, \$114,847 worth of tungsten products.

## WHERE TUNGSTEN ORES ARE FOUND

When I was in Bolivia, in 1912, the following locations of tungsten ore were known, but this list is not exhaustive.

### DEPARTMENT OF LA PAZ, PROVINCE OF INGNISIVI

"Adolfo," a property comprising 30 hectares (hectare = 2.47 acres) at Izara, Canton Caluyo, owned by Arturo Fricke.

"Gran Poder," in the same location and also owned by Arturo Fricke.

"La Sorpresa," on Cerro Morocollo, Izara, Canton Caluyo; owned by Carlos Lemoine.

"La Poderosa," has been bought by A. Fricke & Co. The mine is at Izara. The ore from these groups contains 50% tungsten. The monthly production is 120 quintals (1 quintal = 101.4 lb.).

"Siberia" is in the Viscachani mountains, Canton Caluyo, claim owned by Julian Cespedes. The ore assays 20 to 35% tungsten.

"La Afortunada," Canton Caluyo, owned by Serapio del Villar.

"El Trabajo," on Churicaya mountain, Canton Caluyo, the average grade of the ore mined is 32%, but little work has been done on account of lack of capital; owned by Victor Aldana.

"San Salvador," in the mountains of the Canton de Mohoza, with a grade of ore of 20 to 27%; in pockets the grade rises to 35% tungsten; owned by Antonio B. Quiroga.

"La Cabaña," in the Canton Caluyo, ore contains from 20 to 25% tungsten; owned by Rodolfo Zalles.

"La Candelaria," in mountains of Santa Vela Cruz, Canton Ichoca, with a grade of 37%; owned by Emilliano Orellana.

"Santa Rosa," Santa Vela Cruz, Canton, Ichoca, Province Sud Yungas; owned by Emilliano Orellana.

"La Andina," in the mountains of Yanacachi, owned by Gerardo Zalles.

"Maria de la Luz," in the mountains of Yanacachi, owned by Hector Lorini.

"Wolframita," in the mountains of Yanacachi; owned by Macario Escobar.

### DEPARTMENT OF ORURO AND DEPARTMENT OF COCHABAMA

In these departments are many veins of wolframite.

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## DEPARTMENT OF POTOSI

"La Encontrada y Restauradora," in the mountains of Tasna, Canton Rio Blanco, owned by Cirilo V. Alduate. There are 17 veins, with ore of an average grade of 25%. The production amounts to 60 quintals per month, of a value of 1320 bolivianos. The property requires a capital of £30,000, to produce 100 quintals per month.

Aramayo, Franke & Co. owns the largest tungsten mines in the districts of Chorolque, Chocaya and Tasna. The ore is wolframite, scheelite and hübnerite; the production is 1500 quintals of concentrates per month.

There may be at present 90 tungsten locations in Bolivia. The eastern cordillera passes beyond the southern frontier of Bolivia, all the way through the Argentine provinces of Jujuy, Calto and Tucuman, with the same characteristics as in Bolivia. This whole mountain territory is 1000 miles long, from north to south and of irregular width.

## ORE TREATMENT

Each of the three tungstates is easily concentrated, on account of the high specific gravity. The ore is crushed, classified into sand and slimes and concentrated on tables. The middlings are re-crushed, classified and further concentrated. Sometimes, veins of tungstates and of cassiterite are intertwined, then the material is crushed, roasted and concentrated. Some concentrates contain tin and tungsten, and these minerals being of nearly the same specific gravity, such material has to be dried and passed through a magnetic or an electrostatic separator. The roasted particles of tungsten minerals are amenable to magnetic or to electrostatic action, and thus separate concentrates of tin and tungsten can be obtained. Sometimes silver veins are intermixed with tin or with tungsten veins. In treating such ore the whole material is crushed, the silver is leached out with hypsulphite of lime, as sulphur and lime are found in the country, and the tailings are concentrated.

## MINE INSTALLATIONS

Tungsten and tin ores are found at great altitudes; between 13,500 and 16,500 ft. above sea level. All Bolivia is within the tropics. The snow line is between 15,500 and 16,500 ft. altitude. The upper part of the mountains is steep. Men, mules and llamas can climb up and down, but the slopes are too steep for working and handling of ore. Aerial ropeways are required to bring the ore down to a place where water for concentration is available. These ropeways at the same time serve as a source of power, the surplus power of the descending ore, if gearing is placed in connection with the upper sheave shaft, will generate power for pumps, compressors, etc. Frequently the ropeway consists of two or three separate ropes, with ore bins between two ropes, for receiving and discharging ore to lessen risk of breaking a rope. The cold, strong winds cause such violent swinging of the ore buckets, that from fear of breaking the rope, the buckets are collected at the end stations, and the running of the rope is stopped until the wind moderates. At one of the mines of Aramayo, Franke & Co., at Chorolque, wind power is used to drive a crusher.

Hydro-electric power plants are much used; in fact, wherever there is water for power. Oil and distillate en-

gines in small units, and as many as are required, are also used.

Oil and distillates can easily be obtained, especially as now the Standard Oil Co. carries such fuels to all the South American Pacific ports and besides controls many of the oil wells in northern Peru. Hydro-electric installations are profitable, as power which can be spared can be sold to neighboring mines. One large company buys all its power, an electric locomotive draws the ore cars through an electrically lighted tunnel, while at the same time power is supplied to electric hoist, rock drills, fans, and the concentrator. The steam railroad to La Paz terminates at the edge of the Andean plateau. The city is in the deep cañon of the La Paz River, 800 ft. lower than the plateau. The trains are taken down to the city railroad station in sections by electric locomotives and finally taken up again to the plateau. La Paz has electric street cars, and electric lights throughout the city.

#### OPPORTUNITIES TO OBTAIN MINE PROPERTY

According to Bolivian mining law, all mineral ground below the surface soil belongs to the state. This ground is not sold outright, but is given out by the government in leasehold. The semi-annual charge is 2 bolivianos, 80c. per hectare (2.47 acres); and as long as this charge is paid in continuity the miner is in undisputed possession of the property. The mine operator must obtain a certificate describing the property in detail and stamped by the government, which costs 10 bolivianos, or \$4. If the surface is owned by the state, the miner can have as much of it as he desires without extra charge. If the surface belongs to a farmer, the miner can come to an understanding for surface land against indemnification. In case that the farmer is obstinate, the miner appeals to the government mining bureau, which condemns as much of the farmer's land as the miner needs, and determines the amount of indemnity to be paid to the farmer. In every case the government will side with the miner and will remove all obstructions. This also refers to the making of roads, to aerial ropeways and to the laying of water pipes.

On the whole, the Bolivian mining laws are good. In general there are many more undeveloped properties than mines, and even among the mines proper, there are many much embarrassed by lack of capital. Many of these want capital to make roads or to install an aerial ropeway or a concentrator. Without a concentrator only the best of the ore is sorted out for shipment. Where there are so many mines in a bad predicament and ever so many more prospects, there is always a way to obtain mine property by purchase from present owners. The prospects are mainly in the hands of men of small means. It is comparatively easy to wander over the mountains and to find the outcrops of veins, and also to have them registered and to pay the mine tax every six months. If such prospectors become pinched for the mine taxes, the government will help them by fixing a date on which the property is to be sold by auction, and this is advertised in the newspapers. If no bidder appears, a second date is appointed for the auction, and is again advertised, but if again no bidder appears, the property falls back to the state and is open to anyone for location. In accepting the help of the mining bureau, the miner is relieved from the payment of the last mine taxes.

Since the mining of tin and now also of tungsten has become more profitable than the mining of other metals,

many miners and mining companies, owning gold, silver or copper mines, while they yet hold those mines by paying the mine tax, withdraw their funds from them to invest in tin and tungsten mines.

Bolivian workmen having been engaged in mining for centuries, are strong. The usual wage per day for a man is 1.50 bolivianos, or 60c., and for a woman 1 boliviano, or 40c., from which they pay for their food; but they have to be provided with houses, as a rule of adobe with roofs covered with corrugated iron. The houses for the staff must be comfortable, otherwise the men will not stay with the company.

It is estimated that after the Panama Canal is open and new and fast steamer service has been established, the journey from New York to La Paz can be made in 14 days; the present mail steamers sailing up and down the coast of the Pacific are timed to reach the ports of Mollendo, Arica and Antofagasta twice a week. On the evening of arrival an express train with sleeping and dining cars takes the passengers inland. Leaving Arica in the evening, the train arrives the next morning at La Paz. From Mollendo or from Antofagasta, the train to La Paz takes 48 hr. The Central R.R. of Bolivia is connected with these three Pacific ports, and branch roads run through passes of the Eastern Cordillera, toward the east, from Oruro to Cochabamba, from Rio Mulato to Potosi and from Huyuni to Tupitza.

The line from Tupitza to Jujuy has yet to be built, by Bolivia and Argentine. The distance from Tupitza to Jujuy, in Argentine, is 267 miles; there is a good cart road. The distance from Jujuy to Rosario, on the Parana River, is 836 miles; the railroad is operating. The distance from Rosario to Buenos Aires by steamer is 270 miles. The total distance from Tupitza, Bolivia, to Buenos Aires, is 1373 miles.

All mining machinery and material for mill and concentrators is free of import dues.



#### Platinum in Westphalia

A report of a general meeting of the Deutscher Platinwerke, held recently in Düsseldorf, given in the London *Mining Journal*, says that a platinum ingot of about 500 grams, obtained from the ore occurrences near Wenden in Westphalia, was submitted to the inspection of the board of directors and the shareholders. The inventor of the process, Dr. W. Hommel, of the Clausthal Mining Academy, made an interesting report on the ore deposits, in which he laid stress on the statement that the precious metal occurs as a complex and refractory combination, in which it is bound up with lead, zinc, antimony and nickel. He also expounded his theory regarding the genesis of the deposits, and described the numerous difficulties he had to overcome before he at last succeeded in elaborating, on the basis of the late Mr. Schreiber's laboratory experiments, his present technically and commercially practicable process. A sensation was caused when Dr. Hommel exhibited a lump of pure platinum, which was, he stated, obtained by smelting 1 ton of concentrates obtained from 25 tons of crude ore. In addition to the platinum, the concentrates gave about 10 to 12 per cent. nickel. The cost of production including mining would be about 20 marks (\$4.76) per ton, and ores containing no more than 5 grams platinum would be payable.



At the meeting it was resolved to construct a complete reduction plant in several units to be erected successively as required by the increasing output. The much discussed question of platinum production in Westphalia appears, therefore, to have definitely entered the practical working stage under highly favorable auspices, but with what ultimate results remains, of course, to be seen.

Dr. Paul von Gans, of Munich, is president of the company; Louis Friel, Saarbrucken, mining director; W. Remy, Düsseldorf, engineer.

It appears that several other platinum companies are being floated, some of which seem to be rather unscrupulous in their methods, or at least in their claims.

duction in Chile and Peru are given in an accompanying table.

In computing the world's production of copper, we use our own figures for the United States, Canada, Cuba,

WORLD'S PRODUCTION OF COPPER (a)  
(In Metric Tons)

Country	1910	1911	1912	1913
United States.....	492,712	491,634	563,260	555,990
Mexico.....	62,504	61,884	73,617	58,323
Canada.....	23,810	25,570	34,213	34,880
Cuba.....	3,538	3,753	4,393	3,381
Australasia.....	(b) 40,962	(b) 42,510	(b) 47,772	(b) 47,325
Peru.....	(c) 27,375	28,500	26,483	25,487
Chile.....	38,346	33,088	39,204	39,434
Bolivia.....	3,212	2,950	4,681	(b) 3,658
Japan.....	(c) 50,703	(d) 52,303	(d) 62,486	(b) 73,152
Russia.....	(b) 22,700	(c) 25,747	(c) 33,550	(c) 34,316
Germany.....	(b) 25,100	(b) 22,363	(b) 24,303	(b) 25,308
Africa.....	(b) 15,400	(b) 17,252	(b) 16,632	(b) 22,870
Spain and Portugal.....	(b) 51,100	(b) 52,878	(b) 59,873	(b) 54,696
Other countries.....	(b) 24,888	(b) 26,423	(b) 29,555	(b) 27,158

Totals..... 882,351 886,855 1,020,022 1,005,978  
(a) The statistics in this table are our own compilations, except where specially noted to the contrary. (b) As reported by Henry R. Merton & Co. (c) As officially reported. (d) Privately communicated to us from Japan.

### The Production of Copper in 1913

The production of copper in the United States, Canada, Mexico and Cuba in 1913 and previous years, is given in the accompanying tables. Our figures are based uniformly

SMELTERS' PRODUCTION OF COPPER IN THE UNITED STATES  
(In Pounds)

State	1910	1911	1912	1913
Alaska.....	5,008,171	19,412,000	32,602,000	24,452,000
Arizona.....	299,606,971	300,578,816	357,952,962	399,849,745
California.....	45,793,894	36,806,762	31,069,029	32,390,272
Colorado.....	10,127,012	8,474,848	7,502,000	7,670,090
Idaho.....	6,216,461	3,745,210	5,904,542	8,434,028
Michigan.....	221,400,864	216,412,867	231,628,486	159,437,262
Montana.....	286,242,403	271,963,769	309,247,735	285,336,153
Nevada.....	63,877,500	65,385,728	82,530,608	84,683,961
New Mexico.....	3,632,351	1,518,288	27,488,912	46,953,414
Utah.....	125,042,381	138,336,905	131,673,803	147,591,955
Washington.....	.....	.....	1,121,109	448,805
East and South.....	18,195,450	19,656,971	18,592,655	24,333,014
Other States.....	1,106,525	1,564,207	4,396,667	4,155,135
Totals.....	1,086,249,983	1,083,856,371	1,241,762,508	1,225,735,834

upon reports received from the several producers and represent the smelters' output, which is a different thing from either the mine output or the refinery output. In

SMELTERS' PRODUCTION OF COPPER IN NORTH AMERICA  
(In Pounds)

Country	1910	1911	1912	1913
United States.....	1,086,249,983	1,083,856,371	1,241,762,508	1,225,735,834
Canada.....	52,492,282	56,370,754	75,425,575	76,796,586
Mexico.....	137,797,217	136,430,331	162,295,545	128,579,656
Cuba.....	7,799,764	8,274,563	9,684,934	7,453,805
Totals.....	1,284,339,246	1,284,932,019	1,489,168,562	1,438,565,881

the case of the Michigan production, however, the smelters are also refiners and their figures for smelting and refining productions are consequently the same. The figures that are now presented are the revision of our pre-

SMELTERS' PRODUCTION  
(In Pounds)

Source	1910	1911	1912	1913
N. American ore.....	1,284,339,246	1,284,932,019	1,489,168,562	1,438,565,881
Foreign ore.....	41,976,733	34,392,091	53,701,307	55,803,202
Scrap.....	10,962,099	18,529,547	11,949,348	22,427,889
Totals.....	1,337,278,078	1,337,853,657	1,554,719,217	1,516,796,972
To foreign refiners.....	33,855,800	32,413,440	45,735,673	36,682,605
To American refiners.....	1,303,422,278	1,305,440,217	1,508,983,544	1,480,114,367
Crude copper imported.....	146,185,104	146,422,851	144,480,144	169,315,869
Total crude copper.....	1,449,607,382	1,451,863,068	1,653,463,688	1,649,430,236

liminary figures, published last January. The alterations, either in total or in details, are insignificant.

Our system of collecting the statistics from the smelters of North America enables us to arrive at the totals not only for the United States, but also for Canada, Cuba, Chile, Peru and Mexico. The details of the pro-

REFINERS' PRODUCTION a  
(In Pounds)

Class	1910	1911	1912	1913
Electrolytic.....	1,151,624,597	1,156,627,311	1,288,333,298	1,406,448,665
Lake.....	221,400,864	216,412,867	231,628,486	159,437,262
Casting.....	32,193,196	22,977,534	24,777,266	22,606,040
Pig.....	46,903,463	35,920,626	37,181,237	33,958,862
Totals.....	1,452,122,120	1,431,938,338	1,581,920,287	1,622,450,829

a Communicated by the Copper Producers' Association.

CRUDE SUPPLY AND REFINED PRODUCTION COMPARED (c)

	1910	1911	1912	1913
Crude.....	1,449,607,382	1,451,863,068	1,653,463,688	1,649,430,236
Refined.....	1,452,122,120	1,431,938,338	1,581,920,287	1,622,450,829

(c) Owing to some statistical uncertainties it is unsafe to draw fine deductions from the comparison of figures in this table.

COPPER PRODUCTION OF CHILE AND PERU, 1912 AND 1913

	(In Pounds)		(In Pounds)	
	Chile—1912	Chile—1913	Peru—1912	Peru—1913
Blister copper to U. S.....	8,627,421	18,315,000	43,891,439	42,667,436
Copper in ore to U. S.....	27,445,679	24,911,465	11,373,009	10,089,592
Copper to England and France.....	50,136,800	43,460,480	2,900,000	3,180,800
Sundries, estimated.....	220,000	250,000	220,000	250,000
Total, lb.....	86,429,900	86,936,945	58,384,448	56,187,828
Totals, metric tons.....	39,204	39,434	26,483	25,487

Chile, Mexico and Peru; the official statistics for Russia; and the statistics of Henry R. Merton & Co. for the other countries.

In our issue of Jan. 10, 1914, we reported the world's production of copper as having been 1,000,716 tons in 1913, which now appears to have been about 0.53% too low. Aron Hirsch & Sohn, of Halberstadt, has since then reported 1,009,091 metric tons, and Henry R. Merton & Co., of London, 1,002,157 metric tons. Our own revised total is 1,005,978 metric tons.

### Report of New York Mine Inspector

W. W. Jones, the state mine inspector of New York, in his report for 1913, to the commissioner of labor, notes a reduction in the accidental mining death rate from 3.77 in 1912 to 2.47 in 1913. This is a most creditable achievement. There were, all told, 21 fatal accidents, of which about one-quarter were caused by explosions, one-quarter by hoisting, haulage and mine machinery, and one-fifth by falls of rock. The number of employees was 8500; the number of mines, 42; and the number of quarries, 155.

At one large, iron-mining property, Mr. Jones states that radical changes have been made, or are still being

made in hoisting practice, looking to increased safety. In general, he says, the quarries pay much less attention to safety than do the mines; especially is this true in respect of blasting. He urges the licensing of blasters in order to discourage dangerous practices.

Without accurate figures at hand, it would appear that this death rate of 2.47 is the lowest in any of the important mining states for 1913.

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### The Butte Labor Troubles\*

To those well meaning, but hardly strong-minded persons, who have fallen into the habit of looking upon every case of labor trouble as due to the wickedness of the capitalist class, we commend a little attention to the goings on in Montana. In Butte the rioting, dynamiting, and robbery which have been reported can by no sympathizer with the downtrodden workingman be laid at the door of the great Anaconda Copper Mining Co., which controls the mines there. That company has never in its existence faced a strike of the Butte Miners' Union. Its wages are fixed by a sliding scale; if the price of copper goes up, the wages rise; if copper declines, wages shrink proportionately. The company is in no wise involved in the present disorder, save that it is losing the labor of men in hospital, men drunk with whiskey or rage at their fellows, men idle because they dare not go to work through they have no grievances whatever against their employers. It is universally admitted that labor and capital work together in Butte in harmony and with full consideration on the part of the capitalists for those employed by them.

What we are witnessing there is chiefly a battle between some 2000 of the most lawless of the miners under I. W. W. leadership and the Western Federation of Miners. To find the real origin of the trouble it would be necessary, probably, to go back to the break between those archangels of the Western Federation, Moyer and Haywood, apostles of peace and light, which resulted in Haywood's becoming the head of the I. W. W. From that time on, a struggle between the bodies was inevitable; and the opportunity at Butte has been the more favorable because thousands of miners there have grown extremely tired of being assessed for strike after strike the country over. Butte has been a treasure-house for the Western Federation. In no danger of trouble themselves, the miners there were assessed nearly \$100,000 to help finance the labor battle at Calumet, which resulted so disastrously, and many West Virginia strikers have lived off the earnings of Butte miners. The power of collective bargaining in Butte has meant the necessity of collective contributions to others in whose cause Butte was but remotely interested. This, on top of the ordinary dues and assessments, has naturally made some men restive, just as it made some others look with longing eyes upon the rich union treasury.

It was the safe containing this that the I. W. W. dynamited and looted. It was the I. W. W. that threw the acting mayor out of a second-story window and severely injured him, when he protested. It is the I. W. W. which has so aroused the lowest elements among the miners, the so called "bohunks," as to lead the Governor to inquire whether Federal troops are available. And all this has happened in a state and city unionized to a higher degree,

\*From the New York "Evening Post."

probably, than any other, with an excellent and honest Socialist city government in control of its affairs. In these—from the labor-union point of view—ideal conditions, we find the same reckless disregard of law and order, the same lack of respect for life and limb, that have marked other greater labor conflicts in the West, and the East, too. If it is any reassurance to know that in conflicts between labor organizations the dagger, the revolver and dynamite appear as readily as they do in "wars" between capital and labor, that satisfaction the public now has.

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### Basic Slag as a Fertilizer

It is announced that the Tennessee Coal, Iron & R.R. Co. will shortly begin a new step in the policy of utilizing byproducts, which is being worked out by the United States Steel Corporation and its subsidiaries. The company has begun to build near Ensley, Ala., a large plant for crushing, pulverizing and preparing for market, as a fertilizer, the basic slag from its Ensley works. A series of experiments has been carried on for some time, and designs for the plant and machinery have been completed.

A number of assays of this basic slag show an average of 17% soluble phosphoric acid and 48% lime. It is believed that it will be better as a fertilizer than the basic slag from the Thomas converters, which is largely used in Germany. A small quantity has been imported into the United States from that country, but there has been no systematic use of it here.

The plant will consist of steel and concrete buildings, containing electrically driven crushing, conveying, grinding and sacking machinery. A warehouse will be provided for storing the fertilizer.

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### Milling Costs at Montana-Tonopah

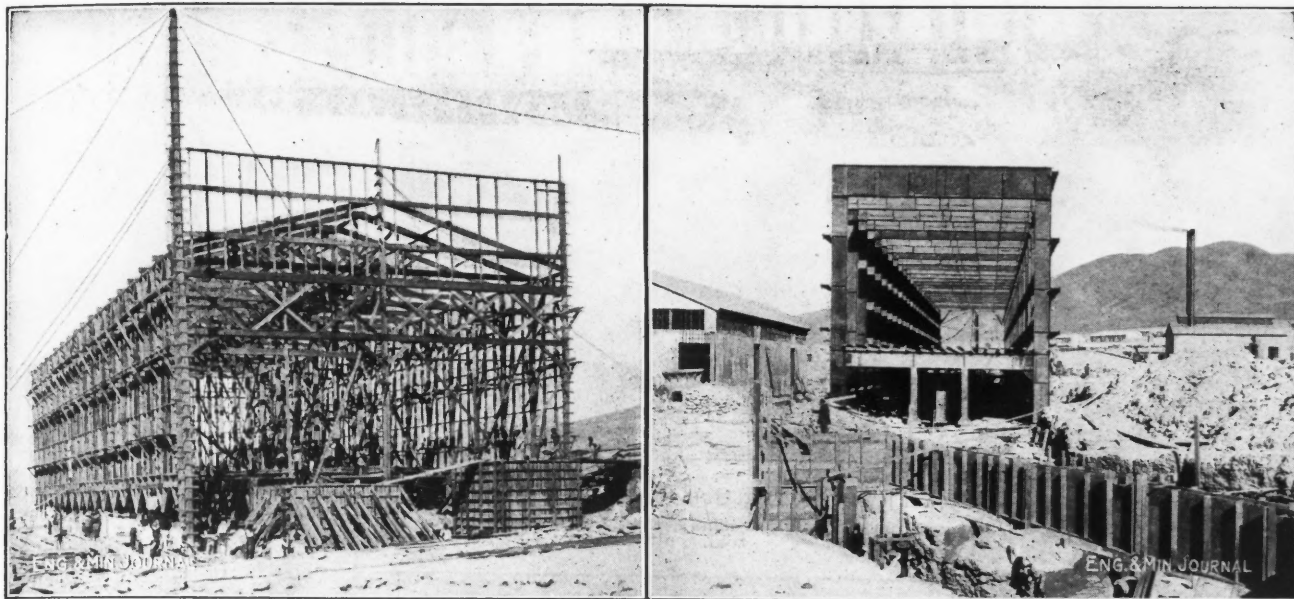
The report of the Montana-Tonopah Mines Co., Tonopah, Nev., for the year ended Aug. 31, 1913, states that 52,402 tons of ore were milled at a cost of \$3.121 per ton. The mill operated continuously for 348.5 days and treated 150.36 tons a day. The average value of the ore was \$12.70 per ton, of which about 73% was silver. Extraction by concentration averaged 23.9% and by cyanidation, 63.3%; total extraction, 91.2%. A tabulation of milling costs follow:

	Labor	Per Ton Power	Milled Supplies	Total
Crushing and conveying	\$0.081	\$0.018	\$0.019	\$0.118
Stamping	0.101	0.136	0.072	0.309
Elevating and separating	0.026	0.027	0.012	0.066
Tube milling	0.030	0.127	0.057	0.214
Concentrating	0.029	0.007	0.005	0.041
Settling	0.030	.....	0.077	0.107
Agitating	0.157	0.097	0.891	1.144
Filtering and discharging	0.104	0.075	0.046	0.225
Precipitation	0.036	0.026	0.095	0.157
Refining	0.028	.....	0.053	0.081
Water pumping	0.024	0.013	0.019	0.057
Steam heating	0.057	.....	0.218	0.275
Mechanical department	0.026	.....	0.003	0.029
Water	.....	.....	0.217	0.217
Storekeeper	.....	.....	.....	0.016
Assaying	0.019	.....	0.005	0.024
Superintendence	0.051	.....	.....	0.051
<b>Total</b>	<b>\$0.815</b>	<b>\$0.526</b>	<b>\$1.780</b>	<b>\$3.121</b>

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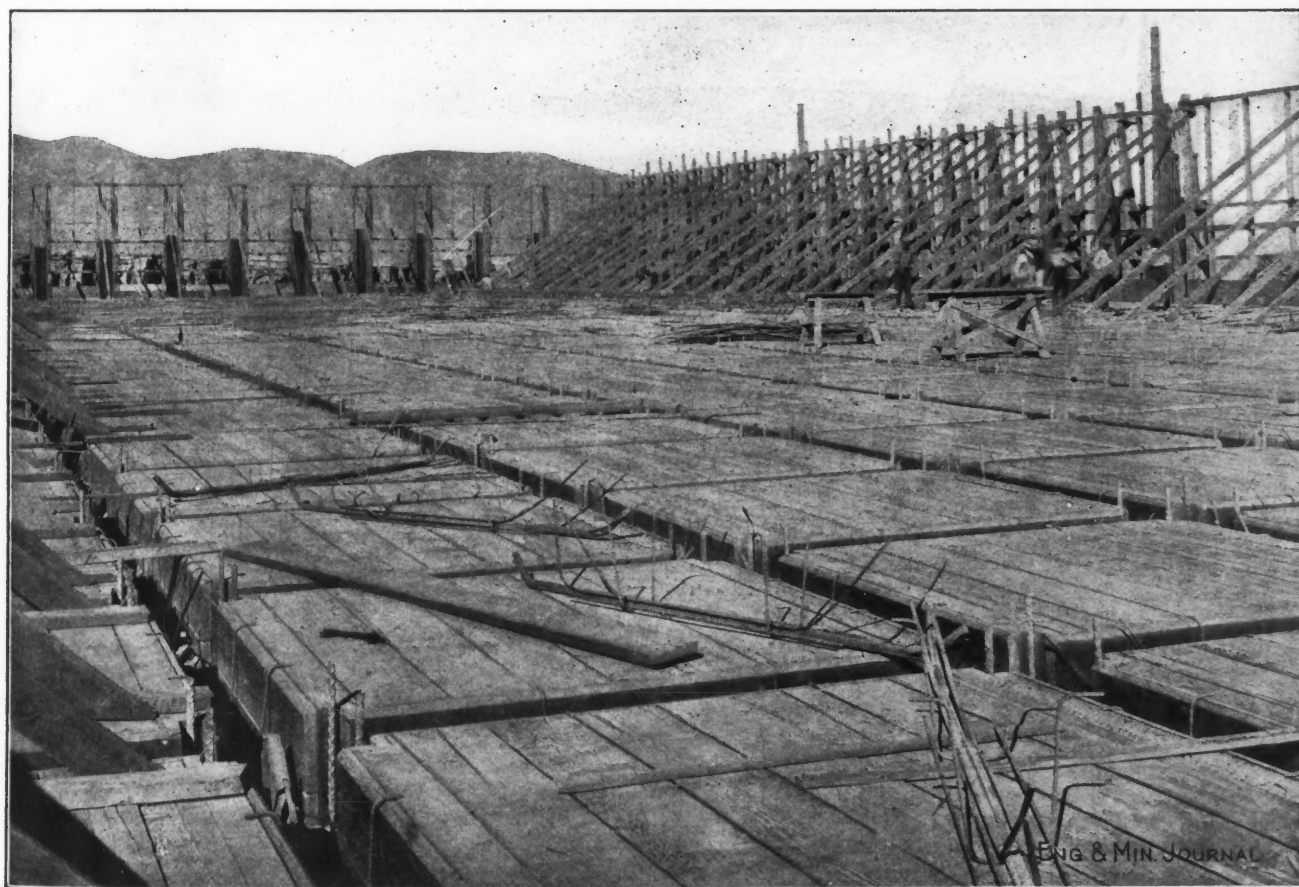
Feldspar Marketed in the United States in 1913 amounted to 120,955 tons, according to the U. S. Geological Survey.

# Chuquicamata Leaching Works



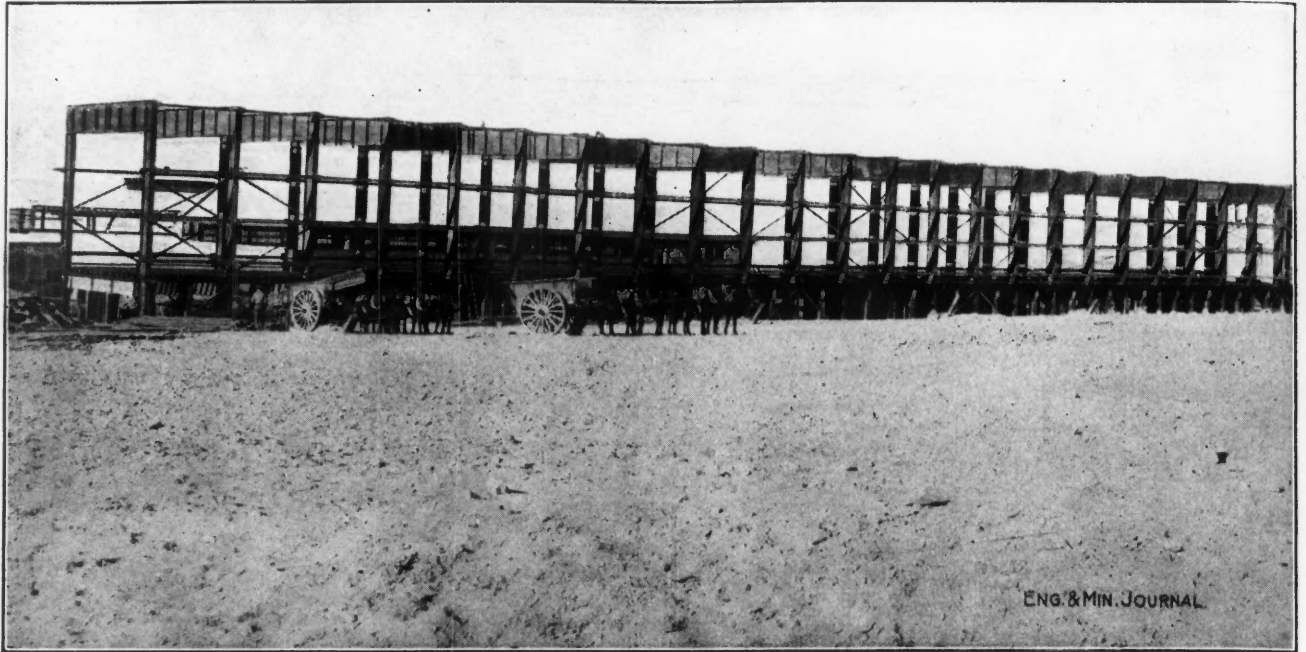
BURNER END OF ACID PLANT, LOOKING WEST, AND ORE BINS

These, and the following photographs were taken recently and indicate the progress made on the Chile Exploration Co.'s plant at Chuquicamata, Chile.



ONE OF THE 10,000-TON CAPACITY REINFORCED-CONCRETE LEACHING VATS UNDER CONSTRUCTION

Vat measures 110x160x16 ft. deep, holds one day's crushing of ore, and is lined with an acid-proof coating 1½ in. thick, made up of Trinidad asphalt, and crushed quartz or granite.



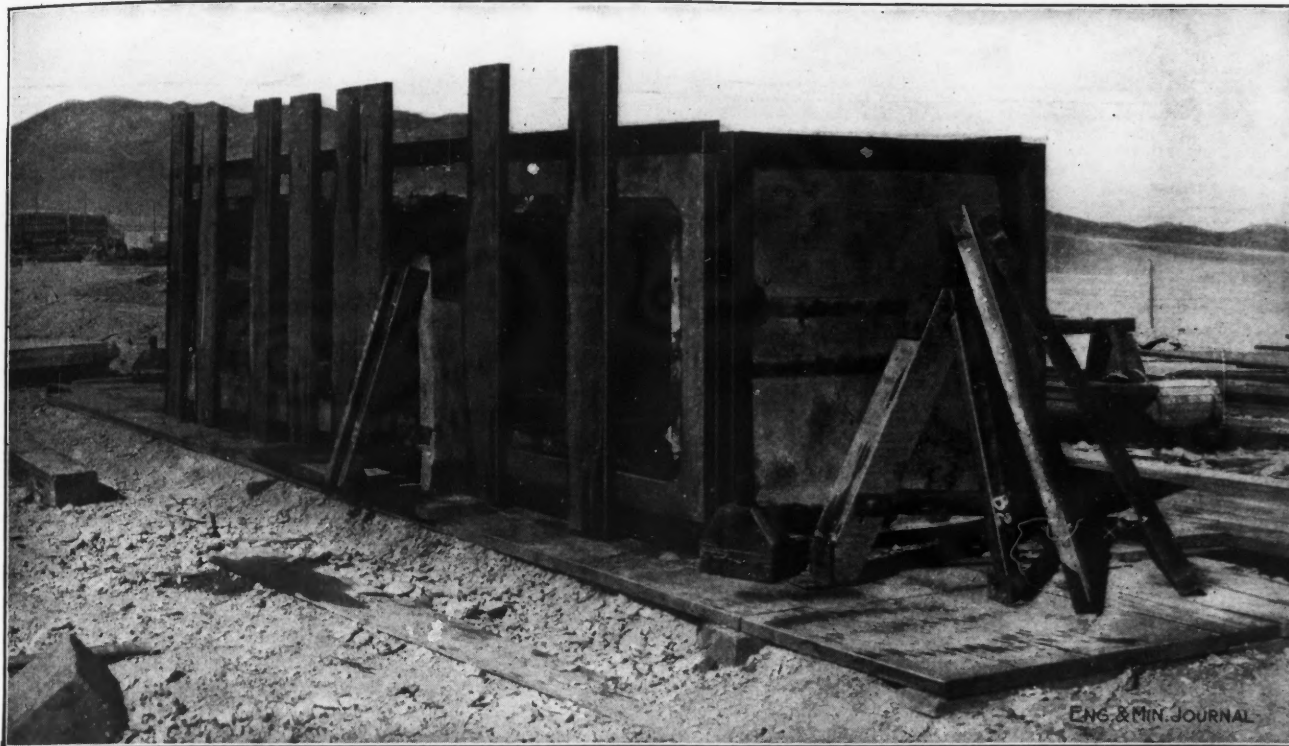
STEEL FRAME OF THE ORE BINS, VIEWED FROM IN FRONT

Ore will be crushed to  $\frac{1}{4}$  in. by gyratory and disk crushers, then by Garfield rolls, product being carried on conveyor belt to leaching vat.



FOOTINGS FOR LEACHING VATS NOS. 5 AND 6, FORMS FOR NORTH, EAST AND SOUTH WALLS IN REAR

Copper mineral is brochantite, soluble in dilute sulphuric acid and present in the ore together with salt, chlorine therefrom being only harmful element tending to accumulate in the solutions.



**ONE OF THE REINFORCED-CONCRETE ELECTROLYTIC DEPOSITING CELLS**

The leaching solution will drain through coco-matting filters over 6-in. openings in the bottom of the vats, thence, after clarifying and partially dechlorinating, flow to the electrolytic cells.



**BUILDING FOR ELECTROLYTIC DEPOSITING CELLS UNDER CONSTRUCTION**

The estimated depositing capacity of this plant is 180,000,000 lb. of copper per year.

## NEW PUBLICATIONS

- ROCK EXCAVATING AND BLASTING.** By J. J. Cosgrove. 5½x8½, pp. 179, illus. National Fire Proofing Co., Pittsburgh, Pennsylvania.
- EDUCATION OF MINE EMPLOYEES.** By H. H. Stoek. 6x9, pp. 136, illus. Bull. No. 1, Illinois Miners' and Mechanics' Institutes, University of Illinois, Urbana, Illinois.
- ESTADISTICA MINERA EN 1912.** By Carlos P. Jimenez. 7x9 pp. 125, paper. Boletín No. 80, Cuerpo de Ingenieros de Minas del Peru, Lima.
- HANDBUCH DER MINERALCHEMIE. VOL. II, Part 5.** Edited by C. Doelter. 7x10, pp. 208, illus., paper; 9.10 marks. Theodor Steinkopff, Dresden, Germany.
- THE MINERALS OF THE BLACK HILLS.** By Victor Ziegler. 6x9, pp. 250, illus., paper. Bull. No. 10, South Dakota School of Mines, Rapid City, South Dakota.
- A CHART OF THE CARBON COMPOUNDS.** Prepared by Charles W. Cuno. 32x44 in., paper, unmounted; 30c. Published by the Department of Efficiency, University of Denver, University Park, Colorado.
- THE FUELS USED IN TEXAS.** By William B. Phillips and S. H. Worrell. Pp. 269, illus. Bull. No. 307, University of Texas, Bureau of Economic Geology and Technology, Austin.
- ANNUAL REPORT OF THE MINING INDUSTRY OF IDAHO FOR THE YEAR, 1913.** Pp. 225, illus. Robert N. Bell, State Inspector of Mines, Boise, Idaho.
- GEOLOGY AND MINERAL DEPOSITS OF THE TULAMEEN DISTRICT, B. C.** By Charles Camsell. Pp. 197, illus. Memoir No. 26, Geological Survey, Canada Department of Mines, Ottawa.
- CLAY AND SHALE DEPOSITS OF NEW BRUNSWICK.** By J. Keele. Pp. 93, illus. Memoir 44, Geological Survey, Canada Department of Mines, Ottawa.
- REPORT ON THE CLAY AND SHALE DEPOSITS OF THE WESTERN PROVINCES. Part II.** By Heinrich Ries and Joseph Keele. Pp. 99, illus. Memoir No. 25, Geological Survey, Canada Department of Mines, Ottawa.
- THE ENGINEERING INDEX ANNUAL FOR 1913.** Compiled from the Engineering Index Published Monthly in the "Engineering Magazine" during 1913. 6¼x9½, pp. 508, \$2. Engineering Magazine Co., New York.
- MINERAL RESOURCES OF SOUTHWESTERN OREGON.** J. S. Diller. Pp. 147, illus. Bull. 546, U. S. Geological Survey, Washington, D. C.
- GEOLOGY AND GEOGRAPHY OF A PORTION OF LINCOLN COUNTY, WYOMING.** By Alfred Reginald Schultz. Pp. 141, illus. Bull. 543, U. S. Geological Survey, Washington, D. C.
- CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1912. Part 1, Metals and Nonmetals except Fuels.** By David White. Pp. 563, illus. Bull. 540, U. S. Geological Survey, Washington, D. C.
- FAUNA OF THE MARTINEZ EOCENE OF CALIFORNIA.** By Roy Ernest Dickerson. 7¼x10½ pp. 170, illus. Bull. Dept. of Geology, University of California, Berkeley.
- SURFACE WATER SUPPLY OF THE UNITED STATES, 1912. Part II. South Atlantic Coast and Eastern Gulf of Mexico Basins.** By W. E. Hall and C. H. Pierce. Pp. 93, illus. Water-Supply Paper 322, U. S. Geological Survey, Washington, D. C.
- SURFACE WATER SUPPLY OF THE UNITED STATES, 1912. Part IV. St. Lawrence River Basin.** By C. C. Covert, A. H. Horton and W. G. Hoyt. Pp. 149, illus. Water-Supply Paper 234, U. S. Geological Survey, Washington, D. C.
- SURFACE WATER SUPPLY OF THE UNITED STATES, 1911. Part VI, Missouri River Basin.** By W. A. Lamb, W. B. Freeman and Raymond Richards. Pp. 374, illus. Water-Supply Paper 306, U. S. Geological Survey, Washington, D. C.
- SURFACE WATER SUPPLY OF THE UNITED STATES, 1911. Part IX, Colorado River Basin.** By Robert Follansbee, W. B. Freeman and G. Clyde Baldwin. Pp. 266, illus. Water-Supply Paper 309, U. S. Geological Survey, Washington, D. C.
- RECONNAISSANCE OF THE GRANDFIELD DISTRICT, OKLAHOMA.** By Malcolm J. Munn. Pp. 83, illus. Bull. 547, U. S. Geological Survey, Washington, D. C.
- HANDBUCH DER MINERALCHEMIE. Vol. III, Parts 1, 2 and 3.** 7x10, pp. 160, paper; 19.50 marks. Theodor Steinkopff, Dresden and Leipzig, Germany.
- MATERIALS FOR THE PALAEOONTOLOGY OF NEW ZEALAND.** By James Allan Thomson. Pp. 103, illus. Palaeontological Bull. No. 1, New Zealand Geological Survey, Wellington.
- GEOLOGY AND MINERAL RESOURCES OF THE YILGARN GOLDFIELD. Part I—Southern Cross.** By E. C. Saint-Smith and R. A. Farquharson. Pp. 193, illus. Bull. 49 Western Australia Geological Survey, Perth.
- ABSTRACTS OF CURRENT DECISIONS ON MINES AND MINING, MARCH TO DECEMBER, 1913.** By J. W. Thompson. Pp. 140. Bull. 79, U. S. Bureau of Mines, Washington, D. C.

The Bureau of Mines published last year a bulletin (No. 61) giving abstracts of legal decisions from October, 1912, to March, 1913, at which time it stated that similar bulletins would be issued in the future if the interest manifested warranted it. Bulletin 61 met with great favor, and it has therefore been decided to issue similar bulletins at regular intervals of about three months.

**GEOLOGICAL MAP OF COLORADO.** 35x49 in.; unmounted, 35c.; mounted on cloth, 75c.; mounted on cloth with sticks and rings, 95c. Colorado Geological Survey, Boulder, Colorado.

This map has been prepared on the same scale as the topographic map, recently issued by the Colorado Geological Survey, namely, eight miles to one inch, and presents the geology of the state, including the results of the most recent field work of the United States Geological Survey and the Colorado Geological Survey. All the various formations of the state are shown in different colors and patterns.

**DIE WICHTIGSTEN LAGERSTÄTTEN DER "NICHTERZE," Zweiter Teil: Kohle (Allgemeine Kohlengeologie).** B. O. Stutzer. 7¼x10, pp. 345, illus., paper; 16 marks. Gebirger Borntraeger, Berlin, Germany.

Doctor Stutzer's earlier volume on the non-metallic minerals is now continued with one on coals. The fossil fuels are treated, however, in the purely scientific rather than the economic or areal way. The chemical and physical characters, the microscopic structure and the light thrown by it upon the forms of origin, the geological relations and stratigraphic distribution are discussed at length. A short chapter of statistics of production on the part of the countries provided with coal concludes the volume.

**THE METALLOGRAPHY OF IRON AND STEEL.** By Albert Sauveur, 7¼x10¾ pp. 306, illus.; \$6. Sauveur & Boylston, Cambridge, Mass.

This is both a scientific and a practical exposition of one of the most important subjects now occupying the attention of iron and steel metallurgists. In reference to the need for such a book Professor Sauveur writes as follows:

While several excellent books on metallography have been published and while numerous papers on the metallography of iron and steel have appeared in the scientific and technical press, a well-balanced, specific, and comprehensive treatise on the subject has not heretofore been written. In the belief that there is a real and urgent need of such a treatise the author has endeavored to supply it, craving for his effort the indulgent criticism of his readers. He offers his book to those seeking self-instruction in the metallography of iron and steel, their special needs having been carefully considered in the arrangement of the lessons; he offers it to teachers and students trusting that they will find it valuable and suggestive as a textbook; he offers it to manufacturers and users of iron and steel in the belief that he has given due weight to the practical side of the subject and has avoided discussions of illfounded or purely speculative theories; he offers it to the general reader interested in the scientific or practical features of the metallography of iron and steel, as the language used should be readily understood by those lacking specialized knowledge of the subject; he offers it to experts in the hope that they will find it not entirely devoid of original thought, original treatment, and suggestiveness.

Since these words were written, the book has found an important place in almost every steel works laboratory in America, and in our leading colleges and schools of engineering. It is written in so clear and simple a manner as to be comprehensible by beginners who have not even the benefit of a technical education. It is comprehensive in scope, and, in distinction from all other treatises on this subject which have appeared so far, it covers every important phase of the subject, from the mere description of apparatus used, (sufficient to enable one to work intelligently with the tools he requires), to the most theoretical considerations of the principles of metallography and the properties of iron and steel, including an illuminating account of the hardening and tempering of steel, and including also the study of defects in iron and steel, such as, flaws, solid impurities, etc.

The book commences with a description of the apparatus required for a metallurgical laboratory and then takes up the study of pure metals, leading thence to the consideration of pure iron, of wrought iron, low-carbon steel, medium-high, and high-carbon steel. The sixth lesson is devoted to an account of impurities in steel; the 7th, 8th and 9th to the thermal critical points of iron and steel, their occurrence, causes and effects. Lessons 10 and 11 deal respectively with cast steel and the mechanical treatment of steel; and then follow four sections dealing with the heat treatment of steel, and including respectively annealing, hardening, tempering, and the theories that have been advanced to explain the hardening. Lesson 16 is devoted to cementation and case-hardening; then follow two lessons on special steels and three on cast iron, entitled respectively: Cast iron; impurities in cast iron; and malleable cast iron.

In introducing the more intricate parts of the subject, Professor Sauveur devotes one lesson to the consideration of metallic alloys, one to the equilibrium diagram of iron-carbon alloys, and the last regular lesson of the book to the phase rule. Following these regular lessons there is a very valuable appendix entitled "Manipulations and Apparatus," and a second one, on the "Nomenclature of the Microscopic Constituents of Steel and Cast Iron."

BRADLEY STOUGHTON.

## The Gold Hill Consolidated

The New York *Sun*, on June 15, called attention to the circulation of a letter by J. C. Williams, "Economic and Mining Geologist," boosting the Gold Hill Consolidated Co., of North Carolina, on the official stationery of the Senate's committees on rules and on the census, of which Senators Overman and Chilton are members. Both these senators are interested in the Gold Hill company, which is a promotion of Walter George Newman, who used to be well known in New York. On certain occasions he figured as "Baron Newman" and "Baron Jones." Respecting the Gold Hill Consolidated Co., the last Copper Handbook says:

Organized 1910 as successor of Gold Hill Copper Co., a notorious promotion that caught many Wall Street operators. New company, under same management, became bankrupt and property sold at auction, Jan. 27, 1910, for \$45,000. Company does not own the adjacent Union copper mine. The mining property consists of 1050 acres in Rowan and Stanley counties, the Gold Hill mine, where gold was discovered A. D. 1799. Gold quartz veins were discovered 1831, and in 1845 this mine was the largest gold producer in the United States. Development is by two working shafts of 615 ft. and 830 ft., and two lesser shafts. The mine was operating in 1913, crosscutting on the 270-ft. level to cut the "Newman" vein, already opened on the 800-ft. level. Shipments to the Perth Amboy smelter returned 1.5% copper and about \$3 gold per ton, with small silver values. Copper occurs in minute particles of chalcopyrite in hard quartz schist and recovery by wet concentration is not commercially profitable. Equipment includes ten 100-hp. boilers and a 10-stamp mill. This company and its companion, the Union Copper Mining Co., enjoyed decidedly checkered careers. Operations conducted on a considerable scale, 1901-1903, were unsatisfactory and failed to show up the much advertised orebodies. A receivership ensued, which was ended early in 1906, but a receiver was again appointed, August, 1906, for the old company, on the application of Walter Geo. Newman, the former president, on claims aggregating \$352,000. Mr. Newman apparently has used this property solely for stock-jobbing purposes. The property itself is considered worked out and low grade, but worthy of some drilling in depth. At best the company could never pay honest dividends on its capitalization and under its present president cannot be regarded as worthy of any confidence whatever.

In the ENGINEERING AND MINING JOURNAL of June 6 was the following news paragraph about this company:

GOLD HILL CONSOLIDATED CO. (Gold Hill)—Mines after lying idle for seven years, are again being worked. Property consists of 1100 acres. Mine was unwatered last October. Since then development work and repairing has been going on at a rapid rate. Mill contains 40 stamps, concentrating tables, rock-crusher, and other equipment. Owing to development work being done, only 20% of the stamps are kept dropping full time. It is expected to have 40 stamps in operation is near future. Mine has been opened to a depth of 800 ft. One shaft is down 600 ft., where sufficient crosscutting has been done to prove three good veins from 3 to 5 ft. in width. These oreshoots are several hundred feet long and reach to surface. Another shaft is 800 ft. deep with 856 ft. of crosscuts at bottom, which cuts six veins. These veins are from 3 to 8 ft. wide. Some stoping has been done on two of these veins and several hundred feet of drifting, proving continuity of veins to 800-ft. level. Ores are sulphides; 80% of the gold is saved by amalgamation, remainder is saved on concentrating tables. Concentrates are shipped to New Jersey to smelters.

The letter that was circulated on Senate stationery is as follows:

"Gold Hill Consolidated Co., Gold Hill, N. C., May 29, 1914. Hon. W. E. Chilton, United States Senate, Washington, D. C.

"Dear Sir: After spending some thirty days on the Gold Hill property and feeling you may be interested in what I may know and believe about the property, I write you this condensed information.

"I have gone over the property of the Gold Hill Consolidated Co. very carefully, both on the surface and through the mine, down to the 800-ft. level. After examining seven veins from two feet six inches to twelve feet in width, samp-

ling and assaying them, I must say I see greater possibilities in the Gold Hill property every day.

"My first opinion is fully confirmed, and the veins will go to much greater depth than the 800-ft. level and carry high values in gold, silver and copper. The copper veins alone show a handsome dividend, leaving the gold and silver clear.

"After comparing the Gold Hill property with other mines and mining properties which I have examined, both in the United States and Canada, on which valuations have been fixed, I would say I believe that \$60,000,000 valuation on the Gold Hill property a conservative estimate.

"Yours very truly,

"J. C. WILLIAMS.

"Economic and Mining Geologist."

Mr. Williams is not a member either of the Mining & Metallurgical Society of America or of the American Institute of Mining Engineers, the two national societies of American mining engineers. His business card reads:

J. C. WILLIAMS

Economic and Mining Geologist

Oil, Gas, Coal and Clay a Specialty

Properties Examined and Reports Made

221 Orchard Ave.

Ridgway, Penn.

Upon the face of the data above given and the record of the property a valuation of \$60,000,000 looks like "going some."

The affair has produced much excitement in the Senate and in Washington generally. Senators Overman and Chilton offer the explanation that the typing of the letter on committee paper was the innocent mistake of a clerk and was simply to oblige somebody. The same mistake happened in two separate committee rooms. An investigation is to be made by the Senate.

A private correspondent informs us that the Gold Hill promotion took well in Washington and that Newman seems to have a big following there.

According to the later press dispatches, a fight against the passage of the resolution investigating the use of the Senate stationery will be made by certain Democrats. The resolution was referred to the committee on the audit of contingent expenses, which did not report on it. After the explanations by Senators Chilton of the Census Committee and Overman of the Rules Committee, certain Senators said that all that would be accomplished would be to advance the stock of the mine in question. Senator La Follette, however, will, it was said, demand that the entire matter be thoroughly threshed out at a public hearing.

"Certain people who have gone short of the stock are using a New York newspaper to stir up a "scandal," depress the stock and buy it back cheaper," said Walter George Newman, promoter of the mine, to the correspondent of the *Evening Sun*:

"I will go before an investigating committee and tell it all I know. I want a full investigation. All John Skelton Williams did was to send a man down to North Carolina to see if it was worth while to reopen the Government assay office down there. And he told me if we kept up for six months, like we were going, he would do so. Now we are doing better than ever."

Let's tell him about the nuggets we took out Saturday," broke in Senator Overman's son-in-law, who was sitting at the table.

"Forty-two ounces," corrected Newman, "but we don't want to talk about the mine. I didn't ask for committee stationery. As soon as Senator Overman's secretary made objection I had copies run off on plain paper."

## Correspondence and Discussion

### Calculation of Extraction in Cyanidation

In two different communications to the JOURNAL (July 12, 1913, and Jan. 3, 1914), W. L. Welton has tried to point out the impossibility of sampling tailings in a wet-treatment plant on account of "serious" losses in overflows from classifiers and dewaterers. Mr. Welton has not given figures or calculations, with reference to a modern plant, to prove his statement. The following considerations will show to what extent the extraction in a cyanide plant, if calculated from bullion recovery and tailings assays, is influenced from the source mentioned by Mr. Welton.

I take as an example a cyanide plant using amalgamation followed by all-slimes, agitation and filtration. The ore is stamped in water and seven parts of water are used to one of ore. After amalgamation the pulp is classified, the slime sent to dewaterers, the sand to regrinding mills, and after being comminuted joins the slime. The latter is subsequently thickened to a pulp with 40% moisture; it is at this point in the process that the loss in overflow is incurred. The efficiency of modern thickening machinery is such that without any effort an overflow with 0.2% solids or less can be obtained.

To compute the loss of slime in the overflow, assuming this contains 0.2% solids, the following equation may be used:

Water in thickened slime + water in overflow = total amount of water used, or if  $X$  is the loss in overflow in lb. per ton of ore:

$$(2000 - X) \times 0.40 + 500 \times X = 7 \times 2000$$

from which is found

$$X = 26.4 \text{ lb. per ton or } 1.32\%$$

If the assay value of the tailing (filter cakes) is  $T$  oz. per ton, and the quantity of bullion recovered per ton,  $B$  oz., the calculated extraction, when the loss through overflow is neglected, will be:

$$E = \frac{B}{B + T}$$

The assay of the total waste from the mill, including slime carried off in the overflow, is:

$$T' = (1 - 0.0132) T + 0.0132 T''$$

wherein  $T''$  is the assay value of the overflow material, assumed to have the same content of precious metal as the slime before cyanidation.

The calculated extraction, when taking into account the overflow-loss, is:

$$E' = \frac{B}{B + 0.9868 T + 0.0132 T''}$$

If we substitute:

$$B = \$8;$$

$$T = \$1;$$

$$T'' = \$4;$$

we find,

$$E = 88.88\% \text{ and } E' = 88.50\%$$

It will be seen that the difference in calculated extractions is by no means as serious as Mr. Welton represents.

If water is used to sluice away the residue from the filters, the stream of tailing-pulp can be joined by the overflow from the thickeners; by placing a good automatic sampler in the launder which conveys this pulp, an accurate sample can be obtained from all solid material that leaves the mill. Mr. Welton might contend that in collecting the individual samples, losses of slime are incurred from the overflow of the receptacle, but the latter can be either made so large that it does not overflow during the shift, or if this is impracticable, a clean overflow can be discharged by using baffles and by adding a few drops of strongly alkaline solution (caustic soda or ammonia) every time a sample flows into the collecting-box. Personally, I prefer the second method.

If, on the contrary, the filter cakes are discharged dry, and stacked by a belt conveyor, it is possible to ascertain the assay value of the overflow by sampling it separately. The quantity of water used, and the percentage of solids in the overflow being known, the loss of precious metal from this source can then be computed. Where the clarified water from the thickeners is pumped back to the mill-storage tank to be used again, no overflow is run to waste, and consequently no losses arise from unsettled slime.

As to the loss of material in concentration through insufficient settling, there is no excuse for a modern plant to suffer from these losses, and as I have said before, if the reject from the mill, including all waste water and floor washings is collected in one main launder, equipped with an automatic sampler, no possible loss can occur of which the mill operator is not aware.

M. G. F. SÖHNLEIN.

Ingenio de Machacamarca, via Oruro, Bolivia.

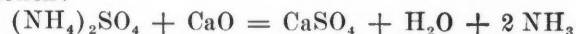
Mar. 12, 1914.

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### Ammonia in Flue Dusts

I notice an inquiry in the JOURNAL of June 14, 1913, p. 1208, by C. Carleton Semple as to the reason for the presence of ammonia in lead-furnace flue dust.

The quality of the coke used in the furnace would seem to account for the quantity of ammonia compounds in the flue dust. If, in the manufacture of the coke, the volatile matter had not been entirely driven off or the ovens not leveled properly, causing the presence of blackbutts in the product, then the furnaces would complete the work of burning, in which case ammonia would be expelled. Under the conditions in the furnace the ammonia would unite at once to form some such compound as ammonium sulphate, and be precipitated in the flue dust. On addition of lime at the briquetting plant, ammonia would be given off according to the following reaction:



E. C. HICKMAN.

East Helena, Mont., June 7, 1914.



## Editorials

### The Supply of Copper Ore

The head of one of our large copper-producing companies writes us as follows:

"There is one thought in connection with the price of copper that I think should be presented to the public. It is that our supply of copper is not unlimited. Because of its low price, we are now using copper for many purposes where other material could be used. At the present rate of consumption, our supply of copper will be exhausted in what, for the life of the Nation, is a very few years; and when it is exhausted we shall find it difficult to get supplies for uses where copper is necessary unless at very high prices. Are we treating posterity fairly when we induce the public to consume copper extravagantly by making too low prices? Is not our action uneconomic and unsound? I should like to see this subject discussed by the readers of the JOURNAL."

This is the same question that is raised regarding the world's resources of coal, iron ore, petroleum and other nonreproductive substances and it is one to which there seems to be no answer short of Socialism or governmental regulation, between which there is perhaps no great difference. Once let a natural resource be capitalized it must soon be caused to be productive. The world's product must be sold for what it will bring. Competition restricts margins. The natural laws of economics prevail.

An old doctrine of economics was that they would and ought to prevail. This was not recognized by later authorities. The classic analogy cited by them is the crowd of people in a burning theater. Left to themselves most perish in their natural disorder. Regulated by some policemen they march out in column of fours and all are saved.

No one yet has shown how to regulate prices, production, etc., in any such ways. The German idea of cartels and conventions is repugnant to American minds and all of our movements in that direction have been reversed. The idea of our own conservationists is to withdraw mineral lands, preventing their capitalization until they are needed. Nobody has any clear conception of how such a policy would work or can be worked.

We shall not enter upon any arguments respecting this question. We should like to see some of our readers do so, as our correspondent suggests. We may, however, state certain premises, which seem reasonably clear.

1. Nobody has anywhere near so clear an idea of what the world's resources of copper may be as they have of iron and coal, nor is it possible in the nature of things. However, there are other mineral resources of which we know even less than of copper—lead and zinc, for example—yet the world's production of them increases steadily.

2. Improvements in the arts adds constantly to the world's resources. Only 10 years ago the porphyry deposits with their 1½ to 2½% of copper content were unworkable. Now they yield hundreds of millions of

pounds of copper annually. At present but about two-thirds of their copper is extractable. Without doubt the percentage will be raised and equally without doubt the new processes will make available the reserves of 1 to 1½% ore.

3. There is undoubtedly a tendency toward appreciation in the price for copper. This is because the demand can only be supplied at a higher price, partly because of the impoverishment of the old mines; partly because of the necessity of bringing in the new, lower-grade mines; partly because of increased costs of production on other accounts.

When the porphyry mines were being promoted during the period 1905-10, there were widely heralded estimates of production costs around 7c. per lb. Sometimes the estimate was as low as 6c.; rarely was it over 8c. In their early days figures purporting to bear out such estimates were grandly stated in the official reports of actual operations. The world knows now that nothing of the sort is really to be expected, and we look complacently on 9 to 11c. costs in the reports of nowadays. There is no disappointment inasmuch as it appears that the average yield of the copper in selling price is also turning out to be higher than was expected and that for natural reasons its tendency is to move still further upward.

### The Gold Hill Affair

The Senate can settle the Gold Hill affair very easily if it wants to, and there is no need for any \$12,000 speeches about it.

1. There are numerous professional investigators in Washington who have been hunting the money devil and making headlines for the press. Let Mr. Brandeis, or Mr. Untermyer, or Mr. Folk be turned loose on a Gold Hill investigation.

2. Inasmuch as official Washington seems to have been playing the curb stock market, it would be a real good thing if the value of the Gold Hill mine be estimated and publicly reported by some distinguished engineer, such as J. R. Finlay, A. H. Rogers, or B. B. Lawrence, mentioning only a few who are unidentified with any "interest."

The Senate ought to be able to arrange these things in about half an hour. Thereafter, Mr. Brandeis, or Mr. Untermyer, or Mr. Folk might develop headlines according as they thought advisable. In the meanwhile the engineer would examine the mine. In about one month the public would have some illuminating information about the promotion of a certain kind of mine and about the machinations of the money devil in Washington itself.

### Smelting in Colorado

According to our Denver correspondent, a petition is being circulated in Colorado praying for the legislature to submit to the people next fall a constitutional amendment leading to the furnishing of state funds to erect a

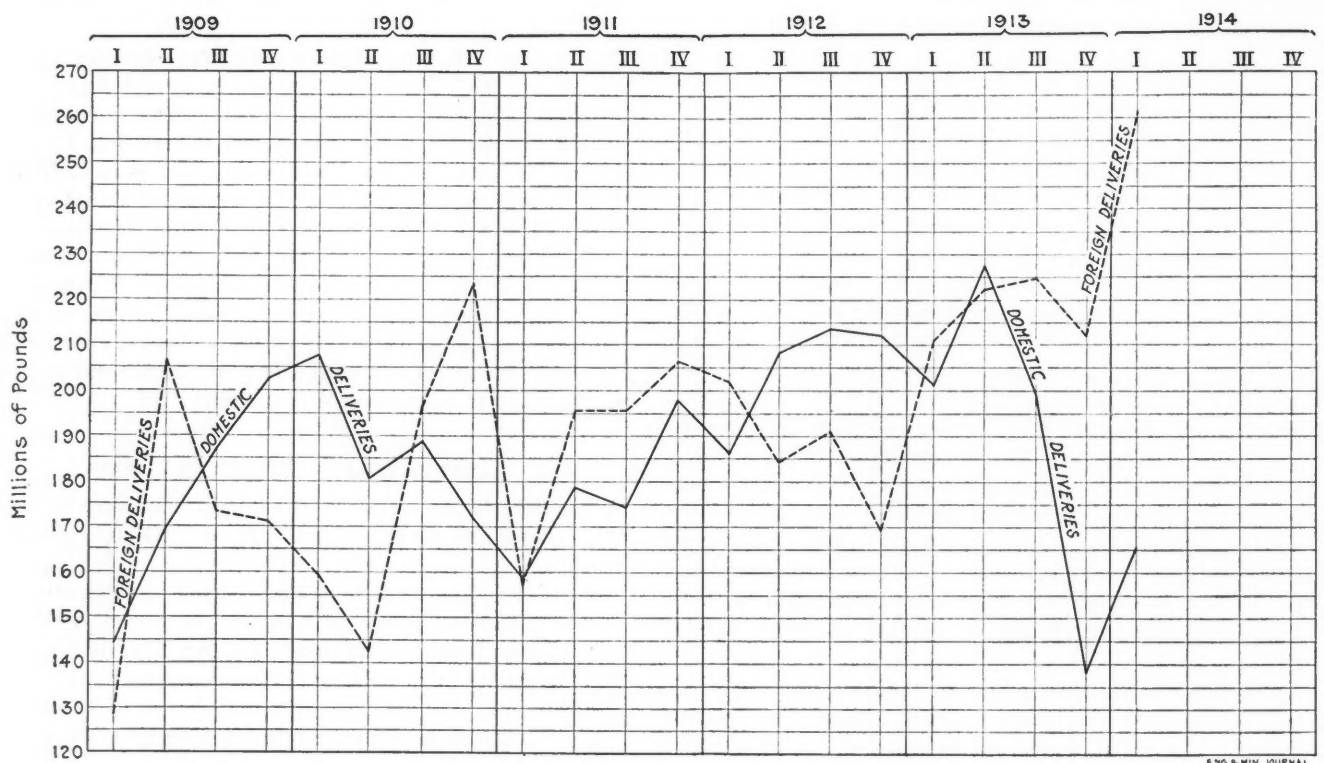
state smelting works. Persons in Colorado have long cherished grievances about the custom-smelting business as conducted in that state by the American Smelting & Refining Co. and the Ohio & Colorado Smelting Co., especially the former. Private capital has been quite indisposed to provide additional competition in this field and if such competition is seriously wanted, state assistance is one way of getting it. We should like to see it tried, although we will admit that the taxpayers of the state might reasonably feel some nervousness about it.

There is another expedient that might be considered, viz., induce the producers of ore to form a coöperative smelting company. We do not recall just that thing having been done before, in the United States, but that is no reason why it should not be. However, there is good precedent for ore producers going into the smelting business. Indeed, that is just the way the Guggenheims

## The Consumption of Copper

The output from the American refineries constitutes so large a proportion of the total production of the world that the amount of it and the amount of the deliveries may be taken always as fair indices of the world's position. It is well known that deliveries from the refineries and consumption by the manufacturers of copper sheets, wire, brass, etc., are two different things. Over a long period they must, of course, be substantially the same, but month by month they may not be in harmony at all. Consequently, there is never any use in drawing deductions from the monthly statement of deliveries. Considering the quarterly deliveries, however, we come nearer to measuring the actual consumption.

We have computed the deliveries by quarters, as reported by the Copper Producers' Association, since the



REFINED COPPER DELIVERIES, 1909-1914

started. Back in the '80s they were interested in the A. Y. & Minnie mine, at Leadville, and did not like the way the smelters treated them, although there was then no A. S. & R. Co. To improve things they built the Philadelphia works at Pueblo. For two or three years the results were disillusionary. They lost a lot of money. However, they learned the smelting business and in acquiring that knowledge laid the foundation of the great fortune that subsequently they earned, so the knowledge was cheap, even if it did cost some hundreds of thousands.

Conditions are different now, yet the field is just as open to the enterprising and intelligent mine owner as ever it was. However, it may be pointed out that the reason why private capital does not go into smelting in Colorado is that for many years the profit there has been too small to be attractive and the available ore supply has been too small to keep all the existing furnaces going. Will another works increase either?

beginning of that organization, and give the figures in an accompanying table. Also we have caused the lines of

Year	DELIVERIES OF COPPER	
	Domestic	Foreign
1909—I	144,312,706	128,659,336
1909—II	169,300,451	206,619,321
1909—III	187,240,245	173,479,455
1909—IV	202,736,991	171,074,403
1910—I	207,621,527	159,646,957
1910—II	180,654,369	142,723,782
1910—III	188,940,464	196,345,443
1910—IV	172,210,182	223,715,303
1911—I	158,678,344	157,400,885
1911—II	178,607,174	195,568,675
1911—III	174,229,530	195,560,329
1911—IV	198,096,557	206,372,344
1912—I	186,059,735	202,095,566
1912—II	208,362,352	184,187,921
1912—III	213,277,609	190,871,277
1912—IV	211,966,252	169,241,688
1913—I	201,471,993	210,251,674
1913—II	227,629,729	222,248,606
1913—III	199,390,890	224,828,815
1913—IV	138,769,148	211,733,689
1914—I	165,395,961	261,416,850

domestic and foreign deliveries to be plotted from them, which are given in an accompanying diagram.

These lines are both erratic and interesting. Certainly no lesson of regular trend can be deduced from them. However, there are two things which stand out clearly, we think. Our domestic consumption has lately been smaller than at any time during the last five years. European deliveries, which formerly used to be inferior to domestic consumption, have lately been far in excess thereof, and since the last quarter of 1912 have been rising rapidly, and with only one interruption. The great demand for copper, notwithstanding the commercial depression that Europe has suffered like America, although less severely, suggests that perhaps copper may be coming more broadly into use in Europe than ever before. In this connection the recent remarks of Mr. Rathenau, the head of the great electrical company of Europe, a summary of which was published in the JOURNAL, are illuminating. The diagram also suggests what interesting developments may happen when American industry once more wakes up.

### BY THE WAY

One of the latest booms in the London stock market to collapse is that in Nigerian tin shares, which was rampant two years ago. The collapse is partly due to the fall in the price of tin; but chiefly to the failure of most of the Nigerian companies to show any satisfactory results. The production of tin has been very small, while costs of mining and transportation are heavy.

It is interesting to note that the Minerals Separation American Syndicate, Ltd., on June 3, contracted with the Engels Copper Mining Co. for a license to use the Minerals Separation process in its new mill in Plumas County, California. The Engels company has just begun the erection of a 150-ton mill near Taylorsville, and as this license was contracted for subsequently to the San Francisco decision, the copper company evidently decided that the experience of Minerals Separation, Ltd., was valuable, regardless of the possible contingencies of patent litigation.

An interesting case of successful fraud is reported by the *Madrid Cientifico*, which derives its information from *El Economista*. It appears that a group of live Frenchmen succeeded in selling some Yankee capitalists a nonexistent gold property. Thus are the tables turned! The ingenious Gauls carried to Alaska a complete moving-picture outfit with scenery and all, and with this equipment they photographed the operations of their "mine" in so convincing a manner that they were able to sell their midnight-sun myth for real money. Seeing was believing; not even a Missouri origin would have helped the goats of this little deal.

The *Boston News Bureau* quotes a copper producer as follows:

Of all the useless statistics which are published, those of the Copper Producers' Association are entitled to the blue ribbon. In the first place, they act as a deterrent on purchases by the consumer for several days before they are made public. Then if a decrease in surplus is shown the consumer

charges that the figures are not on the level. If an increase is shown everybody seems to think that the accumulation would have been greater had not some copper been "stored" abroad, or in some manner held back.

The figures are, however, accurate and put out in good faith, but why the producers of copper should be unique in telling how much of their product they have on hand for sale is beyond comprehension.

The discontinuance of the monthly statement has often been discussed among the members of the association and the sooner some action is taken along this line the better it will be for all concerned. Then would probably come the charge that the producers were afraid to publish facts.

We have received a circular from a broker in New York, inviting subscriptions to the stock of the Inspiration Extension Copper Co. Among other things he says: "It is an extensive porphyry deposit, surrounded by producing mines and the shares of nearly all these companies are listed on the New York Stock Exchange. This property is now being developed and will also be in the producing class just as soon as the large custom smelter now being installed in the locality, is completed." The Inspiration "orebody runs through our property. There can be no question about the absolute safety of the investment and the assurance of realizing large returns from a small investment are positively self-evident."

This is a good example of the way that a prospect ought not to be promoted. The Inspiration Extension has not an extensive deposit of porphyry ore so far as anybody now knows. It may have, but if so it has got to be found and in the opinion of at least one prominent operator at Miami the chances are not good. Anyway it is certain that the property will not be in the producing class as soon as the large custom smelter is completed. The persons who are developing the Inspiration Extension appear to be sincere, but the broker who is offering the stock is quite reckless in his statements.

The JOURNAL has always advocated greater attention to safety provisions in mining. We have felt that the industry in this country was unduly hazardous and should be made safer. We must confess, however, that mining seems no worse in this respect than other fields of activity. We fancy a man would be quite as safe underground as traveling on the ocean, for instance. It is only about two years since the "Titanic" disaster shocked the entire world. The recent sinking of the "Empress of Britain" was about equally destructive of human life. Many other wrecks have occurred within a short period also, and now we have it on the authority of the *New York Evening Post* that a new hazard in ocean travel has developed. The latest Cunarder, the "Aquitania" is the guilty boat. According to the *Post*, this craft carries always a stenographer, an Irish girl, with curly brown hair. The worst of it is that this danger particularly besets mining men. Listen to the *Post*: "Most of the dictation comes from mining engineers. They seem never to forget their business and keep a stenographer well supplied with copy." And again, "Miss Hale, with her fresh color, curly brown hair and Irish gray eyes, is such a very pretty girl that the wonder is that every man aboard does not pretend that he is a mining engineer full of things that must be put on paper." Indeed, indeed! Falls of ground and dynamite, fever and thirst, the Western Federation and gray-eyed, brown-haired stenographers, a mining engineer's life is fraught with peril underground, overground and on the deep sea.

## PERSONALS

F. G. Lasier, of Detroit, Mich., is in the Porcupine district in Ontario.

C. W. Purington has left St. Petersburg for the Lena district, of Siberia.

F. H. Sистерman has returned from Costa Rica and has gone to El Paso, Texas.

Kirby Thomas, of New York, is examining iron properties in Virginia and Tennessee.

Carl A. Allen has left Denver to examine mining property near Golconda, Nevada.

Thomas M. Kekich, recently of the Spassky Copper Mine, Ltd., Siberia, is on his way to London.

Morton Webber has been examining mining property in Nevada, on behalf of New York interests.

Alfred James, who has been in New York for several weeks, sailed for home on the "Vaterland" this week.

Marion L. Thomas has returned to New York after two months spent in investigating phosphate deposits in Florida.

E. G. Spilsbury, who has been engaged on professional work in Belgium, returned to New York on the "Vaterland" last week.

Wilbur E. Saunders is now superintendent for the Alkali Mines Co., which is developing the old Windfall mine, at Eureka, Nevada.

H. V. Winchell returned from Europe on June 13. After stopping in New York he proceeded to Minnesota and later expects to go to Montana.

George E. Collins, of Denver, Colo., passed through New York last week on his way to England, whence he expects to return in two or three weeks.

N. Dickerman, general manager Pato Mines (Colombia), Ltd., has arrived in New York from London, and will be in San Francisco the last of the month.

Herbert Merryweather, general superintendent of mines of the Juragua Iron Co., Cuba, is now with the Bethlehem Chile Iron Mines Co., at La Higuera, Coquimbo, Chile.

Ralph Watson, assistant general superintendent of the Homestead works of the Carnegie Steel Co., has returned from India, where he spent considerable time at the Tata steel works.

Charles P. Perin, of New York, consulting engineer of the Tata Iron & Steel Co., Sakchi, India, left New York last week on a trip to that country. He will visit China and Japan before he returns.

W. D. B. Motter, Jr., recently manager of the Canada Iron Mines, Ltd., at Trenton, Ont., was appointed on May 1 manager of the Benson Mines Co., at Benson Mines, St. Lawrence County, New York.

V. F. Marsters, consulting geologist for the New York & Honduras Rosario Mining Co., was in New York recently, on a visit, and has gone to Nova Scotia. He will return to New York before leaving for Honduras.

F. E. Pierce has resigned his position as chief engineer of the New Jersey Zinc Co., after 15 years' service with the company, and has opened an office as consulting civil and metallurgical engineer, at 35 Nassau Street, New York.

A. L. Walker left New York on June 16 for a pleasure trip to Japan and China. Professor Walker expects to stop at Buffalo, Houghton, Great Falls, Anaconda and Butte to see the smelting plants there, and to sail for the Orient on July 6.

William B. Daly, for some time in charge of the efficiency work of the Anaconda Mining Co., has been appointed general superintendent of mines, to have direct charge of operations. John Gillie, for years acting under that title, is made general manager of mines, and B. H. Dunshee, assistant general manager.

Robert C. Sticht, general manager of the Mt. Lyell Mining & Ry. Co., in Tasmania, who is taking a trip around the world, has been visiting some of his former fields of activity in Montana. Mr. Sticht was the builder of the old lead smeltery at Great Falls, of the East Helena smeltery and of the pyritic smelting plant, at Boulder.

C. H. Fry has been appointed mining manager of the Yellow Aster Mining & Milling Co., at Randsburg, Calif., succeeding John Singleton, president and manager, who died on May 20. Mr. Fry has been for a number of years mine

foreman and assayer at the Yellow Aster, and is thoroughly acquainted with the mine, besides being a mining engineer of ability and experience. J. H. Farrell, of Los Angeles, is consulting engineer. Dr. Rose Burcham retains the position of secretary and treasurer, with office in Los Angeles.

## OBITUARY

John Martin Frederick died at Braddock, Penn., June 10, aged 73 years. He was born at Williamsport, Md., and as a boy entered the Cambria Iron Works at Johnstown. He went to Braddock in 1874 with the late Captain W. R. Jones, who built the first plant there for Andrew Carnegie. Later he was in charge of the finishing mills at Homestead and afterwards at Edgar Thomson, and some 10 years ago was made consulting mechanical engineer.

Sewall Truax died at Highland Park, Ill., June 1. He was a graduate of Columbia University School of Mines, 1903. In 1906 he became manager of the Granadefia Mining Co., at Santa Barbara, Chihuahua, Mexico. In 1911 he conducted extensive experiments at Cañon City, Colo., in evolving a commercial process for volatilizing zinc direct from slag and ores. For several years he has been a sufferer from rheumatism, and for the past two years had been unable to leave his bed. He leaves a wife and two children.

Jean E. Saucier, a well known mine promoter and broker, died in Montreal June 7, aged 52 years. Most of his life was spent in Western Canada. He was extensively interested in electrical development and coal mining in British Columbia, and was connected with numerous mining enterprises in Rossland. He returned to the East in 1900 and devoted much attention to the mining possibilities of Quebec province. Mr. Saucier was one of the pioneers of the Chibougamou mining district, where, in connection with the McMartin brothers, he invested a good deal of money in ventures that proved unprofitable, mainly owing to the lack of transportation facilities. Since 1905 he had carried on business in Montreal as a real-estate and mining broker. He leaves a widow, one son and five daughters.

Robert D. Grant died at Los Angeles, Calif., June 4, aged 50 years. He was born at Sunbury, Penn., and began work when 16 years old as a telegraph operator. After working on the Pennsylvania, the Santa Fé, and the Union Pacific, he finally went to Butte, Mont., and in 1889 took a position in the office of the Parrot Silver & Copper Co. In 1897 he was chosen general manager and later negotiated the sale of the company's property to the Amalgamated. He then moved to Salt Lake City and bought an interest in the Sioux Consolidated group in the Tintic district, which he held until 1905. In the same year he moved to Los Angeles and organized the American Mines & Exploration Co., in connection with Phillip Wiseman and Seeley Mudd. This company secured an option on the English holdings in the Ray Consolidated mines at Kelvin, Ariz., which were subsequently transferred to parties interested in the Utah Copper Co. Several years ago he sold out his holdings for a large sum and since that time he had undertaken no large enterprises. Mr. Grant was well known in Butte, Salt Lake, and California, and was much esteemed for his high character and integrity as well as for his engaging personal qualities. He leaves a widow, one son, and one daughter.

## SOCIETIES

**Utah Society of Engineers**—At a meeting, held in Salt Lake City, June 10, Dr. F. G. Cottrell, in charge of the western division of the United States Bureau of Mines, gave a lecture on his process of smoke control. This was illustrated by lantern slides and experiments. The meeting was well attended.

**Cleveland Engineering Society**—The 34th annual meeting and banquet was held at the University Club, Cleveland, June 9. The guest of honor and principal speaker of the evening was Charles Whiting Baker, editor-in-chief of "Engineering News," New York. Mr. Baker's topic was "Ethics for Engineers." Other speakers of the evening were William O. Henderer, of the Osborn Engineering Co., the toastmaster and retiring president; Rev. Dr. A. B. Meldrum, who spoke on "Some Things That Count," and Elliott H. Whitlock, the president-elect, whose topic was "The Engineer." The society has had a successful year and now has a membership of 741, a net gain of 171 since the last annual meeting.

## Editorial Correspondence

### SAN FRANCISCO—June 11

**Sale of Borax Properties** known as the "Borax" Smith properties, to London men is reported to have been confirmed by Mortimer Fleishhacker, of San Francisco. Negotiations have been in progress for six months, and Smith is now in London closing the deal. The purchasers are said to be a syndicate of bankers in London, presumably representing also other large shareholders in the Borax Consolidated Co. The purchase price was \$4,000,000, which will be sufficient to pay the debts of F. M. Smith secured by borax stock, and leave a considerable amount to be applied on other debts. The indications now are that negotiations for the disposal of the Smith railway interests will be satisfactorily consummated.

**Activity in the Crater of Mt. Lassen** in Northern California, has been the basis of reports that have occupied more or less space in the press since June 1. No one seems to know exactly what is taking place, and so far the only authentic sources of information have been the members of the Forest Service. The first sign of activity was a plume of steam rising above the top of the crater. Later it was discovered that mud, sand, and stones had been expelled, apparently by the force of an explosion caused by steam. No other signs of heat were observed. A few days after the first disturbance, reports of a dense, black smoke issuing from the crater were received. Some witnesses stated that they had seen flames, but the majority report to the contrary. No alarm has been caused by this outburst, and many men acquainted with the region around Mt. Lassen, believe that the action is more geyser-like than volcanic. The reported black smoke is more than likely, just fine ash that has been carried to a great height by the escaping steam. This district is famous for its boiling springs. Recently, earthquake shocks have been felt in Northern California and Nevada, but authorities on this subject do not connect these earth movements with the outbreak of Mt. Lassen. Mt. Lassen is considered to be the most recent point of volcanic activity in the United States. Dead trees are yet standing, partially buried in the lava flows of the past eruptions. So far the present activity is of slight moment, but it serves to attract attention to a district which is rich in natural resources and scenic wonders.

### BUTTE—June 13

**An Employers' Liability Law** has been initiated, and will be voted on at the fall election. It is of special importance and concern to mining corporations, and is likely to be adopted. It was defeated by the last legislature. A grave doubt has been raised as to the validity of the state's constitutional amendment relating to the initiative and referendum, and as several important measures are pending under that provision steps are to be taken to test the law in the Supreme court. The political opponents of the Anaconda company have raised the usual hue and cry that the "Amalgamated" is back of the movement to upset the constitutional amendments. C. F. Kelley, vice-president of the Anaconda company, says no officer or attorney of the company has taken the matter up, and that the company has no interest in it directly or indirectly, or it would have taken action long ago. A measure that seems to be aimed directly at the Anaconda company is urged by some politicians and provides for a "license tax" or fee on all products to the amount of  $\frac{1}{4}\%$ . Petitions are being circulated in a movement to initiate such a law. Its provisions also apply to telegraph, telephone and other corporations.

**Revolt in Miners Union** was participated in by several thousand miners who rebelled June 12 against the assessments levied on them monthly by the Butte Miners Union and Western Federation of Miners for outside strike benefits. Under the local union rules a committee of officers visits each mine once every month to inspect working cards and unless the cards show that the dues and assessments have been paid the men may not go to work. The monthly inspection started at the Speculator mine of the North Butte company and after 50 men had exhibited their cards the others rebelled and refused to show theirs. The men appealed to General Manager Pope but he told them that the company had made a contract with the union and must respect it, and unless the men showed their cards and were

in good standing they could not go to work; 900 men therefore walked away from the mine as the different shifts came on, and the mine had to close down. The same thing was experienced at the Butte & Superior, and the men walked out. Scattering forces at other mines joined the rebels, who were led by several I. W. W. agitators. A mass meeting was held at night and a new union, known as the Independent Industrial Miners Union was organized to oppose the Western Federation and the local union. A committee was appointed to interview mine managers and demand permission to work without a union card. The feeling against union officials was so strong that the sheriff had to protect President Bert Riley and others, who were threatened by a mob. Many miners have been working short shifts and the monthly assessments, running from \$5.50 to \$11, have been more than most of them could pay and they have been charging local and federation officials with a misappropriation of the funds. Miners have never been able to get a statement showing where all the money has gone, and at the mass meeting they charged that officers who have the handling of the funds have built homes and purchased ranches in California. They charged that six years ago the miners union in Butte had but two salaried officers and now has 15; that then it had \$210,000 in the treasury and now has nothing. The mine companies notified the strikers that they could not recognize them or an independent union.

### SALT LAKE CITY—June 11

**Requirements for Patenting Mining Claims** are being more liberally interpreted by the Department of the Interior, it seems, according to a decision in the case of the Great Western Gold & Copper Mining Co., received at the local land office June 8. This decision reverses that of a former commissioner of the land offices, which was adverse to the granting of patent on claims owned by this company, southwest of Park City. Patent was refused on the ground that no discovery of ore in place had been made. Later evidence proved that there was some mineral showing, and that the claims lie between the Daly-Judge on the east and the Mountain Lake on the west, both producers of commercial ore; and that the claims are mineral land and entitled to patent. This has been ordered granted on six claims. The decision follows closely on that of the East Tintic case.

### HOUGHTON—June 15

**Assessment Called on Winona Stock** is not surprising. It is illustrative of the difficulties encountered and the money required to open a copper mine in the Lake Superior district. This last assessment on Winona concludes the possibilities of raising funds in that way. When this assessment is paid the present corporation will have expended approximately \$5,000,000 in development and opening the properties owned by the company. Under the Michigan law the capitalization is limited, and the shareholders of Winona have contributed a total of \$25 per share in the hope of making this mine a success. The market value of the stock is \$2 per share. And Winona is by no means a success now. The management and the shareholders hope for success. They are turned that way, but there is no assurance. In fact, a good many of the shareholders likely will not meet this last call, and the present market value of their stock will influence not a few in a decision against paying. The true situation at the Winona is that the chances for making both ends meet and putting the mine on its feet never were better. Just at the time the strike was called, a year ago, Manager Seeber had completed a long campaign which seemed to indicate a fair degree of prosperity for the Winona. Then the suspension of operations became complete and the Winona made no attempt to resume operations until the situation entirely cleared up, for property is so far from town that the labor difficulty is always worse there than anywhere else. Now for two months the Winona has been working with a force larger than ever before in the history of the mine. The recovery in the mill is showing a little better results than ordinarily, so that conditions generally look good, and if the price of copper can be maintained at a figure which will give this property a chance to market its first substantial output at a respectable figure Winona ought to show a profit on the right side of the ledger from now on. Production in June will break all previous monthly

records, but the true test cannot be expected until July. Winona has a hard-luck story that shows the difficulties of making paying copper mines. Originally the property was opened at the close of the civil war. First work was based on surface showings and a crude shaft was sunk. The lode looked good, but the mine was so far from a railway that the limited capital of the operators was soon exhausted and work stopped. The present company started in 1898 and has worked intermittently since. Absorption of the King Philip, an adjoining property, took place 2½ years ago. There are seven shafts on the two properties. The surface equipment is good and the management efficient.

#### MARQUETTE—June 12

**Ore Shipments Have Increased** somewhat the last few weeks. The movement is, however, still well under the outgo of a year ago, and there is seen no prospect that the tonnage sent out in any month will reach the mark attained in the corresponding period of 1913. There have been further curtailments at the mines. The Cleveland Cliffs Iron Co. has discontinued night-shift operations at its Negaunee property, Marquette range. The suspension is for an indefinite time; 150 names have been stricken from the payroll. The Negaunee has a large stockpile, and shipments to date have been inconsequential. The same company's Stephenson mine, in the Gwinn district, also is now being wrought only on the day shift. Most of the men affected in this instance have, however, been transferred to nonproducing properties in course of development in the field. More than 500,000 tons of ore is in stock at the Stephenson. Room for further storage is scarce. On the Gogebic range, Oglebay, Norton & Co. have curtailed production at their Montreal (Wisconsin) mine one-half; 80 single men have been laid off, and work is proceeding only in the daytime. Much ore is in stock. Production at the Steel Corporation's Soudan mine at Tower, Vermilion range, has been suspended temporarily, the advantage the slack season affords having been taken as an opportunity to build a steel crusher house. This construction will require two months. Most of the 140 men are retained. The Pewabic Mining Co.'s property at Iron Mountain, Menominee range, is again operating on full time, with a force of 400 men employed. Operations had been scaled down for a time. The Pewabic is shipping at the rate of 15,000 tons per week. The movement of ore from the Iron Mountain district is, however, far below the normal. M. A. Hanna & Co., of Cleveland, are preparing to abandon the Barrows mine, Cuyuna range. The owner of the fee, the Brainerd Mining Co., has been notified that the lease will be canceled the last of June. The reason for this action is not stated. It is believed, however, the slack demand for ore has been an influence. Mining operations have been curtailed. One shift of men has been discharged. The stockpile accumulated during the winter months is being shipped. The future of the Barrows is uncertain. It is the hope that the fee owner will be able to lease to some other corporation; otherwise, it is probable the mine will be closed and permitted to fill with water. In the same field of the range, the Barrows-Mississippi Iron Co. is preparing to explore an extensive tract. This is a close corporation, controlled by Superior, Wis., men. It owns 400 acres adjoining the Barrows townsite. Diamond drills will be employed.

#### JOPLIN—June 13

**Flotation Treatment of Joplin Ores** will be investigated by the Bureau of Mines in conjunction with the Missouri Geological Survey. The work will be done this summer and fall and will be especially directed to the treatment of fines where the great proportion of the milling losses are now known to exist. C. A. Wright of the Bureau of Mines corps is beginning this work and the Missouri Survey has had men in the district all the year. While it is believed by local operators that the oil process will be entirely inapplicable to the greater part of the ore, it might prove of value in the treatment of sludge. If it can advantageously be used the milling processes of the district would be greatly benefited. At present while the district does the cheapest milling in any large mining field, its proportion of saving is relatively low. It is believed that present milling practice approximates close to 60% recovery. An additional saving of 15 to 25% would help the field greatly if the cost of such additional recovery were not prohibitive. So far it has been recognized that it is possible to improve the recovery but the additional cost has been more than the additional recovery warranted.

**Prospecting During Periods of Low Prices** for zinc ore as well as any other activity is prone to stifle, so it is a surprise to everyone that so much prospecting work continues in the field with the price of zinc ore down to \$40. Even capital

continues to come into the district and acquires new properties, and surprising as it may seem, this year of all years, has shown the largest single sale of any mining property the district has known. Following the Oronogo Circle sale of a few weeks ago, the Laminite Mining Co. this last week took over the H. L. & S. mine at Lawton, Kan., one of the richest and heaviest new producers in the entire mining district. While the price was not mentioned it is known to have been large. This is the first sale of a mine in the Lawton camp, the developments there having been carried on by the original holders of leases. This sale marks the attention that is being directed to this newly developed camp. It is here that the Eastern Lead & Zinc Co. of which J. B. Jameson, of Concord, N. H., is the eastern representative and Walter Ragland, former state mine inspector the resident manager, has been quietly developing what is now recognized as one of the largest zinc producing properties in the field. Beginning with a comprehensive drilling campaign followed by well directed development a new camp has come to the front as the result of their efforts. This camp is now redeeming the Kansas end of the district from its previous steadily decreasing activity. Four milling properties are now established and the output this year has been excellent even in the face of the low price of ore. At the end of the year this camp will show an increase in output while most of the older established camps will show a marked decrease. So pronounced has been the success of this camp dominated by the Eastern company that it is attracting others to the vicinity and is stimulating drilling activity. It is reported that several tracts will be prospected in this manner this summer and fall.

#### EUREKA, NEV.—June 11

**Eureka** is not in any way the picture of the earlier-day camp, for it is a desolate and woe-begone town, and in its very air it speaks not of the present but tells a tale of the long past. It is no pleasure to see it now. A little jerkwater railroad connects the town with Palisade on the Southern Pacific, but with freight at \$20 per ton over the 84 miles of that road there is little help to the town or the surrounding mines through that connection. The U. S. Smelting, Refining & Mining Co. now owns the old Eureka Consolidated and the Richmond mines, but is doing nothing with them because of rates. There is practically no development, other than this being done in the section, save work by lessees.

#### SILVER CITY—June 12

**Damage by Storm and Cloudburst** on the evening of June 11, was suffered in the residence and business sections of Hillsboro, Sierra County. A torrent ran through the main streets tearing down the bank, post office and other business houses. The loss has not as yet been estimated but it will doubtlessly total several hundred thousand dollars. Warning was given the inhabitants and they escaped to the surrounding hills and no lives were lost. Hillsboro was in its prime in the '80s when its production of silver was over \$2,000,000. The mines have been worked spasmodically ever since.

#### COBALT—June 12

**Fight Over Disposal of Chambers-Ferland Property** is still unsettled, but will be taken up again at the next meeting of the directors which is to be held in England, July 1. The fight is with reference to the proposed bylaw for the transfer of the entire stock and assets of the Chambers-Ferland Mining Co. for 150,000 £1 shares in the Aladdin Mining Co. The Aladdin Mining Co. already holds a majority interest in the Chambers-Ferland and the directors are desirous of obtaining control of the whole property. The minority shareholders claim that the only assets of the Aladdin company is a lease on the Silver Queen mine and a small amount of cash in the treasury. The Silver Queen is a practically worked out property and the possibilities of obtaining further ore-bodies of much commercial value are considered doubtful in the extreme. On the other hand, the Chambers-Ferland has liquid assets of \$150,000, 124 acres of mining property ground rents totaling \$6000 per year. The mine has been worked for several years and while it has never paid a dividend, is supposed to be making some money. On account of its location immediately adjoining the Nipissing and the La Rose, possibilities for the discovery of new ore-bodies in undeveloped territory are considered promising and in addition, there is a considerable tonnage of medium-grade ore available for stoping. The minority shareholders claim that the Aladdin company wishes to transfer assets of a working property of considerable promise for stock in a worked out mine, and they intend to take advantage of the new amendment to the Ontario companies act passed at the last session of the legislature which covers such cases. H. H. Cecil, one of the directors is applying for an injunction to restrain the passing of the bylaw for the sale of the property.

# The Mining News

## ALASKA

**GOVERNMENT RAILROAD SURVEYING PARTIES** are now all in route or have arrived in Alaska. Eleven locating parties have been organized and started north so preliminary work may be completed before snow falls. S.S. "Northwestern" sailed June 7 with eleventh and last locating party, consisting of 86 men, locating engineers, draftsmen, bridge experts, assistant engineers, helpers, pack masters, estimators, clerks and office employees, headed by W. C. Edes, chairman of commission, and Lieut. F. A. Mears. The first locating party and shipments of supplies and equipment in charge of a headquarters' foreman, sent north from Seattle May 27, arrived at Valdez June 5. A party consisting of 22 men, a corps of packers and horses and supplies went north May 30. Locating engineers, headed by Thomas Riggs, Jr., of the commission, also went north June 3 and a party of surveyors left Seattle June 6 for Sheep Creek.

**CIRCLE CITY MINING & DREDGING CO.** (Circle City)—Dredge on Mastodon Creek, in Circle district, was recently purchased at marshal's sale by L. R. Peoples, of Fairbanks.

**NEWSBOY** (Fairbanks)—Faulted portion of vein on 315-ft. level has been found after considerable crosscutting. Considerable ore is reported in sight so that manager for lessees will put a night shift on at mill.

**PATTERSON** (Fairbanks)—These lessees on Wickersham ground on Eva Creek, were forced to discontinue operations for a short time on account of bad air. A hole was drilled by a Keystone drill to connect with drift; there has since been no more trouble from poor ventilation.

**NO. 5 ABOVE, GILMORE CREEK** (Fairbanks)—Winter's prospecting on this claim is said to have disclosed a paystreak 400 ft. wide, running 90c. per sq. ft. Depth to bedrock is 14 to 18 ft., with 9 ft. of muck. Gold begins at top of gravel and continues to bedrock. Ground will be worked by scraping.

**COSGROVE & STRAUSS** (Fairbanks)—Happy Creek, heretofore regarded as too insignificant a tributary of Goldstream to offer inducements to prospector, may contain a workable paystreak. A cleanup of \$2500 has been made by Cosgrove & Strauss after running through part of winter dumps. Operations so far have been on a small scale, but it is probable that more extensive work will be commenced soon.

**HARD LUCK ASSOCIATION** (Fairbanks)—J. Prest, lessee on upper Vault Creek, made a \$16,000 cleanup after sluicing one-third of dump taken out during winter. Since only three or four men were employed and dump was therefore a small one, result of first cleanup shows ground to be rich. A large part of the gold is in nuggets, many of them weighing several ounces. These contain much quartz and show that gold has not traveled far. Consequently, as soon as frost is out of ground, it is to be expected that quartz prospectors will commence searching for vein from which it came.

**NO. 3 BELOW, DOME CREEK** (Fairbanks)—Discovery of what is assumed to be a second paystreak on claims Nos. 3 and 4 Below is reported by Furland & Co., who took out a winter dump estimated to contain \$10,000. These claims were worked by Friend & Lawson six or seven years ago, and were supposed to be practically worthless. One year ago they were sold to Streeten Dockham and D. McRae for a sum that was reported by those informed of terms of sale as being excessive. In fact, Dockham was shortly after sent to Mount Tabor, Ore., as being of unsound mind. First cleanup will yield enough to return amount of first payment. Since ground has turned out well, Dockham has been released from asylum as cured, but just what connection there is between two occurrences is uncertain.

## ARIZONA

### Cochise County

**TOMBSTONE CONSOLIDATED** (Tombstone)—It is reported that when these properties, formerly controlled by Development Co. of America, are put up at foreclosure sale June 23, Phelps-Dodge interests may acquire them.

## CALIFORNIA

### Amador County

**ZEILA** (Jackson)—Stockholders and officials of company visited mine recently. They apparently had no other purpose than to see that surface improvements were properly dismantled and to convince themselves that after 35 years of steady operation they had really closed down a producing mine for lack of enterprise.

### Butte County

**DEVELOPMENT WORK IN FORBESTOWN DISTRICT** has been resumed in several mines with improvement in weather. Carlisle is preparing for extensive development. A contract has been let for driving another 500-ft. on William Biek mine.

**MONTEZUMA** (Enterprise)—A 14-in. vein of high-grade ore is reported as opened. This is a new property and is in vicinity of Forbestown.

### Calaveras County

**SOUTH CAROLINA** (Melones)—Mine will be reopened and a cyanide plant built.

**STANDARD** (Esmeralda)—It is reported that active operations were begun early in June, and that power line and telephone line had been completed.

**NUNER TUNNEL** (Mokelumne Hill)—Mill was started last week in May. Gravel prospects well and indications are that a profitable summer run will be made.

**LIGHTNER** (Angels Camp)—Mine has closed down temporarily. It is stated that shaft will be deepened and lower ground thoroughly explored before undertaking production again.

**REINER** (Angels Camp)—It is reported that forced sale of mine property made possible settlement of all debts contracted under former management. It is believed that mine will resume operation.

**ROYAL** (Copperopolis)—Property has been sold to English stockholders at forced sale. It is stated that amount claimed to have been invested by these stockholders was nearly \$600,000. Property is equipped with 120 stamps. Shaft is 600-ft. deep and drifts total 500 ft. in length. Ore is low-grade. Mine has been idle for several years.

## Humboldt County

**HORSE MOUNTAIN** (Eureka)—An examination has recently been made by O. F. Hershey.

## Inyo County

**WILSHIRE BISHOP CREEK** (Bishop)—It is expected that mine will be unwatered for examination by Harry Johnson, consulting engineer, of Los Angeles. Cyanide plant has been built by Colorado Iron Works, of Denver, and ordered shipped. Road is clear of snow between Bishop and mine.

## Kern County

**SUMNER** (Kernville)—Shaft has been cleared to drainage tunnel. Below that point a compressed air lift will drain lower workings.

**KEYES** (Kernville)—Mine is producing \$100 ore. This is one of the oldest producing quartz mines in southern California, and has been in operation for 50 years.

## Mariposa County

**MOUNTAIN KING** (El Portal)—It is reported that good ore has been disclosed. Construction of a large flume and erection of a power plant are contemplated.

## Nevada County

**EMPIRE** (Grass Valley)—Addition of 20 stamps is being made to 40-stamp mill.

**YOU BET HYDRAULIC CO.** (Grass Valley)—Hydraulic operations have been resumed on Jerry Goodwin gravel deposits; 80 men are employed. Tailings are held in a retaining pond built of concrete. Installation of a gravel mill for treatment of cemented material is contemplated.

## Plumas County

**WALKER MINING CO.** (Salt Lake)—Company was recently organized and capitalized at \$1,250,000 for development of Walker Copper mine, in Grizzly Valley. J. R. Walker, G. L. Bemis and J. F. Collan, of Salt Lake, are incorporators.

## Siskiyou County

**TRAIL CREEK MINING CO.** (Etna Mills)—Sufficient ore has been developed to warrant putting stamp mill in commission.

**BLACK BEAR** (Etna Mills)—Shaft is being unwatered. Extraction of ore will follow. Mine is equipped with a 10-stamp mill and cyanide plant.

**QUARTZ HILL** (Scott Bar)—This mine, which has produced annually an average of \$10,000 by hydraulicking, recently yielded \$7000 within one week. Gold is found in decomposed quartz in a large hill.

**ST. ALBANS** (Yreka)—Building of a concentrator, to cost \$25,000, is contemplated. Ore carries copper and gold and will require smelting. Concentration will reduce shipping costs. Mine would not pay at present for installation of a furnace.

## Tuolumne County

**SUGARMAN** (Sonora)—This mine, on Bald Mountain, reopened recently, is reported to be producing free gold in paying amounts.

**RAWHIDE** (Jamestown)—North shaft has been unwatered and mine is being sampled under direction of Thomas Russell for men who have a purchase option.

**TUOLUMNE DEEP CHANNEL MINING CO.** (Confidence)—Boring machines are employed in prospecting for channel on ridge near Mono road. First hole is down 130 ft. It is expected to go to 280 ft. to reach water. Holes will be drilled 50 ft. apart across channel.

**DUTCH** (Jamestown)—Shaft is cleared of water down to 1800-ft. level, which is bottom of mine. This is first time for 10 years that bottom levels have been entirely clear of water. During period of operation of Dutch while App mine was also in operation, water from the Dutch drained into App. Since closing of App, Dutch has had its pumping costs increased.

## Trinity County

**BONANZA KING** (Trinity Center)—No. 4 tunnel is being advanced from 700-ft. point. This tunnel will also be used for transportation of ore after vein has been cut.

**TRINITY CONSOLIDATED HYDRAULIC CO.** (Douglas City)—Company is working Union Hill hydraulic mine and prospecting ground covered by pipe line, which can be worked with present water plant.

## COLORADO

## Clear Creek County

LOMBARD (Idaho Springs)—Two-year lease to part of No. 3 tunnel has been granted to O'Shea & Co. Mill is ready to start. No. 4 tunnel is in more than 3000 ft. and is being driven to tap main vein at depth of 400 ft. Upper levels produced milling and smelting grades of ore.

## Gilpin County

LONDON (Apex)—Mine on Twelve Mile Creek is unwatered and mill has started.

## Gunnison County

BLISTERED HORN (Pitkin)—A shoot of silver-bearing galena has been opened at 2000 ft. from surface on dip of vein. Claim is between Pitkin and Tin Cup.

## Lake County

HELEN GOULD (Leadville)—This group, in Tennessee Park, near Tennessee Pass, on Denver & Rio Grande Ry., is being developed. Adit exposes good zinc-carbonate ore. Same men are also equipping and operating Jenny June group, a near-by property.

## Routt County

ROYAL FLUSH (Hahn's Peak)—Small hoist, air compressor and boiler are being installed. Mill is under construction. Low-grade gold ore has been developed.

## San Juan County

GOLDEN HORN (Silverton)—Lessees have begun systematic development and intend to remodel and operate mill soon as ore supply is assured.

## San Miguel County

BALLARD (Telluride)—With new tramway cable and new mortar-blocks in mill, S. W. Lacey has resumed operations.

## Summit County

WELLINGTON (Breckenridge)—New tube mill has been installed in dry or magnetic mill to regrind middlings from wet mill.

TONOPAH PLACERS (Breckenridge)—Both dredges in French Gulch are operating. Boat in Blue River is being prepared to start up soon.

PEMROSE-BOSTWICK PLACERS (Breckenridge)—Massachusetts owners will again operate these properties near Hoosier Pass, during summer months.

## IDAHO

## Coeur d'Alene District

TUSCUMBIA—An option has been taken by this company to purchase Toughnut lode, in Beaver mining district, near Wallace, from Essex Lead & Silver Mining Co. for \$75,000. Option follows forfeiture of option given to Idora Hill Co. for purchase of Tuscumbia for \$220,000, and at least partially confirms persistent reports that Tuscumbia company proposes to start active operations on its holdings. Payments extend from May 18, 1916, to Nov. 18, 1918.

WASHINGTON WATER POWER CO. (Spokane)—This company has closed contracts with several mining companies in Idaho for additional power. Western Silver Lead Mining Co., which operated Oddfellows group near Gardner, has contracted to put in a 50-hp. motor and air compressor. Snowshoe Mining Co., in Mullan district, situated east of Snowstorm, is installing a 75-hp. motor and air compressor. Ray Jefferson Mining Co., on Beaver Creek, in Nine-Mile district, contracted to put in a 75-hp. motor and air compressor. Treasury Vault Mining Co., west of Rex mining property, in Nine-Mile Cañon, contracted for power and will put in a 75-hp. motor and air compressor. All equipment is to be installed within 30 days.

AMAZON-MANHATTAN (Wallace)—Final payment of \$80,000 on his option on this property, on Beaver Creek, has been made by John H. Wourms, presumably representing Consolidated Interstate-Callahan Mining Co., which now has acquired full title to property. Bond and option on group was taken by Wourms in December, 1912, for \$160,000, 10% of which was paid at time, 40% Dec. 3, 1913, and remaining 50% June 3. Under option purchasers were required to do certain development work. This has been done through No. 3 tunnel of Manhattan claim, which has been driven 1400 ft., opening a fine oreshoot over 300 ft. in length. This shoot previously had been opened in No. 1 tunnel, where it proved to be 40 ft. wide, and on No. 2 level, where it was 160 ft. wide. Opening ore on No. 3 level has added to value of property, which at time option was taken was reported by some engineers to have \$250,000 worth of ore in sight. Two veins traverse property. Amazon vein to north is larger than Manhattan vein to south. Explorations indicate that veins converge, but those familiar with general characteristics of formation contend that veins eventually will prove to be parallel.

NATIONAL (Mullan)—Adoption of a new method of mining will necessitate closing mill for several months that enough ore may be broken down in stopes to keep mining operations a level or two in advance of treatment demands. By July 1 plant will have been given a thorough tryout, then milling will be suspended and attention devoted entirely to underground development. Mine will be worked by breaking down all ore in stopes before any is removed, broken ore serving in place of stagings now used, thus obviating timbering and effecting a saving of labor. To do this, however, it is necessary to have one or two stopes ready for extraction in advance of mill demand; consequently concentrator will be shut down until enough ore is in storage in mine for several months' treatment. Recently mill was given a complete test, more than 400 tons of ore being put through. Results were satisfactory, demonstrating that normal daily capacity of 500 tons could readily be treated, and it is believed that capacity may be crowded to 600 tons. Mill has been running on ore from dump, which will be exhausted soon, and it is estimated that it may be from three to five months before operations will be resumed. As many men as possible will be worked under ground during shutdown.

## MICHIGAN

## Copper

CENTENNIAL (Calumet)—Operations at present are confined to one shaft, No. 2, down 3700 ft. All commercial rock has come from north side. South side has been of no material value. Production from shaft is necessarily limited. Rock tonnage last month was 11,000.

OSCEOLA CONSOLIDATED (Osceola)—No. 3 shaft at old mine is to be reopened and it is likely that attention will be given to foot wall formation. This shaft has been idle for years except that it was used as a pumping shaft. Old rock house is being dismantled and engine house is being remodeled. New equipment will probably be taken from one of the Calumet & Hecla Kearsarge shafts.

CALUMET & HECLA MINING CO. (Calumet)—Work is being hastened on first portion of No. 2 regrinding mill and it is expected that four tubes with their complement of tables, etc., will go into commission July 1 taking care of a portion of tailings from Hecla mill. Hydraulic dredge that will handle sand from tailing piles is being completed, and pumps are being assembled that will handle sands from classifying house to mills.

TAMARACK (Calumet)—This company has 400 men employed and is operating two shafts. Alterations have been completed at the two-head stamp mill owned by company and this mill has gone into commission stamping Alouez rock. Plans are being worked out for construction of a regrinding plant for working over tailing sands. System of regrinding will in all probability be patterned after method used by Calumet & Hecla company.

## Iron

TAYLOR (L'Anse)—No graphite will be mined from this property this summer, as there are still 1000 tons in stock at property. Considerable was shipped in 1913. Graphite mined here is used principally in paint by Detroit Graphite Co., owners of mine.

NEGAUNEE (Negaunee)—About 180 men were laid off a few days ago and only one shift is now employed. Most of the men let out were unmarried and they will be taken back if ore market shows signs of improving. There are several thousand tons of ore in stock at present.

QUEEN (Negaunee)—Prince of Wales mine of Queen group of mines is first of Oliver Iron Mining Co.'s mines on Marquette range to receive orders to curtail; 100 men were laid off last week and property will now be worked with but one shift. Stocking room is filled and it would be necessary to close down entirely next winter if mine worked to capacity all summer. Only two cargoes have been shipped from mines thus far this season. It is expected that Oliver mines at Ishpeming will have to curtail before long as little ore is moving.

## MINNESOTA

## Duluth

IRON ORE SHIPMENTS TO JUNE 1 from ore docks of Duluth, Superior, Ashland and Two Harbors, grouped at western end of Lake Superior, show that 1914 shipments are 50% of last year's shipments. Following are figures for season to June 1 in each year:

	Season to June 1, 1914	Season to June 1, 1913
Duluth, Missabe & Northern (Duluth)	734,090	2,100,220
Duluth & Iron Range (Two Harbors)	692,496	1,532,939
Great Northern (Superior)	1,672,155	2,243,016
Northwestern (Ashland)	275,617	604,360
Soo (Ashland)	66,149	130,581
Soo (Superior)	46,195	57,255
Northern Pacific (Superior)	17,367	Not operating
	3,514,069	6,668,371

## Cuyuna Range

WILCOX (Brainerd)—McCullough & Cheney have been granted contract for constructing 1¼-mile spur from main line of Northern Pacific Ry. to mine.

## Mesabi Range

SUIT OVER STATE IRON ORE LANDS is being prepared for trial, in case of State of Minnesota vs. Eliza and Annie L. Korrer, Euclid Iron Co. et al. First named defendants are fee owners of iron-ore land at western end of Longyear Lake, near Chisholm, Minn., on Mesabi range. Mine is an open pit, and stripping has been dumped into lake, so that present shore extends for a considerable distance beyond the old natural shore. It was found that former lake bed, now covered by dumped overburden, contained much additional iron ore, and mining was started. State interfered, claiming ownership of all mineral under navigable lakes, to exclusion of all owners of riparian rights. State contends that there has been no natural recession of water; hence shore line has not been advanced and riparian owners have no claim. Minnesota legislature in 1909 passed legislation to effect that all mineral under beds of meandered lakes was state property. It was then estimated that there were 40,000,000 tons of such material in Minnesota. Samuel G. Iverson, state auditor, now estimates this tonnage at 400,000,000, which at prevailing state royalty rate of 25c. means an ultimate income of \$100,000,000 to state. State Attorney-General Lyndon A. Smith and assistants have spent several weeks preparing their brief, and case comes before state supreme court June 30.

LINCOLN (Virginia)—Old wooden headframe has been replaced by a modern steel one purchased from Ward & Allen Co., Chicago. New frame now in use.

HANNA (Mountain Iron)—Shipments have started from this property. Mine is state owned, and ore will therefore be weighed wet as it comes from pit, instead of being weighed after going through drying plant, as royalties on state leases are based on natural iron content. Two state employees will do weighing.



## MISSOURI-KANSAS-OKLAHOMA

## Joplin District

**GIBSON, ELLIS & LEGGETT** (Lawton, Kan.)—Prospecting is in progress by this company on 40-acre lease of virgin territory.

**CRIPPS & O'HARE** (Joplin, Mo.)—Deeper mining has encountered a 10-ft. face of lead ore. Water is causing trouble. Mine is on Connor land.

**VICTOR** (Carterville, Mo.)—Old concentrator, for a time used as an acid plant, has been purchased by Tabor & Maitland, of Joplin, and will be removed.

**J. B. JAMESON & CO.** (Kansas City, Mo.)—Company is erecting a 150-ton concentrator at Melville, Taney County, Mo. Several good prospects are reported.

**CONQUEROR** (Joplin, Mo.)—This mine has been leased by E. A. Blosser, of Harrisburg, Penn., who will drain tract and reopen old drifts. Pelican mine, on same land, is producing well.

**OLD SOPHIA** (Belville, Mo.)—Good strike of zinc ore has been made. Operations are being carried on at 102-ft. level, after hard fight with water. There is a concentrator on tract.

**RICH-IN-ORE** (Thoms Station)—Concentrator is to be removed to Connor tract, near Joplin, to handle ore from Seals mine. Operations in mine are to be carried on at 152-ft. level.

**DERMERETH LEASE** (Cave Springs, Mo.)—Abandoned mine has been taken by Ellis, Hinebaugh & Robeson Bros. Adequate machinery has been installed for thorough development of mine.

**CORNFIELD** (Hattenville, Okla.)—Shaft has reached 110-ft. level and is in good ore, drill records showing face extending to depth of 126 ft. Operators are considering erection of concentrator.

**KENTUCKY LEAD & ZINC CO.** (Joplin, Mo.)—Concentrator is expected to be completed on Putman lease of St. Louis-Joplin land by middle of July. Several good drill holes on tract and company will construct inclines to concentrator.

**TIPTON TRACT** (Joplin, Mo.)—There are four new shafts in calamine ore. Webb & Co. have ore at 53 ft., Smith & Donaldson at 45 ft., Davis & Co. at 20 ft., and Gilmore & Tipton at 40 ft. Blende and lead ore were found by Blurton & Co. at a shallow depth.

**WEYLAND** (Neck City, Mo.)—G. L. Cole is now working old property. Drill holes sunk near shaft are said to have shown 25-ft. face of zinc ore. Operations from shaft will be carried on toward drill strike. Mine, long abandoned, produced more than \$300,000 worth of blende.

## MONTANA

## Cascade County

**MONTANA POWER CO.'S PLANT** at Great Falls, which will cost \$4,000,000 when completed, is half finished. Superintendent Scott states that operation of a portion of the plant should be started by January, 1915, and that the entire project should be completed early the following spring. It is stated that the plant will easily be finished in time to supply power for the first sections of the Milwaukee Ry. to be electrified. About 40% of the dam has been completed, the tail race has been constructed, and the foundations for the power house have been completed to above water level, and will be ready for steelwork by the middle of June. Of a total of 200,000 cu.yd. of concrete to be used in the dam, 50,000 yd. were in place May 20, and the remainder is being poured at the rate of 1300 or 1400 cu.yd. daily. The plant is being constructed in six units, each having a capacity of 15,000 hp., although it is expected that in actual operation they will work at above their rated capacity as is the case at the Rainbow Falls plant of the same company, situated six miles upstream, where much of the time 40,000 hp. is delivered from the six units rated at 6000 hp. each. The greater part of the power used by the electrification of the Rocky Mountain and Bitter Root Mountain divisions of the Milwaukee Ry., comprising 430 miles from Harlowtown, Mont., to Avery, Idaho, will be supplied from this plant. The railroad company has contracted for 25,000 hp. before Jan. 1, 1918, and has an option on 40,000 hp. additional. Power to be used on a portion of the western end of the electrified section will be furnished by the plant now in course of construction at Thompson Falls, Mont.

**ANACONDA COPPER MINING CO.** (Great Falls)—If present plans are carried out, last three units of concentrator at reduction works at Great Falls, will be closed down by July 1 and all company's low-grade ores will be milled thereafter at concentrator of Washoe Works at Anaconda. First three units were shut down Feb. 1. Closing of plant will save company a large freight expense. Whatever new equipment is required to handle concentrating ore, will be installed at Anaconda which is 144 miles nearer Butte than Great Falls. Smelting and refining department at Great Falls works is being renovated and will be made larger and better than ever.

## Silver Bow County

**BUTTE & LONDON COPPER MINING CO.** (Butte)—When this mine was closed, five years ago, a \$15,000 pump was left at the 800-ft. level, it being thought at that time that pump could be sold only as second-hand machinery and would not bring more than cost of getting it to surface. When unwatering of mine recently reached that level, pump was found in perfect condition, having been greased, painted and packed for a long immersion in water. Pump will be used again but will be rebuilt for electric instead of steam drive.

**BUTTE & ZENITH CITY MINING CO.** (Butte)—Since successful unwatering of these mines which are six miles southwest of Butte, development work has been progressing rapidly. From 460-ft. level of shaft, crosscutting was begun to north of shaft without, however, encountering any ore. Attention was thereafter turned to south with result that various stringers of ore were opened, carrying as high as 5%

copper and 19 oz. silver. Main vein has not yet been cut but it is expected that by middle of June Jersey and American veins will be intersected 150 and 200 ft. respectively from shaft station. Shaft is to be sunk to 1000-ft. level, expense for this development work being borne by stockholders who are mostly Duluth men.

**BUTTE & BACORN** (Butte)—Motion of Frank W. Whitman to intervene in case of F. W. Bacorn against Butte & Bacorn company and also to set aside the default of defendant, was argued June 8 in Judge Lynch's court. Whitman claims having been injured as a stockholder by lease given to Bacorn at a special meeting of stockholders. That lease was obtained by fraud and also that same applied to default of company in action brought by Bacorn. Chief testimony in recent court proceedings was given by H. C. Bacorn to effect that company owns 23 patented claims. Should motion to intervene be allowed and default be set aside, case will go to trial on merits of controversy as to legality of proceedings by which F. W. Bacorn acquired possession of properties. Claims are all in extreme northern section of Butte district, which shows signs of renewed activity.

## NEVADA

## Elko County

**FLAXIE MINES CO.** (Jarbidge)—It is reported that a 25-ton mill will be built this summer. Plans have been prepared.

## Esmeralda County

**ATLANTA MINES CO.** (Goldfield)—On account of a great increase in volume of water, operations on 1750-ft. level have been suspended until larger pumps can be installed in Goldfield Merger company's shaft, to which water flows.

## Humboldt County

**BUCKSKIN NATIONAL** (National)—Force has recently been increased. Five sets of lessees are also operating.

**FLYNN-BALDWIN** (Goldbanks)—Shoot of good-grade lead ore has been opened in tunnel and 50-ft. winze. At bottom of winze, shoot is 4 ft. wide and contains gold and silver as well as lead.

**SEVEN TROUGHS COALITION** (Seven Troughs)—New 75-hp. gasoline engine, to be used in pumping, has been installed and is running satisfactorily. Development work is being done in ore in north and south drifts on 1150-ft. level and in No. 4 winze. Mill has been running since Mar. 1, and 40 men are employed in mine.

## Lander County

**GOLD STRIKE AT GILLMAN TROUGHS**, in Wild range, has been made. Discovery is 15 miles southeast of Copper Cañon, and six miles from Nevada Central R.R. It is stated that discovery was made after cloudburst and that ore is low-grade and vein of large size.

## Lincoln County

**SILVER-COMET** (Pioche)—Mill of this company in Comet district is being enlarged and will be in operation soon.

**AMALGAMATED POCHE** (Pioche)—Development work is being done on 12th and 14th levels of No. 1 shaft. Stopping zinc ore above 12th level is now being done.

**PANACA** (Pioche)—Lessee on this claim of Amalgamated Pioche Co. has discovered gold-silver ore of shipping grade in drift from old 50-ft. shaft. Ore is now being sacked for shipment.

**YUBA LEASING CO.** (Pioche)—Shoot of good-grade gold-silver ore has been struck in winze from 900-ft. level of No. 3 shaft and lead ore is being opened on 800-ft. level west of shaft. Plans and specifications for new compressor plant have been made.

## Lyon County

**SMITH VALLEY MINES CO.** (Yerington)—Auto trucks and teams will be employed in near future hauling ore to Hudson.

**MASON VALLEY MINES CO.** (Thompson)—Ore receipts for month of May, 1914, were as follows: From Mason Valley mine, 8551 tons; from Nevada-Douglas, 3418 tons; from other mines, 5320 tons; total, 17,284, or a daily average of 558 tons. In same period, nine cars of blister copper were shipped.

## Nye County

**NEW STRIKES IN TONOPAH** are reported as having been made in Midway and Monarch-Pittsburgh mines. In the former, a shoot assaying \$24 to \$40 has been cut in north crosscut from shaft on 1200-ft. level. Good-grade oreshoot was cut in Monarch-Pittsburgh in crosscut on 1100-ft. level.

**GOLDEN ARROW DEVELOPMENT CO.** (Golden Arrow)—A 10-stamp mill and cyanide plant will be built at once.

**TONOPAH MINING CO.** (Tonopah)—Mill, which was recently altered, is now making a recovery of 92%, it is said.

**CARRARA MINING, MILLING & LEASING SYNDICATE** (Carrara)—Recent shipment of 28 tons gave smelter returns of \$44 per ton.

**GOLD CRATER CONSOLIDATED MINING CO.** (Gold Crater)—Lease has been granted to Charles Orr, of Goldfield, who will commence operations in near future. Plans are being made for a 5-stamp mill.

**WHITE CAPS** (Manhattan)—Shaft sinking will be resumed when new equipment is installed. This will consist of new headframe, 75-hp., Denver Engineering Works hoist, 500-ft. Leyner compressor, Sullivan air drills, sinking pump and blacksmith shop.

## Ormsby County

**NEVADA-DELAWARE MINING CO.** (Carson City)—Shoot of good-grade gold ore has been discovered in 12-ft. shaft northeast of old workings. This property is seven miles west of Carson City.

**NEW MEXICO****Eddy County**

CARLSBAD OIL & GAS CO. (Carlsbad)—Drills now down 1700 ft. in hard limestone. Work progressing smoothly.

SOUTHWESTERN PETROLEUM CO. (Carlsbad)—Company has just put drills to work under supervision of T. A. Stancliff.

**Grant County**

85 MINING CO. (Lordsburg)—Company has bought Three Heroes group from Bonnie Mining Co. Claims have been in litigation for some time.

BONNIE MINING CO. (Lordsburg)—Officials of company have gone East preliminary to purchasing new equipment and doing extensive development.

**San Miguel County**

NEW MEXICO ASBESTOS CO. (East Las Vegas)—Company was incorporated recently. Capital stock, \$100,000, divided into \$1 shares. Charles P. Trumbull is statutory agent. Company will develop asbestos deposits found in San Miguel County.

**Sierra County**

OVERLOOK (Hillsboro)—Development work is in progress on this mine on Franklin Hill.

**Socorro County**

PRECIOUS METALS MINING & EXPLORATION CO. (Mogollon)—Option has been taken by Theodore W. Carter on recent discovery of Alexander Bros. on summit of Mogollon range, altitude 9850 ft. Outcropping is traceable 6000 ft. Assays warrant developing. Ore is of same general character as that of Mogollon district. Discovery was made accidentally while one of the Alexander brothers was lost in mountains. Carter has outlined plans for development. Work is now under way.

**SOUTH DAKOTA****Lawrence County**

ORO HONDO (Deadwood)—Sinking from 1050-ft. level has commenced. Jackhammer drills are being used. Two additional boilers of 100 hp. each have been installed, making boiler capacity 400 horsepower.

BISMARCK (Flatiron)—During last half of May, 4000 tons of ore was treated from which head assays averaged \$1.78 per ton, and tailings \$0.278 per ton, indicating 84.4% extraction by coarse crushing and direct cyanidation. Total costs of mining and milling are between \$1 and \$1.05 per ton, based on five months' work, January to May, this year.

WASP NO. 2 (Flatiron)—Stripping by steam shovel, removing firm shale and sandstone and 1 or 2 ft. of soil, is costing an average of 27c. per cu.yd. Side-dump steel cars, holding 2 yd., are handled by a small locomotive. A day's work of stripping crew, including steam-shovel operators, engineer and crew on dump train, is from 100 to 175 cars per day. At present 30 ft. of waste is being removed to reach 17 to 18 ft. of quartzite ore averaging \$2 per ton, which is cyanided at a profit in a 500-ton plant. Recently a Keystone No. 3 traction drill has been received and will be used in prospecting. A system of wider conveyors has been installed for filling tanks, with result that time of filling has been reduced more than one-half. It now requires 3 to 3½ hr. to load a 420-ton tank.

**UTAH****Beaver County**

LADY BRYAN (Milford)—Articles of incorporation have been filed. Capitalization is 200,000 shares, par value \$5.

KING OF THE HILLS (Beaver City)—Several stringers of copper ore have been cut in this company's tunnel, which is being driven for main ledge. Property is in Granite district 12 miles northwest of Beaver.

SHEEP ROCK (Beaver City)—This property has been taken over by New York and Boston men. A new company is being organized with an increased capitalization, and extensive development is planned.

MOSCOW (Milford)—Station which is being cut at 800 level, is nearly completed. Sinking will soon be resumed. Development is being done at 600-level station, where ore was cut. Production from old workings is increasing, and June output will exceed that for May, which amounted to six cars.

**Salt Lake County**

CLIFF (Alta)—This company's lease on upper part of Michigan-Utah ground is making regular shipments.

MICHIGAN-UTAH (Alta)—A bond of \$10,000 has been filed by N. W. Haire, recently appointed receiver for this company.

SELLS (Alta)—Work is being carried on from west drift of Dwyer tunnel, of South Hecla. Face is 40 ft. inside Sells ground. Some mineral is being followed. Porphyry dikes are found similar to those in City Rocks and other productive Alta properties.

ALTA CONSOLIDATED (Alta)—Raise which is being driven for contact above tunnel level, has opened seams and bunches of ore. In east drift from tunnel a vein 1½ ft. between walls is being followed. Some ore has been found along foot and hanging, and vein has been opened for 80 feet.

OHIO COPPER (Bingham)—At annual meeting in Portland, Maine, William O. Allison was reelected president, and Heinze interests are reported to have lost control. Several Heinze representatives have been dropped from board of directors, and headquarters are to be changed. Heinze still owns Mascotte tunnel and Bingham Central Standard R.R. over which Ohio Copper ships its ore to mill at Lark. It is understood that agreement to pay 15c. per ton transportation charges does not expire for some time. Daily tonnage ranges from 2000 to 2500 tons, including shipments by Bingham Mines Co. This brings a revenue of \$300 per day or \$9000 monthly. Operating expenses it is said will bring this down to \$6000 net per month.

**Tooele County**

CLIFF (Ophir)—Drifting is being done south on 1000-ft. level of Tony incline, to cut a new vein in that section. Regular shipments are being made.

OPHIR HILL CONSOLIDATED (Ophir)—This property owned by Senator W. A. Clark, is producing steadily. In addition to shipping ore, concentrates are being produced by newly remodeled mill.

LION HILL CONSOLIDATED (Ophir)—Two cars of ore running well in silver, with some gold, have been shipped by Nelson St. Clair, who has been leasing here. Work is to be begun shortly by company to open up Gladstone fissure on Buffalo claim.

**Utah County**

MILLER (American Fork)—Shipments are being made by Wadley Bros., who are operating under lease. A jig may be installed to treat lower-grade ore, which is expected to concentrate four into one.

BAY STATE MINING & MILLING CO. (American Fork)—Ore assaying well in lead and silver with some gold has recently been opened. Enough work has been done to show that ore extends to greater depth and old Tyler tunnel will probably be extended to cut vein.

PACIFIC MINING & MILLING CO. (American Fork)—A five-year lease has been taken on this property by Peter Miller, representing Bingham mining men. Work will soon be started sinking winze from upper tunnel to determine whether ore in fissure is same as that opened in lower tunnel. It is planned to sink to some depth in this winze, and if showing warrants, another tunnel will be driven lower down hill. No ore is to be marketed at present. If enough second-class is developed a small mill will probably be built.

**WISCONSIN****Lead and Zinc District**

MERRY WIDOW (Galena)—Eastern men have purchased this mine and mining and milling operations will be resumed.

BENTON-FAIRPLAY (Shullsburg)—W. J. Power, of Hibbing, Minn., has secured an option on this property and will open up mine.

WISCONSIN ZINC CO. (Platteville)—This company has found East End range again, by use of churn drill, at a distance of 1500 ft. ahead of mine workings where ore cut out; a new shaft will be sunk and an aerial tram built to connect with mill.

**CANADA****Alberta**

DINGMAN OIL WELL AT CALGARY, property of Calgary Petroleum Products Co., was uncapped June 4 in presence of a large number of visitors in order to set at rest all adverse rumors as to the genuineness of discovery. A rush of oil followed and 2000 gal. poured into recently installed 12,000-gal. tank at a pressure of 270 lb. per sq.in. in a space of 18 min. Well was then closed, as it was decided not to leave it open for any length of time until machinery for handling the gas, which escaped in large quantities with the oil had been received.

**British Columbia**

GRANBY CONSOLIDATED (Anyox)—Hidden Creek smelting works is now in full operation, third furnace having been blown in. Partial pyritic smelting is practiced, it being understood that coke figures only 4% of gross charge. Gold and silver in blister copper covers freight across continent to Nichols refinery at Laurel Hill, N. Y., it is said. Grand Trunk Pacific and Canadian Pacific are bidding for freight contract promising to meet competition of any Panama Canal transportation.

**Ontario**

COBALT SHIPMENTS FOR MAY were: Beaver, 64.01 tons; Chambers Ferland, 43.98; City of Cobalt, 78.57; Cobalt Comet, 38.06; Cobalt Lake, 96.44; Cobalt Townsite, 285.37; Coniagas, 42.95; Crown Reserve, 118.26; Hudson Bay, 42.96; Kerr Lake, 74.12; La Rose, 41.54; McKinley-Darragh, 306.85; Nipissing, 155.30; O'Brien, 30.63; Peterson Lake, 57.74; Penn Canadian, 59.05; Right of Way, 31.49; Timiskaming, 35.07; Trethewey, 52.04; total, 1654.43.

TOUGH-OAKES—A new vein known as No. 6 has been uncovered for 520 ft. It is claimed that it has best surface showing of any vein on property.

BEAVER (Cobalt)—The report for three months ended May 31 shows cash on hand and ore at mine and smelters of \$125,448. Sinking below 800-ft. level has been started and a number of veins have been found on 300-ft. level.

NIPISSING (Cobalt)—In May company mined ore of an estimated net value of \$211,256 and shipped bullion from Nipissing and customs ore of an estimated net value of \$309,877. The high-grade mill treated 183 tons and shipped 523,320 oz. of bullion. The low-grade mill treated 6560 tons.

BUFFALO (Cobalt)—Annual report for year ended Apr. 30 shows a sharp decline in income and surplus. Total income was \$982,040 as compared with \$1,391,906 for previous year, and surplus after payment of expenses \$386,990 as compared with \$883,451. Payment of dividends to amount of \$660,000 left a deficit of \$273,010.

**VENEZUELA**

COLON DEVELOPMENT CO., LTD.—This British company, which has an oil concession covering several thousand square miles in State of Zulia, has shipped a drilling outfit, provisions and drillers, who will begin work in District of Colon in country between Zulia and Tara Rivers. Gardner W. Murray is resident agent of company at Caracas; head office is at 12 Bishopsgate, E. C., London.

**TRANSVAAL**

GOLD PRODUCTION IN THE TRANSVAAL in May was 720,229 oz., which is 36,352 oz. more than in April, but 74,077 oz. less than in May, 1913. For the five months ended May 31 the total production was 3,893,344 oz. in 1913, and 3,368,921 oz.—or \$69,635,597—in 1914; a decrease of 524,423 oz. this year.

# The Market Report

## METAL MARKETS

NEW YORK—June 17

The metal markets generally remain rather quiet, with no specially notable changes. Prices on the whole are inclined to weakness.

### Copper, Tin, Lead and Zinc

**Copper**—The last week has again been characterized by excessive dullness. The nominal asking price of certain large producers continues to be 14c., delivered usual terms, but there is reason to believe that they did not stick at that price when any real business came in sight. In the meanwhile, other producers offered openly at 13½c. and took some business at that price. During the last two days, however, there were sellers ready to shade that and the market was about 13¼@13½c. delivered, usual terms, with strong indications that it was nearer the lower than the higher figure.

The London market for standard copper has been weakish. On Thursday, June 11, it was £61 17s. 6d. for spot and £62 10s. for three months. On Tuesday, June 16, it was £61 10s. for spot and £62 2s. 6d. for three months. On Wednesday, June 17, spot closed at £61 16s. 3d. and three months £62 8s. 9d.

Base price of copper sheets has been lowered ¼c. and is now 19c. per lb. for hot rolled and 20c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14¾@15¼c. per lb., carload lots at mill.

Copper exports from New York for the week were 5900 long tons. Our special correspondent reports exports from Baltimore for the week at 878 tons.

Imports of copper into Germany for the four months ended Apr. 30 are reported by Aron Hirsch & Sohn at 78,839 tons, of which 69,434 tons were from the United States. Exports were 2479 tons.

According to the Russian Copper Syndicate the total production of copper in the Russian Empire in 1913 was 73,891,640 lb.; a decrease of 521,556 lb. from 1912. This decrease was mainly due to the reconstruction of two large works, which were stopped for part of the year. The output for 1914 is expected to show an increase.

**Visible Stocks of Copper in Europe** on June 15 are reported as follows: Great Britain, 13,430; France, 5210; Rotterdam, 3250; Hamburg, 3690; Bremen, 1080; other European ports, 600; total, 27,260 long tons. The total is the same as on May 31. In addition to the stocks above 1950 tons are reported afloat from Chile and 4300 tons from Australia, making a total of 33,510 tons.

**Brass Prices** are announced by the American Brass Co. as follows, dating from June 15: Brass sheets, high brass, 15½c. net per lb.; low brass, 16¾c. Wire, high brass, 14¾c.; low brass, 17¾c. Tubes, brazed, 19¾c.; open seam, 19¾c. Angles and channels, 19¾c. Scrap allowances are 9¾c. net per lb. for high brass; 10¾c. for low brass.

**Tin**—The better tone to the market was only of short duration. Prices continued to crumble the latter part of last week, and the London market on Wednesday of this week presented a rather demoralized appearance. The serious break was ascribed to forced sales. No interest was shown in this market by the larger consumers, and business was confined to lots of five tons or less. At the close, the market had recovered from the low, and the quotations were £137 5s. for spot and £139 for three months, and about 30¾c. per lb. for June-July tin here.

Tin production of the Federated Malay States, four months ended Apr. 30, was 15,577 long tons in 1913, and 15,657 in 1914; increase, 80 tons.

Exports from Baltimore for the past week included 499,913 lb. scrap tin to London.

Messrs. Robertson & Bense report the receipts of tin ore and concentrates at Hamburg, Germany, in May, at 2706 tons, of which 2689 tons were from Bolivia and 17 tons from Southwest Africa.

**Lead**—The market is quiet and firm, with a fair business doing at 3.90c. New York, and 3.80@3.82½c. St. Louis.

The London market is quiet. Spanish lead is quoted at £19 7s. 6d.; English lead, 12s. 6d. higher.

A consular report gives the imports of lead into China in 1913 at 7748 short tons. Nearly all of it was from Australia.

**Spelter**—There is very little business doing and somewhat lower prices have been accepted. At the close St. Louis is quoted at 4.82½@4.85c.; New York, 4.97½@5 cents.

The European market for good ordinaries is quoted at £21 5s., specials £22 per ton.

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

### DAILY PRICES OF METALS

#### NEW YORK

June	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, Cts. per Lb.
			13.65			3.80		4.85
11	4.8890	56¼	@13.75	31¼	3.90	@3.82½	@5.00	@4.87½
			13.65			3.80		4.82
12	4.8905	57¼	@13.75	30¼	3.90	@3.82½	@5.02	@4.87½
			13.65			3.80		4.82
13	4.8890	56¼	@13.75	30¼	3.90	@3.82½	@5.02	@4.87½
			13.65			3.80		4.82
15	4.8895	56½	@13.75	30	3.90	@3.82½	@5.00	@4.85
			13.60			3.80		4.82
16	4.8900	56½	@13.70	30¼	3.90	@3.82½	@5.00	@4.85
			13.60			3.80		4.82
17	4.8900	56½	@13.70	30¼	3.90	@3.82½	@5.00	@4.85

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

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

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

#### LONDON

June	Silver	Copper				Tin		Lead		Zinc	
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'd	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
11	26¼	61¼	13 44	62¼	66¼	141	142¼	19¼	4 24	21¼	4 64
12	26¼	61¼	13 44	62¼	66¼	139¼	141¼	19¼	4 29	21¼	4 64
13	26¼	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	25½	61¼	13 39	62¼	66¼	136¼	139¼	19¼	4 26	21¼	4 64
16	25½	61¼	13 36	62¼	66¼	136¼	138	19¼	4 24	21¼	4 64
17	25½	61¼	13 43	62¼	66¼	137¼	139	19¼	4 21	21¼	4 62

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.2 = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¼c.

**Other Metals**

**Aluminum**—Business is still quiet and demand light. There is no change in prices, quotations being 17½@18c. per lb. for No. 1 ingots, New York.

**Antimony**—Business continues limited by current consumptive demand and is not especially active. Ordinary brands—Chinese, Hungarian, etc.—are held at 5.75@6c. per lb. Cookson's is quoted at 7.15@7.35c., and for other special brands around 7c. is asked.

**Quicksilver**—A fair business is doing and prices show no change. The New York quotation is \$37.50@38.50 per flask of 75 lb.; for jobbing lots 54c. per lb. is asked. San Francisco, \$37 per flask for domestic orders and about \$2 less for export lots. The London prices is £7 per flask, with £6 17s. 6d. asked from second hands.

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

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

**Gold, Silver and Platinum**

**Gold**—Although the demand for gold is still strong, no premiums were paid on the open market in London, the price remaining at 77s. 9d. per oz. for bars, and a considerable part of the gold arriving went to the Bank of England. In New York, \$16,500,000 gold was taken for export, chiefly to Paris.

Gold production in the Transvaal in May was \$14,887,133; for five months, ended May 31, it was \$69,635,597, a decrease of \$10,839,923 from last year.

Imports of gold into France, three months ended Mar. 31, were 194,407,000 fr.; exports, 23,346,000 fr.; excess of imports, 171,061,000 fr., against 141,072,000 fr. last year.

**Platinum**—The market continues quiet but steady. Dealers ask \$43@44 per oz. for refined platinum and \$46@51 for hard metal, according to quality.

**Iridium**—Current price remains at \$76@79 per oz., New York.

**Silver**—The market has ruled quiet with a lower tendency on lessened demand from India. The London market closes quiet and steady at 25½ pence.

Shipments of silver from London to the East, Jan. 1 to June 4, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£3,421,000	£3,427,500	I. £6,500
China.....	309,500	40,000	D. 269,500
Total.....	£3,730,500	£3,467,500	D. £263,000

Exports to India have run about even with last year, but those to China have been light.

Imports of silver into France, three months ended Mar. 31, were valued at 65,680,000 fr.; exports, 90,614,000 fr.; excess of exports, 24,934,000 fr., against 43,728,000 fr. last year.

**Zinc and Lead Ore Markets**

**PLATTEVILLE, WIS.—June 13**

The market showed a slight increase this week. The base price for 60% zinc ore was \$39@40 per ton. No sales of lead ore were reported.

**SHIPMENTS WEEK ENDED JUNE 13**

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week .....	2,901,110	153,610	585,300
Year .....	68,074,010	2,722,610	19,902,130

Shipments to separating plants for the week not reported.

**JOPLIN, MO.—June 13**

Blende was advanced to \$44 high, the assay base being \$39@41.50 per ton of 60% zinc, and metal base price \$38@39. Calamine continues strong at \$22@23 per ton of 40% zinc, and the average of all grades is \$37.54 per ton. Lead sold at \$47.50 per ton, the base price continuing at \$46 per ton of 80% metal contents. The average of all grades is \$46.44 per ton.

Upward of two months, competition on some grades of ore has been so keen that at least one lot in Webb City has changed buyers every week. After buying the ore one week, the purchaser would attempt to lower the price and another buyer would purchase it on the price current the previous week. That is a fair illustration of the extreme competition existing all over the district. Miami ores heavy in iron

command a price that is equivalent to a premium, selling at \$38@39 metal base, or no deduction for iron.

**SHIPMENTS WEEK ENDED JUNE 13.**

	Blende	Calamine	Lead	Values
Totals this week..	10,328,030	1,402,860	1,829,040	\$262,590
Totals 24 weeks..	249,636,820	17,042,440	43,432,790	\$6,122,385
Blende value, the week, \$201,310; 24 weeks, \$4,822,190.				
Calamine value, the week, \$18,800; 24 weeks, \$193,995.				
Lead value the week, \$42,480; 24 weeks, \$1,046,205.				

**IRON TRADE REVIEW**

**NEW YORK—June 17**

While there is no marked change in the markets, there is a more cheerful tendency, and more disposition to take material for use.

In some quarters an increase in new business is reported, with an increase in orders and more inquiries. This is especially the case with smaller building materials—bars, wire, nails, etc.—in which a fair trade is reported. Structural steel is a little quiet for the present, though there are a number of good contracts under consideration.

Much interest is felt in the contracts for cast-iron segments for the tunnel under the East River on the new subway in New York. These contracts will require some 80,000 tons of castings. The bids are all in, but the contracts have not yet been awarded. The pig-iron market generally has been rather quiet.

The United States Steel Corporation reports on May 31 a total of 3,998,160 tons of unfilled orders on its books. This is a decrease of 278,908 tons, as compared with April 30; and is 615,520 tons less than at the close of last year.

United States Foreign Trade in Iron and Steel, four months ended Apr. 30, is valued by the Department of Commerce as follows:

	1913	1914	Changes
Exports.....	\$103,574,534	\$73,703,802	D. \$29,870,732
Imports.....	11,317,969	11,284,192	D. 33,777
Excess, exports....	\$92,256,565	\$62,419,610	D. \$29,836,955

There was a decrease of 28.8% in the exports this year, as compared with 1913; and a decrease of 0.3% in imports.

**PITTSBURGH—June 16**

The improvement in the steel trade noted in last report has gained much force in the past week, and it is now universally recognized that the market has turned for the better, after fully four months of decreasing activity.

Actual bookings of orders for prompt shipments in bars, plates, shapes, sheets and tubular goods show an increase of about 50%, comparing the first half of May and the first half of June. In tinsplate there has been a slight increase in specifications, though new business is practically absent since the regular demand is covered by contracts. Rails and wire products show no improvement, being entirely out of season now.

If steel bookings should continue indefinitely at the present rate the steel industry would be able to operate up to 75 or 80% of capacity, as compared with a present rate of little if any over 55%. There is prospect of a slight improvement in operations for this month as a whole, compared with May, but July is just ahead of the trade and as it is almost invariably an extremely dull month the steel mills are disposed to avoid speeding up at this time if possible. If bookings continue heavy in July it will be clearly established that a really important and prolonged buying movement has set in.

Prices for steel products for prompt shipment have shown no noticeable decline in the past two or three weeks. On attractive orders for prompt shipment plates can be done at 1.10c., shapes and bars at 1.12½c., plain wire at 1.35c., wire nails at \$1.50, black sheets at 1.80c. and galvanized sheets at 2.75c. Upon third-quarter contracts the mills are as a rule quoting somewhat higher, 1.15c. on bars, plates and shapes, while for fourth quarter, against which there is no important inquiry as yet, they mention 1.20c. as the lowest they would likely do.

Iron and steel imports in April totaled about 30,000 tons, or an increase of about 10% over March. The April imports were at a rate less than 2% of the domestic production.

**Pig Iron**—The Standard Sanitary Manufacturing Co. is inquiring for 1000 to 2000 tons of foundry iron for July and August delivery to its two local plants, and also for a similar tonnage of southern iron for its Louisville plant. Foundry

dry pig-iron inquiry in general has broadened. Basic and bessemer are still neglected, but there are expectations of a moderate movement in basic within 30 days. Prices show no change: Bessemer, \$14; basic, \$13; malleable, and No. 2 foundry, \$13@13.25; forge, \$12.50@12.75, at Valley furnace, 90c. higher delivered Pittsburgh. At least one furnace with a 75c. rate to Pittsburgh has sold No. 2 foundry at \$13 at furnace.

**Ferromanganese**—The market continues quiet with respect to both prompt and contract, the price being well established at \$38, Baltimore, with \$2.16 freight to Pittsburgh.

**Steel**—No interest is yet being shown in billet and sheet bar business for third quarter, the consumers as a rule having more steel bought for second quarter than they have been able to use. There does not seem to be much hope on the part of consumers of shading present nominal quotations, \$19.50@20 on billets and \$20.50@21 on sheet bars. Rods are quoted at \$26.50, though this figure might be shaded 50c. on a desirable order.

**IRON ORE**

Shipments of Lake Superior iron ore by ports for the season to June 1 are reported as follows, in long tons:

Port	1913	1914	Changes
Escanaba.....	955,187	495,917	D. 459,270
Marquette.....	527,041	121,873	D. 405,168
Ashland.....	734,941	341,766	D. 393,175
Superior.....	2,300,271	1,735,607	D. 564,664
Duluth.....	2,100,220	734,090	D. 1,366,130
Two Harbors.....	1,532,939	692,496	D. 840,443
<b>Total.....</b>	<b>8,150,599</b>	<b>4,121,749</b>	<b>D. 4,028,850</b>

Of the 3,852,963 tons shipped in May 2,589,338 tons, or 64.3%, went to Lake Erie ports.

The bondholders and stockholders of the Canadian-Venezuelan Ore Co. have agreed to close up the company's affairs, owing to the failure of the mines in Venezuela to show the quantity or quality of iron ore expected when development work was begun. G. F. Pearson, of Halifax, N. S., has been appointed liquidator. The company has \$4,347,000 stock and \$1,000,000 bonds, and has expended a considerable sum in development.

**Imports and Exports of Iron Ore** in the United States four months ended April 30, long tons:

	1913	1914	Changes
Imports.....	703,224	394,739	D. 308,485
Exports.....	28,810	37,728	I. 8,918

Imports of manganese ore for the four months were 163,269 tons in 1913, and 89,125 in 1914; decrease, 74,144 tons.

**COKE**

Coke production in the Connellsville region for the week is reported by the "Courier" at 243,609 short tons; shipments, 254,831 tons. Production of the Greensburg and Upper Connellsville districts was 33,874 tons.

**Connellsville Coke**—The market continues altogether stagnant. The furnaces in operation are well taken care of through existing contracts, and for the period beginning July 1 there is no interest, since consumers can buy prompt at less than they could do on contract. The market is quotable at \$1.75@1.85 for prompt furnace, \$1.85@2 on contract furnace and \$2.35@2.65 on prompt or contract foundry, per ton at ovens.

**Exports and Imports of Fuel** in the United States four months ended April 30, in short tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite.....	1,143,890	963,729	12	125
Bituminous.....	4,234,477	3,480,054	535,860	517,483
Coke.....	335,888	266,636	22,053	30,054
Bunker coal.....	2,358,265	2,489,698	.....	.....
<b>Total.....</b>	<b>8,072,520</b>	<b>7,200,117</b>	<b>557,925</b>	<b>547,662</b>

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

**CHEMICALS**

**NEW YORK—June 17**

No material changes can be noted in the general market, which continues rather quiet, with business in heavy chemicals only moderate.

**Arsenic**—The market continues slow, with a light demand only. The prices are unchanged, however. Quotations are \$3 per 100 lb. for both spot and futures.

**Copper Sulphate**—Business is rather quiet, but prices

are unchanged. Quotations are \$4.65 per 100 lb. for carload lots, and \$4.90 per 100 lb. for smaller parcels.

**Nitrate of Soda**—Trade is fair for the season and prices are steady, with no immediate change expected. Current quotations are 2.15c. per lb. for both spot and futures.

**Pyrites**—Imports at Baltimore during the past week included 5486 tons of pyrites from Huelva, Spain.

**PETROLEUM**

Another reduction of 5c. per bbl. was made June 16 on Eastern oils. Pennsylvania grade crude is now \$1.75, a reduction of 75c. since last January. Other grades have been reduced in proportion.

**OTHER ORES**

**Molybdenite** of good grade is reported worth £500@550 per ton, at Liverpool.

**Tungsten Ore**, or Wolfram, 65% WO<sub>3</sub> standard, is quoted in Liverpool at £1 10s. per unit.

**COPPER SMELTER'S REPORTS**

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

	January	February	March	April	May
Alaska shipments	2,701,258	1,803,579	2,069,960	1,279,537	585,387
Anacosta.....	24,400,000	21,300,000	23,800,000	22,900,000	23,500,000
Arizona, Ltd.....	3,474,000	3,062,000	3,286,000	3,570,000	3,092,000
Copper Queen.....	3,796,358	6,987,366	7,637,042	7,562,723	8,388,203
Chumet & Ariz.....	5,975,000	5,596,850	5,875,000	5,450,000	.....
Chino.....	6,488,220	5,642,426	5,399,814	5,926,591	.....
Detroit.....	1,590,681	1,814,214	1,973,725	1,790,926	2,105,034
East Butte.....	1,256,000	1,193,960	1,546,180	1,178,000	1,179,962
Giroux.....	148,411	90,017	287,980	45,948	429,553
Mason Valley.....	944,000	1,254,000	1,250,000	862,000	916,000
Mammoth.....	1,625,000	1,400,000	1,800,000	1,850,000	1,750,000
Nevada Con.....	5,791,122	4,588,243	5,218,257	4,880,043	.....
Ohio.....	700,728	582,000	597,520	610,518	.....
Old Dominion.....	2,797,000	3,066,000	2,997,000	2,779,000	3,302,000
Ray.....	5,050,000	5,432,000	6,036,908	6,089,362	.....
Shannon.....	937,432	903,761	1,082,000	1,012,000	1,056,000
South Utah.....	275,569	333,874	406,381	247,641	.....
Tennessee.....	1,474,890	1,232,812	1,262,184	1,370,800	1,336,950
United Verde*.....	3,000,000	2,700,000	3,100,000	3,000,000	.....
Utah Copper Co.....	10,329,564	9,207,111	12,323,493	12,739,757	.....
Lake Superior*.....	7,400,000	8,500,000	11,000,000	13,000,000	.....
Non-rep. mines*.....	8,200,000	7,600,000	8,200,000	8,000,000	.....
Sray, etc.....	2,500,000	2,500,000	2,500,000	2,500,000	.....
<b>Total prod.....</b>	<b>106,600,238</b>	<b>96,790,213</b>	<b>107,036,667</b>	<b>108,554,846</b>	.....
Imp., bars, etc.....	24,504,249	19,918,448	22,676,605	17,043,191	.....
<b>Total blister.....</b>	<b>131,104,482</b>	<b>116,708,661</b>	<b>129,713,272</b>	<b>125,598,035</b>	.....
Imp. ore & matte.....	10,893,969	9,713,164	7,029,292	10,400,122	.....
<b>Total Amer.....</b>	<b>141,998,968</b>	<b>126,421,825</b>	<b>136,742,918</b>	<b>135,998,157</b>	.....
Miami.....	3,258,950	3,316,482	3,361,100	3,130,772	3,347,000
Shattuck-Arizona	1,276,636	1,134,480	1,136,458	1,386,594	.....
Brit. Col. Cos.....	607,930	.....	.....	.....	.....
Granby.....	1,793,840	1,661,212	1,775,852	1,692,102	.....
Mexican Cos.....	.....	.....	.....	.....	.....
Boleo.....	2,369,920	1,984,080	2,535,680	2,204,720	2,213,120
Cunanea.....	3,460,000	2,688,000	4,260,000	2,632,000	2,222,000
Moctezuma.....	3,024,556	2,642,543	2,882,884	2,654,926	2,834,616
Other Foreign:	.....	.....	.....	.....	.....
Braden, Chile.....	2,430,000	2,362,000	1,810,000	2,720,000	2,480,000
Cape Cop., S. Af.	519,680	459,200	660,800	468,160	.....
Kyshtim, Russia.....	1,559,040	1,534,400	.....	.....	.....
Spassky, Russia.....	902,720	902,720	896,000	904,960	.....
Exports from	.....	.....	.....	.....	.....
Chile.....	5,488,000	6,720,000	6,944,000	9,072,000	7,616,000
Australia.....	5,712,000	7,952,000	8,176,000	7,168,000	8,400,000
Arrivals-Europe†	8,599,360	18,334,560	17,572,800	17,299,520	13,558,720

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

**COPPER STATISTICS**

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
VI. '13	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII. ....	138,074,602	58,904,192	78,480,071	52,814,606	77,904,000	124,808,606
VIII. ....	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX. ....	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X. ....	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI. ....	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII. ....	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr. '13	1,622,450,829	767,261,760	869,062,784	.....	.....	.....
I. 1914.	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II. ....	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,405,485
III. ....	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV. ....	151,500,531	63,427,633	82,345,216	64,609,319	46,435,200	111,044,519
V. ....	142,308,287	55,592,170	72,710,477	70,307,001	52,371,200	122,708,201
VI. ....	.....	.....	.....	84,342,641	61,062,400	145,405,041

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

Assessments

Table with columns: Company, Dellnq, Sale, Amt. Lists various companies and their assessment details.

Monthly Average Prices of Metals

SILVER

Table showing monthly average prices for silver in New York and London from 1912 to 1914.

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

COPPER

Table showing monthly average prices for copper in New York and London from 1912 to 1914.

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

TIN

Table showing monthly average prices for tin in New York and London from 1912 to 1914.

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

LEAD

Table showing monthly average prices for lead in New York, St. Louis, and London from 1913 to 1914.

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

SPELTER

Table showing monthly average prices for spelter in New York, St. Louis, and London from 1913 to 1914.

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

PIG IRON IN PITTSBURGH

Table showing monthly average prices for pig iron in Bessemer, Basic, and No. 2 Foundry from 1913 to 1914.

STOCK QUOTATIONS

Table of stock quotations for Colorado Springs and Salt Lake, listing company names and bid prices.

TORONTO

Table of stock quotations for Toronto, listing company names and bid prices.

SAN FRANCISCO

June 16

Table of stock quotations for San Francisco, listing company names and bid prices.

N. Y. EXCH.

Table of stock quotations for New York Exchange, listing company names and bid prices.

N. Y. CURB

Table of stock quotations for New York Curb, listing company names and bid prices.

BOSTON CURB

Table of stock quotations for Boston Curb, listing company names and bid prices.

LONDON

Table of stock quotations for London, listing company names and bid prices.