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## The Design of Gold Dredge Buckets

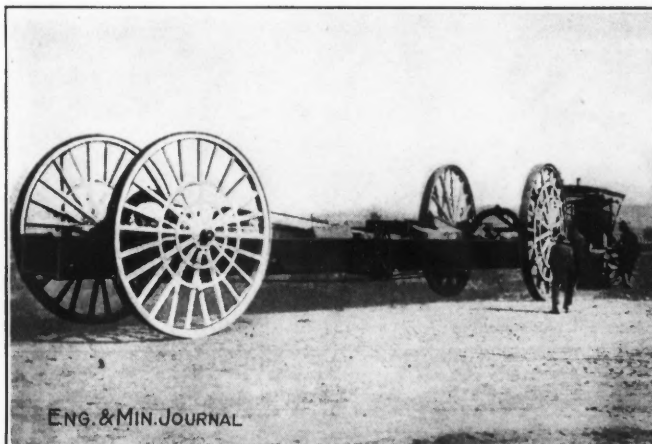
BY GEORGE E. SIBBETT\*

*SYNOPSIS*—Gold-dredger designing requires a wider range of engineering knowledge than most other professions, combining mechanical, electrical and mining principles. Operators have not habitually exchanged experiences, so that mistakes have been repeated and expense incurred unnecessarily. The Yuba Consolidated Goldfields has developed a new procedure involving larger buckets and steel construction for hulls and machinery. The round tumbler instead of polygonal has proved advantageous.

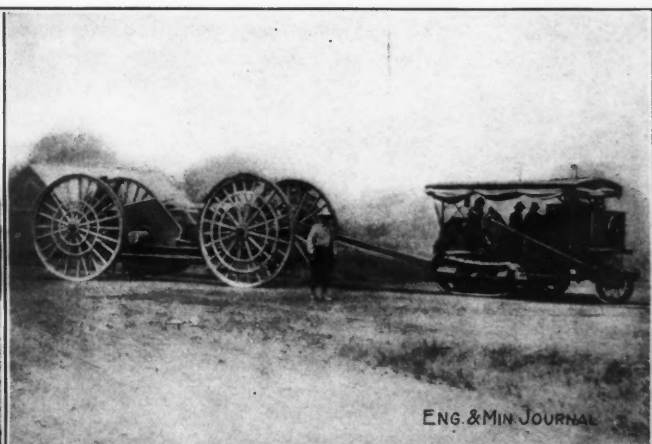
The design of a modern gold dredge probably covers the engineering field more thoroughly than any other single machine, embodying, as it does, the problems of a mechan-

With the coming of steel hulls, the work of the structural engineer has increased. The important parts which have for years been made of steel, such as the digging ladder and spuds, have, except in a very few cases, failed to endure the service required of them for any great length of time. This would indicate that the steel boat is still in the experimental stage, although there is little doubt but that it will be the material of the future boat. The electrical apparatus works under severe conditions, due to dampness and great fluctuations of load. Washing the gravel and saving the gold is a different problem in each field for the mining engineer.

The bucket line and tumblers still present the greatest difficulties to the designer and operator, and the fact that



WAGON FOR SMALL SPUDS



LOWER TUMBLER ON WAGON. WEIGHT 26,000 LB.

ical, structural, electrical and mining engineer. The mechanical equipment brings into use nearly all of the important alloys of steel which have to withstand to the highest degree abrasion and shock. Much pioneer work has been done to determine the best metal to use under different conditions. Twelve years ago cast iron was the metal most used, and no sooner had the operators replaced it with cast steel than many of the parts were again obsolete. At the present time ordinary cast steel forms a small proportion of the cast parts, having been superseded by manganese, nickel, chrome and other special steels.

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on practically every new dredge experiments are made with new types is evidence that the solution has not been obtained.

### ROUND LOWER TUMBLER

A complete bucket line, lower and upper tumblers, was installed about a year ago on one of the Yuba Consolidated Gold Fields dredges, and later on several others. These give promise of cutting in half the lost time and expense due to these parts, which at present amounts to more than all the other mechanical equipment combined. The chief cause of bucket-line troubles is the elongation of the pitch of the buckets and the decrease of the effective pitch

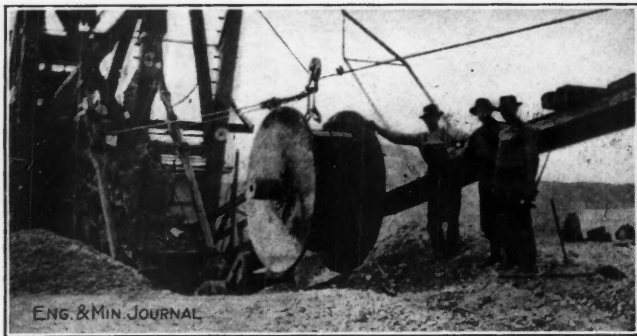
diameter of the tumblers due to wear. The new type was designed to eradicate, as much as possible, the causes which resulted in the above conditions. The most radical change was the substitution of a round-tread tumbler for the usual hexagonal type. This proved to be without doubt the most important step made in the dredging industry



15 cu.ft.                      7 cu.ft.                      1 cu.ft.  
DEVELOPMENT OF YUBA RIVER BUCKETS, SHOWING SIZE ONLY. NEWER DESIGNS ARE NOW USED

in recent years. Credit is due to M. L. Summers for this innovation. He was the first to conceive the present practical round tumbler.

With the old type the difference in pitch of the buckets and tumbler would be noticeable a short time after starting and would continue to increase until there would be a difference of several inches. As the buckets ride around the lower tumbler the difference in pitch accumulates for three or four buckets until the tension in bucket line causes the several buckets to slip to their seats causing a severe shock, and it is this slip which causes the wear



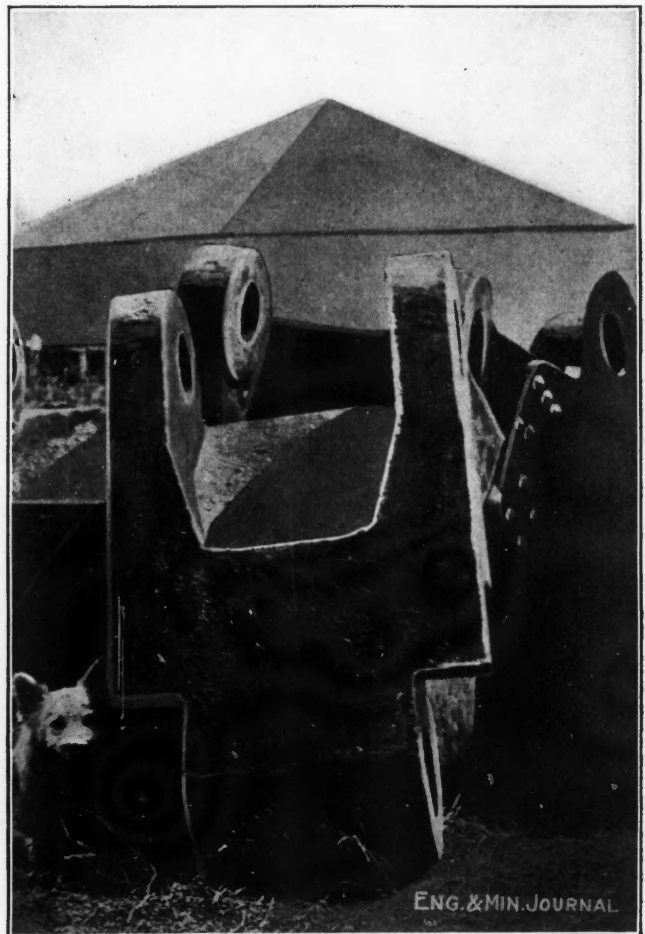
ROUND MANGANESE STEEL TUMBLER AND NEW TYPE BUCKET LINE

on the tread and flanges of the tumbler. With a round tumbler this slip is entirely eliminated.

When it was decided to experiment with a round tumbler, segments were placed on the six sides of an old hexagonal one, which had been worn out in a few months' time, not only the wearing plates but the tumbler body. This built-up round tumbler was placed in commission with the same bucket line, an old one, and it was expected to last just long enough to make a study of the action. It, however, was in service over a year. Several old discarded tumblers were taken from scrap and made round, and their extended life will no doubt be longer than their first life. It was expected that the new type of tumbler would be harder on the buckets and would probably cause them to

break through the middle, and that a rounded surface would be worn on the bottom of the bucket where it had its seat on the tumbler. As has been said, the buckets were in poor condition, yet no buckets broke and the wear was not perceptible, although there was only about 4 in. of metal across the base.

This company has recently installed several round manganese tumblers, one of which is the largest piece of manganese steel ever cast. These should last several years with no attention whatever. The hexagonal tumbler, as usually made, had six tread plates and 12 side plates. These wore out in a short time, especially the tread plates, as the slip was confined to a small area near the edge, and every sixth bucket would wear on the same



BASE OF NEW TYPE OF BUCKET FOR USE WITH ROUND TUMBLER

place. The diameter of the new tumbler was made so that between six and seven buckets would reach around. The buckets would, therefore, not track, each successive bucket taking its seat at a different place causing the wear to be equally distributed all around it. It is, of course, apparent that the efficiency of the round tumbler is not impaired by the elongation of the pitch of the buckets. After the years' service the buckets and tumbler have just been worn bright, and all the lost time incidental to changing plates has been done away with.

#### UPPER TUMBLER

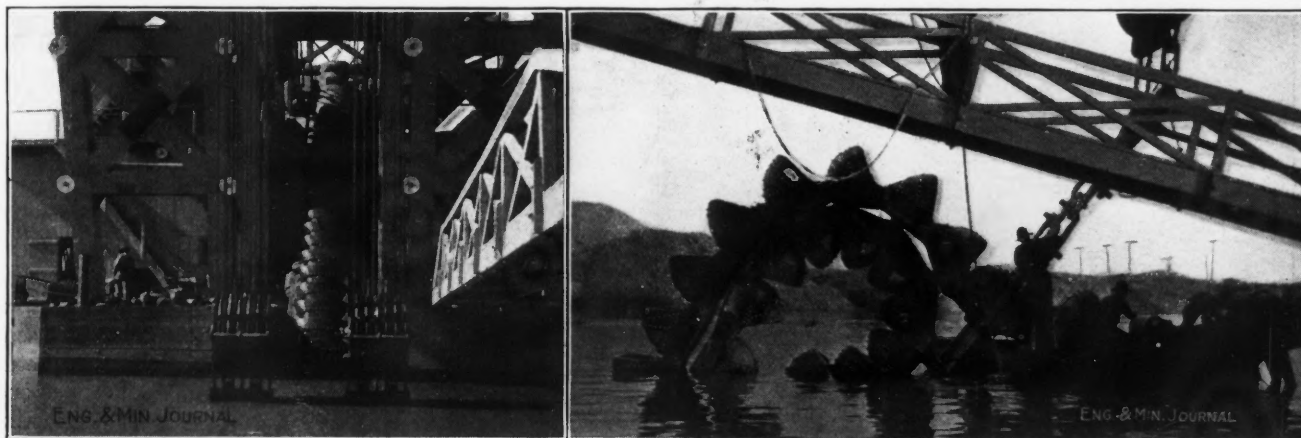
As yet no type of upper tumbler has been designed which will take care of the change of pitch of the buckets.

The closest approach to the ideal condition is to have easily removable wearing plates made in a series of thicknesses and build up the tumbler as the pitch increases. It was the general practice in certain localities to use a plain hexagonal tumbler body and six cushion plates, which cover the entire face of the tumbler. This cushion plate included the flanges, or side lug, as well as the heel. Later practice was to use an additional wearing plate on the cushion on the surface which does the driving. This is usually called the heel plate. It is the latter which is made in a series of thicknesses. In the fields where the digging is deep with the attendant long, heavy bucket lines, the heel plates wear out in three or four weeks, and the cushion plates in about six months. It seems impossible to get away from wearing plates on the upper tumbler and the consequent shutdowns from loose belts, etc., because of necessity the wear is confined to one area. In the fields where the service is not so severe, the problem is more easily solved.

The increase in the number of sides of an upper tumbler has not kept pace with the increase in size of the dredges. The original dredges in this country followed the practice of those in New Zealand and only had four-sided tumblers. The number was increased to five and then to six sides in two or three years, and has remained there for all sizes. In New Zealand they are now changing from four to five sides. For the 15-cu.ft. boats there is no reason why eight sides would not be much superior, and this type will no doubt be adopted in the future for dredges digging in ground which will discharge readily.

#### BUCKET DETAILS

The bucket more than any other part of the dredge must be designed to suit the ground. In general, the size of the gravel determines the shape, and the character and depth determine the distribution of the metal. A well designed bucket for small gravel would be a poor one for boulders, and *vice versa*. When clay is encountered still



BOW OF NO. 13 DREDGE

A BROKEN BUCKET LINE

An upper tumbler is now being designed for this company, which should do away with many of the difficulties which have been encountered. The shaft, tumbler and cushion plates will all be combined in one casting. Wearing plates will be separate and will be of large proportions, so that the metal under them will retain a plane surface.

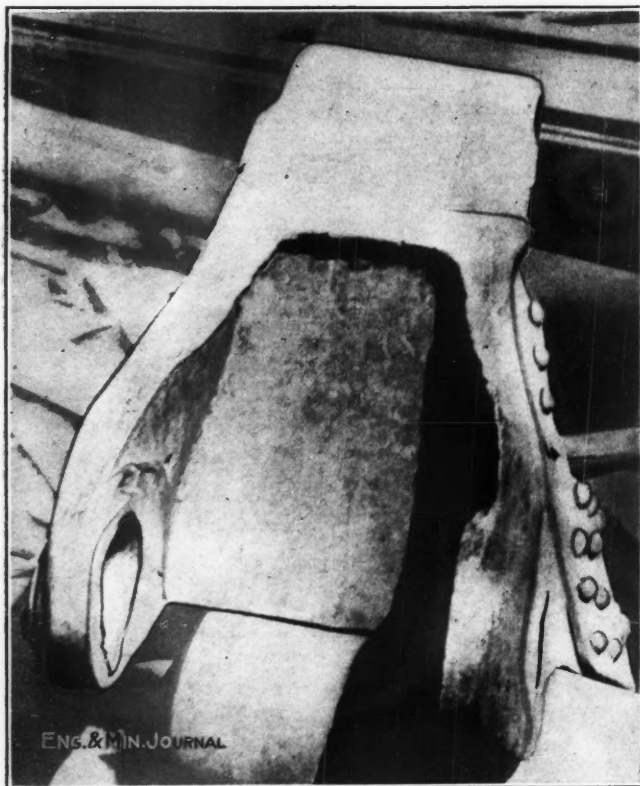
This will be a difficult casting to make and will weigh 10 or 20 tons, depending on the size of the boat on which it is used. In several fields, cushion plates are cast integral with the tumbler body, and in other fields the body has been cast with the shaft, but the writer has never seen them all cast together. The advantage of having the tumbler and shaft together is that greater strength is obtained for the same weight, and the troubles with loose keys are done away with. The general practice of shrinking the tumbler on the shaft and setting a ring around the shaft in a groove will hold the tumbler tight, but the process weakens the shaft. The fact was illustrated when a one-piece tumbler was installed of the same weight and working under identical conditions as nine other tumblers with separate shafts. Several of the latter broke while the former is still in operation after four years of service. The shafts in each case started to crack at the groove. The first cost is also much less for the one-piece tumbler.

another shape would be more suitable. It sometimes seems that the less an engineer knows of dredging the more light-hearted he is about the task of designing a dredge bucket. It is conservative to say that the bucket lines of more than half of the dredges going into new fields are failures, or entirely unsuited to their work. And when it is realized that a bucket line of some large modern dredges costs \$50,000 installed, the matter becomes a very serious one. As each line should wear from three to five years, few men have the chance to observe the performance of a sufficient number of types under different conditions to qualify them to design this part of a dredge.

It would be impossible outside of an elaborate treatise on the subject to take up the factors in detail which enter, and the points which determine the life of the bucket. However, a few of the errors which have proved disastrous will be mentioned. One 15-cu.ft. bucket line was useless after three months' service because the metal forming the bottom was brought so far forward that it pressed against the bucket next ahead when the line was doubled forward and most of the bottoms broke out. The designer apparently assumed that the only bends in the line occur where they double backward in going around the tumblers. There is a reverse curve, however, in the slack part of the line just before it reaches the lower tumbler. There

must not be too much space between the bottom of the hood and the next bucket as excessive spill will occur.

A bucket line was installed on the same size dredge in another field which proved to be an excellent digger, but the base area which came in contact with the wearing plates was so small that the latter would last but a very short time. Another more serious matter was that the metal was so thin from the back eye to the manganese insert plate that most of them broke inside of 15 months, causing many serious wrecks. It was thought that the constant pound on the insert plate caused the metal to flow to such an extent that the back eye was wedged off. Probably the real reason why the break occurred at this place is that a corner is left in the bucket on the bottom



BASE OF OLD TYPE OF BUCKET, SHOWING ELONGATION OF FRONT EYE

at the insert plate, and also one opposite in the eye for the bushing and the crack soon connects these two corners.

When the metal is so distributed throughout the bucket as to eliminate failure by breaking, the life of the bucket depends on the wear of the front eye, as a general thing. The lug on the pin is supposed to keep the pin from turning in the front eye, but the importance of making a tight fit between the lug and the lug seat is usually not appreciated by designers and manufacturers. Even when the fit is a good one the great pressure between the lug and the seat soon wears them both and allows a play between them, which is increased very rapidly. This wear in the front eye not only determines the life of the buckets, but as it increases the pitch, it also determines to a great extent the life of the tumblers, and the life of the dredge, owing to the shock and vibration caused by the slipping.

The new bucket recently installed here had an exceptionally broad base, so that the wear due to the round

tumbler would be a minimum. The width of the bucket which rested on the lower tumbler was about 6 in. for the old type and about 14 in. for the new one. The broader base also increases the life of the upper tumbler wearing plates and the ladder rollers. It has a long, deep lug seat. There are lug seats on both sides of the buckets. Until the last few years the mistake was made of having the lug seat on one side only, and it is sometimes done even yet. But it has been found by experience that the life is increased about 30% by arranging it so that the pin can be reversed when one seat is worn. The bottom and hood were cast in one piece and made of manganese steel. This latter has been done in some fields for considerable time and is gradually becoming universal.

The Yuba Consolidated Gold Fields has used on its dredges at Hammonton, Calif., nearly one million dollars worth of buckets of different designs during the last nine years and the new bucket line is the result of this experience. The trial of past years indicates that it will wear at least 50% longer than any of the previous ones, due, to a great extent, to the new type of tumblers.

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### The Leaching Experiments at Miami, Arizona

SPECIAL CORRESPONDENCE

Experiments are being carried out under the direction of R. C. Canby with a view to finding out the best conditions for the leaching of the partly oxidized ore from the Keystone mine and some of the ore from the Miami mine. The Keystone ore at present being treated contains some sulphide in such coarsely banded structure that it is necessary to remove it before roasting, as such coarse particles of chalcocite would retard the roasting. It is also being determined what proportion of the sulphide is mechanically freed in crushing to a given mesh. The ore is now being crushed in rolls to 8-mesh and put over a Sutton, Steele & Steele dry jigging table, a very convenient device for such tests, on which it has been found that in crushing to this size, about 65% of the sulphide can be recovered as concentrate.

A single-deck rotating-hearth roaster is being erected. The crushed ore will be fed into this with the idea of converting the insoluble red suboxide of copper which may be present into an oxide soluble in dilute sulphuric acid. Sulphatizing roasting as carried out at the Phelps-Dodge plant, at Douglas, will not be attempted, owing to the limited amount of sulphur available.

The roasted material will be leached with dilute sulphuric acid. One of the problems of the plant is to strike a mean size to which to crush, in order to leach by percolation, and yet not have material so coarse that it would take too long to roast.

It is proposed to electrolyze the leach with lead anodes and copper starting-sheet cathodes, but anodes of various material, including magnetite, will probably be tried. The electrolyte is to be kept in brisk circulation through the tanks and through an absorption tower in which the liquor will meet an ascending flow of  $SO_2$ , the electrolyte flowing transversely in the cell so as to pass between the plates forming the poles.

It is hoped to make use of the well recognized but little used fact that in electrolyzing a solution of sulphurous acid with insoluble anodes, the oxidation of the sulphur-

ous to sulphuric acid, which is an exothermic action, creates an electric current, which tends to help the main current (it might be regarded as caused by a back e.m.f.). This naturally results in a much reduced voltage of applied current and economies are hoped to be thus effected, if by the rapid circulation of electrolyte a sufficient volume of SO<sub>2</sub> can be brought in contact with the poles to set up a current of working strength. [This has been tried by Mr. Van Arsdale at Douglas, with good results.—EDITOR.]

The dust and colloidal matter resulting from the crushing in the rolls are separated upon a revolving disk, around the periphery of which a gentle air current is drawn, and are collected in a Cyclone dust collector.

The details for an operating plant have not yet been worked out, the experimental plant being for the study of certain elemental features while at the same time getting data as to the physical and chemical characteristics of the mixed ores.

### Nevada Industrial Insurance Act Applied to Mining

BY ALBERT G. WOLF\*

The object of this act is the just compensation of injured workmen without recourse to law. The attainment of this object will promote harmony and good feeling between employer and employee, and eliminate the immense economic waste due to unnecessary litigation. By the terms of this act, both a direct accident insurance for the employees and an employers' liability insurance are created. A commission is appointed, invested with sufficient power to enforce the law, transact all business in connection with the act, provide offices and employ a secretary, stenographers, etc. The commission is composed of five members, the governor, state mine inspector, attorney general, and two commissioners; the last to hold office for four years.

All employers having two or more employees in their service come automatically under the terms of the act and are not liable to respond in damages by civil action for an injury occurring to any employee in the course of his employment, except in cases where injury is due to the absence of any safeguard or protection required by any statute, or to the removal of the same by the employer, or where injured is less than the maximum age prescribed by law for employment in the occupation in which he was engaged. All employees of employers coming under this act are likewise subject to its terms.

Either the employer or the employee, or both, may reject the terms in a manner prescribed. If the employer rejects, then in actions by an employee against employer for personal injury, it shall be presumed that the injury to the employee was due to negligence on the part of the employer, and the burden of proof shall rest upon the employer to rebut this presumption. If an employee rejects the terms while the employer accepts them, the employer shall have the right to plead and rely upon any and all defenses, including those at common law. If both employer and employee reject, the liability of the employer is the same as if the employee had not rejected. Either party having formally rejected the terms of the act may,

at any time, elect to waive the same by giving notice in due form.

No compensation is allowed for an injury caused by an employee's willful intention to injure himself or another, nor for an injury sustained while the employee is intoxicated. No contractor or subcontractor is entitled to receive compensation, but is deemed to be an employer.

Each employer must pay into the state treasury, on or before the fifteenth day of each month, a sum equal to a certain percentage of his total payroll for the preceding month. This shall constitute the state insurance fund, to be used for the benefit of employees and their dependents. Following is a schedule of rates for different classes of mining and metallurgical work and work directly connected with the mining industry:

RATES UNDER NEVADA INDUSTRIAL INSURANCE ACT	
Operation and Repair: %	
Mines other than coal, dredges, electric power plants, quarries, steam heating and power plants.....	0.025
Coal mines, stone crushers, smelters.....	0.030
Construction:	
Electric power plants, railroads (steam or electricity), chimneys, concrete buildings, road work with blasting; roof work; blasting.....	0.050
Iron or steel structures, wood tanks.....	0.040
Tunnels, bridges, trestles; carpenter work not otherwise specified.....	0.035
Shaft sinking; excavations not otherwise specified; blast furnaces; installations of machinery.....	0.030
Drilling wells.....	0.020

The above rates are subject to revision. The premium for any plant coming under any head may be increased if the work is found to be unduly dangerous, compared to that of other plants of the same class.

A partial list of compensations to employees and their dependents is as follows: For death, \$2000 to \$5000, depending upon earnings of deceased, and burial expenses, not to exceed \$125. For complete disability, 50% of average monthly wages, but not more than \$60, nor less than \$20 per month for 100 months, total amount not to exceed \$5000 (loss of both hands, both arms, both legs or both eyes, or any part thereof, is considered total and permanent disability). For loss of one arm, leg, hand, foot or eye, 50% of average monthly wages for a period of 50, 45, 35 and 25 months, respectively. For partial disability, one-half the difference between wages before and after injury which injured is able to earn thereafter, but not more than \$40 per month for a period not to exceed 60 months.

Compensation for an injury starts on the fifteenth day following the injury. No compensation is paid for the first two weeks' disability unless incapacitation covers a period of eight weeks or longer. Compensation may be converted, at the discretion of the commission, into a lump-sum payment, not to exceed \$5000 in any case.

Forms are furnished by the commission for use in case of accidents. Form 21 is to be filled out by the employer when accident causes loss of one day or more, and form 22 by the injured employee if incapacitated a sufficient length of time to claim compensation. Form 23 is for use by the attending physician, form 24 by the attending physician in case of death, form 26 by the undertaker in case of death, form 29 by the dependents or family of deceased in case of death (these last three forms to be acknowledged before a notary), and form 36 by the employer when injured employee is ready to, or has returned to work, or by attending physician when the injured person is ready to make claim for compensation, if he is still under physician's care. This act became effective July 1, 1913.

\*Mason, Nev.

## Otto von Graeve, a Modern Dowser

The New York *Sun* recently reported the following: Prof. Otto Edler von Graeve, president of the Internationalen Vereins der Rutengänger, the International Divining Rod Association, arrived yesterday by the *doppelschraubensalonpostdamfer* "George Washington." Not to be outpolysyllabled by the liner, the professor alluded to himself as the "*wuenschelrutenforscher* in Deutschland." He explained in English that this was equivalent to saying that he was the most expert divining roddist in Germany. The professor brought his rods with him. Some are for locating gold and silver, some for water, some for iron, and the latest of all is for radium. He says the occupation of finding subterranean waters, metals and oil is nerve racking. When he starts in searching for buried treasure, he says, his pulse is 75, and when his nerves begin to vibrate it goes up to 120 and stays there until the rod does its work. The professor says he has discovered oil in Rumania and gold in Africa and that he is under contract to find radium in the West.

The following interesting account of him was later given by the New York *Sun* in its characteristically excellent style. We are also indebted to the *Sun* for the pictures.

Otto Edler von Graeve, divining-rod expert, who has come over here to locate radium, told a visitor something about himself at the Hotel Astor yesterday afternoon and then illustrated his skill with the rod by bringing it near a gold coin that lay on a mahogany chair. The rod flipped over so viciously as to leave a dent in the mahogany.

Any inclination to believe that Herr von Graeve twisted it over with his fingers vanished at the sound of the blow and the impression made on a reasonably hard piece of wood.

The gold coin was a 10-mark piece, German money, worth about \$2.50. First Herr von Graeve placed the coin on the carpet. Then he strapped around his stomach a leather belt wadded 2 in. thick in front with heavy felt. He explained that this was to protect his stomach when the rod came swishing toward him.

The German expert has no less than 17 divining rods of various metals, but he has brought only three with him to America. One of these, the "finder," an inch thick piece of iron with a kink in the middle of it, he selected for the experiment. He held it tightly with his left hand at one end and the other end lay loosely between the fin-

gers of his right hand. He advanced toward the gold coin.

### WORKS IN ALL DIRECTIONS

He was nearly over it when the rod whipped over and struck his safety belt a hard thump. Herr von Graeve tried it again from the other side and the same thing happened. Then he put the coin on the edge of the chair, with the result already told. The rod hit the chair with a sound like a pistol shot a yard away.

Herr von Graeve suggested that the visitor try it, and he did, but for him the rod turned not at all. But just to show that his own skill was infallible in spite of a heavy handicap Herr von Graeve took one end of the rod in his right hand and bade his visitor grip the other end as tightly as possible in an effort to keep the rod from



OTTO VON GRAEVE, WITH HIS DIVINING ROD

turning. Intermediately hands were clasped, and then an advance was made upon the gold coin. In spite of the visitor's efforts the rod turned slowly over, pointing inward.

That seemed convincing that Herr von Graeve was speaking the truth when he said:

"You have no skill and I have much, so you are not able to do more than retard my control of the rod. The difference is one of nervous makeup. So far as it can be determined now I am susceptible to radioactivity—to the alpha, beta and gamma rays discovered by Herz. You are not.

"Our present guess is that there is a continuous current of these alpha, beta, gamma and other rays—radioactive waves—flowing up from underground. Where there is water, oil, gold, silver, or other mineral under the

earth's surface the flow up of the radioactive waves is disturbed. Either it is stopped entirely, or the waves are swung out of their course. That is because water, oil and the minerals are nonconductors of these waves."

ALSO TRUE OF RADIUM

"And is this true of radium?"

"Yes, radium, too, interferes with the alpha, beta and other waves," Herr von Graeve made answer. "I have never deliberately set out to find radium before, although I have incidentally noted its presence while at work in Austria, but I am sure that if there is any radium in your West, where I am going, I will find it. Nor will it take long. I leave in the morning and I will be back here, my work done, in three weeks.

"Where am I going? I wish I could tell you, but I may not; nor may I say who I am working for. It is, however, a German organization."

An American expert said a week ago that no Europeans as yet own radium-bearing lands in this country.

Herr von Graeve, who is of a noble family dating back to 1400, he says; and who, therefore, writes "Edler" in the middle of his name, is 41 years old, bald, with a black beard, a pleasant but excitable manner, and back at home a wife and seven children. His farm is in the Harz Mountains, in Anhalt. He has practiced with the divining rod only for the last seven years.

Besides his familiar iron rod used to "find" substances Herr von Graeve uses an aluminum rod, the handles of which are much more nearly in a straight line than are those of the iron rod. This aluminum rod is to discover the depth at which the oil, water or mineral lies. To show how it works Herr von Graeve made some experiments in the north corridor of the second floor of the Astor.

EXPLORES UNDER FLOOR

First he used the iron rod to find out that water was flowing somewhere under the floor of the bedroom corridor in a direction diagonal to that of the hall. But was it water? Herr von Graeve approached from the opposite direction and soon "bounded" his hidden substance. It was only about two yards wide and the expert decided that it was not a stream of water, but a series of cables carrying electricity. Now he took his aluminum rod to find out how far down the cables lay.

First he hovered over the spot beneath which the cables were. Then he went down toward the other end of the hall and began slowly to approach the point where he stood directly over the cables. The aluminum rod swished over while he was yet a good way off.

From this point the expert paced the distance to the spot right over the cables. It was 66 strides and he said that the electric cables must lie approximately 66 m. below him. The hotel folk said afterward that this was quite possible; just how exact Herr von Graeve's determination was could only be told by the engineers of the building.

Herr von Graeve is not a university man and does not like to be called "Professor." He says that the divining rod is taken with the utmost seriousness in Germany and showed the register of a recent convention at Halle called to clear up questions concerning the rod. In the register were the names of professors of almost every German and Austrian university, some of them very well known.

Herr von Graeve has written a book called "Meine Wuenschelrutentaetigkeit," which means "My work with

the divining rod," and this is being translated into English. In it the German expert gives the results of 402 jobs he undertook, in 93.12%, of which he says he was successful and in 91% of which the water, oil, or mineral was found at the depth he announced beforehand. His work has taken him from Germany to Roumania and Russia, and he has been hired often to locate nitrate deposits useful as fertilizers.



Holding Companies

Discussing the contemplated legislation prohibiting holding companies, the *Sun* remarks that the holding company represents a method of doing business that is absolutely necessitated by the diversity of the state laws of the United States and by the laws of foreign countries, and cites some examples from the metallurgical industry.

One of these is the Amalgamated Copper Co., which sells \$30,000,000 worth of copper each year in Europe and in parts of the globe outside of the United States. If the company, for instance, were to do business directly and in its own name in England it would have to subject itself to all the minute regulations of the English corporation law just as if it were a domestic English corporation. The burden of complying with these regulations, even as mere routine, would be so great as substantially to bar it from England; but a greater difficulty still would be the fact that the company would be subject to the high English income tax upon its entire business as a company. If the company were to do business in England through a middleman, his commission would be so large as to make the business in great degree unprofitable. Therefore, the company's only recourse is to do business in England through a small organization established for the purpose, owned entirely by the Amalgamated interests and run substantially as a branch of the Amalgamated company. The same state of affairs applies to other countries besides England; and it is obvious that the Amalgamated company can transact its foreign business as a profitable commercial enterprise only in the manner described.

Another instance that occurs out of scores that might be selected is that of the International Nickel Co., one of our great corporations, that mines its ores in Canada and smelts them in a splendid plant which it has lately erected in New Jersey at a cost of over \$8,000,000. The Canadian laws as to foreign corporations are such that the company is compelled to do its mining business there through a subcompany organized in Canada. If the International Nickel Co. could not exist as a holding company it would have to go out of business.

These illustrations, says the *Sun*, show what a grievous thing it is proposed to do.



The British Mint in the Year 1913 turned out a larger number of pieces than in 1912, but the value was less, owing to the smaller proportion of gold coins. The statement is as follows:

	Imperial	Colonial	Total
Gold coins .....	30,633,962	.....	30,633,962
Silver .....	32,296,527	16,905,000	49,201,527
Bronze .....	87,158,672	6,169,000	93,327,672
Nickel .....	.....	12,281,760	12,281,760
Total .....	150,089,161	33,355,760	185,444,921
Total, 1912 .....	162,493,688	8,622,130	171,115,818

The total value of the gold coins in 1913 was £27,180,082; silver, £1,934,354; bronze and nickel, £214,525. During the year £2,363,031 in gold and £667,390 in silver were withdrawn as being light weight.

# Status and Plans of the Alaska Juneau Gold Mining Co.

BY ROBERT A. KINZIE\*

**SYNOPSIS**—Outline of the mining and milling plans of the Alaska Juneau company. Ore will be brought through raise and tunnel from Silver Bow Basin to a point on Gastineau Channel above Juneau for treatment. Will be passed through two crusher houses before distribution to stamps. Treatment will probably include stamping, amalgamating, concentrating and cyaniding. A 10-stamp pilot mill will be used to determine the method for the permanent plant. Character and value of the deposit.

In the issue of the JOURNAL of Nov. 29, 1913, there were published two plats, one showing an outline of the present property of the Alaska Juneau Gold Mining Co., together with the position of its water rights, flume lines, power-transmission lines, etc., and the second showing in greater detail the proposed position of the various buildings and improvements constituting the milling plant. The plans and operations thus illustrated were determined upon as the result of a number of years of careful study and experiment.

## DEVELOPMENT AND HANDLING

On account of the climatic conditions and the situation of the old workings in Silver Bow Basin, it is impossible to carry on milling operations even in small units for more than five or six months during the year; for this reason and others the milling plant has been located on the navigable waters of Gastineau Channel and connected with the mine by a system of tramways operating on the surface and through tunnels. The most important tunnel, known as the Gold Creek, starts at a point on Gold Creek, about two miles back of the town of Juneau and at an elevation of 420 ft. This tunnel crosscuts the entire formation in which the Alaska Juneau lode occurs, starting in the greenstone foot wall, crossing the orebodies and entering the schist hanging wall. It has been driven a distance of 6538 ft. The general dimensions of the tunnel are 8 ft. in width and 9 ft. in height; it is to be used as the first main adit and haulageway for the mine. At a point in this tunnel 6430 ft. from the mouth an inclined raise has been started to connect with the surface workings of the mine in Silver Bow Basin. Fig. 1 shows the general dimensions and equipment of this raise, which when finished will be about 800 ft. long.

While the work in the raise is under way, a 40-stamp mill, which will be part of the first unit of 150 stamps, is being constructed and will be ready to crush ore as soon as the raise is connected through to the floor of Silver Bow Basin and the first stopes started from the Gold Creek tunnel. The 40 stamps are divided into two sections; the primary object of 30 stamps is to crush ore for a profit; 10 stamps are to be used as a pilot or experimental unit, which is arranged according to the flow sheet illustrated in Fig. 4. The object of the 10 stamps is to determine the accuracy of the sampling and assaying of the ore cut by the Gold Creek tunnel and to expose any defects, if they exist, in the flow sheet as at present

determined upon. The lode where cut by the main tunnel has an actual thickness of about 500 ft., with an average assay value of about \$2 per ton. It is believed that this width and value will persist for some distance both longitudinally and vertically. This belief is based upon the results of a 30-stamp mill working five months each year for the last 15 years on ore mined by openpit work along the croppings of the lode. Confidence in the persistency of the lode and its value is also based on milling results obtained by the small Ebner mill on a continuation of the lode westerly into the Ebner property, and by the milling results obtained by the old 100-stamp Perseverance mill on the continuation easterly into the Perseverance property. From the ore so far developed it is believed that it will be possible to obtain a recovery of \$1.70 per ton, at an average cost of about 80c. per ton when handling from 6000 to 12,000 tons per day.

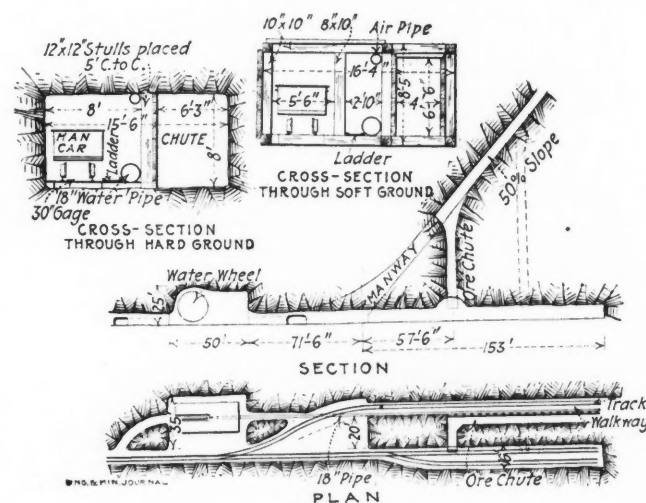


FIG. 1. RAISE FROM GOLD CREEK TUNNEL

The Alaska Juneau ore will be mined by openpit and underground stoping; during five months of the summer openpit work can be resorted to. The cropping of the vein is peculiarly adapted to this method, as it is situated on the steep hillside above the collar of the main transfer raise from the floor of Silver Bow Basin to the tunnel. The ore will be broken by bank blasting and transferred to the raise, where it will be crushed and roughly sorted in what is known as the No. 1 crushing plant. This plant will contain one 36x48-in. Buchanan jaw crusher followed by a secondary crusher of the gyratory type, a trommel and sorting belts. The ore thus broken will be transferred through the raise to Gold Creek tunnel, where it will be loaded into cars and taken direct to the stamp-mill bins. During the summer as well as the winter months, stoping will be carried on underground, both for the purpose of storing up broken ore for the winter period and for supplying additional ore for the mills. The method to be adopted for breaking the ore underground will be a combination of the caving and shrinkage systems; the predominant method will depend on the character of the

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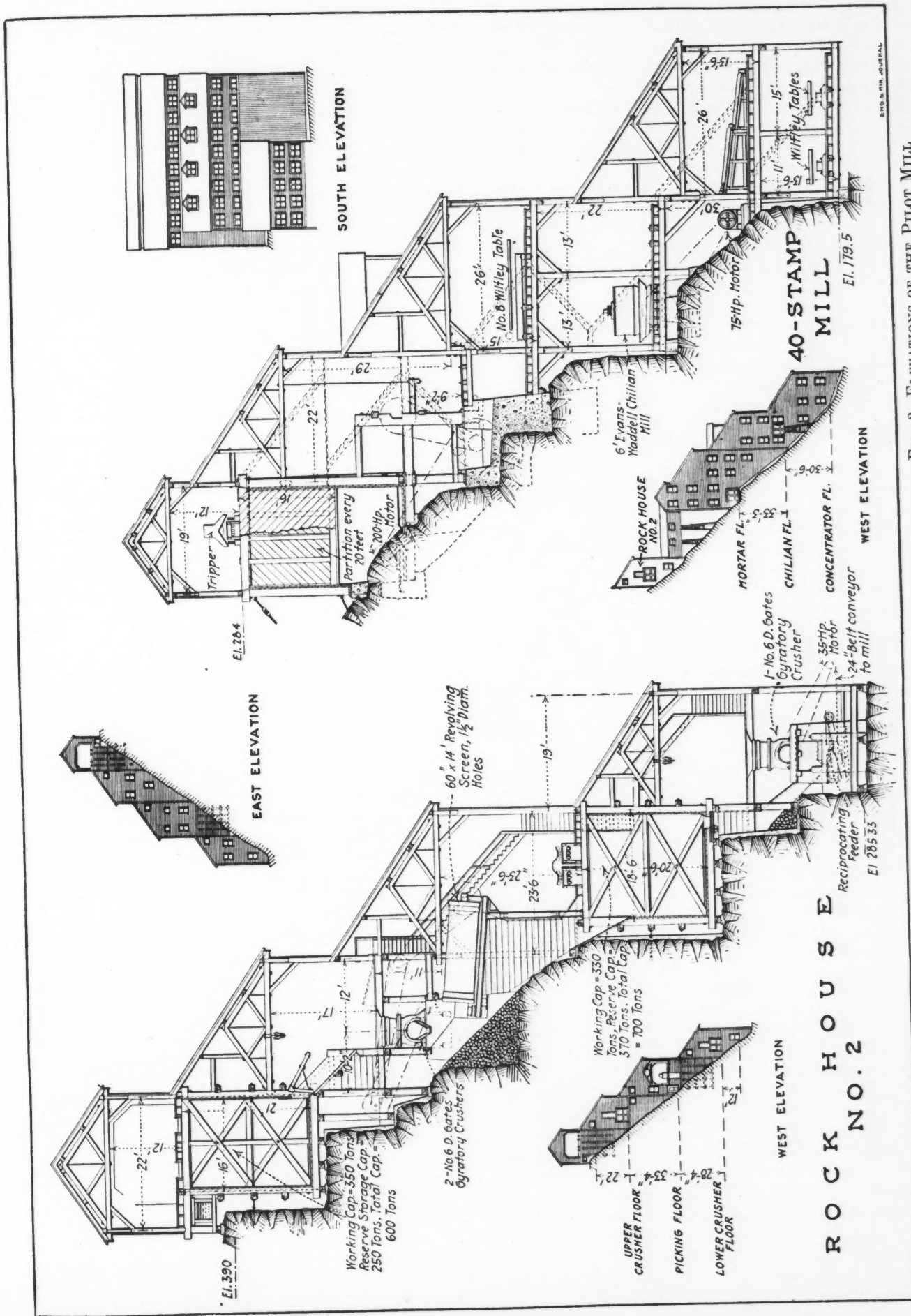


FIG. 3. ELEVATIONS OF THE PILOT MILL

FIG. 2. ELEVATIONS OF THE CRUSHING HOUSE

ore in which the particular stope is being opened up. In the openpits there should be obtained a high duty per machine-drill shift, with a low consumption of explosives and a low labor cost. In the underground stopes while the duty per machine will not be so great as on the surface, it will yet be much greater than the duty now obtained in the Douglas Island mines, where the shrinkage system is used to the exclusion of all other methods. These results can be obtained, because the ore in the Alaska Juneau vein is much more friable and has entirely different physical characteristics from that of Douglas Island. The ore broken from the underground stopes will be loaded through chutes, which will be a combination of the finger chute used on Douglas Island and the arc-type chute used in the soft-ore mines. Bottom-dump cars of a capacity of  $3\frac{1}{2}$  tons will be used for the first unit, but plans have been perfected for a 12-ton car, which will handle the ore much more economically directly to the No. 2 crusher house.

The motive power for hauling ore trains from the mine to the No. 2 crusher house will at first be a 10-ton gasoline locomotive, but as soon as the first milling unit is completed, electric locomotives of the overhead trolley type will be installed. The tramway and electric haulage thus outlined will be sufficient to supply ore to the first two units of 150 stamps each, but when the two final units are completed it will be necessary to have a second means of obtaining ore from the mine. For this reason a tunnel has been started from tide water on Gastineau Channel to intersect the ore-body at a point about 400 ft. below the lowest developed ore in the mine. The distance from the beach where the tunnel starts to the point where it will intersect the Alaska Juneau vein is about 9500 ft.

#### NO. 2 CRUSHER AND THE STAMP MILL

The ore hauled from the mine will be delivered to the No. 2 rock house, shown in detail in Fig. 2. The ore is dropped into bins which feed directly into gyratory crushers, it then passes to revolving screens, the undersize being sent to bins which feed into the mill conveyor, the oversize delivered to sorting belts. While the slate and metagabbro themselves assay from 20c. to 80c. per ton, the principal value of the ore is contained in the white quartz stringers. As the ore passes through the screens it will be thoroughly washed, making it a relatively easy task to sort out by hand the white quartz from the black slate and metagabbro, and by this method it is believed

that at least 20% of the slate or waste material can be discarded before it reaches the stamps, thus increasing the duty of the stamps, and raising the value of the ore fed to them. The ore obtained from the sorting belts is dropped through chutes to a bin which feeds into a No. 6 D Gates crusher; this discharges on the belt conveyor, which carries the ore to the distributing conveyor over the stamp-mill bins.

Fig. 3 shows a section of the 10-stamp pilot plant being installed at the west end of the first 150-stamp unit. The crushed ore from the mill bins passes over shaking feeder screens where the material under  $\frac{1}{4}$  in. is screened and washed by means of water sprays. The over-size is fed to the stamps and crushed through  $\frac{1}{4}$ -in. screens. The undersize from the feeder screens joins with the product from the stamps and is delivered to a classifier where the slimes will be taken off and sent to a slime plant. The coarse product from the classifier will be delivered to two Wilfley roughing tables which will make two products, one product being sent direct to waste, and the other to a Chilean mill. After fine grinding in the Chilean mill the ore goes to a three-spigot classifier, the slime from which goes to the slime plant and the product of each spigot to a separate amalgamating table. The tailing from each amalgamating table goes to a separate Wilfley concentrating table, the concentrates from which go to the cyanide plant and the tailings to waste. I do not mean to convey the idea that the above indicated process is to be the one finally adopted for all of the mills, but it is the one that will be adopted in the pilot plant, and from the results of this work the final method will be determined upon.

The power for operating the mill will be partly water power obtained from Gold Creek and partly electric power. An auxiliary plant of 1000 hp. is being constructed on the ground, so that a deficiency in any one of the supply stations can be made up. It will be equipped with both steam and water-operated generators, to be used either singly or together, depending upon the time of the year and the demand. One of the most vital requirements in operating a mill of the capacity of the final units as now determined upon for the Alaska Juneau is a cheap method of disposing of the tailings. The sorted waste from the No. 2 crusher plant will be sluiced on barges, which will be in turn towed out to the deep water and dumped. The final tailings from the mill will be deposited locally to the extent of the available storage which the company now owns along the shore of Gastineau Channel. As the mill tailings are discharged at a point 170 ft. above salt water, it will be a simple matter to convey these tailings long distances both up and down the shore of Gastineau Channel. When the storage capacity of the tailings pond located near the mill is eventually filled, there can be utilized additional storage space which the company owns on Gastineau Channel, beyond Sheep Creek.

Battery water for the mill will be obtained from two sources, namely, fresh water from Gold Creek during the greater part of the year, and salt water pumped by means of electrically driven two-stage centrifugal pumps for the remaining portion of the year when fresh water is scarce, due to freezing; the latter will supply not only sufficient water for battery purposes, but for fire protection as well. A contract has been entered into with the city of Juneau, whereby the company's property within the incorporated limits is exempted from taxes in return for furnishing a supply of fresh and salt water for fire protection.

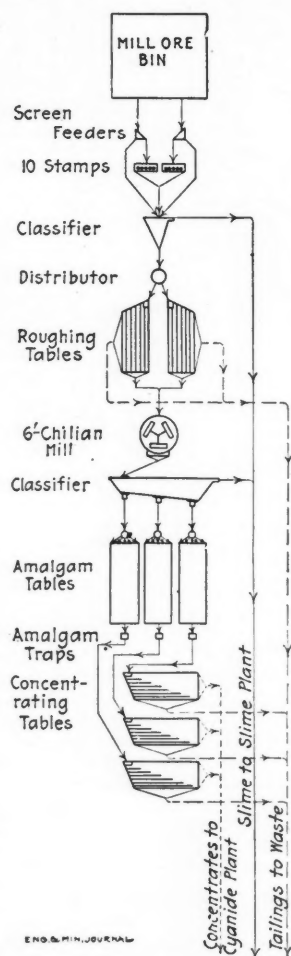


FIG. 4. FLOW SHEET OF PILOT MILL

### Who Sells the Copper

The *Boston News Bureau* gives the following statement of the copper production coming to American refineries at the present time and the distribution of the refined product among the several selling agencies.

#### AMERICAN SMELTING & REFINING CO.

	Pounds
Company's own product.....	120,000,000
Cerro de Pasco.....	45,000,000
Utah Copper Co.....	119,000,000
Nevada Consolidated.....	64,600,000
Tennessee Copper Co.....	17,500,000
Ray Consolidated.....	53,000,000
Chino.....	53,500,000
Mason Valley.....	14,600,000
Ohio Copper.....	7,400,000
<b>Total.....</b>	<b>494,600,000</b>

#### UNITED METALS SELLING CO.

Anaconda and North Butte.....	271,000,000
Copper Range.....	30,000,000
Arizona Copper Co.....	45,000,000
Tooele smelter.....	10,000,000
Greene-Cananea.....	45,000,000
Giroux.....	5,000,000
Pennsylvania Salt Mfg. Co.....	6,000,000
Imports.....	30,000,000
<b>Total.....</b>	<b>442,000,000</b>

#### PHELPS, DODGE & CO.

Copper Queen smelter.....	132,000,000
Detroit Copper Co.....	22,000,000
Calumet & Arizona.....	55,000,000
<b>Total.....</b>	<b>209,000,000</b>

#### AMERICAN METAL CO.

Old Dominion Copper Co.....	30,500,000
Shannon Copper Co.....	13,700,000
Granby.....	21,300,000
Imports and miscellaneous (including Ducktown).....	56,000,000
East Butte.....	14,400,000
Teziutlan and Torreon (Mexico).....	9,000,000
<b>Total.....</b>	<b>144,900,000</b>

#### L. VOGELSTEIN & CO.

United States Smelting Co.....	20,500,000
Imports.....	69,500,000
Orford Copper Co.....	18,800,000
United Verde Copper Co.....	35,600,000
<b>Total.....</b>	<b>144,400,000</b>

#### E. P. EARLE

South Utah Mines and Smelters.....	1,700,000
Mexican imports.....	1,000,000
Japan imports.....	4,000,000
South American imports.....	3,000,000
<b>Total.....</b>	<b>9,700,000</b>

#### BEER, SONDEHEIMER & CO.

British Columbia Copper Co.....	8,500,000
Cuba Copper Co.....	6,000,000
Miscellaneous.....	4,000,000
<b>Total.....</b>	<b>18,500,000</b>

#### CALUMET & HECLA (LAKE COPPER)

Calumet & Hecla.....	50,000,000
Osceola.....	10,368,000
Allouez.....	4,014,000
Ahmeeek.....	8,685,000
Superior.....	2,086,000
Tamarack.....	4,059,000
Isle Royale.....	3,660,000
Centennial.....	1,244,000
<b>Total.....</b>	<b>84,116,000</b>

#### ADOLPH LEWISOHN & SONS

Miami Copper Co.....	33,250,000
Shattuck-Arizona.....	13,200,000
<b>Total.....</b>	<b>46,450,000</b>

#### DIRECT BY PRODUCERS (LAKE COPPER)

Quincy Mining Co.....	12,000,000
Wolverine and Mohawk.....	10,085,000
Franklin.....	1,000,000
Mass.....	1,300,000
<b>Total.....</b>	<b>24,385,000</b>

#### W. PARSONS TODD

Winona.....	1,500,000
Lake Copper Co.....	800,000
Victoria.....	1,700,000
<b>Total.....</b>	<b>4,000,000</b>
<b>Grand Total.....</b>	<b>1,622,051,000</b>

### Mr. Shaw on the Mine-Strike Inquiry

The following statement was made on Jan. 28 on behalf of Quincy A. Shaw, president of the Calumet & Hecla Mining Co., respecting the proposed Congressional inquiry into the Michigan copper strike:

I regret and resent the Congressional resolution directing an investigation of the Michigan copper strike. I regret it because its only effect will be to prolong the present semblance of a strike until the investigation is concluded. I say semblance because our mines are today employing over 7000 men, as compared with about 8000 just before the strike, and the handful of strikers who remain are delusively persuaded not to work for us or any one else to their own continuing loss and the injury of their families.

We will never recognize or deal with the Western Federation of Miners, not because of antagonism to labor organizations as such, but because we cannot in justice to ourselves, our men or the community, deal with an organization possessing an established reputation for inciting disorder, dissension and violence.

At the very time when 1500 strikers were relying on the political influence of the American Federation of Labor to force this inquiry against the law and the facts, 11,000 miners and 50,000 inhabitants of the copper country have been and are petitioning the operators not to recognize the Western Federation or even employ its members and thus permit it to become a permanent menace to the hitherto undisturbed peace and prosperity of that community.

I resent the inquiry, not because myself and associates will not cheerfully afford every facility to get the facts, but because the terms of the direction which Congress gives in the resolution are unfairly aimed at one side of the controversy and exclude from any form of allegation or investigation the notorious disorders and bloodshed inspired by the leaders of the strike and directly presented to the Department of Labor in the gravest terms by the findings of the by no means impartial ex-union officials who spent many weeks inquiring into this very condition and whose report to the Secretary of Labor has never been read by the Congress which directs this repetition of the Department's inquiry.

I resent it further because of the subterfuge by which conditions never alleged by our bitterest critics have been deliberately pleaded to give the semblance of a Federal question.

No charge has been made which the courts are not competent to investigate. No court of the State or of the United States has been closed. No man, striker or strike leader, has charged a violation of his rights of Federal citizenship in a court of the United States to a Federal District Attorney or the Department of Justice. No one has dared to prefer in those appropriate places a single one of these charges. Now Congress proposes to abandon its functions as a legislative body and investigate them as a Grand Jury.

Competent lawyers of the Democratic Rules Committee could find no Federal question, but a power greater than reason forces by telegraphic appeal and personal solicitation the conduct of an investigation which the judgment of the leaders of the Democratic House, expressed in the debate upon this resolution, rejected.

We have nothing to conceal. We shall give to the committee every facility to ascertain every fact, but we hope in the interest of justice and fair play that this committee will so familiarize the American people with the character and methods of the Western Federation of Labor that they will understand why an entire community of thousands of citizens petition the directors of their basic industry to exclude such an organization from their midst.

# Graphic Solution of Slag Composition

By DONALD M. LIDDELL\*

The accompanying diagrams are offered to simplify the determination of the type of a slag. They are all calculated to a basis  $FeO + CaO + SiO_2 = 90\%$ , and in their use, the silica will be found the best constituent to go by. It should be noted the silica decreases from diagram No. 1 to No. 6, the first diagram representing a metallurgical "bisilicate," the sixth a "monosilicate," while the other diagrams show various intermediate degrees.

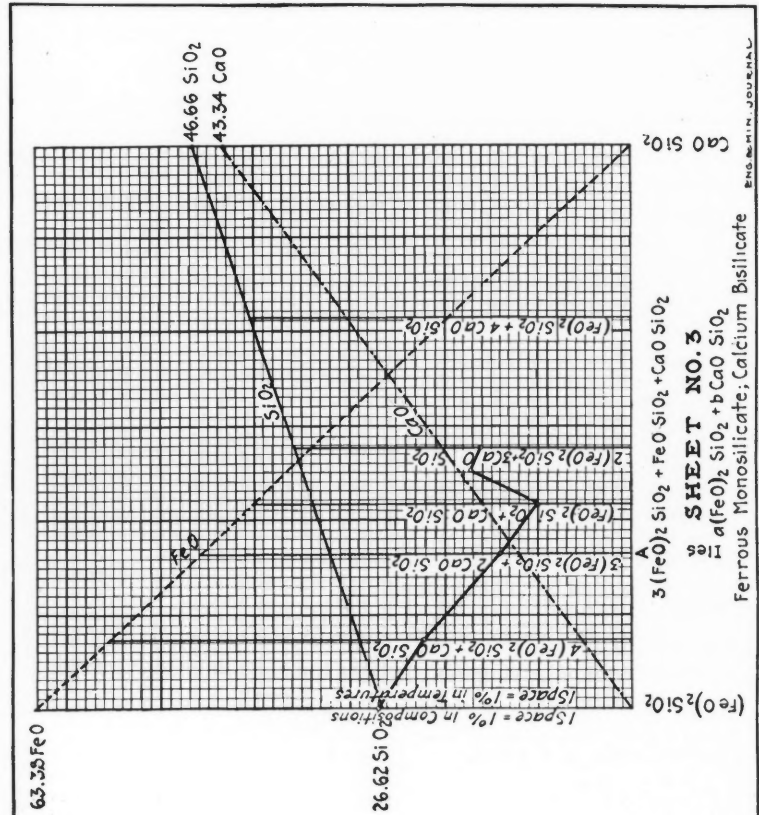
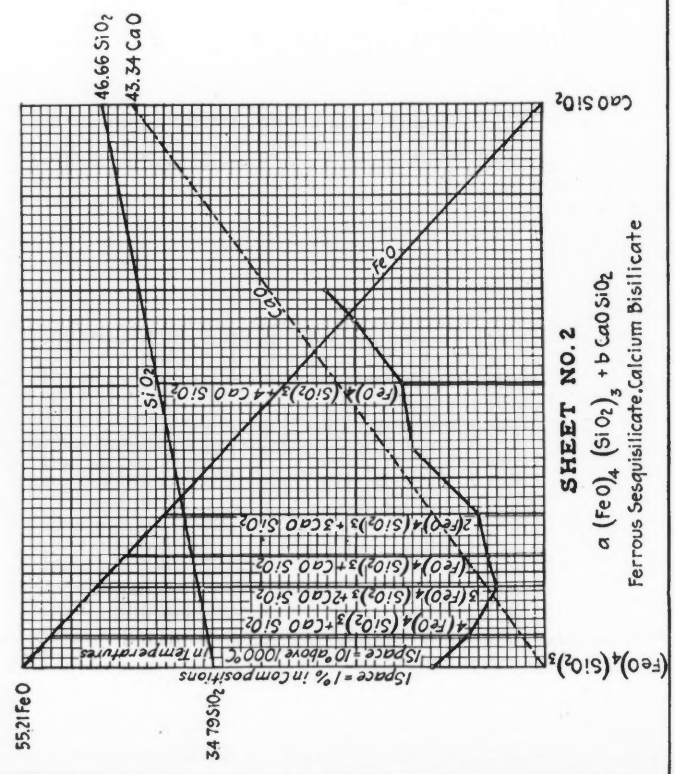
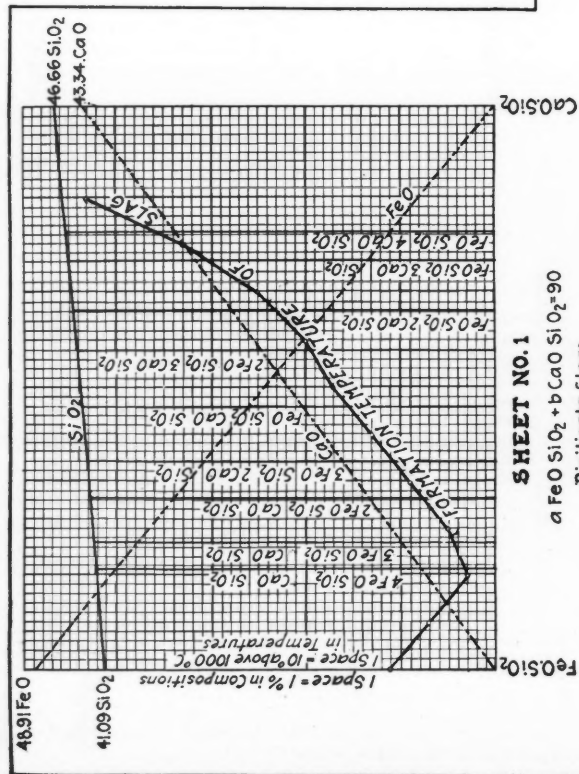
As an example, take a slag  $SiO_2, 34; FeO, 32; CaO, 24\%$ . It can immediately be seen that the slag cannot lie upon diagrams 1 or 2. For  $SiO_2 = 34$ , diagram 3 shows  $FeO = 40$ , which rules that out. Diagram No. 4 also represents impossible conditions. Diagram 5 shows  $SiO_2 = 34; FeO = 29.4; CaO = 26.6$ ; which shows the slag is approximately a ferrous monosilicate and a calcium sesquisilicate, and incidentally very close to a favorite lead slag of Raht. (Various metallurgists' names will be found under certain slags which were their preference.)

Diagram 7 represents some high alumina slags. I find in my records simply the notation that "any alumina slags of these compositions are recommended." I do not know by whom, so I cannot give credit. I have compared these with certain highly successful Arizona slags carrying high alumina,

\*Associate editor, "Engineering and Mining Journal."

and they compare closely with these recommended formulas.

There is a supplementary line showing formation temperatures; the figures are, I believe, by Hofman and by Fulton, but I am not certain of this. They are, at any rate, useful figures since reference to them will often show how a slight change in composition will give an easier



DIAGRAMS FOR THE QUICK DETERMINATION OF SLAG TYPES

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running slag. On Sheet No. 5 the curve of formation temperatures is not plotted in, as the data given seemed insufficient. However, four circles will be found, one near the line  $4(\text{FeO})_2\text{SiO}_2 + (\text{CaO})_4(\text{SiO}_2)_3$  the others on

Raht's slag, on  $(\text{FeO})_2\text{SiO}_2 + (\text{CaO})_4(\text{SiO}_2)_3$ , and on  $2(\text{FeO})_2\text{SiO}_2 + 3(\text{CaO})_4(\text{SiO}_2)_3$ , which will give some indication of the formation temperatures of these slags. For convenience in slag calculation a table of the molecular weights of various acids and bases is appended (figured on the basis of  $O = 16$ ), which I have also found useful.

MOLECULAR WEIGHTS OF ACIDS AND BASES

$O = 16$ . BASES

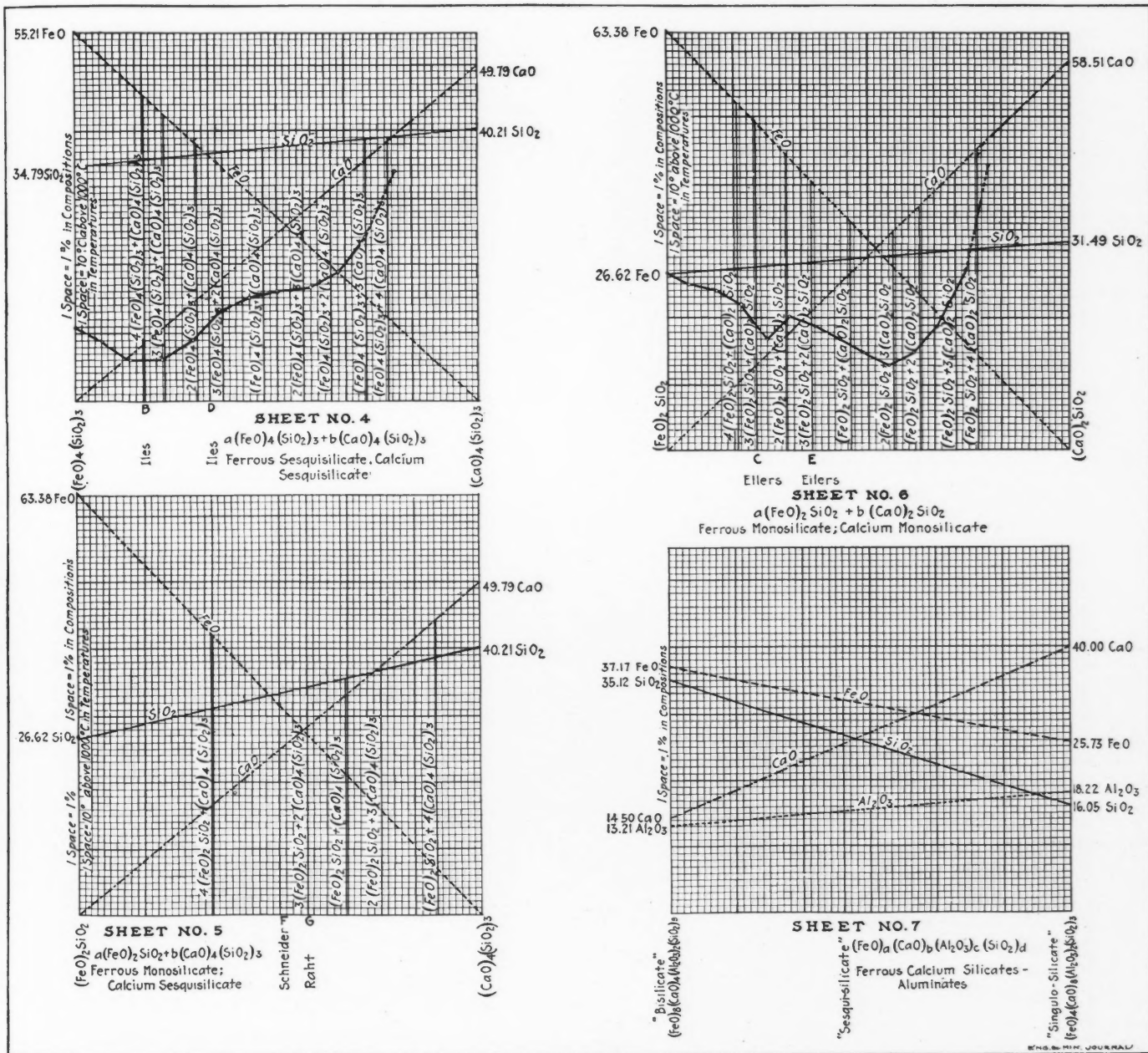
Radical	Mol. Wt.	Log
MgO	40.36	1.60595
CaO	56.1	1.74896
Na <sub>2</sub> O	62.1	1.79309
MnO	71.0	1.85126
FeO	71.9	1.85673
K <sub>2</sub> O	94.3	1.97451
SiO	103.6	2.01536
ZnO	106.6	2.02776
Cu <sub>2</sub> O	143.2	2.15594
BaO	153.4	2.18583
PbO	222.7	2.34772

ACIDS

Radical	Mol. Wt.	Log
Al <sub>2</sub> O <sub>3</sub>	102.2	2.00945
B <sub>2</sub> O <sub>3</sub>	70.0	1.84510
P <sub>2</sub> O <sub>5</sub>	142.0	2.15229
SiO <sub>2</sub>	60.4	1.78104
TiO <sub>2</sub>	80.1	1.90363

If a complete slag analysis is available, it may be worth while to figure how much silica is combined with the magnesia, and make this deduction before using the diagrams. In general, since alumina is nearly always present, and since it is usually impossible to say whether it is acting as base or acid, this refinement is unnecessary.

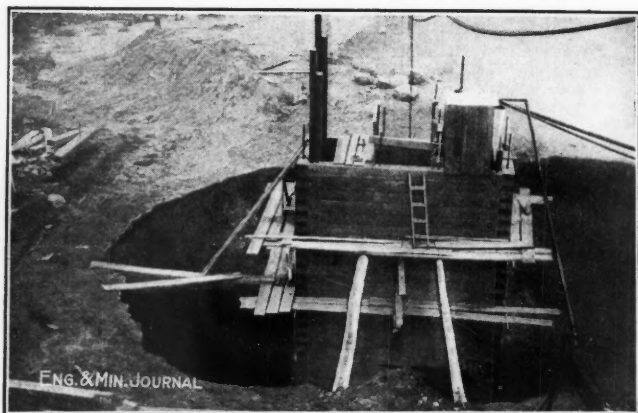
It is almost unnecessary to say that in this article the terms bisilicate, sesquisilicate, etc., are used in their metallurgical, not their chemical significance, that is, the terms indicate oxygen ratio between acids and bases, not the ratio of the radicals themselves.



DIAGRAMS FOR THE QUICK DETERMINATION OF SLAG TYPES

## The Wakefield Property on the Gogebic

One of the most interesting events in several years on the Michigan iron ranges was the discovery of the Wakefield orebody, and the plans adopted for its development are no less interesting. The Gogebic ore formation, in its general easterly and westerly trend, makes a bulge at the town of Wakefield and until recently the only mines worked were those along the northern edge of the formation. R. S. Rose, of Marquette, held that orebodies also existed along the southern edge. One company was induced to drill in the vicinity on lands controlled by Mr. Rose and his associates. The drilling, however, against the wishes of Mr. Rose, was done about half a mile back from the contact and no ore was found. A second company, the M. A. Hanna, was later induced to drill close to the contact, according to the ideas of Mr. Rose and the great Wakefield orebody was found. This is commonly believed to contain 10,000,000 tons, although official figures are not forthcoming.



No. 2 DROP SHAFT

The occurrence of the ore, while apparently in a dike-and-foot-wall trough, as is usual on the Gogebic, is much nearer the surface than has been the case with other orebodies and for that reason it was decided to strip part of the property and mine it as a steam-shovel openpit. The illustration shows one of the two shovels at work in the first cut of the stripping, which is being done by Butler Bros. on contract. The water in which the shovel worked, promised to make the first cut an exceedingly expensive job. The pit will be a long, narrow one and is of particular importance as being the first pit in Michigan of any size in which the ore is loaded by shovels into standard railroad cars.

The maximum depth of overburden on the ore is 160 ft. The western end has the thinner covering and this is to be stripped; the eastern end will be mined by underground methods, and it is probable that the bottom of the ore in the western end will be finally extracted by milling or underground mining. The east end of the property is being developed with two shafts. Shaft No. 1 is a five-compartment shaft sunk by the ordinary hanging method. It was got through the quicksand and landed in rock only with the greatest difficulty. The sets pulled apart and the heaviest trussing of the surface bearers failed to hold. No. 2 shown in the illustration is a three-compartment drop shaft, lying some distance east of No. 1; it may be later enlarged. It was sunk by the

drop shaft method and at the time of visiting, was down almost to the rock which was believed to lie at 100 ft. A small central compartment was being spiled down to reach the rock. The cableway system was used for hoisting

Work was nominally started on the property on Jan. 1, 1913. Active work was not begun until March 1. No. 1



TAKING THE FIRST CUT IN STRIPPING BOGGY GROUND

shaft was sunk in spite of difficulties, 20,000 tons of ore hoisted and 16,000 tons shipped before December 1, this, of course, in addition to the tremendous amount of surface construction such as road and railroad building, change and power house erection, etc., together with the starting of the stripping work and the dropping of No. 2 shaft. This is remarkably good work.

## Petroleum at Panama-Pacific Exposition

BY LEWIS H. EDDY\*

The chief features of the petroleum exhibit at the Panama-Pacific Exposition will be working models of production and manufacture, a model of a developed oil field and field storage and processes of electric water-oil separation. The developed field model will be drawn to scale and will show surface details and strata of the formation, and other characteristics of some California field with full-size drilling wells in operation, equipment for handling high pressure and large flows of oil and gas, and equipment for conserving oil and gas under low pressure and small flows, together with working models of pumping and flowing wells. The storage systems will be shown by models of tanks for collecting oil from flowing wells, vacuum systems for drawing off vapors, and methods of protecting against loss by lightning.

The manufacture of the various petroleum products will be demonstrated by a working model of a battery, probably 10 stills of 50 gal. each, which, running continuously, will make 15 to 20 cuts, producing gasoline, gas oil, fuel oil, heavy naphthas, heavy fuel oils, and various other products. There will be a compressor installation showing the method of producing gasoline from natural gas.

**Chilean Mineral Exports in 1912** were: Borate of lime, 43,541 tons, of which 15,304 to the United Kingdom, 15,204 to Germany, 8288 to France, 2667 to Belgium, and 2078 to the Netherlands; copper, 34,854 tons, of which 20,830 to the United States and 12,877 to the United Kingdom; copper ore, 84,169 tons, of which 47,571 to the United Kingdom and 35,959 to the United States; copper and gold ore, 3516 tons, all of which went to the United Kingdom; iron ore, 6452 tons, of which 6400 went to France; iodine, 458,342 kg., of which 238,904 went to Germany, 154,490 to the United States, and 54,664 to the United Kingdom; nitrate of soda, 24,985,290 metric tons.

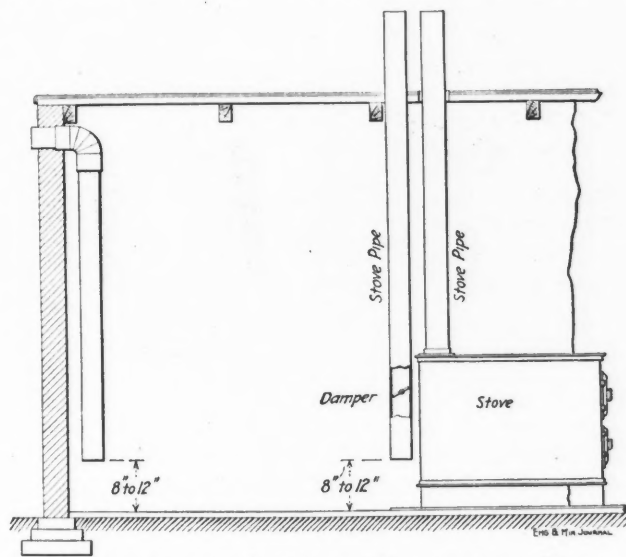
\*Editorial staff, "Eng. and Min. Journ.," 3430 Peralta St., Oakland, Calif.

# Details of Practical Mining

## Method of Ventilating Bunk-houses

By GEORGE S. ROLLIN\*

A device which has been used for a long time in logging camps for maintaining ventilation in the bunkhouses has been found equally effective in drilling camps. The stove is usually set near the center of the building; for the device in question, a secondary stove pipe is erected as close as possible to that of the stove, beginning 8 to 12 in. above the floor and extending through the roof; it is provided with a damper. In one corner of the building, a hole is cut through the wall, a short length of stove-



ARRANGEMENT OF AUXILIARY VENTILATING PIPES

pipe inserted, and connected with an ell to a downright section. This latter also extends to a point 8 to 12 in. from the floor. The pipe next the stove is heated and tends to draw up the air, thus adding to the amount of ventilation. The pipe from the outside carries the air to a point near the floor, so that direct draft is avoided, and the incoming air is also somewhat warmed before discharging into the room.

## Churn Drill Holes for Blasting

The Dittlinger Lime Co., of New Braunfels, Texas, has a side-hill quarry with a face about 50 ft. high and 240 ft. long. Formerly the drilling was done with tripod drills. Recently a No. 3½ Keystone blast-hole rig was installed (*Keystone Drill Magazine*, September, 1913). The top of the hill was rough, covered with boulders, ledges of unequal height and trees, unfavorable ground for the traction rig. In the first round of holes, about 50 ft. was drilled per day; the holes were 6 in. in diameter and

\*District superintendent, E. J. Longyear Co., Crystal Falls, Mich.

the depth 45 to 70 ft., always reaching a common level 5 ft. below the quarry floor. The holes were spaced a little close in order to be sure to break, being 10 ft. apart and 20 ft. back from the face. The 24 holes were shot at one time with 6000 lb. of 40% dynamite, 10 to 25 lb. at a time being dropped in the hole and tamped with a wooden plug 5 ft. long and 5½ in. in diameter; this was operated by a rope on a pulley in a light tripod erected over the hole.

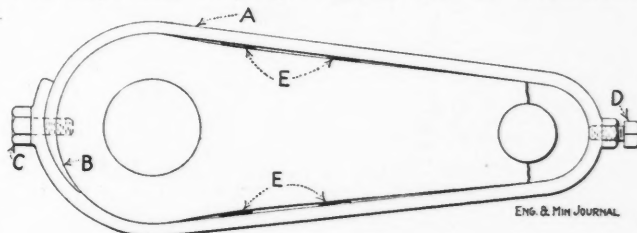
In succeeding work, one man at \$3 and one at \$1.50 were employed to run the drill; they drilled about 40 ft. per day. Fuel came to about \$5. About 300 to 400 cu.yd. was broken for a day's drilling, bringing the drilling cost to 31½c. per yd. During the first four months of 1913, the explosive cost was 6¾c. per ton.

The old equipment was five tripod drills and three hand drills. The present outfit is one churn drill, one tripod and one Jackhammer. The actual saving in costs is little, but the fact that sufficient broken rock is always available is a tremendous advantage. The blasts are set off about every three weeks.

## Repairing a Crank Web

By E. A. DIXIE

The article "Broken Crank Repaired with Wire," in the *JOURNAL* of Dec. 27, 1913, attracted my attention. I have had much experience in making repairs, with many tools, with few tools and sometimes without any tools at all, so I appreciate that without a list of those available, it is impossible to judge whether G. A. Robertson's



REPAIRED ENGINE CRANK WEB

method of repairing was good practice or not. Assuming that there were the usual tools, a ratchet brace, drills, taps and dies, hammer and chisels, center punch and some ordinary flat iron, a better way would be as follows:

A piece of flat iron, its thickness and width depending on the job and the available supply, is scarfed as at B and bent to fit the crank web. It is then placed over the broken parts and one or more holes, as many as the width of the web will allow, are drilled at C and tapped into the web.

The hole or holes through the flat iron are made a snug fit for the body of the tap bolts used. This band, though made as tight as possible, will still be too loose to hold the parts snugly together. It can, however, be

tightened in either of two ways. Wedges *E* may be driven in between it and the web or a hole or holes may be drilled and tapped at *D* and setscrews with check nuts on them screwed through the band and against the broken tip of the web. If wedges are used their thin ends where they pass beyond the flat iron band should be turned up to prevent the wedges from slacking back. In either case a hole should be drilled through both broken parts and the crank pin, and a pin driven in to keep the parts from shifting.

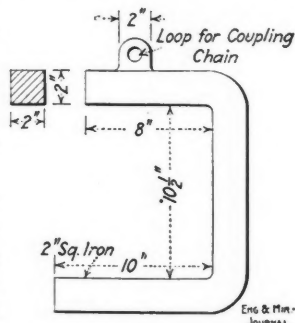
If a forge is available the job could be made as good as new by welding the band, heating it to a bright red heat all over and driving it on the broken web, while still hot. The band cooling will shrink and draw the parts solidly together. I have made satisfactory repairs to crank webs and similar parts by both the foregoing methods, but my only attempt to wind wire around a similar break was without success.

It would be interesting to know how G. A. Robertson managed to wind his wire so that the tension was uniform on all the strands. This is difficult even with simple cylindrical objects, such as wire-wound guns, and was, I understand, the principal cause which led to their failure and the abandonment of their manufacture. Years ago, in England, I was one of a squad engaged on the early experiments with wire winding, so I know to a certain extent whereof I write.

### Pulling Posts from Soft Ground

At the Central mine, Broken Hill, N. S. W., Australia, it is continually necessary to drive new crosscuts over those that have sunk in soft ore (Proc. Aust. I. M. E., No. 10, 1913). When labor was cheap, it paid to pull the old posts. This was performed as follows: A piece of 40-lb. railway rail about 7 ft. long was placed with its ends supported on two adjoining caps of the new timbering, and right over the posts, i.e., at the side of the crosscut.

Sufficient room for the rail was generally available in this position at the end of the cap and between the cap and the spiling "bridge" above it, but if not, the bridge was wedged up and one of the blocks used to support it knocked out, so making room for the rail. Over this rail a strong chain was passed and secured to a powerful screw coupling. If the post to be pulled stood out clear, a chain was hitched around it, but if the back of the post was hard against the side lagging, an iron collar, shown in the figure, was placed on the post and attached to the coupling by a chain; the diagonal pull on the collar caused it to grip the leg strongly. Then with a capstan bar, one man tightened the coupling, getting a pull of several tons, while his companion struck the post vigorously with a heavy hammer to loosen it. Some posts could not be recovered, but in most cases the method was successful.



COLLAR FOR GRIPPING POSTS

### Sheet-Metal Flumes

The wood flume, although cheap in first cost, is always unsatisfactory on account of the impossibility of making it water-tight, particularly after periods of non-use. Reinforced-concrete flumes usually give good service, but the cost of forms is an expensive item. Metal flumes are easily constructed, give satisfactory service, and are not extremely expensive in first cost. The wood flumes are the shortest lived, and the concrete, the longest; in first cost, the order is reversed. Metal flumes have grown rapidly in favor in the last few years, and are frequently used in irrigation practice.

There are five general types of semicircular metal flumes in use in the irrigated regions of the United States: (1) The rough interior (old Lennon), in which the metal sheet of the flume is corrugated transversely at regular intervals of a few inches; (2) the semi-rough interior (Maginnis) shown in Fig. 1, in which the general surface of the sheets is smooth, with small compression bands at the joints protruding into the water channel; (3) the smooth interior (Hess), in which the inside surface is perfectly smooth, (Fig. 1); (4) the smooth interior (Lennon) shown in Fig. 3; and (5) the smooth interior (Hinman) shown in Fig. 4.

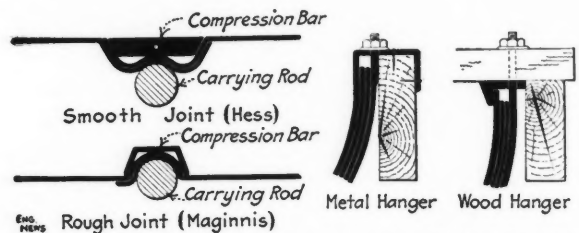


FIG. 1 - JOINTS & CARRYING RODS

FIG. 2 - METHOD OF SUPPORT

#### HESS AND MAGINNIS JOINTS

Owing to the difference in the smoothness of the interior surfaces of the types referred to, there is a difference in the value of *n* in Kutter's formula applicable to them. Tests made by the Reclamation Service gave 0.0157 for the Maginnis and 0.0116 for the Hess. The Lennon company gives 0.011 for its smooth type.

In all types, the trough is made of galvanized sheets of steel or some special corrosion-resisting metal, in widths sufficient to make the semicircular section of the flume, and in lengths of about 30 in. for the larger flumes and greater for the smaller. In forming the union of these sheets the joints are made by lapping corrugated portions of the sheets, encircling the laps with carrying rods and placing compression bars on the inside of the lap. The encircling carrying rods are threaded on both ends and provided with nuts, and the ends of the compression bars are fitted with shoes, or are turned out at right angles to form such shoes, which are bored for the insertion of the ends of the carrying rods. The tightening of the nuts on the carrying rods secures a high degree of compression of the lapping sheets.

Flume sections for curved alignments are made by the manufacturers. The curvature is taken up equally at each joint of the flume on the curve, or is concentrated in the lapping sections at the joints at the ends of the stringers, thus making the flume a series of short chords.

Note—Prepared from articles in "Engineering News," Nov. 27 and Dec. 25, 1913.



The latter plan is much more satisfactory from the erection viewpoint, and gives an efficient structure.

The joint of the smooth-interior Lennon flume is shown in Fig. 3. Provision is made in this design for expansion at every joint by the use of a larger bead or corrugation along the edges of the transverse sections than is afforded by an inside clamping bar. The intervening space around and above the inner bar of this joint is filled with a type of mineral rubber that is softened by heat and yields to the pressure resulting from the longitudinal expansion of the flume. This also gives the flume an absolutely smooth surface at the joints as well as between them. The joint distributes the load to two carrier rods and in its construction tends to prevent sagging.

The Hinman joint (Fig. 4) is based on the principle of wedging. The inner bar being in compression and the outer bar in tension, the tendency is to wedge the metal

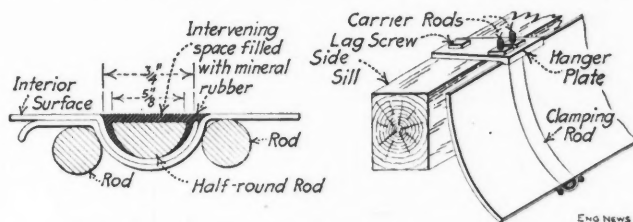


FIG. 3. DETAILS OF SMOOTH LENNON JOINT

sheets which compose the flume between the wings of the inner or wing bar. The greater this wedging the tighter is the joint. The groove in the inner sheet is smaller than the groove in the outer sheet so that the surface adjacent to the flow of water is in perfect alignment. The wing bar, being specially designed for stiffness and being placed on the outside of the waterway, will maintain the cross-section of the flume under various conditions of loading. This wing bar has a much larger moment of inertia than the ordinary round bar and tends to prevent the sagging and resulting leakage which is especially liable to take place when the flume is under half or two-thirds capacity, making the center of pressure lower. At the ends of the wing bar the wings are sheared, leaving the ends round in section so that they can be threaded.

In some flumes the shoes are made to extend over the stringers as carriers for the flumes, but in the larger sizes usually and in the Maginnis and Hess flumes, the carrier rods are brought up through carrier beams and held with washers and nuts. The carrier beams extend far enough laterally to support the flume on the stringers. The illustrations show both types of construction. The new Lennon flume is put up, in large as well as in small sizes, with steel hanger plates at the joints. The necessity of bringing the carrier rods up through any timbers during the handling of the sheets is thus avoided. In smaller and medium sizes of Lennon flumes no crossbars are necessary. In some larger sizes, crossbars are spaced 4, 6 or 8 ft. apart, and in others the intermediate rod on each section is carried up through crossbeams of wood used to brace the side walls. The elimination of carrier beams prevents dams of weeds in smaller sizes, and in larger ones reduces the timber necessary for the structure.

Both methods are used with the Hinman flume. The hanger method leaves the flume top free, so that weeds

or trash will pass through without clogging. But the unobstructed waterway is obtained at the expense of alignment, as the hangers must necessarily follow the stringers and the action of the weather on the latter will gradually twist and bend them until this alignment is destroyed, thus affecting the value of  $n$  and the capacity of the flume. Furthermore the weight of a large flume loaded, transmitted to the stringers through the hangers, produces torsion in the stringers, as the result of which they tend to twist inwardly toward the waterway. These stresses can be neglected in small flumes, as the sizes of the stringers can be made such that they will not be noticed in the finished structure, but for large flumes these stresses and the direction in which they act are indeterminate, and in order to make sure of the structure the engineer must necessarily use such sizes of timbers as are uneconomical when compared with the carrier construction. With the carrier beams the weight is transmitted vertically to the stringers and the loading of the beam can be accurately computed; the alignment of the waterway is more nearly maintained, as the distance across the top is constant at each carrier; and more rapid erection is possible.

An expansion joint is advisable at the inlet or the outlet of a long metal flume which, in the Maginnis type, can be made by riveting to a section of the flume a strip of sheet iron about 9 in. wide, with a filler between. The adjacent corrugation of the succeeding section of flume is sheared off, and the section is inserted to form the joint. One of the regular outside supporting rods is run around the joint. The weight of the water compresses the strips of metal together on the rod, making the joint water-tight, and at the same time permitting slipping in case of a longitudinal force. The Hess flumes

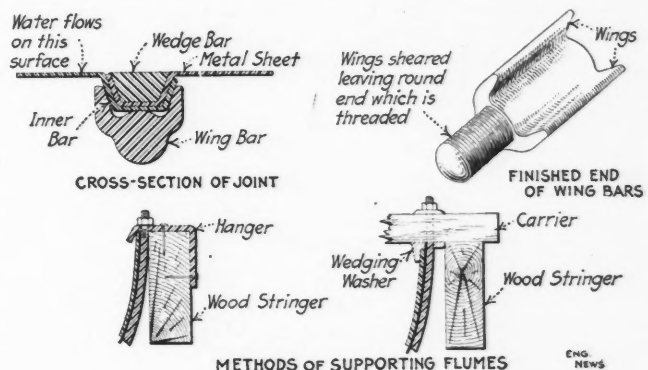


FIG. 4. DETAILS OF HINMAN JOINT

are provided with a patent flexible expansion joint, one of which is used for about every 300 to 400 ft. of flume length.

The conditions applying to the expansion of sheet metal of the gage usually employed in flume construction, however, necessarily are different from those pertaining to structures built of heavy plates. The flexibility of the former does not permit carrying an end compressive stress any great distance, so as to deliver an expansion effect to a given point. The Lennon company therefore maintains that it is better to take up expansion at frequent intervals and the joint of the Lennon flume is designed to meet these conditions.

The expansive movement for a variation of 130° F., is only about 1/70 in. per 30-in. section. This small movement confined to its own section, according to the

Hinman company, is negligible. Damage may be caused by permitting the movement to accumulate and concentrate its effort at one or two points. This accumulation of movement can be prevented by securing each end of each crosscarrier to the stringer on either side of the waterway by means of a large spike or bolt. This will force the stresses of expansion or contraction into each sheet, buckling or stretching it and the effect will never be detected in any way.

There should be little difficulty experienced in keeping the regular joints of the metal sheets water-tight. It may be necessary at intervals to go over the flume and tighten the nuts on the carrying rods at a few of the joints. Sheets in which there are welded or riveted joints, give trouble from leakage, and should not be used. The sheets are always galvanized to prevent corrosion. Four years of service has showed the galvanizing to be in good condition, with no rusting of the body of the sheets. Rusting of consequence has occurred where the sheets were made of ordinary steel or iron, but not where they were made of a special rust-resisting product. Undoubtedly, the use of a rust-resisting, anti-corrosive body out of which to form the sheets as well as galvanizing them is desirable, but the increased life to be obtained from the use of these specially prepared products, is not yet known. In fitting the sections together, it is supposed to be desirable to paint them at the joints, and also to paint the rods and bars to secure water-tightness and prevent corrosion. The Hinman bars, shoes, washers, etc., are dipped in heavy asphaltum coating before shipment, however, and the painting of the sheets at the joints before assembling is not recommended because of the fact that in the field, poor paint is likely to be used, being lumpy, or containing "paint skin" which will prevent the grooves from nesting closely, and will result in a leak. It is advised therefore that painting at the joint should be done, if at all, when the flume is all in place and the rods tightened. It will then work down into any small openings that may exist and form a film over the entire joint. Even in sheets that appear to be smooth, there are occasionally places where the galvanizing is a little rough. This will permit a small drip and can usually be remedied by painting the inside.

The Lennon joint, illustrated in Fig. 3, is stated to prevent the retention of water, sand or moisture between the lap of the sheets at the joint when the flume is not in service, and thus eliminate the chief source of rust and corrosion at the joints.

Much attention is now being given to the design and construction of steel trestles for metal flumes. The cost of such steel trestles in a number of average conditions has been about 50% more than that of timber trestles, based on a cost of timber of \$40 per 1000 ft. in place.

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### Catching Compressed Air Leaks

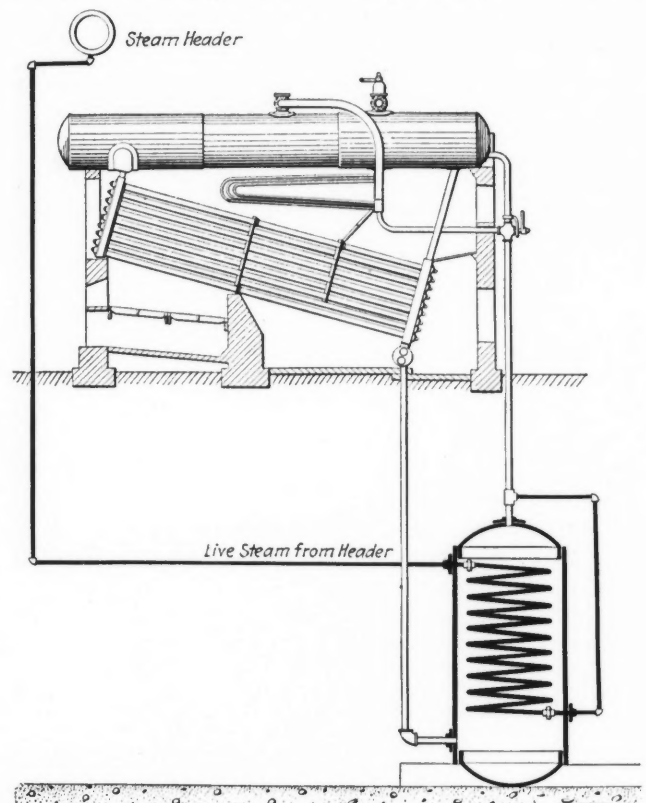
When steam escapes you can generally see it; when there is a leak in the ammonia pipe line it is most certainly evident; but a leaky compressed air line causing a waste may go for a long time undetected.

Others may profit by the procedure of an Illinois manufacturer recorded in *Factory* who, at fixed regular intervals, puts essence of peppermint into the air tank and then has the entire system inspected for leaks. If the slightest amount of air escapes it is detected by the odor.

### Quick Firing of Standby Boilers

A novel method of quick firing for boilers is described in the *Electrical World* for Dec. 6, 1913, (*Power*, Jan. 6, 1914). The Union Electric Light & Power Co., of St. Louis, purchases electricity to supply part of its system, but to guard against interruptions, should the hydroelectric power fail, its Ashley St. steam station is maintained in condition to take all the load in a few minutes.

The 20 extra boilers are kept full of water at 212°, with fuel ready to ignite on the grates. The grate is first covered with a high-grade nut coal to a depth of about 7 in. and three rows of oily rags are then placed in cross trenches. Another row of rags extends down the middle to carry along the flame to all parts of the grate. On top of these rows of rags is laid kindling wood soaked in kero-



METHOD OF KEEPING WATER HOT IN BOILER

sene, while a few gallons of fuel oil are sprinkled over the entire bed. This produces a hot fire rapidly; the best time made in getting a boiler on the line, starting from a zero gage-pressure, has been 16 min., much less than is required to get a boiler up to pressure from a banked fire.

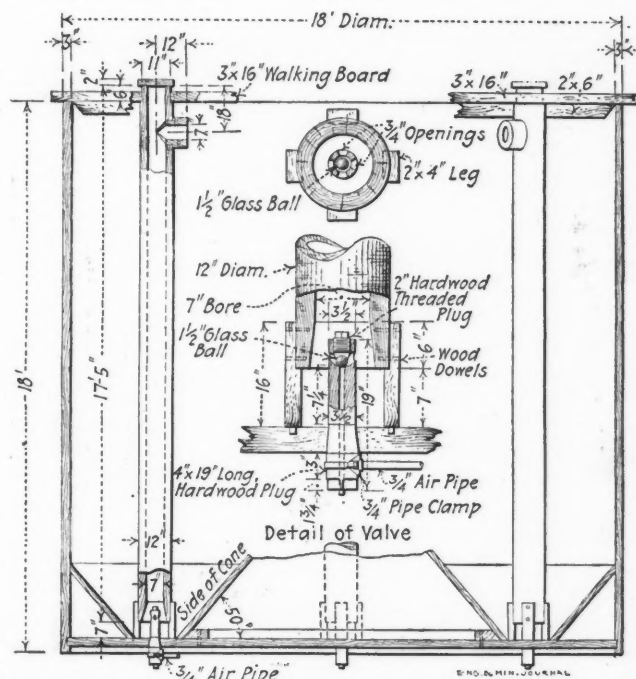
The method of keeping water hot in the emergency boiler is shown in the illustration. The common blowoff header connecting the boilers in service was connected to the lower part of one of the two blowoff tanks in the basement. This header serves to bring the cool water from the lowest part of each boiler. In the tank is installed a coil through which the waste steam from one of the large steam headers is caused to flow, thus serving also to drain the header. The steam heats the water in the tank, sets up a circulation and delivers hot water to the steam drum of each boiler. The water is thus kept at practically the boiling point with a coal expenditure of only 12.5 lb. per boiler per day as compared with 3100 lb. using banked fires.

## Details of Metallurgical Practice

### The Parral Tank in the Hydro-metallurgy of Copper

BY BERNARD MACDONALD\*

For the last few years the hydro-metallurgy of copper ores has been passing through formation stages, but it has now come to be generally recognized that it will have a wide range of application when mechanical details have been perfected. The process has advantages that will doubtless stimulate its adoption in plants at isolated or individual mines and auxiliary plants at the large smelting works. Among the factors pointing to its adoption are, the existence of large bodies of low-grade siliceous ores left in mines, that cannot be handled profitably, but which suggest a satisfactory profit if treated by hydrometallurgical plants; large dump accumulations of tailings, which might be treated by this process at a small



WOODEN PARRAL TANK FOR COPPER HYDRO-METALLURGY

profit; all oxidized surface ores; the flue dust from copper smelters, the values in which could probably be recovered more economically than by resmelting; small mines in isolated localities where sufficient fuel exists for roasting sulphide ore; the low cost at which plants using this process may be constructed, and the product being recovered in the form of metallic copper.

The vigorous corrosive action of the acid solutions used in this process on metallic substances constitutes its main mechanical difficulty. In the leaching of coarse, porous ore this difficulty may be considered negligible because metal tanks may be eliminated. The leaching of fine

sand, however, will be difficult because the acid will destroy the canvas filter commonly used.

The sandy pulp resulting from milling and concentration of the ore must be reground to a slime, and this product, together with the natural slime in the ore must be treated by agitation in tanks.

Agitation of pulp in the Parral tank is effected in the simplest and most economical way and differs in method and results from other systems. Briefly stated, it is effected by the continuous transfer of the pulp from the bottom to the top of the tank charge by compressed air through a plurality of transfer pipes. These pipes stand vertically in the tank, their lower or intake ends supported from the bottom and close to it, their upper or discharge ends terminating in ells or tees at the charge level in the tank, with the discharge outlets so directed as to spout horizontally in the same direction round the tank. The spouting force of the pulp thus discharged from the several transfer pipes creates a rotary flow in the tank charge in the manner and with the effect mentioned.

By this method of agitation the solution and solid constituents of the pulp charge kept in proper proportional mixture, a condition essential for the effective dissolving of the metals in the pulp undergoing treatment in solution.

As compared with the first and operating costs of other systems, those of the Parral tank are the lowest. This is due to the fact that there are no bridge or side structures, no belts or gears, no interior moving parts, and no centrifugal pumps or motors connected with the tank, or required for its operation. Incidentally, all the operating apparatus of the system, that is, the tank, transfer pipes and air nozzles may be made of wood, which is acidproof.

The Parral tank is particularly adapted for the agitation of the slimes from copper ore and flue dust. The tank, transfer pipes and compressed-air nozzles may be made entirely of wood, and the ball in the air nozzle of glass or earthenware, so that all of the apparatus is acidproof. The accompanying drawing shows the tank and operating apparatus designed for the plant of the Minerals Recovery Co., of Los Angeles, Calif. The problem which this company was called upon to solve was the dissolving and removal of the copper contained in a large deposit of tailings, prior to cyanide treatment for the recovery of the gold and silver contents. The metallurgical tests showed that this could be easily accomplished by agitating the pulp in sulphuric-acid solution and giving it a lime-water wash to remove the acid residues, when the pulp would be in the best possible condition for cyanide treatment.

The design of the Parral tank shown was accepted by the company's metallurgist, as completely acidproof. This tank is suitable for the agitation of the slime of copper ore or flue dust in acid solution, either for the recovery of the copper alone, or for its removal prior to subsequent agitation in cyanide solution for the recovery of gold and silver.

\*Mining engineer, South Pasadena, Calif.

Ordinarily the Parral tank is made flat-bottomed when used for agitating the pure slime from quartzose ores, but in case the material to be agitated is unclassified, as is usually the case with tailings, or is highly-mineralized, a cone is set on the bottom and the corners of the tank inclined as shown. By this construction an annular trough is formed on the bottom into which the rotary flow in the tank charge sweeps the settling pulp. This coming underneath the intake ends of the transfer pipes, is picked up by them and thrown to the top.

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### Herringbone-Gear Drive for Hardinge Mills

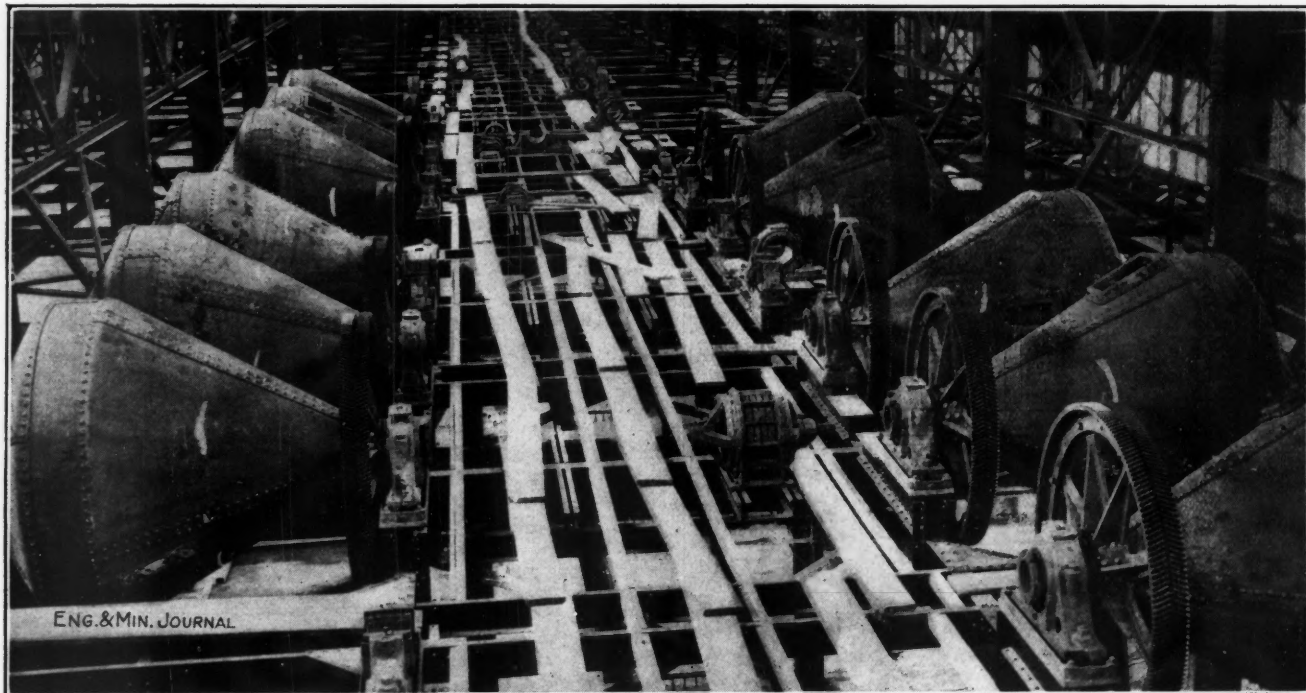
The herringbone-gear drive is becoming the most acceptable method for driving Hardinge mills where the conditions will permit, and particularly in new mills. As an example of this it may be stated that 64 Hardinge 8-ft. mills in the Calumet & Hecla company's new No. 2 regrinding plant are to be driven in this manner; in the new No. 6 concentrator of the Arizona Copper Co., at Morenci, the Hardinge mills will also be driven by herringbone gears. The upkeep for this kind of drive is comparatively slight. An 8-ft. Hardinge mill operating

is reported to be about 15% less than in the case of countershaft drives. It is also much lower than ordinary gearing. Besides the power consumption being less, the elimination of vibration and noise is another factor in favor of the herringbone gear. Some of the Hardinge mills have been driven from the feed end, but the majority of the installations have the herringbone-gear drive at the discharge end, as shown in the accompanying view, taken during the construction of the new Calumet & Hecla regrinding plant at Lake Linden, Mich.; there will be 64 of these motor-driven, 8-ft.x18-in., Hardinge mills in the new C. & H. plant. It is of interest to note that these mills have the shortest length of cylinder (18 in.) of any of this style of mill thus far constructed; this length was arrived at after three years' operation of 18-in., 22-in., 30-in. and 72-in. lengths of cylinder in the Lake Superior district, the conclusion being that the short cylindrical length was the one of greatest efficiency for those ores.

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### Rendering Pyrite Ores Amenable to Concentration

A method of rendering sulphide ores high in pyrite amenable to concentration is proposed by William Morley



HARDINGE MILL SECTION OF CALUMET & HECLA No. 2 REGRINDING PLANT, LAKE LINDEN, MICH.

The 64 Hardinge mills that comprise this section have the shortest cylindrical length (18 in.) of any mills of this style.

at the Calumet & Hecla plant for 10 months was examined, and it was found that there had been practically no wear on the gear and less than  $\frac{1}{16}$  of an inch on the pinion.

In a recent shipment of a group of eight mills, the Hardinge Conical Mill Co., of New York, estimated that there was a saving of 10% in the cost of transmission equipment by the use of Wuest herringbone-gear drives. The cost for building was estimated to be 25% less on account of lighter construction, due to the elimination of countershafts, etc. The power consumption by this drive

Martin, of Redruth, England (U. S. pat. 1,066,830). The ore is mixed with a small proportion, usually about 2%, of some such oxidizing agent as sodium nitrate, and heated. The pyrite undergoes partial oxidation, the zinc, lead and copper sulphides will remain unaffected. The material after this partial oxidation, can then be effectively concentrated.

If the concentrate is itself a complex sulphide, the process may be repeated, obtaining a tailing carrying one metal; a concentrate carrying another. Lead sulphide is said to oxidize more readily than zinc.

# The Cost of Doing Things

## Recent Transvaal Costs

The costs given in the table were taken from the Quarterly report of the General Mining & Finance Corporation of the Transvaal, South Africa, for the quarter ended Sept. 30, 1913. Government taxes on profits are not included. To get the total expenditure the amounts charged to capital accounts must be included. A similar table was published in the Cost of Doing Things department, Oct. 18, 1913.

TRANSSVAAL MINING COSTS

	Aurora West United	Meyer & Charlton	New Goch Gold Mines	Roode- poort V.M. Reefs	Van Ryn Gold Mines
Feet of development work	2260	1385	1240	3478	640
Average stoping width, in.	44.14	47.32	52	38.66	42
Ore mined, tons	53,807	45,769	91,830	79,250	110,606
Per cent. sorted out as waste	21.18	7.58	14.2	14.08	5.97
Ore sent to mill, tons	42,507	42,301	78,790	68,089	104,000
Number of stamps operated	80	75	120	50	135-140
Number of tube mills operated	2	2	4	3	6
Total days running time	83.43	82.29	81.55	77.55	77.12
Total tons of ore milled	42,550	42,516	78,540	67,939	103,770
Duty per stamp per day, tons	6.38	6.88	8.02	17.52	9.84
Sand and slimes cyanided, tons	42,636	42,279	78,491	67,344	103,770
Yield in gold per ton ore, dwt.	6.25	11.25	4.53	4.68	6.19
<b>Working costs:</b>					
Mining	\$2.33	\$2.05	\$2.32	\$2.54	\$1.72
Sorting, crushing and transport	0.13	0.13	0.19	0.19	0.13
Milling	0.42	0.48	0.41	0.35	0.36
Cyaniding	0.41	0.48	0.31	0.33	0.36
General charges	0.55	0.61	0.40	0.53	0.29
Local and London offices	0.09	0.44	0.10	0.10	0.14
Mine development redemption	0.73	0.26	0.19	0.49	0.45
Accumulated slimes treatment			0.03		
Permanent works			0.05		
Total working cost reported	\$4.66	\$4.45	\$4.00	\$4.43	\$3.45
Expenditures charged to capital accounts	0.13	0.23	0.15	0.63	0.10
Miscellaneous earnings not credited in above	0.02		0.02	0.03	0.02

## Cost of Cyanidation at Nipissing

The cost of cyanide operations at the new low-grade mill of the Nipissing Mining Co., Ltd., is given by James Johnston, in *Bull. A. I. M. E.*, January, 1914. Table I shows the operating costs at the mill, representing an average for July, August and September, 1913. The costs are calculated on a basis of 7320 tons treated per month. Table II shows the proportion of total cost which is chargeable to each department or important item.

TABLE I. OPERATING COSTS PER TON OF ORE TREATED  
Calculated on basis of 7320 tons treated per month

Sundry Costs	Labor	Sup- plies	Power	Work- shops	Totals
	\$	\$	\$	\$	\$
Meyer receiving plant	0.049	0.002	0.003	0.001	0.055
Aerial tram line	0.059	0.004	0.003	0.009	0.075
Surface tram line	0.073	0.045	0.005	0.027	0.150
Washing, jigging and picking plant	0.138	0.042	0.006	0.024	0.210
Totals	0.319	0.093	0.017	0.061	0.490
New construction	0.036	0.209		0.065	0.310
<b>Milling, costs per ton</b>					
Preliminary crushing, to 3 in.	0.074	0.004	0.006	0.002	0.086
Secondary crushing, conveying, elevating	0.028	0.015	0.005	0.001	0.049
Battery	0.077	0.053	0.095	0.013	0.238
Tube mills and classifiers	0.096	0.103	0.282	0.019	0.500
Slime collecting, desulphurizing and transferring	0.042	0.294	0.022	0.008	0.366
Alkaline filtering and transferring	0.070	0.017	0.023	0.004	0.114
Cyanide treatment and transferring	0.120	0.793	0.071	0.020	0.004
Cyanide filtering and discharging	0.072	0.041	0.034	0.015	0.162
Precipitating and clarifying	0.050	0.221	0.008	0.005	0.284
Drying, melting and refining	0.074	0.050			0.124
Water supply	0.001	0.001	0.021	0.002	0.025
Totals	0.704	1.592	0.567	0.089	2.952

Electrical power is used in the mill and represents an important portion of the total expense. In view of this

fact, an attempt has been made to keep it as low as possible. The installation was planned so that each motor should be of correct size to carry its load at highest efficiency and power factor. As a measure of success attained it may be said that the power factor of the mill averages 82.5%.

TABLE II. PROPORTION OF COSTS AT NIPISSING MILL

Department	Per Cent.
Labor	28.207
Cyanide	19.943
Electric power	14.542
New construction supplies	5.586
Aluminum dust	4.761
Aluminum ingots	4.709
Caustic soda	1.811
Aluminum plates	1.401
Refinery fluxes, fuel oil, coke, etc.	1.332
Pebbles	1.284
Battery supplies	1.013
Lime	1.579
Sundry supplies	14.832
	<hr/>
	100.000
Motors, switchboards, wiring, etc., and labor	
	\$26,532.86
Electric lighting of mills	
	1,635.61
	<hr/>
	\$28,168.47
Extra wiring, poles, etc., for the Peterson Lake pumping plant, about 1560 ft., from main buildings	
	250.00
	<hr/>
	\$28,418.47

Power is received at 11,000 volts and is transformed to the working pressure of 550 volts in a substation 150 ft. from the main building. A three-phase overhead line from the substation feeds the main switchboard which is on the tube-mill floor, this being about the center of power consumption. In detail, its cost was as follows:

## Cost of Power Plant Items

As a rule, selling prices of machinery are carefully guarded by manufacturers. Prof. A. A. Potter,\* in *Power*, Dec. 30, 1913, gives some extremely valuable figures and equations, obtained from letters to several hundred manufacturers, asking for net selling prices. Most of the companies responded with confidential price lists. These were carefully tabulated and plotted, the equations deduced from these plots are of great value for preliminary estimates.

The equations in the table are arranged in the alphabetical order of the machinery for which prices are given. The prices are f.o.b. at the factory, and do not include erection costs. There are many varying factors entering into erection costs, so that it is impossible to give general estimates which may be regarded as accurate. Some manufacturers quoted the following erection costs for high-speed engines:

Size of Engine, Hp.	Approximate Erection Cost in Dollars
75	125 to 150
100	150 to 200
150	200 to 300
300	300 to 400
450	400 to 450
600	400 to 600

Prof. C. H. Benjamin, in his book on the "Steam Engine," gives the following formulas for the costs of engine settings:

\*Professor of steam and gas engineering, Kansas State Agricultural College.

TABLE OF COSTS OF STEAM AND GAS POWER-PLANT EQUIPMENT

Name of Apparatus	Type	Capacity	Equation of Cost in Dollars	
Air compressors	Single cylinder, belt-driven	Up to 4000 cu.ft. per min.	$52 + 1.95 \times \text{cu.ft.}$	
	Duplex, belt-driven	Up to 850 cu.ft. per min.	$316 + 1.675 \times \text{cu.ft.}$	
	Compound, belt-driven	Up to 550 cu.ft. per min.	$3.1 \times \text{cu.ft.}$	
	Single cylinder, steam-driven	Up to 350 cu.ft. per min.	$231 + 2.32 \times \text{cu.ft.}$	
	Duplex, steam-driven	Up to 600 cu.ft. per min.	$460 + 2.55 \times \text{cu.ft.}$	
Boilers, steam	Compound, steam-driven	Up to 500 cu.ft. per min.	$71.25 + 4.025 \times \text{cu.ft.}$	
	Vertical, fire-tube	Under 20 hp.	$49.2 + 6.66 \times \text{hp.}$	
		20 to 50 hp.	$116.4 + 3.35 \times \text{hp.}$	
		Up to 50 hp.	$51.5 + 3.62 \times \text{hp.}$	
	Submerged tubes, 100 lb. per sq.in. or less	Up to 200 hp.	$64 + 4.14 \times \text{hp.}$	
		Up to 100 hp.	$5.8 \times \text{hp.} - 20$	
		100 hp. to 225 hp.	$211 + 3.35 \times \text{hp.}$	
	Full length tubes; 100 lb. per sq.in. or less	Up to 100 hp.	$121 + 5.68 \times \text{hp.}$	
		Up to 100 hp.	$121 + 5.68 \times \text{hp.}$	
	Horizontal, fire-tube cylindrical, multi-tubular, 100 lb. per sq.in. or less	Up to 200 hp.	$64 + 4.14 \times \text{hp.}$	
Up to 100 hp.		$5.8 \times \text{hp.} - 20$		
Portable locomotive	Up to 100 hp.	$211 + 3.35 \times \text{hp.}$		
	Up to 100 hp.	$121 + 5.68 \times \text{hp.}$		
Vertical, water-tube, pressures over 125 lb. per sq.in.	100 to 500 hp.	$912 + 6.28 \times \text{hp.}$		
	100 to 600 hp.	$149 + 8.24 \times \text{hp.}$		
Horizontal, water-tube, pressures over 125 lb. per sq.in.	100 to 600 hp.	$149 + 8.24 \times \text{hp.}$		
	100 to 600 hp.	$149 + 8.24 \times \text{hp.}$		
Condensers	Barometric (28-in. vacuum)	Up to 30,000 lb. of steam per hr.	$1055 + 0.112 \times (\text{lb. steam cond.})$	
	Jet condensers	Up to 30,000 lb. of steam per hour; 28-in. vacuum	$1176 + 0.1138 \times (\text{lb. steam cond.})$	
		26-in. vacuum	$116 + 0.0591 \times (\text{lb. steam cond.})$	
	Surface condensers	Up to 35,000 lb. of steam per hr.; 28-in. vacuum	$1630 + 0.2038 \times (\text{lb. steam cond.})$	
Up to 30,000 lb. of steam per hr.; 26-in. vacuum		$413 + 0.1015 \times (\text{lb. steam cond.})$		
Economizers	Number of tubes 32 to 10,000, heating surface per tube = 12 to 13 sq.ft.	Capacity in lb. of water per tube = 60 to 70		
		Economizer alone	$\$8 \text{ to } \$10 \text{ per tube}$	
Engines, internal combustion	Gas engines	Economizer erected	$\$12 \text{ to } \$15 \text{ per tube}$	
		Up to 300 hp.	$33.6 \times \text{hp.} - 115$	
		Up to 100 hp.	$141 + 24.8 \times \text{hp.}$	
		Up to 75 hp.	$309 + 36.1 \times \text{hp.}$	
		Up to 400 hp.	$63.8 \times \text{hp.} - 316$	
Engines, steam	Simple	Up to 300 hp.	$400 + 33.5 \times \text{hp.}$	
		Up to 300 hp.	$400 + 33.5 \times \text{hp.}$	
Engines, steam	Simple	Throttling governor, slide valve, vertical	Up to 70 hp.	$63.5 + 17.5 \times \text{hp.}$
		Throttling governor, slide valve, horizontal	Up to 70 hp.	$107 + 13.3 \times \text{hp.}$
		Upper limit in cost	Up to 200 hp.	$30 + 5.81 \times \text{hp.}$
		Lower limit in cost	Up to 500 hp.	$386 + 6.69 \times \text{hp.}$
		Flywheel governor, piston or balanced slide valve, horizontal	Up to 30 hp.	$164 + 9.53 \times \text{hp.}$
		Automatic cut-off, single valve, vertical	30 to 150 hp.	$372.5 + 9.55 \times \text{hp.}$
		Flywheel governor, Corliss non-releasing valve, horizontal	Up to 600 hp.	$1100 + 8.94 \times \text{hp.}$
		Corliss governor and valves, horizontal	Up to 400 hp.	$1040 + 8.45 \times \text{hp.}$
		300 to 900 hp.	$730 + 9.1 \times \text{hp.}$	
		Flywheel governor, multiple flat valves	Up to 400 hp.	$685 + 7.69 \times \text{hp.}$
		Cross compound	Up to 330 hp.	$735 + 8.0 \times \text{hp.}$
		Ball governor, single-valve, horizontal	Up to 200 hp.	$750 + 10.4 \times \text{hp.}$
		Flywheel governor, multiported valves, horizontal	Up to 600 hp.	$1100 + 9.62 \times \text{hp.}$
		Shaft governor, Corliss non-releasing valves, horizontal	Up to 600 hp.	$2015 + 9.74 \times \text{hp.}$
		Tandem compound	Up to 400 hp.	$559 + 8.83 \times \text{hp.}$
Flywheel governor and slide valves, horizontal	Up to 140 hp.	$610 + 12.7 \times \text{hp.}$		
Flywheel governor and slide valves, vertical	Up to 300 hp.	$1295 + 10.79 \times \text{hp.}$		
Flywheel governor, Corliss non-releasing valves, horizontal	Up to 500 hp.	$1010 + 7.65 \times \text{hp.}$		
Flywheel governor, multiple slide valves	Up to 500 hp.	$6.25 \times (\text{size in inches}).$		
Fans and blowers	Open	Sizes 70 to 140 in.		
		Up to 1500 boiler hp.	$114.5 + 0.3787 \times \text{hp.}$	
Feed-water heaters	Closed	1500 to 3000 boiler hp.	$326 + 0.237 \times \text{hp.}$	
		Up to 3000 boiler hp.	$40 + 0.72 \times \text{hp.}$	
Generators, electric	Direct current (voltage 110-250), belted	Up to 7 kw. (1400 to 2300 r.p.m.)	$21.1 + 28.5 \times \text{kw.}$	
		10 kw. to 300 kw. (600 to 1400 r.p.m.)	$10 \times (\text{kw.}) - 9$	
		Up to 300 kw. (100 to 350 r.p.m.)	$313.3 + 10.92 \times \text{kw.}$	
		300 to 1000 kw. (moderate speed)	$12.08 \times (\text{kw.}) - 383$	
		Up to 300 kv.a. (600 to 1800 r.p.m.)	$81 + 9.723 \times \text{kv.a.}$	
		Up to 300 kv.a. (200 to 300 r.p.m.)	$375 + 7.477 \times \text{kv.a.}$	
Generators, electric	Alternating-current, belted	250 to 2500 kv.a. (100 to 250 r.p.m.)	$2413 + 4.69 \times \text{kv.a.}$	
		Up to 300 kv.a. (200 to 300 r.p.m.)	$375 + 7.477 \times \text{kv.a.}$	
		250 to 2500 kv.a. (100 to 250 r.p.m.)	$2413 + 4.69 \times \text{kv.a.}$	
		Up to 1.5 hp. (1400 to 2500 r.p.m.)	$18.53 + 42.37 \times \text{hp.}$	
		1.5 to 30 hp. (1000 to 1800 r.p.m.)	$53.3 + 12.4 \times \text{hp.}$	
		30 to 100 hp.—Upper limit (500 to 800 r.p.m.)	$191.7 + 10.94 \times \text{hp.}$	
Motors, electric	Direct-current, belted; small sizes	Lower limit—(800 to 1000 r.p.m.)	$213 + 8.264 \times \text{hp.}$	
		Up to 10 hp.—Upper limit	$64.1 + 36.786 \times \text{hp.}$	
		Lower limit	$69.2 + 10.56 \times \text{hp.}$	
		Variable speed		
		Alternating current:		
		Single-phase (110-220 volts)	Up to 25 hp. (1200 to 1800 r.p.m.)	$25 + 11.75 \times \text{hp.}$
Belted; polyphase induction	Up to 130 hp. (1200 to 1800 r.p.m.)	$116 + 4.72 \times \text{hp.}$		
Producers, gas	Suction	Up to 25 hp.	$60.7 + 7.15 \times \text{hp.}$	
		35 to 60 hp.	$157.6 + 3.573 \times \text{hp.}$	
Producer plants, gas	Pressure	Up to 300 hp.	$252 + 14.2 \times \text{hp.}$	
		Up to 300 hp.	$860 + 15.15 \times \text{hp.}$	
Pumps	Suction	Up to 200 hp.	$570 + 46.5 \times \text{hp.}$	
		Up to 200 hp.	$570 + 46.5 \times \text{hp.}$	
Pumps	Boiler feed	Single-cylinder, piston pattern	Up to 6000 gal. per hr.	$17.8 + 0.2586 \times (\text{gal. per hr.})$
		Duplex, piston pattern	6000 to 27,000 gal. per hr.	$106.8 + 0.011045 \times (\text{gal. per hr.})$
		Single-cylinder, outside-packed, plunger pattern	Up to 29,000 gal. per hr.	$585 + 0.0115 \times (\text{gal. per hr.})$
		Duplex, outside-packed plunger pattern	Up to 24,000 gal. per hr.	$0.034 \times (\text{gal. per hr.})$
		Centrifugal	Up to 49,000 gal. per hr.	$0.042125 \times (\text{gal. per hr.})$
		Horizontal, low-pressure, single-stage	Up to 14,000 gal. per min.	$52 + 0.05525 \times (\text{gal. per min.})$
		Horizontal, high-pressure, single-stage	Up to 5000 gal. per min.	$61 + 0.0868 \times (\text{gal. per min.})$
		Horizontal, high-pressure, multi-stage	5000 to 20,000 gal. per min.	$210 + 0.0567 \times (\text{gal. per min.})$
		Vertical, low-pressure, single-stage	Up to 2200 gal. per min.	$117 + 0.233 \times (\text{gal. per min.})$
		Vertical, high-pressure, single-stage	Up to 20,000 gal. per min.	$60 + 0.05575 \times (\text{gal. per min.})$
		Vertical, high-pressure, multi-stage	Up to 20,000 gal. per min.	$50 + 0.0865 \times (\text{gal. per min.})$
		Geared power	Up to 1100 gal. per min.	$125.7 + 0.27 \times (\text{gal. per min.})$
		Single cylinder	Up to 20,000 gal. per hr.	$90 + 0.0316 \times (\text{gal. per hr.})$
		Double-acting, triplex	Up to 83,000 gal. per hr.	$56 + 0.03867 \times (\text{gal. per hr.})$
		Rotary force pumps	Up to 89,000 gal. per hr.	$195 + 0.0148 \times (\text{gal. per hr.})$
Wet vacuum pumps	1200 to 20,000 gal. per hr.	$8 + 0.0117 \times (\text{gal. per hr.})$		
	Up to 13,000 gal. per hr.	$18 + 0.01435 \times (\text{gal. per hr.})$		
	13,000 to 50,000 gal. per hr.	$14 + 0.00863 \times (\text{gal. per hr.})$		

Name of Apparatus	Type	Capacity	Equation of Cost in Dollars	
Purification plants	Water	1000 to 20,000 gal. per hr.	$1000 + 0.2 \times (\text{gal. per hr.})$	
Stokers	Chain-grate	100 to 300 boiler hp.	$86 + 4.28 \times (\text{hp.})$	
	Front-feed	300 to 500 boiler hp.	$434 + 3.1 \times (\text{hp.})$	
	Under-feed	100 to 600 boiler hp.	$312 + 3.015 \times (\text{hp.})$	
Superheaters	200 to 750 boiler hp.	Up to 600 boiler hp.	$379 + 2.785 \times (\text{hp.})$	
		100 deg. of superheat	$165 + 2.578 \times (\text{hp.})$	
Transformers	Air-cooled	200 deg. of superheat	$52 + 3.466 \times (\text{hp.})$	
		300 deg. of superheat	$40 + 4.28 \times (\text{hp.})$	
		Sizes up to 3000 kv.a.	$439 + 1.467 \times \text{kv.a.}$	
		Sizes up to 30 kv.a.		
		25 cycles	$52.9 + 8.1 \times \text{kv.a.}$	
	Oil-cooled	60 cycles	$26.2 + 6.25 \times \text{kv.a.}$	
		Sizes 30 to 100 kv.a.		
		25 cycles	$157 + 4.68 \times \text{kv.a.}$	
		60 cycles	$119.5 + 3.57 \times \text{kv.a.}$	
		Sizes up to 1000 kv.a.	$181 + 1725 \times \text{kv.a.}$	
Water-cooled		1000 to 3000 kv.a.	$805 + 1099 \times \text{kv.a.}$	
Turbines, steam	Reaction type:	Turbine and generator	500 to 5000 kw. $3335 + 13.33 \times \text{kw.}$ 5000 to 10,000 kw. $17,500 + 10.5 \times \text{kw.}$	
		Impulse type:		
	Turbine alone		Up to 50 hp.	$171.5 + 10.7 \times \text{hp.}$
			50 to 400 hp.	$10.74 \times \text{hp.} - 54$
	Turbine and generator		Up to 40 kw.	$304.2 + 36.78 \times \text{kw.}$
			25 to 350 kw.	$30.4 \times \text{kw.} - 100$
			1000 to 10,000 kw.	$8106 + 11.34 \times \text{kw.}$

1. Setting for high-speed engines. Cost in dollars =  $50 + 0.75$  (horsepower).

2. Setting for low-speed engines. Cost in dollars =  $500 + 1.3$  (horsepower).

Settings for water-tube boilers vary from \$400 for a 100-hp. boiler to about \$650 for a 600-hp. boiler.

In the case of internal-combustion engines, the erection will vary from 7% to 15% of the total cost of the engines. The erection cost of large engines may be as low as 3% of the cost of the engine.

Difficulty was experienced in developing an equation for the cost of stokers which would be applicable over a wide range, as the size of stokers for the same boiler horsepower varies greatly with the fuel to be handled, the available draft, and other conditions. Also, in the case of underfeed stokers which include a forced-draft equipment, the cost depends on the number of boilers. Thus a quotation of \$1055 was given by one concern for an underfeed stoker to be used in connection with one 125-hp. fire-tube boiler; \$1793 for an equipment suitable for two boilers of the same size, and only \$6300 in the case of eight boilers. A manufacturer of front-feed stokers quotes \$975 for a stoker equipment for one boiler, and \$1680 for an equipment for two boilers. The equations apply closely to equipments of four stokers, or less.

The prices in the case of condensers are based on a cooling-water temperature of 60° F., the equations being developed with reference to the pounds of steam condensed per hour.

The prices for internal-combustion engines include standard equipment. This in the case of gasoline engines consists of a battery, gasoline tank, water tank or circulating pump, muffler, and all pipes and fittings needed for the ordinary installation. With oil engines, oil pumps, heating lamps and mufflers are supplied. Also with an internal-combustion engine above 25 hp. self-starting devices are usually included.

The prices on oil engines include such internal-combustion engines as are suitable for exceedingly heavy oils. The cost of oil engines suitable for oils of 39° Bé., or lighter, does not differ more than a few per cent. from that for gasoline engines.

The capacity of producers is given in horsepower, this being based on a producer efficiency of 75% to 80%, and on 10,000 to 11,000 B.t.u. per brake horsepower per hour, as the term producer horsepower has no definite meaning unless it is based on the B.t.u. consumption of the internal-combustion engine to which the gas is sup-

plied. Some manufacturers of gas producers have abandoned the horsepower rating, and rate their producers in pounds of coal, which is the same as the B.t.u. basis.

The prices given for generators and motors apply to standard speeds. Of the many variables which must be taken into consideration in connection with prices on dynamo-electric machinery, speed is the most important, as the amount of copper in a machine (the voltage remaining constant) is determined by the speed for which it is designed.

The prices for transformers are for voltages of 1100 and 2200. The increase in cost for higher voltages, above that for 1100 and 2200 volts is about as follows:

Voltage	Per Cen
6,600 volts	2.5
11,000 volts	7
22,000 volts	18
44,000 volts	40

It is impossible to give the cost of switchboards in the form of an equation.

### Stratton's Independence

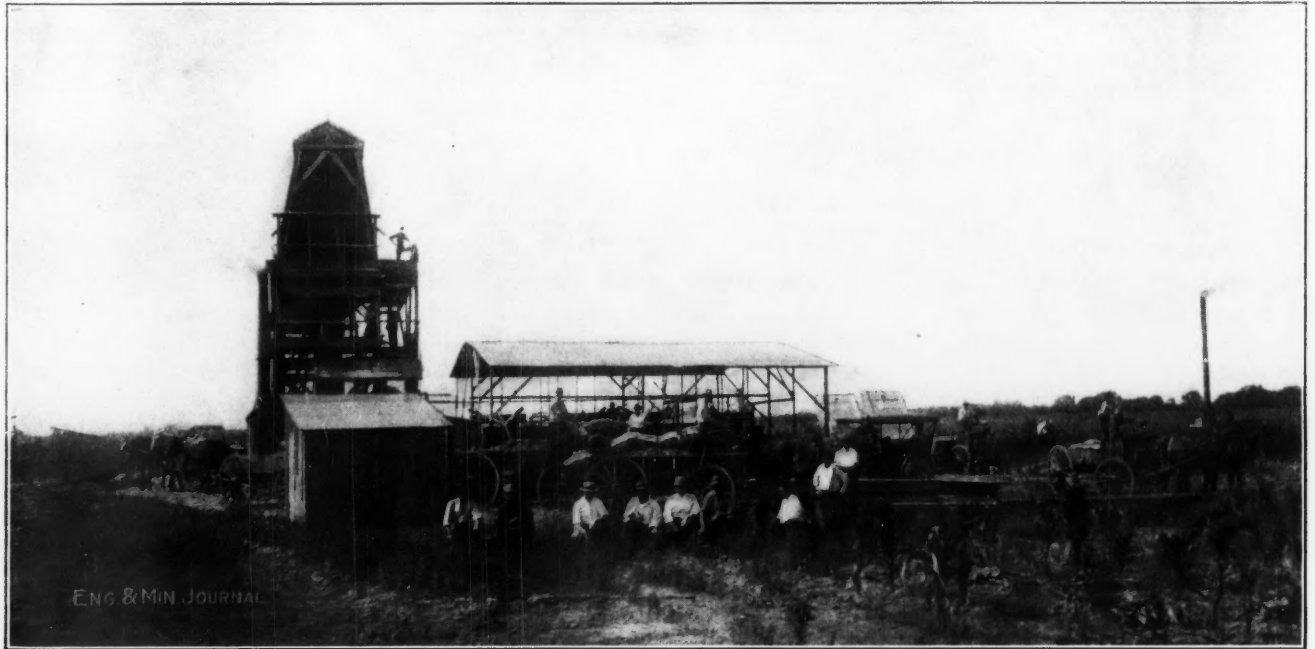
According to the annual report of Stratton's Independence, Victor, Colo., for year ended June 30, 1913, no orebodies of importance were discovered, hence the area of stoping ground was diminished. The net production from lessees has rapidly declined during the past two years, decreasing \$60,791 for the year ended June 30, 1912, and \$127,264 during the year under review. The production of shipping ore by the company shows a decrease of \$20,072 over the previous fiscal year. Apparently a net profit of \$86,400 was made after charging off depreciation and all office expenses in London. Dividends amounting to \$121,500 were paid during the year.

A summary of milling operations follows:

Dump ore milled, tons	104,111
Mine ore milled, tons	25,999
Total ore milled, tons	130,110
Total ounces of gold contained in ore	20,013
Ounces of gold per ton of ore	0.1538
Total ounces of gold recovered	15,707
Per cent. recovered in concentrates	34.43
Per cent. recovered in bullion	44.05
Milling costs:	
Coarse crushing and sorting, per ton	\$0.173537
Fine crushing, concentrating and treating concentrates, per ton	0.517619
Cyaniding and chemicals, per ton	0.500490
Miscellaneous expense, per ton	0.126211
Total milling, per ton	\$1.317857
Mining dump ore, per ton	0.122176
Total cost at mill, per ton	\$1.440033

It is expected in the future a working profit of \$7000 per month is all that can be reasonably expected under present conditions.

## Photographs from the Field



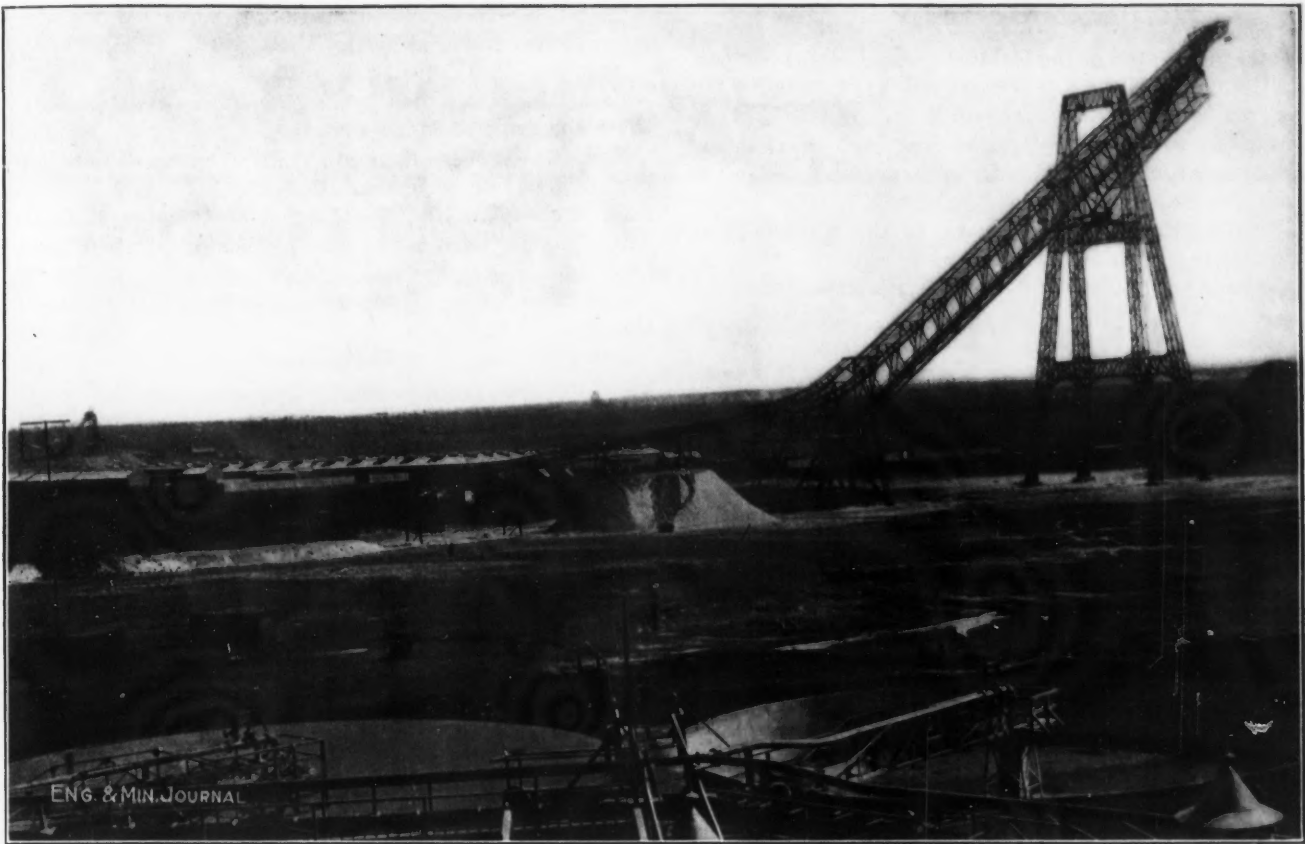
THE TWO BOBS, A TYPICAL JOPLIN, MO., ZINC-LEAD MINE

A comprehensive drainage scheme is now being carried out, which together with extension of the field through exploration drilling renews interest in the region.

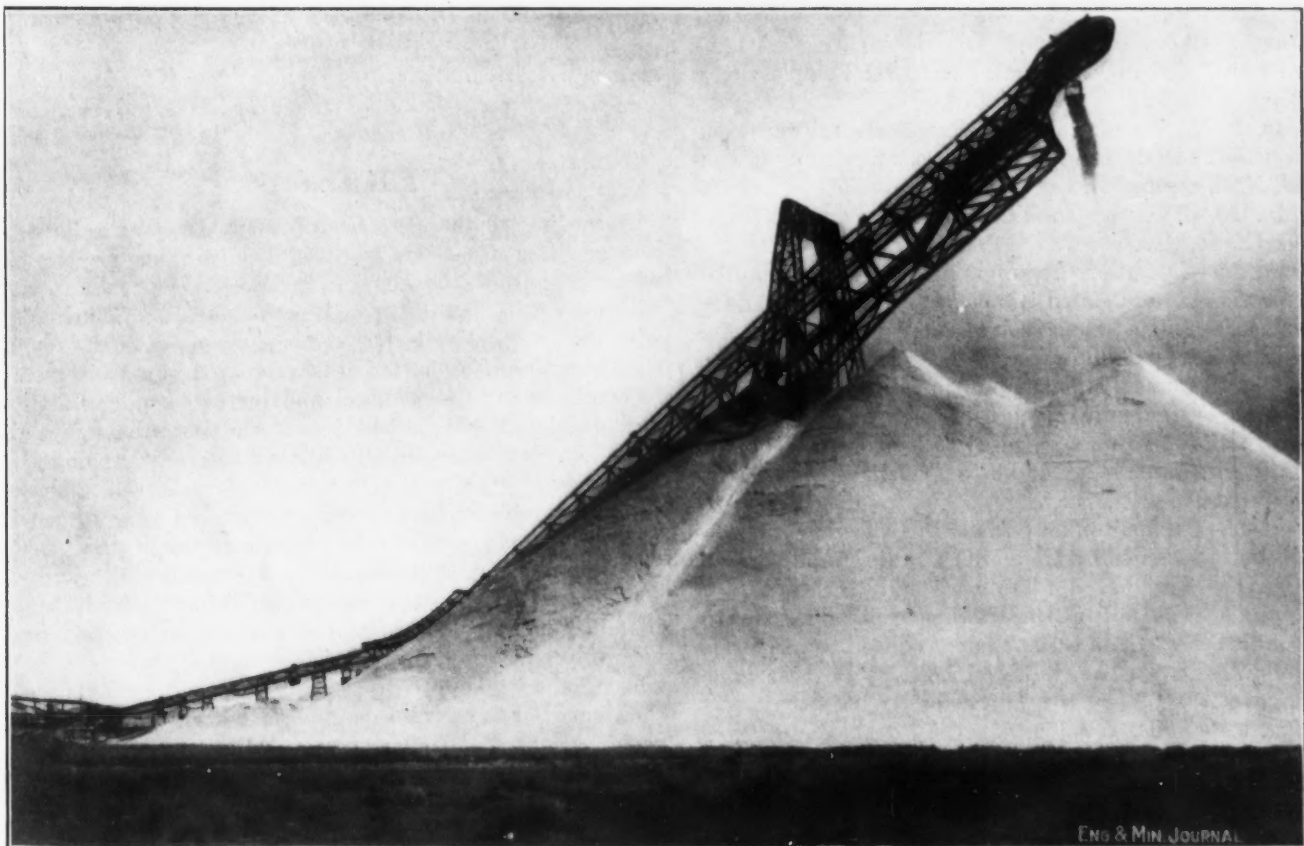


TRANSVAAL STAMPS WITH LOCKED GUARDS OVER PLATES TO PREVENT THEFT OF AMALGAM





**TAILINGS STACKER AT BRAKPAN MINES, LTD., CYANIDE PLANT ON THE EAST RAND**  
Brakpan is one of the newer Transvaal mines. Many novel features are found in the 160-stamp mill.



**BRAKPAN TAILINGS PILE IN THE SUMMER OF 1912**  
The flat country makes dewatering and stacking the tailings necessary.

## Goldfield Consolidated

Total production of the Goldfield Consolidated companies, Goldfield, Nev., for December, 1913, was 28,804 tons, realizing \$153,353. The mill was run to full capacity, but grade of ore treated was low. Development work amounting to 3071 ft. was accomplished, the cost of which was \$4.53 per foot.

The operating costs are shown in the accompanying table:

	Mining	Cost per Ton Milling and Transportation	Total
Mining:			
Stoping.....	3.10	.....	.....
Development.....	0.48	.....	3.58
Shipping expense.....	0.26	.....	0.26
Dump moving.....	0.03	.....	0.03
Transportation.....	.....	0.08	0.08
Milling.....	.....	1.81	1.81
Marketing.....	.....	0.05	0.05
General expense.....	0.45	0.07	0.52
Bullion tax.....	0.14	.....	0.14
Construction.....	.....	.....	.....
Flood damage.....	0.01	.....	0.01
Total costs.....	4.47	2.01	6.48
Miscellaneous earnings.....	0.02	.....	0.02
Net costs.....	4.45	2.01	6.46

## Chronology of Mining for January, 1914

Jan. 1—Arizona Copper Co.'s old smelting plant, at Clifton, Ariz., permanently closed.

Jan. 3—Strike at Tacoma, Wash., smelting works.—Miner killed by fall of ore in Pewabic mine, Iron Mountain, Mich.

Jan. 4—Tacoma smelting plant closed on account of strike.

Jan. 5—Buckhorn Mining Co.'s 400-ton mill, at Buckhorn, Nev., put in commission.

Jan. 7—Work resumed at Tacoma smelting works.—Two men killed in Elkton mine shaft, at Cripple Creek, Colo.

Jan. 8—Strike of South African state railways' employees.—Thorndyke-Bley Mining Co.'s new mill, at Sunland, Nev., completed.

Jan. 10—Twelve men killed in colliery explosion at Rock Castle, Ala.

Jan. 12—Operations begun in 600-ton testing mill of Inspiration Consolidated Copper Co., Miami, Ariz.—Junta Consolidated Gold Mining Co.'s new mill, at Telluride, Colo., put in commission. Fire in Negaunee mine, at Negaunee, Mich.; two men killed.

Jan. 14—Man killed by crusher belt at Alaska mine, Pike, Calif.—Two men killed by fall of ore in a Forbestown, Calif., mine.—Miner killed by fall of ore in Kennedy mine, Jackson, Calif.

Jan. 15—Miners' union officials in Lake Superior copper country indicted by Houghton County grand jury.

Jan. 16—Strike at Rio Tinto.

Jan. 18—New mill of Cinco Minas company in Hostotipaquillo district, Jalisco, Mexico, started.

Jan. 20—Three men killed at hoist at Coggins mine, Eldorado, N. C.

Jan. 21—F. E. Woodbury, general manager of Newport Mining Co., killed in the Newport mine shaft, at Ironwood, Mich.—Fire in Boston mine of Utah Copper Co., at Bingham, Utah; five deaths, three rescuers losing their lives in attempt to find two miners who were caught in workings.

Jan. 24—Man killed by gas in York tunnel, at Bing-

ham, Utah.—Miner killed by falling under ore train in Never Sweat mine, at Butte, Mont.

Jan. 25—Rio Tinto strike settled.

Jan. 26—Man killed by electric burn at Green Hill-Cleveland mine at Mace, Idaho.

Jan. 27—Leaders in South African railway strike deported, it having been found that they planned starting a revolution.—Cave in Capote mine of Cananea Consolidated Copper Co., at Cananea, Sonora Mexico; four killed.

Jan. 29—Strike of miners at Coniagas mine, Cobalt, Ontario.

Jan. 30—Explosion in Achenbach colliery near Dortmund, Germany; 22 killed.

## Guggenheim Exploration Co.

The report of the Guggenheim Exploration Co. for 1913 shows a net income of \$3,353,853, equal to 16.13% on the capital stock. Dividends paid amounted to 13½%, or \$2,807,096.

The comparative balance sheets of Dec. 31, 1913, and Dec. 31, 1912, are given below:

GUGGENHEIM EXPLORATION CO.			
	Assets		
	Dec. 31, 1912	Shares, Dec. 31, 1913	Dec. 31, 1913
Security			
Am. Sm. Sec. Co.....	\$3,960,000	34,000	\$3,060,000
*Utah Copper Co.....	9,161,767	404,504	9,161,767
*Yukon Gold Co.....	10,091,189	2,842,625	10,114,564
*Chino Copper Co.....	2,534,833	97,750	2,534,803
*Am. Sm. & Ref. Co. com....	4,764,265	69,500	4,767,265
*Ray Con. Copper Co.....	2,585,638	154,300	3,245,851
*Miscellaneous investments..	53,010	.....	56,439
*Alaska Yukon properties....	1,144,102	.....	1,119,443
Furniture, fixtures, etc.....	2,310	.....	2,256
Accounts collectible.....	4,550	.....	5,989
Cash and demand loans.....	10,303,299	.....	11,537,164
Totals.....	\$44,607,933	.....	\$45,604,640
	Liabilities		
Capital stock, issued.....	\$20,793,300	.....	\$20,793,300
Surplus.....	23,814,633	.....	24,811,340
	\$44,607,933	.....	\$45,604,640

\*Carried at cost.

## Elianite

According to the *Electrical Review*, Dr. Carlo Rossi, manager of a nitric-acid works at Legnano, has produced with the aid of the electric furnace a new substance, which he calls elianite, proof against acids. Compared with cast iron, elianite has about three-quarters the tensile strength and a quarter to three-quarters the resistance to compression; its electrical and thermal conductivities are 20% lower, but its hardness is 1.6 times that of cast iron. Its density is slightly less. The melting point of elianite is 1400° C. The new material casts well, and is suitable for the construction of apparatus of large dimensions for the concentration of nitric acid in vacuum pans by steam heating, a process which will facilitate the production of fuming nitric acid required for the manufacture of explosives. Professor Matignon states that the new substance probably consists essentially of a ferrosilicon, and, therefore, is readily attacked by alkaline solutions; but to the acid-manufacturing industries it will be of the greatest importance, enabling many processes to be adopted which have hitherto been impracticable for want of a suitable material.

**Butte & Superior Report to Federal Court** for November as required in oil-flotation patent litigation shows mill treated 28,138 tons of ore and recovered 6716 tons of zinc in concentrates having value of \$23.32 per ton. The cost of concentration per ton was \$5.26.

## Correspondence and Discussion

### Bear Lodge Mining Co.

My attention has been called to an article appearing in the *JOURNAL* of Dec. 27, under the caption "Mining News—Wyoming, Crook County, BEAR LODGE (Bear Lodge)." This article is somewhat at variance with the facts in the case, and in accordance with the policy of the Service, I desire to present them that the position of the Service may be understood.

In the article it is stated that:

Company experienced considerable trouble in getting patent to its property, land being in a forest reserve, but now title has been perfected.

The records of the county and those of the land office were consulted by the local representative of the Service at Sundance, Wyoming, and it cannot be found that the Bear Lodge Mining Co. owns any patented mineral claims in the Bear Lodge district. There is no record in the local land office that application has ever been made by this company to patent any of its mineral locations within the National Forest. It is, however, reported that this company has purchased 320 acres of land in the state of Wyoming. It is a fact that the forest service has not reported or known of any mineral lands of this company having gone to patent.

J. W. NELSON,  
Acting District Forester.

Denver, Colo., Jan. 12, 1914.

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### Financing Mining Property

I have recently noticed in the columns of the *JOURNAL* editorials, articles and correspondence on the relation between the prospector and the large mining and exploration companies that are in the field looking for new properties. It appears to me that there is a good deal of misunderstanding regarding these matters and that while there is a certain amount of blame on both sides, a clearer understanding would result in greater progress in the development of new properties.

As a general rule the prospector has little conception of the attitude taken by the large companies. To the responsible company, mining is a business in precisely the same sense as any other form of investment, and while longer chances must be taken in mining than in an industrial business, the companies do not look upon it as a gamble but endeavor, as far as possible, to eliminate the chance. The majority of companies, when considering a mining property, usually insist on one of the following conditions.

That the surface of the deposit, so far as exposed, should show the presence of payable ore over a sufficient width to justify operation.

That, if the surface conditions are not attractive, sufficient work should be done to demonstrate the presence of payable ore.

That the geological conditions in the vicinity of a

proven orebody should be sufficient to justify the assumption that other orebodies may exist.

Too many owners and prospectors believe that the large companies will not consider a property unless it has been developed. This is not the case, but unfortunately the price and terms often asked for a bare prospect are such as would be asked for a developed or partially developed mine. While responsible companies are, to a certain extent, interested in the stock-market end of a mining venture, they are not justified in taking up a property as a business proposition unless they have reason to believe that subsequent operations will result in getting back, with good interest, all expenditures for purchase, development and equipment. Prospectors should consider these points in discussing price and terms because companies when considering a prospect, do not believe that it is good business for them to pay a prospector for the privilege of developing his property and finding out whether or not it is any good. Properties which are often given no consideration on account of insufficient information and the high price asked, might be considered were the owner willing to give a working option with deferred payments, or to take a small payment and an interest in the venture. Companies are sometimes accused of squeezing out the small holder, but this is usually a myth. Even if they did have the desire to do this, they would be deterred on the ground of its being poor business. A company that is in mining as a permanent business cannot afford to jeopardize its reputation for the sake of one property.

In submitting a property to a company, the prospector or owner usually gives incomplete and unconvincing information. Statements regarding properties should be accompanied by assays of samples carefully taken at regular intervals, mentioning the width over which they were taken. Too often the assays are from single pieces of the best ore. These assays convey no useful information and in themselves are prejudicial to a consideration of the property, particularly when the accompanying statements are no more convincing than the assays. Prospectors should give clear-cut, definite statements regarding the width of the vein, the length over which it can be traced, the amount of work and the length of the exposures. This should be accompanied by assays of samples carefully cut over measured widths and a sketch, no matter how rough, showing the vein and the location and the distance apart of the samples. Every large company has hundreds of properties submitted each year, and if the statements regarding these properties are not accompanied by convincing data, the prospector will not get much consideration, as the examination of all properties submitted would entail a totally unwarranted expense.

Unfortunately, personal contact between the engineers of an exploration company and the prospector is usually lacking. There is no psychological method which will enable the engineer to differentiate between good and poor properties unless the proposal is accompanied by

convincing data. If this information is lacking, the prospector's property, on which he may have spent months and sometimes years of labor, is too often dismissed with a few curt phrases and with no explanation of the reason for not making an examination and no statement of the company's requirements. The prospector is entitled to every consideration, because on him, to a great extent, depends the future of new enterprises and the development of a more harmonious relationship lies largely in the hands of the companies. The engineer needs the constructive assistance of the prospector and if the prospector would take more pains to determine the value of his property, there is a much greater possibility of his being able to convince the engineer.

Toronto, Ont., Jan. 5, 1914.

ENGINEER.

### Salted Mines

The interesting article on mine salting, by G. L. Sheldon, in the *JOURNAL* of Dec. 13, 1913, recalls an incident that occurred in southern Nevada during 1907, when the boom was on in one of the later camps.

The townsite had changed hands and was being managed by a newly arrived Chicago millionaire; that is, he was heralded as such. As the townsite was laid out over lode claims, the new manager hired two old miners to perform the annual work in order to hold the ground. Being short of money, the boys wanted to draw on their salary before the month was up, but the boss insisted on their waiting until their time was due. The boys heard that the manager, although a millionaire, was slow on paying his bills, so they talked the matter over and on the night before they finished the work, gave out the information that they had struck ore. Of course, the boss heard of it and hastened over the following morning; one of the boys kept very busy, while the other picked out specimens from the face, blew the dust off and handed them to the manager, remarking that the gold could be seen with the naked eye. The boss said, "Yes, I can see it." He then left and sent the samples to the assayer, who gave him good returns.

In the meantime the boys had finished and gone to the office and asked for their time, saying that if they were not paid in full they would have to put an attachment on the property to protect themselves. As the boss had already gotten busy with the typewriter and the telegraph trying to promote a new company on the strength of the strike, he paid the boys in full, rather than have any litigation. Some weeks later I met the boys by chance and spoke about "that strike," remarking, "Of course, there never was any gold in that country rock, but how did you work it?" They replied that they had gotten wise to the deadbeat and concluded that the only way they would ever get their money was to find ore, so they found it. The night they gave out the tip, they borrowed a \$5 gold piece from the postmaster, and the following day when the boss called, the miner who handed him the samples simply contrived to rub the edge of the gold piece over the rock, and naturally a good many flakes of gold, which could be seen with the eye, stuck to the rock. They said the boss was highly elated and settled. All they wanted was their money, but that gold piece lost most of its milling in their efforts to win their salary. All of which goes to show that the country rock can sometimes be made to carry gold.

While a tenderfoot was caught on the foregoing, the fol-

lowing incident happened to a "practical" miner, who has made his mine and stake, and is still at the game. He had a group of claims about a mile from a prospect that was producing ore and his persistency was finally rewarded by finding colors on the surface, after which he secured capital which enabled him to sink and crosscut to the main shoot, from which he shipped a car a day of \$100 ore, until a mill was finally erected, which is still running. During the period of shipment, one of the ore haulers one evening, after leaving the corral, entered the restaurant, and I saw him hand a friend, "Slim," a specimen, about three inches square and one-half to one inch thick, that had half of one flat side streaked with gold, the metal having apparently been deposited in a crevice and exposed when the rock was broken. With it he showed the broken extension which was considerably larger, the ends of the two fitting perfectly. He wanted \$20 for the larger one which he retained. About a week later he sold this for \$15 to a Denver mining man, who placed it in his private collection at home. I was told that he sold a number of smaller specimens and that he had given one to a waitress in the restaurant. She gave me permission to examine it the following day, and I soon saw the joke. The rock was especially fitted for the work, and had been skillfully painted with banana oil and picture-frame gilt. The mine owner producing the ore hauled, was tipped off that some nice specimens were being found and when he saw the one Slim had, he at once bought it for \$5, and also several of the other ones in circulation, which now repose in his and other private collections. This is a case where an owner's own ore was salted and sold to himself.

CHARLES E. DUTTON.

Goldfield, Nev., Jan. 26, 1914.

### Problem of the Prospector

One thing has got to take place in the mining world; the prospector has got to have some help from capital or the usefulness of the mining engineer will be at an end and that before long. It seems to me that after accomplishing so much in the treatment of ores, the mining engineers might put some of their knowledge to the finding of new orebodies. But where will one see a mining engineer prospecting?

And why should not the mining schools enlarge the scope of their instruction to properly fit their young men for prospecting? In this way they would put new life into the business of prospecting, and give it the advantages of a knowledge which has done much for the handling of properties after they are in the paying list.

The business of the prospector is on the same level now as it was 50 years ago, poor living, no money, no ability to get money, just a hanging on by the eyebrows, from day to day. How do you expect these fellows to develop a property? It is out of the question. They must have the assistance of capital. Capital says it is looking for a mine, has plenty of money, but must be shown the goods. It wants a developed property and consequently there is nothing doing. What will the result be? How are we going to continue to have paying mines in this country?

T. K. ANDERSON,  
Pilot Knob Mining Co.

Gottville, Siskiyou Co., Calif., Jan. 21, 1914.

## Editorials

### The Copper Queen Mine Model

A noteworthy feature of the forthcoming meeting of the A. I. M. E. will be the exhibition of the model of the Copper Queen mine in the American Museum of Natural History, which is now nearly completed. This model is one of the finest illustrations of a mine that has ever been made; perhaps it is the finest. It is due to the munificence of Doctor Douglas. The work has been executed under the direction of Doctor Hovey, of the museum.

This model is about  $18\frac{1}{2} \times 12$  ft. in horizontal dimensions, and about 5 ft. high, thus representing a block of ground about one mile by two-thirds mile in area. The vertical face shows a section through the country rock, exhibiting the geological formation, the occurrence of the orebodies and the stopes of the mine. In the case of the greatest stope the observer is able to look clear through it and perceive its whole extent, stretching under the town of Bisbee, the timbering, position of the mine workings, etc., being accurately represented.

Upon the surface, every mining plant and every building of the district, even the shanties of the most inferior character, are represented in precise form, appearance and color. So with the railway lines and all other features, both natural and constructional. The scale of the model is 24 ft. to the inch. So faithful is the representation, that in the case of the buildings covered with corrugated iron, the corrugations of the sheets are to scale. Back of the model proper, which sits in a corner, the walls are painted to show the distant view. So cleverly has the whole work been done that it is not easy to tell where the model leaves off and the mural painting begins.

The big model, above described in a very brief way, is the main feature of the exhibit, but there are two other models. One of these is a reproduction of one of the famous stalactitic caves of the Copper Queen, a wonderful piece of work. The other is a model of the Sacramento shaft and the mine workings adjacent thereto, on the scale of 6 ft. to the inch. This model is designed to illustrate the methods of mining. Both upon the surface and underground everything is a faithful reproduction, even as to minute details. In the shaft house, the hoisting engine is not only reproduced in form, but also it is reproduced as a piece of working mechanism, and during exhibition hours it will continuously operate the two skips of the shaft, one going up and the other going down.

These models stand in one of the rooms of the geological division of the museum. One of the sessions of the Institute meeting will be held in this room. Several papers will be read at this session, including one by Doctor Hovey, who will describe the Copper Queen mine and will incidentally tell something about the construction of this wonderful model, which the museum has secured through the generosity and public spirit of Doctor Douglas.

### Our Directory of Engineers

Readers of the JOURNAL who refer to the advertising pages, as most readers do, will this week observe a change in the form of the professional directory, or directory of engineers, which has appeared for many years. The change has been made in recognition of the essentially directory character of such a publication. Engineers do not, as a rule, advertise themselves in the pages of a periodical solely with the idea that such advertising is going to bring them business. Many engineers occupying distinguished positions, which engage all their time, see fit to publish their name and address in such a way in order that the public may know how to communicate with them.

This is the true idea of such a publication, viz., a directory immediately available in all of the principal cities and mining districts of the world, through the medium of which acquaintances, clients and correspondents may be kept informed of an engineer's whereabouts, change of address, or whatever he pleases to tell. Business comes very often to the advertiser just because he can, in this way, be promptly found. It happens also that some engineer may be needed in a place where the person so needing him has no regular correspondent, in which event he is likely to turn to a professional directory to learn what engineer is to be found in that place.

Conditions being so, there is no need for an engineer to consume valuable space in making a display of his name. The mere printing of his name and address in a couple of lines is sufficient. We have changed the form of our professional directory to conform to these ideas and have so been able greatly to reduce the charge and to put the insertion of his name in the directory upon a basis that will no doubt make it desirable in the mind of many an engineer and professional man.

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### The Alaska Railroad Bill

The Senate has passed the Alaska Railroad bill. It is highly probable that a similar bill will pass the House and after the usual parleying, some final form will become a law. The President seems to desire a government railroad in Alaska and the President's fiat has so far been remarkably effective. The bill in general provides for a road from tidewater on the southern coast to the navigable waters of the interior. A bond issue to the extent of \$40,000,000 is authorized, with redemption provided for out of the proceeds of the disposal of public lands and the earnings of the road. The President has pretty complete control of the location, building and operation of the road. Permission to use the canal equipment is granted without its being charged against the \$40,000,000 allowed. The taking over of existing roads by condemnation is permitted.

The only opposition is from those to whom government ownership of railroads is an undesirable innovation. Some

talk of the "interests" opposing the bill is probably mere talk. The "interest" owning the road to the Bonanza mine would surely ask no better fate than a sale to the Government at the cost of reproduction less depreciation—the terms of condemnation provided.

The United States owes this road to Alaska. Eventually it should be self-supporting even in the narrow sense, without regard to its broad function of increasing the value to the nation of its greatest remaining territory. Meanwhile, its construction is a simple act of justice. The Government having set its face against the old fashioned exploitation of Alaska by the "interests"—and only "interests" build railroads—is in duty bound to do the useful work that would be included in such exploitation.

No road can be built that will not help Alaska tremendously. Nevertheless, it is highly important that this first road be the right road and that it be well built and the question of who is to build it arises. The name of our momentarily most prominent Colonel will suggest itself to everyone. We submit that out of a great plentitude of jobs, a police commissionership offers too much to lose and too little to gain, and the operation of a completed canal is a tame job, but the subjugation of Alaskan glaciers, mountain ranges and floods offers an opportunity well worthy of his steel. Our advice to the President on the building of the Alaskan railroad would be succinct, "Let George do it."

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### The Buying of Prospects

The letter from Mr. Anderson in this issue voices emphatically the oft-heard complaint of the prospector and prospect owner against capital. The assertion that the prospector himself cannot develop his find is perhaps valid. The same is not always true of the prospect owner, who is frequently a local storekeeper or saloonkeeper and a man of some resources. The JOURNAL has heretofore expressed the belief that some relief for the bear market in prospects might be found if the owner would himself turn to and develop.

Admitting, however, that many prospects cannot be so developed, their claim on the attention of outside capital is economically quite valid. If capital be susceptible to praise or blame, its unwillingness to engage in the development of prospects deserves censure. The attempt to scold capital, as represented in the development and exploration companies, is, however, unjust. These companies are doing a legitimate business and making money in their own way. If they do not care to buy raw prospects, that is their concern. The only possible objection to them is that their titles are frequently misnomers.

The Guggenheim Exploration Co., for example, does not explore, but merely buys blocks of stock in going concerns. This is also partly true of many English companies. Other companies, like the United States Smelting, Refining & Mining Exploration Co., want only developed mines. The United States company operates on the principle that by virtue of its organization and superior methods, it can mine more cheaply than the operator with whom it deals. It will buy a mine at its value to the owner, provided this is fairly determined, and depend for its profit on its ability to mine more economically. The General Development Co. desires only the high-

ly meritorious prospect or the semi-developed mine; its successful handling of Miami is an example.

There is, then, no fault attributable to the existing development companies. But is capital as a whole so derelict as we are told? There are many difficulties in the way of successfully handling prospects. In the first place, it is hard to obtain reliable information on the properties submitted for consideration. Often the accompanying description is unintelligible, usually unreliable. Even an honest man finds it difficult to state only existing facts and to set down just what he sees. If the prospect owner would intrust the preparation of his property description to some local engineer, his chances of interesting capital would be greatly increased.

It is likely that the local technical men could be made good use of by both parties. It is quite impossible for a purchasing company to send its engineers to investigate all the prospects submitted to it. Traveling expenses would eat up all possible profits to be expected. A local engineer, familiar with his district, honest and intelligent, could perform a most useful function in furnishing information to intending purchasers.

Another possible method of obtaining this information would be through the offices of a local board of trade. If such organizations would make it their business to collect and preserve all the data obtainable on the properties in the vicinity, they would be of the greatest service. By confining themselves to a record of the bare facts without an expression of an opinion, they could avoid getting into difficulties with either party. A third possibility is that proposed by Arthur M. Swartley in the JOURNAL of Jan. 24, 1914, namely, the employment of a state organization to collect data on districts and property.

As a matter of fact, economic situations of this sort must largely be left to work out their own salvation. When mines become scarce enough, prospects will become more attractive, and purchasers will not be lacking.

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### Colorado's Radium

The radium imbroglio seems now to be in a fair way of settlement. Out of the volumes of nonsense that has been talked, some things stand out clearly. If radium be indestructible (in practical consideration), bountiful in supply in Colorado (which is doubtful) and of incalculable value to humanity (which is still questionable), its conservation in the earth is manifestly undesirable. On the contrary, the sooner all of Colorado's radium can be extracted, the better off shall we be. However, the Department of the Interior never had any serious idea of withdrawing the radium lands. It wants simply to go into the radium business, build a factory, buy ores, treat them, regulate prices, etc. This is to be the first step in the governmental operation of metallurgical works, and is in line with the talk of the governmental ownership and operation of railways, telegraphs, and all the rest. The fact that the government operates its own great monopolistic enterprise, the post office, in an admittedly inefficient manner, does not deter the advocates of governmental operation of all things.

Of course, the proposal to withdraw any mineral lands from location in Colorado was like waving a red flag before a bull, which, no doubt, Secretary Lane knew as well as anybody. Having got in the first shot, however, he was able gracefully to offer a compromise, leaving the

public lands open to prospecting and location, but reserving to the government a call upon the product, in so far as such product is wanted for the government works that Congress apparently is going to finance. All of this is now going through Congress on greased ways, just like a successful ship launching.

Incidentally, the affair precipitated in Colorado a rush to the radium fields that was reminiscent of the rush to Cripple Creek; or shall we more accurately find our analogy in the Mt. Pisgah excitement? From the radium fields there will, no doubt, return a collection of sad but wiser prospectors. But one thing is now lacking, viz., the appearance of the wildcat radium promoter and the listing of his shares on the Curb.

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The rise in the price for copper that occurred in January was almost wholly due to European buying, which in the aggregate absorbed a good deal more copper than anybody but the well informed were aware. American buyers always wanted copper a little cheaper than the market price at any time. Waiting for a reaction they lowered their ideas when the reaction actually came. In the meanwhile the Europeans were buying at the market pretty much right along. After the advance became well pronounced the absence of American business was a conspicuous feature of the market. The American buyer was reluctant throughout. However, when the price reached about  $\frac{3}{4}c.$  above the lowest, there began to be some considerable domestic business. Thus we have had one more repetition of the proverbial experience that the European buys copper cheapest while the American buys on a rising market.

**BY THE WAY**

We hear that the flotation plant of the Inspiration is treating 500 tons of ore per day and giving 78% extraction; and has been giving such satisfactory returns from the start.

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The newspapers report that the Department of Justice has concluded that it has sufficient ground for suit to dissolve the American Smelting & Refining Co., and that a bill in equity to that end is being drawn.

✽

The natural resources of Colorado have not been appreciated before, if one believes one of our contemporaries: "Another natural product of Colorado is carborundum. This is a substance as hard as a diamond and will cut glass just as if it were cheese. The material sells for \$100 per ton, and there is a mountain of it down in Costilla County."

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One of the Duluth papers recently reported a phenomenal find: "W. L. Randall, who has a homestead near the Northwest Angle, for some time has been under the impression that there was mineral in that vicinity and while digging his cellar discovered a bed of sand that showed indication of being gold-bearing. A sample was sent to W. W. Bonner, an assayer, at Port Arthur, Ont., to be analyzed. The report says the sand contained 15%

gold to the cubic yard. Mr. Randall is still content to stick to his usual homestead duties, but hopes to some day get things in shape so that there is prospects of something doing in the mining line at the Northwest Angle."

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The comparison of successive balance sheets of the Guggenheim Exploration Co. affords interesting studies of the prices at which the company buys and sells shares. During 1913, the Exploration company bought 7740 shares of Yukon Gold Co., at \$3.02 per share; and 33,100 shares of Ray Consolidated at \$19.95. The company also sold 10,000 shares of American Smelter Securities, pfd. B. The surplus account is also interesting. The net income was \$3,353,853 and dividends paid were \$2,807,096, a difference, presumably carried to surplus, of \$546,756. The surplus, however, increased by \$996,708, showing an unexplained increase of \$449,954. As the Smelter's Securities stock is carried on both the 1912 and 1913 balance sheets at \$90, and 10,000 shares were sold, a portion of the unexplained increase is doubtless due to a premium over \$90 received for the stock sold, which is 6% cumulative issue. Part of it is also probably due to a sale of a portion of the Alaska Yukon holdings at a price greater than the \$24,659 shrinkage in the balance-sheet value

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Some idea of the extensive interests of Consolidated Gold Fields of South Africa will be obtained by a glance at the accompanying table showing its principal investments as at June 30, 1913:

Companies	Shares
Abbottiakoon Mines, Ltd. ....	42,119
African Land & Investment Co., Ltd. (Ordinary)....	88,320
African Land & Investment Co., Ltd. (Debentures)....	£26,900
Afrikaner Proprietary Gold Mines, Ltd. ....	43,333
Anglo-Colombian Development Co., Ltd. ....	40,636
Bell Reef Development Co., Ltd. ....	41,955
Booyens Estate, Ltd. ....	18,035
Cam & Motor Gold Mining Co., Ltd. ....	42,923
Cinnamon Bippo Co., Ltd. ....	23,944
Crown Mines, Ltd. ....	5,372
East Rand Extension Gold Mining Co., Ltd. ....	29,968
East Rietfontein Syndicate, Ltd. ....	6,951
Elandsfontein Estate Co., Ltd. ....	11,753
Falcon Mines, Ltd. (Debentures)....	£25,328
Falcon Mines, Ltd. ....	39,804
Fanti Consolidated Mines, Ltd. ....	17,763
General Motor Co. (6% notes, 1915)....	\$125,000
General Petroleum Properties of Trinidad, Ltd. ....	19,555
Gold Coast Amalgamated Mines, Ltd. ....	37,675
Gold Fields American Development Co., Ltd. ....	1,000,000
Gold Fields Amer. Development Co., Ltd. (10s. paid)....	800,000
Gold Fields Rhodesian Development Co., Ltd. ....	647,484
Gold Mines Investment Co., Ltd. ....	113,559
Jupiter Gold Mining Co., Ltd. ....	214,688
Knights Deep, Ltd. ....	401,862
La Rochelle Syndicate, Ltd. ....	11,700
Lonely Reef Gold Mining Co., Ltd. ....	10,325
Mississippi River Power Co. (Bonds)....	\$212,100
Mississippi River Power Co. (Preference)....	\$249,900
Nourse Mines, Ltd. ....	19,865
Robinson Deep Gold Mining Co., Ltd. ....	404,483
Shamva Mines, Ltd. ....	12,402
Simmer & Jack Proprietary Mines, Ltd. ....	1,356,974
Simmer Deep, Ltd. ....	327,686
Simmer Deep, Ltd. (2d Debentures)....	£82,400
South Deeps, Ltd. ....	78,031
Sub Nigel, Ltd. ....	116,549
Turfontein Estate, Ltd. ....	23,751
Victoria Falls & Transvaal Power Co., Ltd. (Ordinary)....	58,785
Victoria Falls & Trans. Power Co., Ltd. (Preference)....	187,279
West African Mines, Ltd. (Ordinary)....	10,275
West African Mines, Ltd. (Founders)....	25

In addition to the above the company holds shares and debentures in various companies, which on quotations of June 30, 1913, or estimations represent a value of £302,256. In schedule No. 2, the company's investments on account of reserve amount to over £400,000, and further assets are represented in its unfloted mining properties in South Africa and real estate in London, Johannesburg, Salisbury and Bulawayo.

## The Russo-Asiatic Corporation

At the adjourned first annual meeting of the Russo-Asiatic Corporation, Ltd., the chairman, C. J. Cater Scott, described the operations of the company in an address from which the following is taken:

The corporation was formed to acquire and develop mines within the limits of the Russian Empire. After considerable exploration and examination three properties have been taken up, the Nerchinsk, the Ridder and the Ekibastus.

The Nerchinsk is a concession in eastern Siberia, covering 8000 square miles, in which the corporation has the right to acquire and work mines on a royalty basis for 75 years. In this area a large number of old zinc-lead-silver mines are found, with varying records of past production. The most important seems to be the Kadainsky, in which it is estimated there are 50,000 tons of available ore assaying 22.8% zinc, 9.3% lead, and 7.8% silver. The property is 160 miles from the Siberian railway and eight miles from the Argoon River; on the latter, however, navigation is uncertain, so that steps have been taken to obtain a railway concession. The concession contains other mines indicating possibilities as great as those of the Kadainsky.

The Ridder concession covers an area of about 3000 square miles in the southernmost part of the Altai Mountains. Mines taken up are held on 75 years' lease with a small ground rent and with a reasonable royalty on production, and the exclusive right to take up other mines for 10 years is granted, together with timber, water power, railway, road, smelting flux and building-material rights. The Ridder mine, 60 miles from the Irtish River, is the most important property. The river gives communication with Omsk six months in the year. Projected railway construction will greatly improve communication with the mine. It is stated that above the water level of the mine, 98,000 tons of ore are developed, carrying 28.5% zinc, 13.5% lead, 1.7% copper and \$18 in gold; together with 110,000 tons of concentrating ore, running 5.5% lead, 1.2% copper, and \$14.50 in gold. In addition to this, a reserve of 1,550,000 tons of mixed sulphide ore with an average value of \$50 per ton, is claimed as developed by two drill holes, and a considerable body of gold ore, which should give a tonnage of 370,000 for every 100 ft. along the strike, with an indicated average value of \$11. On the same concession, the Sokolni mine has excellent possibilities and shows several thousand tons of ore on the dumps. The mines on both these concessions have previously been exploited solely for their oxidized ores.

The Ekibastus concession is a coal property, 75 miles southwest of the town of Pavlodar, on the Irtish. The main series of beds is said to show 190 ft. of workable coal. A broad-gage railroad, 74 miles long, to the river will be acquired and put in shape for use. There is a market along the river for an annual production of 150,000 to 200,000 tons per year.

Immediate future work contemplates, on the Ridder concession, the defining of the Ridder orebody by drilling and developing, the investigation of neighboring water-power possibilities, the importation of an experimental treatment plant, a survey for a narrow-gage railroad connecting the mine with the river, the examination of the Sokolny mine and general prospecting; on the Nerchinsk concession, diamond drilling at the Kadainsky mine and

the development of other properties; and the development equipment and operation of the Ekibastus coal property. The developed properties will eventually be offered to the public.

□

## Mining Dividends in January

Dividends paid by 34 United States mining companies making public reports amounted to \$7,258,432 in January, 1914, as compared with \$7,595,709 paid by 39 companies in January, 1913. Payments by 20 Mexican and Canadian companies amounted to \$2,505,321, as contrasted with \$3,672,144 paid by 26 companies a year ago. Thirteen holding and metallurgical companies paid \$4,085,688.

United States Mining Companies	Situation	Per Share	Total
Ahmeek, c.	Mich.	2.00	100,000
Anacoda, c.	Mont.	0.75	3,249,375
Bunker Hill and Sullivan, l.s.	Ida.	0.25	81,750
Bunker Hill Consolidated, g.	Calif.	0.05	10,000
Camp Bird, pfd., g.	Colo.	3 1/2%	110,565
Center Creek, l.z.	Mo.	0.05	5,000
Continental Zinc, z.	Mo.	0.50	11,000
Colorado Gold Dredging, g.	Colo.	2.50	250,000
Daly Judge, l.s.	Utah	0.15	45,000
Fremont, g.	Calif.	0.02	4,000
Golden Cycle, g.	Colo.	0.03	30,000
Grand Central, g.	Utah	0.05	25,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Iron Blossom, s.l.g.	Utah	0.10	100,000
Kennecott, c.	Alas.	.....	1,000,000
Mary McKinney, g.	Colo.	0.02	26,185
North Butte, c.	Mont.	0.50	205,000
Old Dominion M. & S., c.	Ariz.	1.25	202,500
Osceola, c.	Mich.	1.00	96,150
Portland, g.	Colo.	0.02	60,000
Shattuck-Arizona, c.	Ariz.	0.50	175,000
Tightner, g.	Calif.	500.00	50,000
Tom Reed, g.	Ariz.	0.06	54,573
Tonopah-Belmont, g.s.	Nev.	0.25	375,000
Tonopah Mining, g.s.	Nev.	0.25	250,000
Tonopah Extension, g.s.	Nev.	0.05	49,180
United Globe, c.	Ariz.	7.50	172,500
United Verde, c.	Ariz.	0.75	225,000
Wellington, g.	Colo.	0.00 1/2	50,000
Yellow Pine, l.z.s.	Nev.	0.02	10,000
Yellow Aster, g.	Calif.	0.05	5,000
Yindicator, g.	Colo.	0.03	45,000
Yosemite, Gold Dredging, g.	Calif.	0.10	2,400
Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Alacran, g.s.	Mex.	2.00	19,200
Buffalo Mines, s.	Ont.	0.15	150,000
Canadian Goldfields, g.	B. C.	0.001 1/2	7,500
Chontalpan, g. s. l. z.	Mex.	0.75	5,250
Crown Reserve, s.	Ont.	0.02	35,376
Cons. Min. & Smelt. Co.	B. C.	2.00	116,088
Dominion Steel, com.	Can.	1.00	345,896
Esperanza, g.s.	Mex.	0.24	165,848
El Favor, s.	Mex.	0.01	35,000
Enciño, g.s.	Mex.	1.00	3,000
Greene Cananea, c.	Mex.	0.50	50,000
Hollinger, g.	Ont.	0.15	90,000
La Rose Con., s.	Ont.	0.45	674,382
Lucky Tiger, g.	Mex.	0.06	42,920
McKinley-Darragh-Savage, s.	Ont.	0.06	134,861
New York & Honduras Rosario, g.	C. A.	0.20	20,000
Nipissing, s.	Ont.	0.37 1/2	450,000
Nova Scotia, S. & C., pfd.	N. S.	2.00	20,000
Nova Scotia, S. & C., com.	N. S.	1.50	90,000
Standard Silver-Lead, l.s.	B. C.	0.05	50,000
Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Sm. Securities, pfd., A.	U.S. Mex.	1.50	255,000
Am. Sm. Securities, pfd., B.	U.S. Mex.	1.25	375,000
Bethlehem Steel, pfd.	Penn.	1.25	186,350
Cambria Steel	Penn.	0.50	450,000
Colo. Fuel & Iron	Colo.	4.00	80,000
Guggenheim Exploration	U.S. Mex.	1.25	1,039,665
La Belle Iron	Ohio	0.50	49,577
Old Dominion of Me., c.	Ariz.	1.25	366,691
Pennsylvania Salt	Penn.	1.50	150,000
Republic Iron & Steel	U. S.	1.75	357,296
Sloss-Sheffield, S. & I.	U. S.	1.75	117,250
U. S. S. R. & M., pfd.	U.S. Mex.	0.87 1/2	425,530
U. S. S. R. & M., com.	U.S. Mex.	0.75	263,329

The Lake copper companies were hit badly by the strike, Ahmeek and Osceola paying reduced dividends, Champion and Copper Range, none. Kennecott paid one of its \$1,000,000 dividends.

While the dividends paid show a reduction from last year, it seems comparatively small when it is remembered that we are seeing the close of a long industrial depression, which has heretofore not been reflected in mining, that Mexico is still disturbed, and that the dividend payers of the Lake Superior region have made no money for the last half year.



## PERSONALS

Archer E. Wheeler sailed on Jan. 31 from New York for London, on his way to the Belgian Kongo.

E. Harms, general superintendent of the Torreón Smelting Works in Mexico, is in New York on a business trip.

W. B. Oliver, formerly of Bingham, has been appointed superintendent of the Daly mine at Park City, Utah.

H. F. E. Gamm has gone to Yavapai County, Arizona, where he will be engaged for several weeks in professional examinations.

J. F. Nielson is at present at the Knight-Christerson Reduction Works, Robinson, Utah, in charge of the machinery and preparing it to start.

Dorsey A. Lyon, Pittsburgh, has been appointed chairman of the committee on electrometallurgy of iron and steel of the American Electrochemical Society.

Eli Taylor Conner has removed his office from the Real Estate Trust Building to Room 1315, Stephen Girard Building, 12th St., below Market, Philadelphia.

Berkeley Williams, of Richmond, Va., Hennen Jennings and A. L. Perkins, of Washington, have been in Birmingham, Ala., inspecting properties of the Alabama Co. in that district.

Llewellyn W. Jones, vice-president in charge of production and manufacture of the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., and its allied interests, has resigned to enter other business.

Robert E. Cranston is making an examination of the Zeile mine at Jackson, Calif., assisted by B. M. Snyder, of Los Angeles; R. H. Elliott, of Berkeley; Alexander Wise and Donald Cameron, of San Francisco.

A. Reiche, general manager of the Orenstein-Arthur Koppel Co., Koppel, Penn., has severed his connection with that company and sailed for Germany, Jan. 14. He has been succeeded by Erich Joseph, formerly New York manager of the company.

John Mocine is now manager of the National Copper Mining Co., at Mullan, Idaho, succeeding Charles McKinnis, who has left for the East on account of ill health. Mr. Mocine was formerly in Idaho, but for some years past has been at Goldfield, Nev., and in Alaska.

John H. Davis, formerly superintendent of the Otis Steel Co., and who resigned as general manager of the Standard Steel Castings Co., Cleveland, Ohio, the latter part of December, sailed from San Francisco, Jan. 13, for Sydney, Australia. He expects to return to Cleveland next April.

William H. Marston, an English mining engineer, is missing from the Hollinger mine in Ontario. He is 30 years old, 6 ft. high, weight, 170 lb., has light-brown hair and mustache, stoops noticeably. Anyone having any information about him, or having seen him, is requested to write to Mrs. W. H. Marston, Hollinger Mine, Schumacher, Ontario.

Richard S. McCaffery has just been appointed professor of metallurgy in the University of Wisconsin. Professor McCaffery is a graduate of Columbia, and has during the past few years been professor of mining and metallurgy at the University of Idaho and chairman of the Spokane section of the American Institute of Mining Engineers. He has had a wide metallurgical experience in the United States, Central and South America, in operating, construction and consulting practice, having served in capacities from chemist and assayer to general superintendent and manager.

## OBITUARY

George Flemming died in Alameda, Calif., Jan. 19, at the age of 84 years. He was a native of Canada. He went to California in 1852 and engaged in mining.

Bradford Barnard died at Middletown, N. Y., Jan. 21, aged 74 years. Most of his life was spent as a teacher, though he was a mining engineer by profession. He was for a time in Mexico, and was concerned with the Esperanza mines there.

Edwin Starrs Sperry died at Bridgeport, Conn., Jan. 31, aged 48 years. He graduated from the Sheffield Scientific School at Yale University and was instructor there for a time. For some years past he had been editor of the "Brass World," and had written much on metallurgical topics.

The Russian Geological Committee has sustained a great loss by the death of the director, Théodose Tchernycheff, mining engineer, member of the Imperial Academy of Sciences of St. Petersburg, and honorary member of many learned societies. The deceased engineer died Jan. 15, aged 57 years.

Samuel W. Vaughn died in Lorain, Ohio, Jan. 23. He served several years as superintendent of the Lorain blast furnaces and previously was employed for 32 years by the Cambria Steel Co., at Johnstown, Penn., serving several years as superintendent of that company. The widow, four sons and three daughters survive.

W. P. Monahan was drowned in Fresno County, Calif., on Jan. 25, while attempting to cross Jose Creek during a heavy rainstorm. Mr. Monahan was a graduate of the Massachusetts Institute of Technology and for the past two years was employed as an engineer by the Stone-Webster Construction Co. His body was recovered.

Isaac N. Chapman died in Alameda, Calif., on Jan. 24. He was born in Ohio and went with his parents to Oregon in 1852. He served in the Indian wars of 1855-6 and went to California in 1861 and engaged in mining. Since 1877, Mr. Chapman had been almost continuously employed as city engineer of Alameda, and for one term was a member of the State Board of Harbor Commissioners.

J. C. Meader, pioneer of the Mogollon mining district, died at Silver City, N. M., Jan. 25. He was 79 years of age and was born in Troy, N. Y., in 1835. In 1879 he went to New Mexico and engaged in mining near Alma. He participated in the early wars of the Indians and was known as one of the bravest pioneer Indian fighters. Mr. Meader did much toward developing the Mogollon district and his death is sorely felt by the mining men in the Southwest.

John P. Collins, aged 45, general superintendent of the city blast furnaces of the Carnegie Steel Co., Pittsburgh, including the Lucy, Isabella, Edith and Neville groups, died in that city, Jan. 21. Mr. Collins took charge of the city blast furnaces about a year ago, upon the retirement of James Scott, and, as a blast-furnace operator, had made an enviable record, particularly in connection with the development of the Gayley dry-blast process and thin-lined furnaces. Mr. Collins was born in Pittsburgh, and was educated in the public schools of his native city. In 1891, he accepted a position at the Lucy furnace plant, and was appointed superintendent of the Lucy furnaces in 1900. Later, he was appointed assistant general superintendent of the city furnaces, and held that position until a year ago. Mr. Collins was a member of the American Iron & Steel Institute, American Institute of Mining Engineers, and the Engineers' Society of Western Pennsylvania.

John L. Howard, president of the Western Fuel Co., died in Oakland, Calif., on Jan. 22. He was born in Philadelphia and was 63 years old. Mr. Howard with seven other officials of the Western Fuel Co. was on trial in the United States District Court on a charge of conspiracy to defraud the government. He was stricken with apoplexy the day preceding his death. Permission to dismiss the charge as to Howard was granted from Washington when his illness was made known, but the wire was received at San Francisco a few minutes after his death. During the trial Howard's name has not been mentioned by any of the witnesses and no charges were personally made by anyone connected with the trial. Mr. Howard was president also of the Alameda Sugar Co., Alameda Farms Co., Atlantic Securities Co., Holmes Lime Co., Union Commercial Co., Howard Co., and last November was elected president of the Beet Sugar Manufacturers of America, at the Chicago meeting. He was also a director in other enterprises. He spent a large part of his time at the mines of the Western Fuel Co. in British Columbia.

## SOCIETIES

**Iron and Steel Institute**—Secretary G. C. Lloyd, 28 Victoria St., London, S. W., England, announces that May 7 and 8, 1914, have been fixed as the date of the next annual meeting of the Iron and Steel Institute. The annual dinner will take place May 7, at the Connaught Rooms, Great Queen St., London. On invitation of the Comité des Forges de France, the autumn meeting will be held in Paris, the dates of Sept. 18 and 19, having been provisionally fixed for the business sessions. The first half of the following week will be devoted to excursions to the chief iron-mining and manufacturing districts of France. The Bessemer gold medal for 1914 will be awarded to Dr. Edward Riley.

## Editorial Correspondence

SAN FRANCISCO—Jan. 28

**Ample Water for Power** is assured the electric power companies throughout the state for 1914. It is not probable that there will be any shortage of water for general mining purposes, although the rain storm in the third week of the month washed out a large amount of snow. The storm broke on Jan. 27 with bright, clear, cold weather and a strong north wind. The indications at that date were that cold weather would prevail and that the February storms will carry lighter rains in the lower elevations and snow in the mountains, with enough freezing weather to insure storage equal to the requirements of mining all over the state. A large amount of damage was done by the last storm in January in the washing out of bridges and roadbeds and delaying of train service.

**Accidents in California Mines** would no doubt be largely diminished by a law similar to or like the new Nevada law, requiring all underground men to speak and read English. A large number of foreigners are employed as carmen and shovelers underground in the mines of this state, and there have been fatal accidents directly due to ignorance of this class of men. It is the habit of many foreign laborers in various vocations in California, and doubtless in other states, to avoid the use of English as much as possible even when capable of speaking and comprehending the language. Many of them disregard the suggestions and assistance offered by English-speaking fellow workmen and obstinately follow their own methods irrespective of the right or wrong of their actions. About the only commendable characteristic of these men is their utter fearlessness, which is undeserving of commendation when it becomes foolhardiness. The adoption of such a law would probably make underground labor scarce for a time; but there is no doubt the foreigners would improve quite rapidly if they knew their jobs depended upon a knowledge of English.

**Passage of the Alaska Railway Bill** by the Senate was received in San Francisco with less demonstration than in Seattle, but with a large degree of confidence that the future of mining in Alaska is to be enhanced. While there is not a large California following of the advocacy of government-owned transportation as applied to all parts of the United States, the men who are interested in the practical and permanent development of mining in Alaska recognize the value of railway transportation and are not particular as to the ownership and operation so long as economic handling of machinery and ores is assured. The recent developments on Gastineau Channel and the opinion expressed in the "Journal" that the Gastineau district is destined to become the most important gold-mining district in America has stimulated interest in Alaska mining. The statement of Doctor Holmes, director of the Bureau of Mines, regarding the Matanuska coal fields also attracted the interest of possible investors and prospectors who make San Francisco their starting point. Another thing has added to the zest, that is not favorable to California but inevitable. The freak legislation of 1913 has acted as a deterrent to investors who recognize the resources of California, but who do not fail to recognize also that the recent new laws, some of which are now operative and others that will probably be made operative by vote in the next general election, are a handicap that will preclude an even chance for money expended in development and operation in this state. The "progressives" of California have unwittingly advanced the progress of Alaska.

DENVER—Jan. 31

**Scout Engineering** is an expression that is being glibly handled in Colorado and is intended to cover the investigations heretofore pertaining to consulting engineers and exploration companies. So firm a hold has the idea of amortization taken on all the successful mining companies of the West that each one appears to be reaching out for virgin ground that will constitute the basis for continued operations. It is heard that Stratton's Independence, Ltd., is sidetracking a dividend that the fund may be appropriated to such a purpose; that the Cresson company has already completed such investigations; and that the El Paso Gold Mining Co. has

just had engineers at work investigating the property of the Golden Cycle with a view to purchase. This principle is not confined, by any means, to the Cripple Creek district, but is prevalent throughout the state and the West in general.

**Unwatering the "Downtown" District** in Leadville is a new enterprise now under way. Ex-governor Jesse F. McDonald is furthering this project. The topography of Leadville is such that in general drainage adits have not been found feasible. Pumping schemes here have twice before failed. One such plan comprehended the unwatering of Fryer Hill while the other similarly would drain Iron Hill, both of which are solid areas of ground that have produced wonderfully. In each case, however, the scheme was effectively blocked by the covetousness of a single individual. In McDonald's new project, he is obtaining long-term leases on the properties of numerous companies, estates and individuals and he will thus secure control of a block of approximately 400 acres of the choicest downtown area surrounding the Penrose shaft which is planned to be the main mine opening. Among the companies and estates that are negotiating with McDonald and who will, in all probability, enter into formal contracts with him are the following: Penrose, Orion, Gray Eagle and Pocahontas, Gazelle, Star Consolidated, Wolcott, Augusta, Estrella, Eli, Bismarck, St. Louis, Nubian, Aetna, Crescent and Iroquois. In addition to these properties there are the holdings of several individual interests for which contracts are being made. At present, negotiations are progressing nicely and it would seem that the first operations on the ground might perhaps begin about Apr. 1. It is estimated that the normal inflow of water to be permanently handled is about 1400 gal. per min. The equipment will be planned with a capacity considerably in excess of this flow and it is expected that a whole year may be required to unwater the old workings sufficiently so that mining development may proceed. Water will be discharged through the Penrose shaft, but whether steam or electricity will be the form of power used has not been decided. The shaft is about 900 ft. deep, but the water will be lifted only to the level of a short adit about 60 ft. below the collar of the shaft. There are known to be reserves of sulphides that were purposely left in the old workings as too low grade when this mine was formerly worked; while there is no doubt that the various properties in this deal contain tremendous bodies of zinc carbonate that had not been identified prior to the cessation of operations. This whole project has been investigated and reported on by Prof. W. B. Potter, of St. Louis, formerly of the Missouri School of Mines and Metallurgy. About \$200,000 is to be subscribed by St. Louis men and this gives assurance that the Penrose will again become an active mine within a few months.

CALUMET—Jan 31

**The Congressional Investigation** that is to be carried on by the committee of mines is not causing any undue interest in the Lake Superior copper country, with the exception that it is being used by the local agitators to maintain the remnant of the strike that now exists. The mining companies have been investigated in various ways and one or two more investigations will not reveal any conditions that have not been made public, but if as much attention is given to the investigation of the Western Federation of Miners as has been given the mining companies, some interesting facts may be revealed, relative to the conditions that have prevailed throughout the district for the last six months. Men are coming in in large numbers of their own accord and the mines throughout the district are practically full-handed, with the possible exception of one or two properties where there is a scarcity of mines. The New Arcadian has encountered a promising amygdaloid lode in the crosscut from the 750-ft. level. The crosscut has cut through the formation and is 14 ft. wide. Drifting has been started in both directions on the lode. Superior is shipping about 500 tons of rock to the mill each day, and a party of men is employed putting No. 2 shaft in shape to resume development work. Calumet & Hecla is shipping about 8000 tons per day to the mills, making it necessary to put on a night crew on the railroad.

**SALT LAKE CITY—Jan. 29**

**Recent Heavy Snowstorms** throughout the state insure an abundant water supply for the coming summer. Parts of the Salt Lake watershed are solidly packed, large ice fields having been formed in places. The total precipitation for the month of January amounted to 3.08 in., or greater than that for any previous January in the history of the Weather Bureau. Last January it was 0.81 in. Six feet of snow fell at Brighton in Big Cottonwood Cañon, Jan. 24 and 25. At Park City there has been 61 in. of snow this month. A small snowslide occurred at Alta, Jan. 26, carrying away an orebin, but causing little loss. Further slides are expected at Superior Gulch, where the usual spring slides occur. An exceptionally heavy fall of snow followed by warm weather caused a slide at Storrs, a new coal-mining camp near Helper, in Carbon County, Jan. 26. Three persons were killed, and several injured. At Eureka, the Knight railroad operating between Knightsville and Silver City has been somewhat hampered by large snowdrifts near the Beck Tunnel.

**MARQUETTE—Jan. 31**

**Building Activity at Alpha**, on the east side of Iron County, promises this summer to be exceptional. It is in this field that the Longyears are developing the Judson mine and Pickands, Mather & Co., the Balkan. Both of these properties will eventually rank with the largest producers on the Menominee range and it is evident that Alpha will become a community of no small importance. The Judson is already stockpiling ore and will be in position to ship directly upon the opening of the season of navigation, notwithstanding the development of the mine was started only on Aug. 6, 1913. An inclined shaft was sunk to a depth of 300 ft., at which point a station was cut and drifting to the orebody was started. The deposit was encountered early in January, 145 ft. from the shaft. The construction of the engine house, boiler house, shops, miners' change house and the office building has been in progress since autumn and these structures are practically completed. The force at work underground is being enlarged as room for additional employees becomes available.

**The McDonald, Huron and Groveland companies**, three affiliated iron concerns operating on the Menominee range, are in the hands of a receiver, Attorney Richard T. Looney, referee in bankruptcy for the Upper Michigan district, due to internal dissension among the stockholders. The McDonald company has recently filed in the United States court at Marquette a schedule showing assets of \$132,824 and liabilities of \$27,271. The company operates the McDonald mine, adjoining Corrigan, McKinney & Co.'s Armenia property at Crystal Falls. The Huron company operates the Youngs mine at Iron River, and the Groveland company the Groveland mine in the Felch Mountain district. All three were promoted by George W. Youngs, who came to Iron River in the late '90s to engage in lumbering operations and who branched into the mining industry. Mr. Youngs developed the Hiawatha mine, subsequently sold to the Rogers-Brown Ore Co., the present operator, and he discovered the Youngs mine. He was instrumental in putting the Groveland on its feet, after the property had had a discouraging career, and last summer he operated the McDonald. The McDonald is a property without particular promise, it is understood, although it is claimed that the ore mined last season was sufficient to pay the running expenses. The death of the late Captain Bartow, of Cleveland, who was closely associated with Mr. Youngs, is understood to have been a factor largely contributing to the present condition of the affairs of the companies. There is hope that matters will soon be adjusted.

**IRON RIVER—Jan. 31**

**Iron River is in Early Stages of Development**, although a producer for many years. Great quantities of ore have been discovered during recent years and more mining and exploratory companies are at work in the field than in any other region of similar area in the Lake Superior country. With trade conditions favorable, the output undoubtedly will more than double within the next few years. The Northwestern, which has handled the bulk of the Menominee range traffic for years and which has tracks into practically every property that has yet been a shipper, is improving and strengthening its line to permit of the use of heavier locomotives and the hauling of heavier trains. Heavier steel is being laid where necessary and more substantial steel bridges are being constructed.

**A New Railroad in Iron River**, on the Menominee range, is expected by Apr. 1, when the Chicago, Milwaukee & St. Paul Ry. will be running trains on a regular schedule. There-

after the company will compete with the Chicago & Northwestern for the ore traffic of an important field of the Lake Superior iron region. The Milwaukee road is reaching out for this business through an extension from Crystal Falls, 14 miles due east of Iron River. The extension itself is practically completed. The principal work remaining is the bridging of Iron River, the building of assembling yards, and the construction of spur lines to various producing properties. Contracts for the grading for tracks leading to the Bates, Bengal, Rogers and other mines have already been awarded. By the opening of navigation on the Great Lakes, the road will be in position to care for a heavy tonnage. The ore will be taken through the Crystal Falls country to Channing over the company's own tracks and from that point it will be transported over the Escanaba & Lake Superior tracks to Escanaba, Lake Michigan, the shipping port for all of the Menominee output and part of that of the Marquette range. The Milwaukee is assured of a traffic of large proportions, as is, also, the Northwestern road.

**HANOVER—Feb. 2**

**Shipments of Zinc-Carbonate ores** are being made from Hanover, and preparations are under way for the operation of several of the copper properties. The district, in which are the camps of Santa Rita, Hanover and Fierro, is one that is greatly in need of deep development, as it is said by some geologists that there are prospects of finding copper deposits extending to considerable depths. The district lies in a horseshoe surrounded by mountains. Lying between the two ranges are zones cut up with porphyry dikes in which the copper is found under an iron capping. It is generally believed that the ore deposits of Santa Rita will extend west under Hanover and Humbolt peak, connecting with Copper Flat, a distance of over three miles. The deepest shaft in the Hanover region is 400 ft. No churn-drill work has been done in or about this camp for a distance of three miles. Companies now holding property and operating in the district are, the Chino Copper Co., General Electric Co., Empire Zinc Co., Colorado Fuel & Iron Co., Phelps, Dodge & Co., and Calumet & Arizona, and the Brockman and Penrose estates. On account of the coal strike in Colorado the iron shipments of the Colorado Fuel & Iron Co. have been curtailed and work on the Jim Fair mine suspended. Progress is being made rapidly on the Emma mine, under the ownership of the Phelps-Dodge company, but nothing definite has been given out as to the character of ore encountered. One of the largest and richest iron deposits in the district is owned by J. W. Bible, of Silver City, and plans are being outlined for extensive operations within a short time.

**TORONTO—Jan. 31**

**Petroleum and Natural Gas Rights** on Dominion lands are governed by new regulations which have been issued by the Canadian government. Rights may be leased at 25c. per acre for the first year, and 50c. an acre for each subsequent year, the leases to be for 21 years, with privilege of renewals for a similar period. The maximum area for a petroleum or natural-gas location is fixed at 1920 acres, and no person shall be permitted to acquire a greater area except by assignment. Lessees are required to have on their property within one year machinery and equipment to the value of \$5000, and must begin boring operations within 15 months. In cases where locations are grouped, the equipment need not exceed in value \$10,000.

**CALGARY—Jan. 29**

**Natural Gas in Saskatchewan** is available, it is indicated by the work of the Dominion Geological Survey. Although the geologists are not in a position to state the exact location where the gas may be found. This can only be determined by drilling wells. Eugene Coste of the Coste, McAuley Co., states that drilling operations will be commenced as soon as negotiations with Moose Jaw and Regina have been completed. As soon as the agreements have been filed, drilling will commence, but so far no information has been given as to where the wells will be started. Coste is president of the Western Natural Gas Co. which supplies Calgary and a company with which he is identified agrees to supply natural gas from Saskatchewan fields by Oct. 1, 1916 at 20c. per 1000 cu.ft. on condition that the city agrees to take a minimum of 4,000,000 cu.ft. per day for the first year, 6,000,000 for the second year, 8,000,000 for the third year and 10,000,000 for the fourth year. The company can be penalized at the rate of \$100 per day if the pressure on their supply main falls below 25 lb. and \$200 per day if it falls below 20 lb. Should the supply fall below 90% of the demand, the city has the right to buy from other gas companies or to manufacture gas.

# The Mining News

## ALABAMA

### Calhoun County

LYNCHBURG FOUNDRY CO. (Anniston)—Plant was started, Jan. 26, capacity 100 tons per day; cost, \$250,000.

### Cleburne County

GOLD MINING HAS BEEN RESUMED in Cleburne County after several years of inactivity.

### Jefferson County

CALDWELL WATSON FOUNDRY (Birmingham)—Plant was destroyed by fire lately; loss, \$50,000.

SHELBY IRON CO. (Birmingham)—Boiler exploded at pumping station at Kewahatchee, destroying plant.

ALABAMA MARBLE CO. (Birmingham)—A considerable sum will be spent in driving tunnels in order to double capacity. This is first departure from open quarrying in district.

BIRMINGHAM R.R., LIGHT & POWER CO. (Birmingham)—Taking byproduct gas for illuminating purposes from Fairfield plant of Tennessee Coal, Iron & R.R. Co. is being considered.

GULF STATES STEEL CO. (Birmingham)—It is announced that Lacey-Buck properties, consisting of 600 acres of iron-ore and coal lands, and Trussville furnace property will be relinquished. Coal lands are at Labuco, brown-ore lands at Oremont, Ga., and red-ore mines at Crudup, Ala.

U. S. STEEL CORPORATION—Of \$15,000,000 appropriated for betterments and extensions, Birmingham district expects about \$2,500,000. It is said that following improvements are contemplated: Addition to steel plant at Ensley; erection of finishing-steel plant at Ensley; benzol works to be added to byproduct coke plant at Fairfield; and betterments at coal mines.

## ALASKA

MATANUSKA COAL FIELD, states George W. Evans, chief engineer of the U. S. Navy expedition is capable of furnishing at least 400,000 tons of coal per year to the Navy. The coal is friable, but nearly all high-grade bituminous coals are. Pocahontas coal, which the Navy now uses, contains only about 12% lump. There are no climatic obstacles in way of mining coal. Work of expedition consisted of making a detailed geological examination of Kings River and Chickaloon areas, in which are high-grade steaming coals. Mining and sacking 800 tons was completed about Oct. 1, when a crew was put to work making a trail along Chickaloon River across which coal is now being hauled to coast in order that a test may be made next summer.

ALASKA MEXICAN (Douglas)—In December, 19,758 tons ore yielded \$44,481, or \$2.27 per ton; profit, \$16,166.

ALASKA TREADWELL (Douglas)—In December, 80,094 tons ore yielded \$216,784, or \$2.73 per ton; profit, \$106,899.

ALASKA UNITED (Douglas)—In December, 37,912 tons ore yielded \$71,248; profit, \$13,457. Ready Bullion ore averaged \$1.98, 700 Claim \$1.80.

## ARIZONA

### Gila County

INTERNATIONAL SMELTING & REFINING CO. (Miami)—Contract for steelwork for smelting plant has been let to American Bridge Co. Contract calls for beginning work within 90 days, and necessarily work on plant's foundation will begin immediately. Plans, prepared by Repath & McGregor, may not be wholly completed as to lesser details, but all essentials have been worked out sufficiently to begin with certainty and continue building with unbroken sequence as structure is reared. Steel contract calls for somewhat in excess of 6000 tons of that material. Price of the steel may be roughly estimated at about \$92.50 per ton, which would give a total cost for steel somewhere about \$550,000. From this item of steel alone the estimate of a total cost for smelter of \$2,000,000 or more can be seen to be not wholly amiss. Grading has been almost finished, natural adaptation of the site's topography to the use for which it was chosen making deep grading unnecessary, except for the slag pit and lower railroad track. Besides the reverberatory furnaces for treatment of Inspiration and Miami concentrates there will be provision for reduction of ore, the gradual development of various properties outside of the Miami district making it certain that this section of smelter will be enlarged. Because of nature of smelter site it will be a matter of no unusual expense to extend building as district's increasing output requires it. All steam-shovel work has now been completed at smelter site and MacArthur Bros. Co. has now started grading for reservoir site. This reservoir will be just north of smelter site and will have a capacity of more than 3,000,000 gallons.

INSPIRATION CONSOLIDATED (Miami)—Underground work has been greatly handicapped since the new test mill started, because Scorpion shaft is kept busy with ore hoisting until such time as all ore cars have been filled. Result is that after blasting in all drifts breasted in waste broken ground must remain there several hours, naturally retarding work. This difficulty, however, will soon be overcome by installation of an incline conveyor now being erected from crusher to ore-storage bins. When this is completed ore will be stored in a compartment of the bins, an arrangement that is expected to afford ample reserve for test mill without interfering with mine's normal rate of development. Drift now being driven on sixth level to connect Colorado ore-

body with incline shaft is advancing rapidly, work being in progress at each end, but it will be several months before connection is made. A number of raises are now being lifted from 42½ North drift on fourth level into Joe Bush orebody for purpose of blocking out this section. Raises are still being lifted to Joe Bush ore dump and this stockpile will soon be in condition for drawing. Driving of main drifts on sixth level has been discontinued because of present inability to handle waste. Work continues on main east shaft and apparently is progressing faster than it did on main west. Week before last two carloads of iron gates for draining ore-storage bins were received and are now being put in place on the bins, which will require 140 gates. General Electric Co. has shipped three of the large transformers and they should soon be in Miami. Transformers, which are shipped from Pittsfield, Mass., weight 5000 lb. each. One of the large Pacific Electric No. 4 air compressors has been received and is on track near the main shafts. Because of bad weather, American Bridge Co. has been forced to suspend operation for a time. Steel continues to arrive for concentrator, coarse-crushing plant and trestle, greater portion being for latter. Ore bins are now being erected at main shafts and within a short time work will be begun on headframe. Nearly all steel for coarse-crushing plant building is now in place and if the weather will permit riveting will be started soon. United States reclamation-service force now has towers of the transmission line erected up to the main east and west shafts and is continuing the work toward Superior. The recent heavy rains caused a rock slide in the railroad cut and delayed train service until a dozen cars of the material could be removed.

## ARKANSAS

### Marion County

VIRGINIA J. (Yellville)—New mill has been completed, and active milling operations started.

MORNING STAR (Yellville)—Mine is now running full time. There is a big face of rich disseminated ore. Ore is shipped by team to Yellville. Property is now in hands of John Shepherd, an experienced mining man who came to district about a year ago from Mexico. Output from Zinc and Rush Creek for last week was seven cars, including 5000 lb. of lead.

## CALIFORNIA

### Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—It is reported that new mill will be built by D. D. Demarest Co., at Altaville shops near Angels Camp.

GRITTON (Volcano)—Work has been suspended pending arrangement for insurance under workmen's compensation law. Holder of purchase option has been given 30 days' extension.

ARGONAUT (Jackson)—Disarrangement of electrical machinery recently was only temporary. No serious damage was done. Men climbed ladders going off shift instead of going up in skip.

ZEILA (Jackson)—Mine is being sampled by R. M. Snyder, of Los Angeles. It is stated that Robert E. Cranston and Alexander Nise, of San Francisco, are interested with Mr. Snyder in examination.

KENNEDY EXTENSION VS. ARGONAUT (Jackson)—Testimony contained 850,000 words and oral argument 155,000 words. Stenographers' fees amounted to about \$4000, including per day attendance.

### Nevada County

BLACK BEAR (Rough and Ready)—New stamp mill is running on ore from Forlorn Hope. Development is progressing also on Black Bear.

SULTANA MINING CO. (Grass Valley)—Development has been resumed in Orleans shaft. Sultana and Prescott Hill will be operated through the Orleans.

EAGLE BIRD (Washington)—Los Angeles men with capital \$50,000 will reopen mine under management of E. C. Klinker, formerly manager of Oustomah. Mine is said to have yielded \$500,000 in early days.

OUSTOMAH (Grass Valley)—A 3-plunger electrically driven pump will be installed on 1000-ft. level for raising all mine water. Shaft will be deepened to 1200 ft. Mill is running on good ore from 600-ft. level.

GOLDEN CENTER (Grass Valley)—New 10-stamp mill is crushing high-grade ore. Mine is developed to 500-ft. depth. It is situated in center of town, old workings extending under business blocks and residence sections.

### Placer County

EXCELSIOR (Forest Hill)—Company is developing Baltimore tunnel and Dardenelles. Both were large producers in early days.

HIDDEN TREASURE (Forest Hill)—It is reported that mine will be reopened this season. It was formerly one of the largest producers in county.

GOLD BLOSSOM (Ophir)—A shaft is being sunk on Harrison end, following a shoot of good ore. There is prospect that mine will be extensively developed.

GRAY EAGLE (Forest Hill)—Mine has been sold by S. M. Sprague to a company recently organized which will develop this, Peckham Hill and Spring Garden mines in conjunction.

**San Bernardino County**

THE SEARLES LAKE TROUBLE seems to have ended with dismissal of complaints against members of American Trona Co. charging assault, and an attachment filed upon suppliers of invaders for auto hire, supplemented by a warning from sheriff to both parties to behave themselves. There is said to be a charge of highway robbery still pending against deputy sheriff. Also a civil suit for \$1,000,000 is said to have been brought by Rasors against Trona people.

CALIFORNIA TRONA CO. (Searles Lake)—A syndicate composed of Henry E. Lee, W. J. Davis, Thomas R. Gabel, William A. McGuire has been formed to secure a loan of \$210,000 with which to get an option on entire stock of company. Money for construction of railroad from Searles station to lake is said to have been secured and men are at work. There are three corporations in the legal mixup regarding ownership and operation of deposits. Foreign Mines Development Co., American Trona Co. and California Trona Co.

**Siskiyou County**

HYDRAULIC MINES IN CHERRY CREEK, Greenhorn and Hawkinsville, are all working to capacity. Rain that followed snow in December gave plenty of water.

DRY GULCH MINERS in Humbug and Greenhorn districts have sufficient water for first time in six years. Many dry gulches are rich in gold, but there are only occasional seasons when they can be worked profitably.

**Trinity County**

TRINITY CONSOLIDATED MINES CO. (Weaverville)—D. W. Shanks has taken charge. J. J. Murphy, superintendent for last four years, has resigned. Company operates Union Hill near Douglas and Hupp in Weaverville basin.

**COLORADO****Lake County**

NORTH SIDE (Leadville)—While lessees were mining iron ore, they opened a fine mass of lead-silver ore.

LILLIAN (Iowa Gulch)—Zinc carbonate continues to be shipped. A recent find has been made of oxide ore rich in gold.

MT. CHAMPION MINING CO. (Leadville)—Mill is again running full capacity after a few days' shutdown for repairs.

IBEX (Leadville)—This property, also familiarly known as Little Jonny, is working many leases, all of which are prosperous.

DENVER CITY (Leadville)—Shaft has been repaired in its upper portion while sinking has been in progress. New drifts will be started from bottom.

DINERO (Leadville)—So encouraging was mineralization of vein 100 ft. below tunnel level that preparations are now being made for sinking another lift in winze.

SIWATCH TUNNEL (Leadville)—Venture vein has been cut by tunnel 580 ft. below outcrop. Old workings are draining and making of connection is proceeding cautiously.

TINGLE TANGLE (Leadville)—Lessees drove an old adit about 100 ft. and caught vein carrying silver-lead ore. They then started another adit lower down and have encountered still another vein.

**La Plata County**

BROOKLYN NO. 1 (Needleton)—Cason & Coston located this claim last summer and have worked against hard climatic conditions all winter. They have uncovered a splendid vein but are unable to ship before summer. A small lot of 1600 lb. was taken out early in the fall and this returned \$101. Another lot weighing 246 lb. was packed down to Durango and returned \$3150. Years ago, this property was prospected by Frank Weston who claimed spiritual guidance. The spirits probably were not quite definite enough.

**San Juan Region**

ORO CASHIER (Ophir)—E. H. Van Endert is purchasing equipment for a 50-ton stamp mill.

MOUNTAIN TOP (Ouray)—Main raise is progressing and is now up 190 ft. A body of \$40 ore has been uncovered.

BUTTERFLY (Telluride)—Mill is treating lots of ore from leases but will soon resume treatment of company ore.

ROYAL (Telluride)—This property in Bridal Veil basin is being developed by a tunnel that has been advanced 150 ft. Breast is now in gold-bearing quartz.

SUFFOLK (Ophir)—This company is planning reopening its properties under management of George B. Pickett. Extensive development is under consideration.

SILVER BELL (Ophir Loop)—Raise which is being extended on Ida vein from level of crosscut tunnel has reached a height of 35 ft. Raise is developing a 4-ft. vein of pay ore.

JUNTA CONSOLIDATED (Telluride)—The 50-stamp mill is finished and has been tested. Ore is conveyed to it from Jim Crow mine on Mt. Ballard by a 3000-ft. aerial tram. Bins in mill have a capacity of 1500 tons. Equipment includes two 15x9-in. jaw crushers, stamps which crush to 1/2-in. mesh, tube mills, Dorr thickeners, and agitators. Precipitation is by zinc dust. Capacity is 300 tons per day.

**Teller County**

ERIE MINES CO. (Victor)—Ruby shaft on Bull Hill has been leased to S. A. Worcester and associates.

VINDICATOR (Victor)—Sinking was resumed in main shaft, Jan. 27. Ingersoll-Rand Jackhamer drills are used for this work. Company's annual report, just published, shows a very satisfactory year's work in 1913.

STRATTON ESTATE (Cripple Creek)—So called bad air was encountered Jan. 22, in Orpha May shaft on Bull Hill. Two men were overcome, and Portland rescue crew, equipped with oxygen helmets and pulmotor, was called out; but fortunately men had made their way to safety before it became necessary to use oxygen apparatus.

**IDAHO****Cœur d'Alene District**

IDORA (Wallace)—After a shutdown of several weeks, during which period a number of changes were made, mill on Sunset Peak started Jan. 23 for what is expected to be a prolonged and profitable run. Mill is situated on north side of Sunset, on Beaver Creek, and about 1600 ft. below mine. Ore is conveyed from mine to mill by an aerial tramway.

SUNSET (Wallace)—Crosscut from bottom of shaft at a depth of 400 ft. reached vein week before last. At that time vein had been penetrated about 5 ft., all in ore. While both lead and zinc ore are found in mine, there are no complications in the way of treatment. The two ores are separate and distinct and can be concentrated by usual methods employed in district. It is known that 400 shaft taxed capacity of small hoist and air compressor, so further development with present equipment seems out of the question. While plans have not been announced, it is rumored that a railroad is to be constructed up Beaver Creek, or some such plan of reaching property by railroad from Wallace side of divide.

**MICHIGAN****Iron**

EUREKA (Ironwood)—Sinking is in progress as it is believed that a continuation of Palms-Anvil orebody will be found.

BRULE MINING CO. (Iron River)—Company has closed down its Chatham and Berkshire mines, throwing about 200 men out of employment. Failure to make adequate sales of iron ore is believed to be reason for suspension of operations.

JONES & LAUGHLIN (Ishpeming)—Shaft sinking has commenced at Iron Mountain Lake property and a depth of 20 ft. has been reached. Upper part of shaft will be concreted. It will probably be sunk to 500 ft., although most of ore proved up does not lie that deep. A combination boiler house and engine house has been erected and a compressor and hoist installed.

AMERICAN (Diorite)—Shaft has been lined with concrete from tenth to sixteenth level, which will eliminate trouble that management had in keeping that part of shaft in good repair. Washing plant is now treating about 250 tons per day, half capacity. Several Woodbury plunger jigs were recently installed and will shortly be given a trial. Concentrates run close to 60% iron, which is considerably higher than when plant was started.

LUCKY STAR (Negaunee)—Sinking of shaft is progressing rapidly. It is now down 800 ft. and will be sunk to 1200 ft. Ore will not be hoisted through it, however, until early part of 1915. Most of equipment has been ordered and buildings of modern fire-proof construction will be built. When all is in readiness Breitung interests will have one of the best equipped mines on Marquette range. A new shaft is also being sunk near Breitung mine and ore will probably be coming to surface there next June.

PALMS (Ironwood)—New four-compartment shaft has been bottomed and work of widening that part which was raised is now in progress. This will be a busy mine in a short time as 15,000,000 tons of ore have already been blocked out and lease of Newport Mining Co. has only 13 years to run. Workings are connected with Anvil, which adjoins. Newport company has sold 1,000,000 tons of iron ore for 1914 delivery, part of which will come from Palms and Anvil, and remainder from Newport proper.

**MINNESOTA****Cuyuna Range**

CITY OF BRAINERD HAS GIVEN EXPLORING OPTION on lands recently bequeathed to city by Judge G. W. Holland. One parcel lies in trend of orebody being opened by Brainerd-Cuyuna mine.

ADAMS (Oreland)—On 207-ft. level orebody was encountered at a distance of 295 ft. from shaft.

BRAINERD-CUYUNA (Brainerd)—Shaft now down 74 ft.; ore at 92 ft. Shaft will penetrate ore 100 ft. before drifting is commenced. One new 150-hp. boiler has been added.

CANADIAN-CUYUNA ORE CO. (Brainerd)—Contract for sinking shaft has been awarded to Paterson Construction Co., which will also equip surface plant. Construction company has been organized for this special purpose.

**Mesabi Range**

MADRID (Virginia)—Dismantling of surface plant by lessee, A. B. Coates, started Feb. 1. Mine still contains some high-grade ore but owners have not formulated plans for operating.

**Vermilion Range**

WALSH COMPANIES annual meetings were held recently in Duluth. These companies, all headed by T. J. Walsh, include the North America Development Co., and the Consolidated Vermilion & Extension Co., both still somewhat in prospective stage. North America has a three-compartment shaft, concrete lined, 400 ft. deep, with a 1000-ft. drift at bottom. President Walsh announced that at this shaft stockpiling would begin immediately. Consolidated Vermilion & Extension has a three-compartment shaft 440 ft. deep. Three levels have been opened, and two more will be. About 1200 ft. of drifting has been done. Mine has pumping capacity of 2500 gal. but at present is making only about 250 gal. per min. Mine has no railroad connections yet. To stockholders of Minnesota Steel & Iron Co. Walsh states that company's property is crossed by two iron-bearing zones, and that shaft now being sunk has passed through a stratum of fire clay. He talks about gold in this clay. All companies are stock companies, with shares well scattered throughout Minnesota. Should they reach dividend stage, it would be a unique event in Vermilion range history, which range heretofore has been disappointing to small investors. Every little while some one talks of gold in Minnesota but so far it has never amounted to anything more than talk.

## MISSOURI-KANSAS-OKLAHOMA

## Joplin District

**A CAVEIN AT CHICAGO-LEHIGH MINE** at Carl Junction was profitable to company. Huge slab revealed large orebody and also rich ground on United-Lehigh Co.'s lease adjoining. Operators say deposits probably would have been overlooked had cavein not occurred.

**BURKE MINING CO. (Joplin, Mo.)**—Good turnins are being made from W. E. Johnston tract. Ore is cleaned on custom concentrator on same lease.

**BONANZA LAND (Galena, Kan.)**—W. C. Kramer, of Joplin, has obtained lease and will start drilling campaign. Tract a few years ago was big producer of Galena camp.

**CAL CANADY (Galena, Kan.)**—Company of Ruple Adams, Smith Brothers and John Jarrett, all of Galena, are working this mine on Edna tract. Ore is running from 25 to 30% blende.

**GERSTER & RAINS (Joplin, Mo.)**—From 20 to 30 tons of zinc concentrates being reported weekly from Red Lion lease. Present operators took property year ago and moved concentrator from Galena, Kan.

**NAPOLEON MINING CO. (Joplin, Mo.)**—Company has incorporated and will further develop lease on Perry land at Thoms Station. Mine and mill have been in operation several months, with good weekly turnins.

**"D" (Carl Junction, Mo.)**—This old mine has been reopened by local prospectors and after much work in placing ground in order, rich ore is being hoisted. Mine is on Avondale land, lease being held by United Zinc Co.

**WEYMANN TRACT (Joplin, Mo.)**—George Menchall has taken lease of 40 acres and will mine on drill holes he put down several years ago. Although Menchall has records showing good drill cuttings, property never was developed, for some reason.

**YELLOW JACKET (Klondike, Kan.)**—Mill is being removed by O. W. Sparks and associates to Riseling land, in Joplin. Expected to be rebuilt within 60 days. Old Yellow Jacket mine caved recently. Sparks & Co. has good orebody on Riseling tract.

**MISSION (Lincolnville, Okla.)**—Mine has been leased by Wheeler & Hardy, operators of the Vinegar Hill mine at Thoms Station, Mo. Operations at 140-ft. level are to begin immediately. Famous old property has been under various managements and worked spasmodically. Was one of the first zinc mines of importance in northeastern Oklahoma. Concentrator of 500 tons capacity is on lease.

## MONTANA

## Granite County

**BOULDER MINING & DEVELOPMENT CO (Princeton)**—Development of gold-bearing veins has been so satisfactory that company is making preparations for work on a large

**SWASTIKA MINING CO. (Philipsburg)**—Manager Williams has been in Butte to complete arrangements for transportation and marketing ore which carries copper, silver and gold. Shipping will begin immediately.

## Deer Lodge County

**GOLD HAS BEEN DISCOVERED NEAR ANACONDA**—Excitement ran high when a similar discovery was made some 15 years ago resulting in a stampede. A discovery of gold, it is claimed, was recently made in Dry Gulch near Anaconda. Years ago placer mining was carried on in Sheep Gulch, a narrow cañon, joining Warm Springs cañon behind Anaconda courthouse. Since then prospectors have been at work to discover source of placer gold but without success. Recently E. E. Van Dyke and Edward Murdoch sunk a shaft 50 ft. deep in Dry Gulch, half a mile south of Anaconda which uncovered two veins, each of which is said to carry free gold. Specimens of ore have been exhibited in Anaconda and have aroused much curiosity.

## Silverbow County

**BUTTE LOCAL NO. 65** of the Brotherhood of Electrical Workers went on record at a meeting held Jan. 23 as being in favor of a union of McNulty and Reed-Murphy factions that have been divided for several years. Vote stood 45 to 17. General results of proposed amalgamation of two factions will not be known until a referendum vote has been taken by all locals in other Western states.

**NETTIE (Butte)**—Unwatering of this mine, a recently acquired property of Anaconda company, and which is in extreme west end of Butte district, is still in progress and a new pump was put into service a few days ago to expedite this work and to take care of water in future operations. Water which has filled mine during many years of idleness, has been lowered 135 ft. to date. Shaft is 500 ft. deep.

**ANACONDA (Butte)**—At a conference Jan. 30 between President Thayer and operating officials, it was decided to recommend to directors erection of a 2000-ton leaching plant at Washoe smelter. Plant will later be enlarged to capacity of 9000 tons per day. Other extensive improvements at smelter will be recommended, cost of whole to be in excess of \$6,000,000, and requiring more than two years to complete. It is believed that leaching plant and other economies will result in a saving of 40,000,000 to 50,000,000 lb. of copper per annum from slimes and tailings.

**NORTH BUTTE (Butte)**—On Jan. 23 company issued its report for quarter ended Dec. 31, 1913. During quarter there were mined from Speculator, Adirondack, Edith May and Snowball veins 123,289 tons of ore which produced 7,493,889 lb. of copper, 437,221 oz. of silver and 412 oz. of gold. Development work on various veins amounted to 1512 ft. of crosscuts, 2222 ft. of drifts and 1153 ft. of raises Granite Mountain shaft was sunk 183 ft. and connection with the Speculator workings was made on 2800 level. Value of mining properties was increased from \$7,876,171 as estimated in annual report a year ago to \$8,759,841 at present. Total increase in assets of company in one year amounted to \$1,458,805.

## NEVADA

## Churchill County

**GOLD STRIKE IN MOUNT GRANT DISTRICT**, north of Wonder, has been made. One sample assayed \$276. Topography similar to that of Wonder. Water is scarce, making prospecting difficult.

## Elko County

**RAILROAD EXTENSION TO BULLION** will be built by Eureka & Palisade R.R. Road will leave main line at Raine's siding and will be 14 miles long. Average grade, 2%; maximum, 4%; most of grade will be in favor of ore haulage.

**FLAXEY (Jarbidge)**—A 10-stamp mill is being built, which, it is expected, will be ready for operation next spring.

**BLUSTER (Jarbidge)**—Ore assaying \$100 to \$150 per ton has been opened on 300-ft. level. Two carloads have been mined from narrow shoot and will be shipped. Shoot 4 ft. wide, assaying \$19, has been drifted on for length of 225 feet.

## Humboldt County

**ONYX NEAR IRON POINT** has been discovered in commercial quantity.

**STAR PEAK (Unionville)**—Mine and mill have been closed on account of heavy snows. Mill will be remodeled this winter and put into commission in spring.

**ORANGE (Little Humboldt Cañon)**—Large shoot of low-grade gold ore showing bunches of free gold has been prospected by cuts and shallow shafts. Equipment for sinking is being installed.

**SEVEN TROUGHS COALITION (Seven Troughs)**—Ore-shoot below 1000-ft. level has been opened by 50-ft. drift. Shoot is 2 ft. wide and of shipping grade. New incline winze has been sunk to this level from 1000-ft. level, and 20-hp. electric hoist and self-dumping skip are installed.

## Lyon County

**NEVADA-DOUGLAS (Ludwig)**—Satisfactory results have been obtained by diamond drilling below lower levels.

**EMPIRE NEVADA (Yerington)**—Satisfactory progress is being made in churn drilling; third hole is now being drilled.

## Mineral County

**EXPERIMENTAL MILL AT CANDELARIA** is being built. Mill will have daily capacity of 25 tons and experiments will be made on low-grade, refractory ores of camp. Large tonnage remains in old mines, which could not heretofore be economically treated. If tests are successful, 250-ton mill will be built.

**PINE GROVE MINING CO. (Pine Grove)**—Mill has been closed temporarily on account of damage to power line by severe storms.

**LUCKY BOY (Hawthorne)**—Large flow of water in tunnel, which stopped work for a time, has decreased, and driving is again in progress. Tunnel is now in 4300 ft.; advance at present is slow on account of loose ground, which necessitates heavy timbering.

## Nye County

**TONOPAH MERGER (Tonopah)**—Vein was crosscut in face of west drift on 1170-ft. level and is 20 ft. wide. Continuation of drift on foot-wall side is cutting stringers and bunches of good-grade ore and new oreshoot may be opened. Sufficient ore to cover current expense is being shipped. Pump and motor will be installed in winze below 1170-ft. level.

**ROUND MOUNTAIN MINING CO. (Round Mountain)**—Crosscut on 450-ft. level cut, in vein 471. oreshoot which has now been driven on for 250 ft. Shoot is 1 to 3 ft. wide and assays \$20. Raises have opened shoot to height of 140 ft., and winzes will be sunk; further drifting is also being done. Crosscuts will be driven from 600- and 700-levels to cut this shoot. Large mineralized zone below mill, exposed by placer operations, is being prospected by drifts. This body will be mined by glory hole, material sized, and fines milled; fines will assay \$3 to \$15 per ton. Continuation of oreshoot from 700- to 900-ft. level in main incline has been found. Drifting in ore is being done. Mill is treating 170 tons per day.

## Washoe County

**TROJAN MINING & LEASING CO. (Jumbo)**—New Baker-Hansen pump has been received and will be installed at once, as increased flow of water is expected from development work under way.

## NEW MEXICO

## Eddy County

**CARLSBAD OIL & GAS CO. (Carlsbad)**—Drill has been started seven miles southeast of Carlsbad. Drillers are being brought from Oklahoma and a complete camp established. Over 250,000 lb. of material have been delivered into camp. If present drill hole proves dry, three more will be sunk to fully prospect property.

## Grant County

**RICH GOLD ORE AT PINOS ALTOS** is being found by lessees on old Hearst property. Custom ore will be received by Peterson & Co. plant within a month.

**C. & O. (Pinos Altos)**—Grading is completed and machinery purchased for erection of mill next month. Initial capacity will be 25 tons daily. Company has large tonnage of ore blocked out.

**McKENNA & GERHART (Hanover)**—A patent has been granted this firm for Mountain Home group of zinc claims. Extensive development work has just been completed, and a large tonnage of ore blocked out.

**UNITED STATES COPPER CO. (Hanover)**—Operations at Philadelphia mine are to be started by May 1 according to reports from management. A large force will be employed. Mining equipment has been purchased for a large tonnage and installation has already been made. Ore, which carries iron and copper, is in demand at smelters.

**Otero County**

IRON MINES at OROGRANDE have been examined lately by a representative of Colorado Fuel & Iron Co. with an object of leasing. His report on several properties was favorable.

**NEW JERSEY****Hudson County**

INTERNATIONAL NICKEL (Bayonne)—Subscription to common shares by employees, in accordance with offer made early in January, is proceeding satisfactorily, according to officials. Stock was offered at \$110 per share, pro rata, according to length of service and amount of salary or wage. Of some 1200 employees at plant at Constable Hook about 600 have subscribed for their allotment of one share each. An interesting feature is that most of these employees are from eastern Europe and have been with company as long as 10 years in many cases. In all 3000 shares were offered. In addition to regular dividends, which have been at the rate of 10%, employees will receive an extra compensation equal to 5%, payable annually for five years on stock paid for, providing they remain in employ of company.

**NORTH CAROLINA****Mecklenburg County**

PARTRIDGE SMELTER (Charlotte)—Plant is being overhauled preparatory to commencing operations.

**Rowan County**

OLD UNION COPPER SMELTER is being cleaned up by S. T. McKinney, who is shipping matte to smelter.

GOLD HILL (Gold Hill)—Stopping and raising are under way on west vein. Occasional mill runs are being made.

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

TITANIC (Carbonate)—Combination shaft is now 190 ft. deep; good progress is being made with Jackhammer drills recently purchased. Lateral work under way on 150-ft. level has entered mineralized zone, and ore is anticipated at any time.

MINNESOTA (Maitland)—Water is being removed from shaft and lower workings preparatory to starting important developments. Shaft is 200 ft. deep, with extensive workings on 100- and 200-ft. levels, from which considerable ore has been extracted and milled.

HIDDEN TREASURE (Deadwood)—Contract will be let to sink an additional 200 ft.; shaft is now 210 ft. deep. Equipment includes gasoline hoist and air compressor. Hammer drills will probably be used for sinking. Developments in tunnel work performed last summer were satisfactory; orebodies will now be explored at 400-ft. level.

**Pennington County**

HILL CITY MINING & DEVELOPMENT CO. (Hill City)—Installation of hoisting engine, boilers and compressor is practically complete, and sinking will commence soon. Shaft is now 100 ft. deep; it will be sunk 200 ft. more.

CONTINENTAL COPPER (Hill City)—Water is being held short distance below 700-ft. level, while installation of a Rumsey electric driven triplex pump is being made. This machine has capacity of 400 gal. per min., and when in operation water will be quickly removed to bottom, 823 ft., when sinking to 1000-ft. level will commence. Ingersoll-Rand hammer drills will be used in sinking. Shaft has been unwatered to date with two air lifts, 4 and 6 in. in diameter, respectively. Diamond-drill work indicates that 3000 ft. of drifting will be necessary on 1000-ft. level to reach of copper ore.

**TEXAS****Cherokee County**

TEXAS IRON ASSOCIATION (Rusk)—Plans for extensive development of iron ore resources of east Texas by Pennsylvania iron interests were disclosed at a recent hearing of the Texas railroad commission at which special rates on iron ore and limestone were asked by Texas Iron Association. It was stated by Judge H. F. Oneal, representing these interests, that company has acquired 11,000 acres or over 40,000,000 tons of high-grade ore and is still acquiring lands. Proposed outlay is approximately \$700,000, of which a large amount has already been expended at Rusk, where state's furnace and pipe works now under lease, is located, and in ore fields. Company is also erecting a plant at Bowie Hill, Cass County, two miles from Richey's Spur, on the Texas & Pacific, which will turn out daily 600 tons of crushed, washed and roasted iron ore. This ore will be shipped to Rusk. Texas Iron Association plant has expended \$30,000 in improving the state's plant at Rusk and intends to start operations at once if lower rates are granted.

**UTAH****Salt Lake County**

OHIO COPPER (Lark)—An average of 2100 tons of ore daily is being milled. This ore is said to average a little over 1% copper.

UTAH APEX (Bingham)—Lessees working in old Pedro stope have recently made a small shipment assaying high in silver and gold.

COLUMBUS EXTENSION (Alta)—It is reported that there is an unsettled question pending between this and Mone-taire company in regard to extralateral rights.

UTAH METAL (Bingham)—Eastern stockholders have been inspecting tunnel between Bingham and Tooele. Ten mine cars of shipping ore, carrying galena, are being mined daily from development.

WASATCH MINES (Alta)—Leases have been taken by J. W. Wade and B. F. Tibby, on ground in old Columbus Consolidated and Flagstaff mines. Twelve or 14 men are working, getting things in order for mining ore.

MONTANA-BINGHAM (Bingham)—Tunnel is in 2550 ft., face being about 900 ft. vertically below surface, or 1200 ft. on dip of vein. Face of tunnel is under ore, which carried 3 to 9% copper at surface. Ten men are working, and a

horse is used for hauling out waste. Costs for last few hundred feet are reported to be \$12.55 per foot.

BINGHAM MINES (Lark)—Shipments of lead ore are being made from this company's Yosemite mine, ore coming largely from 500 level. Development is also being done on 1100. Recent work has been made possible by connections made with Mascotte tunnel, which has drained entire property to bottom of 2000-ft. inclined shaft.

**Summit County**

PARK CITY SHIPMENTS for week ended Jan. 24 amounted to 2,722,820 lb., shippers being Silver King Coalition, Daly-Judge, and Daly West. Shipments by last company coming from ground jointly owned with Daly-Judge, which is extracting the ore.

SILVER KING CONSOLIDATED (Park City)—Ore bins are full of first-class ore mined in development on and above 1550 level. Work has been started on 1700 to reach ore on dip.

GLENCOE (Park City)—A company is being formed to take over this group of claims. Among others, M. S. Hanauer and J. V. Sadler, of Union assay office, of Salt Lake City, are interested.

JOHN THE REVELATOR (Park City)—Owing to heavy snowfall, work has been temporarily suspended by lessees. Conditions are encouraging, and operations will be resumed as soon as roads are open.

THOMPSON-QUINCY (Park City)—First-class ore is being mined from limestone bedding near east raise; this ore is 8 in. thick. A shipment of 35 tons of first-class is on the way to market, while second-class is being stored, pending arrangements for milling. Property is reported to be in better physical condition than it has been in some time.

**WASHINGTON****Okonogan County**

PEACOCK (Conconully)—A contract has been let for 100-ft. extension to main working tunnel.

RECO (Chesaw)—Some fine ore has been encountered and preparations are being made for extensive development work.

COPPER KING (Chewelah)—Officials of this property are considering erection of a matting plant to cost about \$35,000, also a concentrator.

GRACE DEVELOPMENT (Oroville)—Property has been sold to estate of late Adolphus Busch, of St. Louis, and it is understood new owners will develop it.

EDNA—This mine which has been idle for over six years is to be reopened at once, under direction of Valley Mining Co. of Chewelah. A new plant has been ordered for prompt delivery.

**Stevens County**

SECURITY COPPER—Operations on the 400-ft. tunnel will continue throughout the winter.

**CANADA****British Columbia**

BRITISH COLUMBIA COPPER CO. (Greenwood)—For purpose of supplementing its ore reserves, company has for past few years applied itself to exploration and acquisition of additional mining property. Within last 18 months it has expended upward of \$650,000 in acquiring additional mining lands in British Columbia, and in exploration and development of such lands, and other properties which are now under option. For purpose of financing itself to enable it to complete payment for properties now under option and arranging for their further development and operation, a plan has been formulated details of which are now being perfected for submission at an early date to stockholders with recommendation of board of directors. Proposed new issue of securities of \$1,000,000 or \$1,500,000 in convertible bonds, has been underwritten by Hayden, Stone & Co., subject to adoption of plan by shareholders. Annual meeting of stockholders will be held Mar. 10, and although call has not yet issued, it is thought probable that action on proposed financing will be taken at that time.

**Ontario**

MANN (Gowganda)—Property is stated to have been sold to an English syndicate for \$500,000.

PORCUPINE CROWN (South Porcupine)—A quarterly dividend of 3% payable Apr. 1 has been declared.

BURNSIDE (Swastika)—Kirkland Lake Proprietary, Limited, has definitely announced its decision to exercise its option on this property.

THREE NATIONS (South Porcupine)—Mine has been closed on account of financial difficulties and necessity of a cyanide plant. It is also understood that there is not sufficient development work ahead to keep mill running.

CONIAGAS (Cobalt)—A strike of underground workers took place a few days ago, miners claiming that company was evading provisions of new eight-hour law. Large number of unemployed men resulted in company being able to break strike within a few days.

HOLLINGER (Timmins)—A diamond drill working on lower level has cut new oreshoots of satisfactory widths and grades. Company has placed an order for two new compressors, each having a capacity of 4500 cu.ft. of free air per minute.

TOUGH-OAKES (Swastika)—At annual meeting, manager stated that ore extracted to date has a value in excess of actual cost of all development work. Gross value of ore blocked out on three sides is estimated at \$750,000. Average grade of milling ore after high-grade streak has been eliminated is placed at \$23 per ton.

CROWN RESERVE (Cobalt)—At annual meeting, it was stated that dividend of 24% on stock had not been fully earned but that rate had been maintained pending development of Carson vein and other veins since lowering of lake. Surplus of the company is a little less than for preceding year and amounts to \$844,615.

# The Market Report

## METAL MARKETS

NEW YORK—Feb. 4

The metal markets have been for the most part quiet and rather steady, with only moderate changes in quotations.

### Copper, Tin, Lead and Zinc

**Copper**—The market has been strong and advancing right through the week. After the transaction of a large volume of business for export, domestic manufacturers began to be interested and a large business with them was done on Jan. 31 and Feb. 2 and 3. Up to the end of January, the bulk of the business was done at 14% @ 14 1/4 c., delivered, usual terms. On Feb. 2, 14 1/4 c., delivered, etc., was the well established price and one agency advanced its asking price to 14 1/2 c. Up to the end of the week, however, nothing higher than 14 1/4 c. was reported as actually realized and at the close there were sellers at that price.

The domestic manufacturers of copper report an improvement in the demand for finished material, and it is noteworthy that some of the ultimate consumers are beginning to buy for future delivery. The copper manufacturers themselves are not well covered. Deliveries of American copper during January, both for the home trade and for export, have been good, and the statistics in Europe show a decrease so that all in all the intrinsic position of the metal is strong.

The average of our daily prices is 14.558c. for electrolytic. The standard market has been strong and advancing. On Thursday, Jan. 29, spot was £65 15s., and three months £66 2s. 6d. On Tuesday, Feb. 3, spot advanced to £66 7s. 6d., and three months to £66 12s. 6d. On Wednesday, Feb. 4, spot closed at £66 13s. 9d., and three months at £67 per ton.

Base price of copper sheets was reduced 1/4 c. per lb. on Feb. 2, and is now 20c. per lb. for hot rolled and 21c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 15 1/4 @ 16c., carload lots at mill.

Exports from New York for the week included 6747 long tons of copper. Our special correspondent reports the exports from Baltimore for the week at 1042 tons copper.

**Visible Stocks of Copper** in Europe, Jan. 31, are reported as follows: Great Britain, 10,420; France, 1710; Rotterdam, 3650; Hamburg, 3840; Bremen, 1700; other European ports, 1050; total, 22,370 long tons, or 50,108,800 lb. The total is a decrease of 1050 tons from Jan. 15. In addition to the stocks above, 1700 tons are reported afloat from Chile and 3000 from Australia, making a total of 27,070 tons.

**Base Prices of Brass** are noted as follows, to date from Feb. 2: Sheets high brass, 15 1/4 c. net per lb.; low brass, 17 1/2 c. Wire, high brass, 15 1/2 c.; low brass, 17 1/2 c. Rods, high brass, 15 1/2 c.; low brass, 18 1/2 c. Tubes, brazed, 20 1/4 c.; open seam, 20 1/4 c. Angles and channels, 20 1/4 c. Scrap allowances are 10 1/4 c. net per lb. for high brass; 11 1/2 c. for low brass.

**Tin**—Speculation is rampant in the London market. Notwithstanding the deterioration in the statistics, which were published at the beginning of the month, the market remained firm. Last week large purchases were made by American consumers, but since then the consumptive demand has slackened. American interests are still willing to undersell the parity of the London market, and the close is strong at £187 10s. for spot and £188 10s. for three months, and about 41c. for February tin here.

Exports from Baltimore for the past week included 477,274 lb. scrap tin to Antwerp.

**Lead**—There has been an excellent demand for lead throughout the week. On Feb. 2, the American Smelting & Refining Co. advanced its price at New York to 4.15c., and since then sales have been made by it and by outsiders at that price. Lead has continued to sell in St. Louis at above the New York parity.

The London market is quiet, Spanish lead being quoted at £20, and English 10s. higher.

**Spelter**—The demand for spelter has improved. The inquiry from the galvanizers has been better than for some time past, and business has been done at higher figures. The largest consumer has been exhibiting some interest in the market. On Feb. 3 a considerable tonnage was reported sold at 5.25c. and a little under, which is about the basis prevailing at the close, there being sellers all around at 5.27 1/2 cents.

The London market is quiet, good ordinaries being quoted at £21 7s. 6d., and specials 5s. higher.

Base price of zinc sheets is now \$7.25 per 100 lb. in carload lots, f.o.b. Peru, Ill., less 8% discount.

**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.

### DAILY PRICES OF METALS

#### NEW YORK

Jan.-Feb.	Sterling Exchange	Silver	Copper		Tin Cts. per lb.	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
29	4.8585	57 1/2	@ 14 1/2	@ 14.45	39 1/2	4.10	4.00	5.35	5.20
			@ 15	@ 14.50			@ 4.02	@ 5.40	@ 5.25
30	4.8565	57 1/2	@ 14 1/2	14.45	40	4.10	4.00	5.35	5.20
			@ 15	@ 14.55			@ 4.02	@ 5.40	@ 5.25
81	4.8565	57 1/2	@ 14 1/2	14.50	40	4.10	4.00	5.37	5.22
			@ 15	@ 14.60			@ 4.02	@ 5.40	@ 5.25
2	4.8565	57 1/2	@ 14 1/2	14.55	40 1/2	4.15	4.02	5.37	5.22
			@ 15	@ 14.65			@ 4.05	@ 5.42	@ 5.27
3	4.8565	57 1/2	@ 14 1/2	14.55	40 1/2	4.15	4.02	5.37	5.22
			@ 15	@ 14.65			@ 4.05	@ 5.42	@ 5.27
4	4.8590	57 1/2	@ 14 1/2	14.60	41	4.15	4.02	5.37	5.22
			@ 15	@ 14.65			@ 4.07	@ 5.42	@ 5.27

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. 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. The quotations for lead represent wholesale transactions in the open market for good ordinary brands; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15 1/2c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12 1/2c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.

#### LONDON

Jan.-Feb.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.								
29	26 1/4	65 1/2	14.28	66 1/2	70 1/2	180 1/2	182	20	4.35	21 1/2	4.67
30	26 1/4	65 1/2	14.28	66 1/2	70 1/2	182 1/2	183 1/2	20	4.35	21 1/2	4.67
31	26 1/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	26 1/4	66 1/2	14.39	66 1/2	71	185 1/2	186 1/2	20	4.35	21 1/2	4.67
3	26 1/4	66 1/2	14.42	66 1/2	71	184 1/2	185 1/2	20 1/2	4.37	21 1/2	4.64
4	26 1/4	66 1/2	14.49	67	71 1/2	187 1/2	188 1/2	20	4.35	21 1/2	4.64

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the 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 = 2.17 1/2c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21 1/2c.



Other Metals

**Aluminum**—Business seems to be improving and demand is better, but quotations are unchanged. Current prices are 18½¢ @ 19c. per lb. for No. 1 ingots, New York.

**Antimony**—A good business is reported both for spot and future delivery. Prices are firm at 7.20 @ 7.35c. per lb. for Cookson's, and 7 @ 7½c. for Hallett's. For Hungarian, Chinese and other outside brands, 6 @ 6½c. per lb. is asked.

**Quicksilver**—Business has been good with fair sales. New York quotations are \$39 per flask of 75 lb. for large lots. Jobbing price is 54c. per lb. San Francisco, \$38.50 per flask for domestic orders. London price is £7 10s. per flask, with £7 quoted from second hands.

Gold, Silver and Platinum

**Gold**—For the first time in many weeks a premium on gold was paid in the open market in London on some urgent buying orders from Germany and Austria. The price named was 77s. 9½d. per oz. for bars, and 76s. 4d. per oz. for American coin. In New York another \$2,000,000 in gold was taken for shipment to Paris. At the same time about \$2,000,000 in gold was received from Canada.

**Iridium**—Demand continues easy and prices show no change. Dealers ask \$75 @ 78 per oz., New York.

**Platinum**—The market remains quiet with about the usual demand. Prices are unchanged, \$43 @ 44 per oz. being asked for refined platinum and \$46 @ 49 per oz. for hard metal.

Our Russian correspondent writes under date of Jan. 20 that the market is rather strong, but large business cannot be noted for the last fortnight. The demand for small lots is good. The stock of platinum is not large and is in firm hands. New regulations for the platinum trade in Russia are definitely adopted by the state duma and by the state council. The quotations are at Ekaterinburg, 9.65 rubles per zolotnik; in St. Petersburg, 37,000 @ 37,100 rubles per pood—equal to \$36.28 and \$36.31 per oz., respectively.

**Silver**—The latest mail advices from London are that the silver market has been rather languid, transactions being unusually small, but prices have been fairly well maintained. The passing of the Chinese New Year has contributed to the inaction. It is to be noted, however, that spot silver is commanding a premium over futures.

Shipments of silver from London to the East for the year from Jan. 1 to Jan. 22, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£ 871,500	£ 281,000	D. £ 590,500
China.....	10,000	10,000	.....
Total.....	£ 881,500	£ 291,000	D. £ 590,500

Shipments to India have been light this year, chiefly on account of the bank troubles in that country and the large stock of metal held in the East.

Zinc and Lead Ore Markets

JOPLIN, MO.—Jan. 31

Blende sold as high as \$44, the assay base ranging from \$40 @ 42, the metal base from \$39 @ 40 per ton of 60% zinc. The calamine base is reported at \$21 @ 24 per ton of 40% zinc. The average of all grades of zinc is \$38.38 per ton. Lead sold as high as \$54 on a base of \$50 per ton of 80% metal content, and the average of all grades is \$50.50 per ton. The first blizzard of the winter fell upon the district Wednesday night, spreading a blanket of snow on Thursday with a 6-in. fall following a sleet storm. The warmth of the earth soon began melting it from the under side, followed by a south wind part of today that finished the snow and left roads in very bad condition for delivering ore aboard cars.

SHIPMENTS WEEK ENDED JAN. 31

	Blende	Calamine	Lead	Value
Total this week.....	9,475,530	966,690	1,636,610	\$241,700
Total January.....	50,456,460	3,056,230	9,605,000	1,281,570

Blende value, the week, \$190,235; the month, \$1,008,145.

Calamine value, the week, \$10,150; the month, \$34,025.

Lead value, the week, \$41,315; the month, \$239,405.

PLATTEVILLE, WIS.—Jan. 31

The market was a shade higher this week, the base price paid for 60% zinc ore being \$41 per ton. The base price paid for 80% lead ore was \$50 @ 51 per ton.

SHIPMENTS WEEK ENDED JAN. 31

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week.....	2,801,280	357,140	3,756,610
Year to date.....	13,270,100	423,140	4,636,010

Shipped during week to separating plants, 2,960,520 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Feb. 4

The whole tone of the iron and steel market has undergone a further and very decided improvement, and the only question now raised is whether the improvement can be continued. If the mills were attempting to run full at this time the movement would probably fall, but it appears that all they are attempting is to get away from the extremely low prices and await a definite and important improvement in actual consumption. New orders are coming in, with a definitely better tone in the market all around.

As to prices, practically the entire steel market has moved up \$1 a ton this week and prices seem to be as firm at the new level as they were at the old, premiums being asked for far forward delivery, while extremely desirable orders for quick shipment frequently secure a slight concession.

The mills have advanced prices without having first completely filled their order books for a full run; in other words, they are content to increase their operations slowly, as actual demand increases, but have effected a slight advance on the strength of the heavier orders the past few weeks, which have been prompted largely by the desire of buyers to round out badly depleted stocks at what the mills represented were bargain prices.

Steel-mill operations have been increasing gradually but do not now average much if anything over 65% of capacity, this, however, making a favorable comparison with the 50% operation in the fore part of December.

PITTSBURGH—Feb. 3

There is heavier inquiry for foundry pig iron in nearly all markets, while the Valley market has seen a very sharp demand for basic iron, with advanced prices paid. The Youngstown Sheet & Tube Co. has bought 50,000 tons of basic and forge iron, chiefly the former.

Under date of Feb. 2 the National Tube Co. issued new pipe discounts, making a change of a half point or about \$1 a ton, and advanced oil country goods by about the same amount. Independents immediately issued new lists to correspond. This removes half the reduction of last August. At the same time the American Steel & Wire Co. advanced wire products \$1 a ton, making nails \$1.60, and the independents generally are following.

The large mills are all announcing an advance of \$1 a ton in plates, shapes and bars, the usual quotation now being 1.25c. for first quarter and 1.30c. for second quarter. The mills are comfortably filled on these products for an operation of 65 to 75% up to April.

Sheets have continued to advance, and are now within \$1 a ton of the minimum prices of the leading interest announced 10 days ago, 2c. for black and 3c. for galvanized. The full establishment of this level is expected within a week, which would mean a total advance in sheets of \$4 a ton since the end of December.

**Pig Iron**—The Youngstown Sheet & Tube Co. today closed for 50,000 tons of basic and forge pig, chiefly the former, taking about 30,000 tons of basic from the Lowellville furnace and the balance from another Mahoning Valley interest, the basic commanding about \$13. The market had been \$12.50, Valley, based on sales some time ago. Other smaller sales of basic have been made, all at \$13, Valley. It is stated that there remains inquiry for 75,000 tons of basic, and that the next sales will be at \$13.25. Bessemer is sentimentally stronger, but no sales have been made yet at above \$14, Valley. There are inquiries out for small lots. Foundry iron is looking up, but is not yet quotable at above the level of recent sales, \$13.65, Pittsburgh, and \$13, Valley. W. P. Snyder & Co. figure from actual sales in January average prices of \$14.035 for bessemer and \$12.325 for basic, representing declines from December of 80.7c. in bessemer and 19.8c. in basic.

**Ferromanganese**—The English makers last week made another \$5 a ton reduction, putting the price at \$35, Baltimore, and a heavy tonnage, possibly over 50,000 tons, was moved. The previous reduction from \$45 to \$40 removed the Carnegie Steel Co. as a seller, but the English makers did not seem to be sure of this, and made their second reduction. The sales of some 10,000 tons made a month ago by the local interest were at monthly adjusted prices, so that buyers get the benefit of the reductions made by the English pool. After the large sales mentioned had been made the English sellers advanced their price to \$38, Baltimore.



Assessments

Table of Assessments with columns for Company, Delinq., Sale, and Amt. Includes entries for Amador, Arctie, Black Balsam, etc.

Monthly Average Prices of Metals

SILVER

Table of Monthly Average Prices for Silver, showing New York and London prices from 1912 to 1914.

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

COPPER

Table of Monthly Average Prices for Copper, showing New York and London prices from 1913 to 1914.

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

TIN

Table of Monthly Average Prices for Tin, showing New York and London prices from 1913 to 1914.

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

LEAD

Table of LEAD prices for 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 of SPELTER prices for 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 of PIG IRON IN PITTSBURGH prices for Bessemer, Basic, and No. 2 Foundry from 1913 to 1914.

STOCK QUOTATIONS

COLO. SPRINGS Feb. 4

Table of Stock Quotations for COLO. SPRINGS, listing companies like Acacia, Cripple Crk Con., etc.

SALT LAKE Feb. 4

Table of Stock Quotations for SALT LAKE, listing companies like Beek Tunnel, Black Jack, etc.

TORONTO Feb. 4

Table of Stock Quotations for TORONTO, listing companies like Bailey, Conlagas, etc.

SAN FRANCISCO Feb. 4

Table of Stock Quotations for SAN FRANCISCO, listing companies like Comstock Stocks, Alta, etc.

N. Y. EXCH. Feb. 4

Table of Stock Quotations for N. Y. EXCH., listing companies like Amalgamated, Am. Agrl. Chem., etc.

N. Y. CURB Feb. 4

Table of Stock Quotations for N. Y. CURB, listing companies like Ariz. Belmont, Barnes King, etc.

BOSTON EXCH. Feb. 4

Table of Stock Quotations for BOSTON EXCH., listing companies like Adventure, Ahmeek, etc.

BOSTON CURB Feb. 4

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