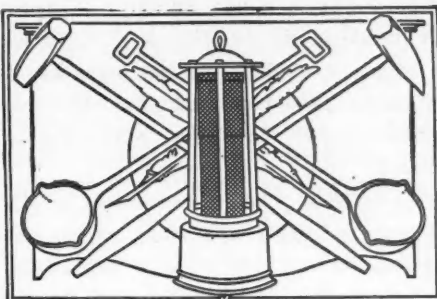


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A Campaign Against Fraud

The action of the Government in raiding a notorious mining-stock promoting concern, last week, indicates a well defined policy on the part of the Administration to eliminate illegal schemes, masquerading under the guise of business operations, for the enrichment of unprincipled "promoters." This action has been taken by the highest authorities in the administration at Washington, and is, we believe, the beginning of a policy for which the administration will be commended in all quarters. The policy is clearly outlined in the following statement by the Department of Justice, referring to the recent raid:

"In this connection it may be stated that recently a number of alleged schemes to defraud have been brought to the attention of the Department whose promoters are said to be using the United States mails extensively in furtherance of their operations. Directions have therefore been given for the speedy investigation and prosecution of all such cases in which it appears that the mails are being made an instrument in the defrauding of the public."

The Government had previously moved against the Cellas, charged with conducting extensive bucket-shop transactions, and the promoters of the United Wireless Telegraph Company, both of which parties are now under indictment. These actions, together with the announcement that the Government has other cases under consideration, have already caused numerous schemers to tremble and become circumspect.

The mining business has long been a happy hunting ground for this sort of gentry and their deluding of the public has been to the discredit and to the disadvantage of the legitimate mining industry. Many organizations have tried in vain to cut out this sore. It will be good if the Federal Government has at last found a way.

The JOURNAL, as an organ of the real mining industry, has long led the way in correcting abuses against the industry for which it stands. About a year ago we exposed some of the operations of the concern that was raided last week, and that exposure was perhaps contributory in drawing the attention of the authorities to it.

The Granby Report

At last we have detailed information respecting the Granby mine, the directors having presented to the stockholders at their meeting, Oct. 4, the report of Mr. Sussman, which led to the collapse of Granby shares last spring. Along with this the directors submit reports of the officers of the mine, the whole making a pamphlet of 38 pages. Let us make haste to say that no stockholder need trouble himself to read it all, inasmuch as the important information is comprised in comparatively few pages. It is sufficient to confine attention to the reports of the president, and of the general manager, to the concluding pages of Mr. Smith, the mine superintendent, and to the full report of Mr. Sussman. A large part of the reports of Mr. Smith and Mr. Williams, the smelter, are devoted to the history of the mine and works, and their present

equipment. Under the circumstances the presentation of those data is humorous.

There is nowhere in the report any specific explanation of why this mine that had commonly been supposed to be a sort of Rio Tinto was suddenly found to be of decidedly limited life. Such deductions as are made respecting this matter are largely inferential. Mr. Langeloth, the president, says: "It had been the intention for some time past to have your mining properties examined by an independent engineer. Last January, upon the resignation of the local manager, A. B. W. Hodges, it was determined to have this examination undertaken at once. . . . It was found that his (Mr. Sussman's) tonnage estimates corresponded closely with those made by the company's engineers." Mr. Sussman's estimates could not, therefore, have been any surprise to the local management, though evidently they were to the eastern office.

The report of Mr. Graves, vice-president and general manager, is not particularly instructive, being essentially of the hurrah order and to the effect that the company has had a grand mine and perhaps some more ore will be discovered in spite of the criticism of knockers. The mines have never been prospected below the present workings of about 600 ft., says Mr. Graves, except by one drillhole that was put down to a depth of 600 ft. below the 300-ft. level and "encountered mineralized material and some ore." This rather obscure statement seems to disregard facts stated in the reports of Messrs. Smith and Sussman.

Mr. Smith states in his report that "up to about 1904 it would have been impossible to figure actual tons in sight. . . . All estimates from 1904 to the present time have been made by taking the actual total tonnage developed at the time of the estimate and subtracting from this the actual tonnage shipped to that date." Probably the stockholders of the company would like to know why these estimates were not communicated to them.

Mr. Smith estimates that on July 1, 1910, the company had 6,429,169 tons of ore remaining blocked out, of which 90 per cent. would be extractable, or 5,786,252 tons, and reckons the grade of this ore at 1.25 per cent. copper, 0.043 oz. gold, and 0.25 oz. silver. Dr. Sussman estimates 5,595,000 tons of ore extractable, and reckons the grade as 1.24 per cent. copper, 0.04 oz. gold and 0.25 oz.

silver. The agreement between these estimates is so close that no further comment need be made. Mr. Smith says that the chief mining claims of the company have been fairly well prospected with diamond-drills holes averaging in depth from 200 to 500 ft. "In all of the holes . . . in which ore has been found, we have passed through the ore into waste before the holes were discontinued."

At the time when the summary of Mr. Sussman's report was made public last spring attempts to discredit it were made, and that engineer with lips sealed by his professional obligations was obliged to wait patiently for vindication. Even now Mr. Smith says "I consider that figures given from this office now will be far more correct than any which could be given by any engineer, even after a protracted examination." In fact the two sets of figures are almost identical. This puts a wretched aspect upon the attempt to belittle Mr. Sussman's report and renews our amazement that the board of directors did not see fit to publish it in full in the first place.

But after all, the chief concern of the stockholders is not as to the ore actually developed, which at present rate of production will last only 4½ years, but as to the possibilities of developing more ore. Mr. Sussman says that the orebodies in the Old Ironsides—Knob Hill group decreased in size from No. 3 tunnel downward. "The 500-ft. level and all the diamond drill work done on the 500-ft. level disclosed no ore. A number of holes were drilled from the 400-ft. level downward; all of them after a few feet passed out of the ore and entered barren ground. All the drill holes drilled from the 300-ft. level and from the surface in an attempt to find the downward continuation of the orebodies passed out of ore above the lowest workings of the mine; in some cases they did not disclose any ore at all. Consequently the limits of the orebodies in depth have been found to be a few feet below the 400-ft. level." In other words the mine, in Mr. Sussman's opinion, has been bottomed. The determination of that question must, of course, rest largely upon geological reasons. The geology of the district and of this mine was studied by the Canadian Geological Survey in 1908. According to this the orebodies are replacements in Paleozoic limestones and tuffs, overlaid by Tertiary sediment-

aries and underlaid by Paleozoic quartzites, breccia and conglomerates, the Paleozoic formation occurring as a basin or trough. It is to be regretted that Mr. Sussman did not go more fully into the geological conditions, and we cannot understand why the Granby directors failed to publish with his report the maps and sections that he mentions as accompanying it.

Mr. Sussman evidently considers that the present ore-bearing zone has been so extensively prospected that the chances of finding new orebodies in it are poor, that prospecting has reached to the bottom of the ore-bearing zone, and that there is no evidence to show that there may be another ore-bearing zone below the quartzites, breccia and conglomerates. He concludes that the chances of developing any large additional tonnage are "exceedingly slim."

If Mr. Sussman's report needs any further confirmation it is upon this point alone, and this is something upon which the advice of a good economic geologist, aided if necessary by one or two deep drill holes to prove the underlying formations, would be best. It would easily have been possible to settle this matter during the six months that have elapsed since Mr. Sussman's report was made. There is apparently no great use in desultory prospecting that does not have this crucial factor in view. However, the stockholders of the company will be safest in basing their valuation upon the ore that both Mr. Smith and Mr. Sussman estimate as developed, with little or no allowance for possibilities.

An active competition for the petroleum trade of Europe and the East has begun between the Standard Oil Company and the Shell Transportation and Trading Company which is the great European seller and distributor of oil. Both companies have begun to cut prices in all competitive fields, and it is reported that the Shell company has even made shipments to this country. The Standard's published statement is that it desires to discourage overproduction of oil by reducing prices; but makes no mention of its competitor. The contest will undoubtedly be an interesting one, if it continues. Both parties are able to carry on a long fight.

The New Clancy Cyanide Patents

Some reference has already been made to the Clancy cyanide patents in these columns' but owing to the widespread interest in this process further details are given. The main points are the use of cheaper cyanogen-bearing compounds than the ordinary commercial cyanide, and regeneration of the spent cyanide liquors by electrolysis.

The following excerpts are taken from one of Mr. Clancy's foreign patent application:

I have discovered that a cyanogen-bearing compound which is not a solvent of the precious metals can be made a solvent of the same by the addition of an amidine or amide compound in the presence of an electric current. As a result of this discovery I am able to use cyanogen compounds heretofore not available in the cyanide process, . . . to regenerate spent cyanide solutions, and . . . to use in the cyanide process oxidizing agents without loss of available cyanide.

ELECTROLYSIS USED TO REGENERATE CYANIDE

I have also discovered that when the pulverized ore is converted into a pulp by mixing the said ore with a substantially nonacid solution of a thiocyanate containing a halogen salt, and electrolyzing this mixture, that the precious metals only will be dissolved to the substantial exclusion of the baser metals, and that the above solution may be used with advantage in conjunction with the ordinary cyanide solution, and that this process may be successfully applied to either rebellious or nonrebellious ore without preliminary roasting even though such ores containing reducing agents or tellurium or both.

In the practice of my invention I may use the crude cyanamide of commerce, its isomerides and polymerides as a solvent for the precious metals and other metals contained in ores; or a soluble cyanamide in conjunction with the cyanide process in the treatment of ores, and as a means of regenerating cyanide solution or nonavailable cyanogen-bearing solution.

ALL CYANOGEN COMPOUNDS AVAILABLE

When a soluble amidine or amide compound (such, for example, as dicyandiamidine, urea, guanidine, guanidy-lguanidine, guanidine carbonate, formamide, oxamide, cyanamide, dicyanamide, or the various polymeric and isomeric modifications of the last-mentioned compounds) is added to a cyanogen-bearing solution and the mixture electrolyzed in contact

with ore, the consumption of cyanide is strikingly reduced; and also solutions containing cyanates, before, after or during the treatment of ore (together with ferrocyanides, ferricyanides, thiocyanates, or other such nonavailable cyanogen compounds formed in the treatment of ores) may be converted into compounds which readily dissolve the precious metals contained in ores; and finally one may regenerate cyanide from cyanates, such as alkaline cyanates, isocyanates and the various isomeric and polymeric compounds, or the oxygen derivatives of cyanogen, their isomerides and polymerides.

USE OF CHEAP CYANAMIDE

I have described the addition of a soluble amidine or amide compound, which may also include any of the above mentioned compounds; but I use preferably . . . a soluble cyanamide (such as calcium cyanamide, as it is at present the cheapest source of an amidine or amide compound). A solution of calcium cyanamide, or its isomerides and polymerides, when subjected to electrolysis, is, under proper conditions, capable of dissolving the precious metals, and other metals, without any other admixture of cyanogen-bearing material. From cyanamide all the amide or amidogen compounds I have mentioned are easily prepared. For instance: by the action of sulphuric acid or hydrochloric acid upon cyanamide, water is absorbed and it becomes urea. An alkaline sulphide converts it into thiourea; NH_3 converts it into guanidine; while substituted guanidines are produced upon introducing the hydrochlorides or primary amines, etc. It will, therefore, be obvious that my claim for a soluble amidine or amide compound includes all the polymeric and isomeric modifications and transpositions of soluble cyanamides.

INACTIVE CYANOGEN COMPOUNDS MADE ACTIVE

To show the action of these amide compounds, take, for example, urea (carbamide) and add this to a solution of a cyanate (such, for example, as potassium cyanate) and electrolyze this mixture between inert electrodes. After a few minutes the said mixture will be transformed into one which will dissolve the precious metal in alkaline solution. It is well known that cyanates have absolutely no dissolving effect upon the precious metals, and that the formation of cyanate in the cyanide solution represents the chief source of loss of cyanide in the cyanide process, since, when cyanates are allowed to stand for any considerable time, or are retained in solu-

tion, they are converted into ammonia and potassium carbonate, and are transposed by the lime used in the cyanide process into insoluble carbonates or by the action of sulphuric acid in the ore into sulphates—so that the original cyanide finds itself eventually in the residue dumps in the form of sulphates or insoluble carbonates.

OXIDIZING AGENTS TO HASTEN REACTION

Any oxidizing agent, when used in the cyanide solution to hasten the dissolution of the precious metals, increases the cyanide consumption, due to the formation of cyanate, which is often great; and up to the present, no means for regeneration or recovery of cyanide from cyanate in aqueous solutions has been discovered, so far as I am aware; but my discovery that a soluble amidine or amide compound (such, for example, as calcium cyanamide) added to the cyanide-bearing solution, in conjunction with the electrolysis of said solution, opens up a cheap way whereby oxidizing agents other than atmospheric oxygen (such as treatment of cyanide-bearing solutions with oxidizing agents and soluble halogen compounds, etc.), may be successfully employed for readily dissolving and extracting precious metals from refractory ores, such as tellurides, arsenides, sulphides and other ores containing reducing agents. . . .

THE ELECTROLYZING TANK

The apparatus for carrying my process into effect is simply the ordinary agitating tank furnished with electrodes spaced about from $1\frac{1}{2}$ to 2 in. apart. These electrodes may be made of carbon, or one of iron and another of carbon; that is to say, the negative electrode undergoes no deterioration, as only nascent hydrogen is produced at the said electrode; therefore, iron answers the purpose. The positive electrode or anode is made preferably of a hard graphite or other such inert material.

The agitation keeps the whole mixture constantly circulating between the said electrodes. This circulation is maintained for a period of from eight to 12 hours to obtain the desired result. The said agitating tank with the electrodes is the electrolyzer hereafter referred to, the circulation usually being kept up by air agitation.

Different ores require variations in the composition of the solution and in the current. For example, in treating ores containing tellurides or arsenides, we may add a soluble halogen compound to the cyanamide-treatment solution, or to the cyanogen-bearing solution, or to the nonavailable cyanogen-

bearing solution, in the manner shown in the examples following.

USE OF HALOGEN COMPOUNDS

The function of a halogen compound—such, for example, as potassium iodide, when added to the cyanogen-bearing solution—is, that during electrolysis the iodine liberated at the anode acts as an oxidizing agent. It is clear, therefore, that the presence of a halogen compound, such, for example, as potassium iodide, in said solutions, insures complete absorption of any nascent oxygen which might escape without doing oxidization work. The halogens also form addition compounds with cyanamide, these addition compounds in themselves acting as oxidizing agents.

EXAMPLES OF THE SOLVENTS USED

In the following examples I use a solution of a soluble cyanamide alone, or in conjunction with the cyanide solution, or in conjunction with a nonavailable cyanogen-bearing solution. By nonavailable cyanogen-bearing solution I mean one that contains cyanogen in a different combination from that in which it exists in what are known as simple alkaline cyanides. For example, a solution after being used in the treatment of ore on testing shows no available cyanide. The cyanide in such solution is said to have been consumed, and is unfit for further treatment of ore until strengthened by the addition of more cyanide. It is clear, therefore, that my process aims at, besides its other features mentioned, the substitution of a cheap amidine or amide compound (such, for example, as calcium cyanamide) in the place of cyanide or together with only a small proportion of cyanide.

[The application gives as typical solvent mixtures the following, 2000 lb. ore and 2000 lb. water being used with each:

- (1) Four pounds calcium cyanamide, 2 lb. caustic soda or lime, with or without 1 lb. potassium iodide.
- (2) One pound potassium cyanide, 2 lb. calcium cyanamide, 2 lb. caustic soda or lime, with or without 1 lb. potassium iodide.
- (3) Two pounds potassium ferrocyanide, 2 lb. calcium cyanamide, 2 lb. caustic soda or lime, with or without 1 lb. potassium iodide.
- (4) Two pounds potassium thiocyanate, 2 lb. calcium cyanamide, 5 lb. pulverized calcium carbonate, with or without 1 lb. potassium iodide.
- (5) One pound potassium cyanide, 2 lb. calcium cyanamide, 10 lb. pulverized calcium carbonate, with or without 1 lb. potassium iodide.
- (6) One pound potassium cyanide, 1 lb. potassium thioeyanate, 1 lb. calcium cyanamide, 10 lb. calcium carbonate, with or without 1 lb. potassium bromide.

In every case the ore and solution of the above chemicals is circulated through

the electrolyzer for a period of 12 hours, with a current density of about 50 amp. per sq.ft. of electrode surface; equivalent to 90 to 120 amp. per ton of ore.—EDITOR]

CYANIDE REGENERATION

In this specification I have described my meaning of a nonavailable cyanogen-bearing solution and I now give the following example as being a typical one for the regeneration of cyanide from spent cyanide solutions; that is, those solutions in which the cyanogen is nonavailable, such, for example, as cyanides, ferrocyanides, ferricyanides, sulphocyanides, etc.

Example: Take 2000 lb. of solution which has an original strength of 2 lb. cyanide per ton and which has already been used for the treatment of ore, on testing shows only $\frac{1}{4}$ lb. of cyanide per ton of solution. Add 4 lb. of calcium cyanamide and electrolyze this mixture between inert electrodes for a period of two hours at a current density of 50 amp. per sq.ft. of electrode surface. On again testing the said solution it will be found that the available cyanide is increased, or rather gives a titration equal to 2 lb. of available cyanide. This solution is then ready for treating a fresh batch of ore. From the above it will be seen that ores which are readily leachable may be treated by percolation with the above described electrolyzed solution.

SIMULTANEOUS REDUCTION AND OXIDATION IN THE ELECTROLYZER

It will be seen that by my invention I generate solvents and continuously dissolve the precious metals, transforming them into compounds soluble in the above solution. The function of the electric current in conjunction with a soluble amidine or amide compound (such, for example, as calcium cyanamide in the cyanogen-bearing solution) is one that is both reducing and oxidizing. It is clear that I make use of both the anodic and cathodic reactions. From the above solutions or pulp the dissolved metals may easily be recovered by filtration and precipitation by methods well known and in use. . . . It may be mentioned that a salt such as sodium sulphate or ammonium sulphate may be added to the solutions to render the same more conductive. In practice I find the addition of from 10 to 20 lb. of either of the above salts to a ton of solution gives satisfactory results.

In treating ores containing among other compounds silver sulphide or other sulphides, it may not be necessary to add a halogen compound, such, for example, as potassium iodide, to the thiocyanate or cyanogen-bearing solutions, as the nascent oxygen produced by the electric current regenerates the alkaline cyanide from the alkaline thiocyanate.

It is obvious that in treating the silver ore or other sulphide-bearing ores with the

ordinary cyanide solutions, the cyanide undergoes destruction and is said to be consumed. Means at present employed to prevent this cyanide consumption and increase the extraction are the use of lead salts, such, for example, as lead acetate, litharge, etc., added to the cyanide solution, but these chemicals are expensive and irrecoverable and often inefficient when dealing with ores high in sulphides. The consumption of cyanide is largely due to the sulphide constituents of the compounds contained in the ores acting upon the cyanide solution in the presence of atmospheric oxygen; this gives rise to the formation of sulphocyanides—a direct loss in cyanide, because the cyanide is then in a nonavailable form and cannot be made to dissolve the precious metals by the ordinary means employed. By my process a nonavailable cyanide solution, is converted into an available cyanide solution, ready and active, together with any unconsumed cyanide, to dissolve the precious metals; for example:

Two thousand pounds of the pulverized sulphide ore are suspended in a solution of 6 lb. potassium cyanide (carrying 3 to 5 lb. of protective alkalinity; the alkali used being preferably lime) in 2000 lb. of water, in an agitation tank.

This mixture of ore and solution is continuously subjected to agitation and aëration by a current of air, for a period of from about 16 to 72 hours (the time depending upon the cyanide consumption). When the cyanide consumption has about ceased, the whole mixture of ore and solution is (then) subjected to electrolysis, in the said agitation tank, by introducing electrodes (preferably inert) into the said mixture, carrying a current density of about 50 amp. per sq.ft. of electrode surface. From 50 to 100 amp. are used per ton of ore. The electrolysis is continued for about from 10 to 12 hours, the length of time depending upon the regeneration of the unavailable cyanide into alkaline cyanide; the latter may be determined hourly by titration or otherwise.

DESTRUCTIVE EFFECT OF ELECTROLYSIS ON STRAIGHT CYANIDE

From the above descriptive example it will be obvious that to start electrolysis of the ore pulp together with the ordinary cyanide solutions would result in immediate destruction of the cyanide, as there would be insufficient or no sulphocyanide present in solution to protect the cyanide against the nascent oxygen produced at the anode, which would at once oxidize the cyanide to cyanate.

I give the following examples of my process with and without the use of the halogen salts without, however, limiting myself to the details of each.

[In each of the examples it is understood that 2000 lb. of ore and 2000 lb. water are used, and that these, with

the dissolved reagents, are circulated continuously in the electrolyzer for about 12 hours, using a current density of about 50 amp. per sq.ft. of electrode surface, equivalent to about 90 to 120 amp. per ton of ore:

(1) Two pounds potassium thiocyanate, 2 lb. caustic soda or lime, 1 lb. potassium iodide.

(2) Two pounds potassium thiocyanate, 1 lb. potassium cyanide, 2 lb. caustic soda or lime, 1 lb. potassium iodide.

(3) Two pounds potassium thiocyanate, 2 lb. caustic soda or lime, 2 lb. potassium bromide, 1/2 lb. potassium iodide.

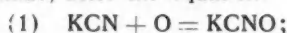
(4) Two pounds potassium thiocyanate, 2 lb. lime.—EDITOR.]

EFFECT OF THE ELECTRIC CURRENT

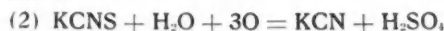
It will be seen that the function of the electric current is simply to produce nascent oxygen in contact with the ore in said solution. The nascent oxygen in the above examples liberates iodine from potassium iodide which combines with the cyanide or the thiocyanate to form cyanogen iodide. This cyanogen iodide is an excellent solvent for gold contained in refractory ores containing gold tellurides, sulphides, arsenides, etc.

REASON FOR USING THIOCYANATES

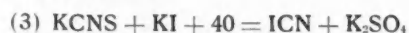
It may be seen from the following equations the reason for using thiocyanate alone or in conjunction with the simple cyanide solution in preference to the ordinary alkaline cyanide solution is that, if cyanide solution be used without containing sulphocyanide or the addition thereof, the nascent oxygen produced by the electric current destroys the cyanide by converting the same into cyanate, which is not a gold solvent, and, therefore, simply results in the destruction of the cyanide, after the equation:



whereas by using thiocyanate the equation is



It will be seen from the equation No. 2 that cyanide is produced when the solution is kept alkaline, and the cyanide so formed is not decomposed as long as there is thiocyanate present in the solution. By adding a halogen compound to the thiocyanate solution which may or may not contain free alkaline cyanide and electrolyzing same, the following equation takes place:



It may be stated at this point that any alkaline sulphides present in the solution would act to regenerate potassium thiocyanate as:



This reaction would also open up a way for substituting alkaline sulphides for zinc as a silver precipitant.

The same solution can be used again and again by keeping the requisite strength

in thiocyanate, but no further addition of potassium iodide is necessary, except to compensate for mechanical losses. The nascent oxygen produced by the electric current regenerates the iodine to begin its work over again. Between each operation it is desirable to pass the liquor through zinc shavings in the ordinary way.

In the above examples the desired result is prevented if the solution be substantially acid, but the solution may be alkaline, neutral or slightly acid. By slightly acid, I mean this: That while a solution of thiocyanate may be technically termed "slightly acid" because showing acidity to certain tests, yet for practical purposes it is substantially a non-acid solution, as well as those which are alkaline or neutral.

USE OF OZONE AS AN OXIDIZER

Another way of carrying my invention into practice is to treat pulverized ore with a solution of a thiocyanate containing a halogen compound, with ozone, or with a solution of thiocyanate containing a halogen compound, in the presence of an electric current.

[For example, the use of a current of ozonized air carrying say 100 grams of ozone per ton of ore, would produce, it is stated the same effect in 12 hours agitation, as would the electrolyzer previously mentioned with about 90 to 120 amp. per ton of ore for the same period.—EDITOR.]

Having described my invention and different ways of carrying it into effect, it will be understood that the various changes in the described processes may be made and equivalent substances employed without departing from the spirit of my invention or exceeding the scope of my claims.

RECAPITULATION OF THE CLAIMS

(1) The process of treating ore containing precious metals which consists in subjecting said ore to the action of a solution containing a cyanogen-bearing material and an amidine or amide compound and electrolyzing said solution or mixture.

(2) The process of treating ore containing precious metals which consists in subjecting said ore to the action of a solution containing a cyanamide, and electrolyzing the said solution or mixture.

(3) The process of treating ore containing precious metals which consists in subjecting said ore to the action of a solution containing a cyanamide in the presence of a halogen compound and electrolyzing said solution or mixture.

(4) The process of treating ore containing precious metals which consists in subjecting said ore to the action of a cyanogen-bearing solution containing a cyanamide and electrolyzing said solution or mixture.

(5) The process of treating ore containing precious metals which consists in

subjecting said ore to the action of a cyanogen-bearing solution containing a soluble cyanamide and a halogen compound and electrolyzing said solution or mixture.

(6) The process of regenerating cyanogen-bearing solutions which consists in subjecting the said solutions to the action of a soluble amidine or amide compound (such, for example, as calcium cyanamide) and electrolyzing the said solutions.

(7) The process of treating ore containing precious metals which consists in subjecting ore to a thiocyanate solution, containing a halogen salt and electrolyzing the mixture.

(8) The process of treating ore containing precious metals which consists in subjecting ore to a solution containing a thiocyanate, a soluble cyanide and a halogen compound, and electrolyzing the mixture.

(9) The process of treating ore containing precious metals which consists in subjecting the ore to a solution containing thiocyanate, and a soluble iodine compound, and electrolyzing the mixture.

(10) The process of treating ore containing precious metals which consists in subjecting ore to a solution containing a thiocyanate, a soluble cyanide, and a soluble iodine compound, and electrolyzing the mixture.

(11) The process of treating ore containing precious metals which consists in subjecting the ore to a substantially non-acid solution of thiocyanate, and electrolyzing the mixture.

(12) The process of treating ore containing precious metals which consists in subjecting the ore to a substantially non-acid solution of thiocyanate containing a soluble cyanide, and electrolyzing the mixture for a sufficient period to extract the precious metals.

13. The process of treating sulphide ore containing precious metals which consists in subjecting the said ore to the action of an alkaline cyanogen-bearing solution in presence of oxygen, until a part of all of the cyanide has been transformed into a nonavailable sulpho-cyanide compound, or other nonavailable cyanide compounds, then subjecting the said solution or mixture to electrolysis.

(14) The process of treating ore containing precious metals which consists in subjecting the ore to the action of a soluble thiocyanate and a halogen compound and oxidizing said mixture by means of ozone.

(15) The process of treating ore containing precious metals which consists in subjecting the ores to a solution containing thiocyanate and a halogen compound and electrolyzing the mixture.

(16) The process of treating ore containing precious metals which consists in subjecting the ore to the action of a thiocyanate and a soluble halogen compound and oxidizing the mixture.

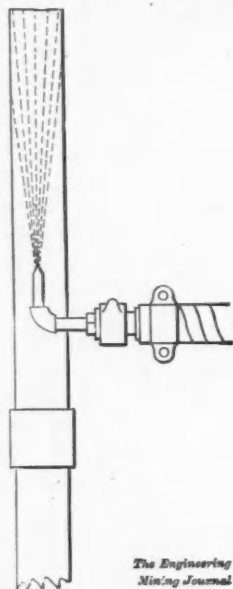
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Ventilation by Suction

BY ARTHUR O. CHRISTENSEN*

The following method for sucking air through a pipe, although not new, may be novel to some and a suggestion to others. The illustration shows an arrangement of the apparatus that has been found satisfactory in La Noria mine, Zacatecas, Mexico. A pipe about 2½ in. in diameter or a wooden conduit 4 in. square, is laid into the working to be ventilated by suction. Into the lower end of the pipe a ¾-in. pipe is inserted and bent or fitted, as shown in the illustration. This is coupled direct to the compressed air line. When the valve is opened the



JET FOR VENTILATING BY COMPRESSED AIR

jet of compressed air, rushing into the larger pipe and parallel to its direction, creates a strong suction in the pipe or conduit, producing the ventilating current.

In operation it is better to use the full air pressure available, and cut down the amount used by the size of the nozzle rather than employ a large nozzle and only partly open the valve, as is sometimes done. Where the larger pipe is not over 4 in. in diameter, a ¾-in. pipe tipped with a ¼-in. nozzle is large enough for a 30-lb. air pressure. For higher pressures and where it is necessary to be economical, an aperture of from ⅛ to ¼ in. may be used. The nozzle should be placed in the pipe or box at a point so situated that the jet issuing from it will be spread out to fill

the pipe before leaving it. The higher the air pressure used the farther back the nozzle need be placed. I have found that placing the nozzle 12 to 18 in. from the outlet of the pipe was about right. If the nozzle is put farther back than is necessary the pipe ahead of it hinders the rush of air, and thus impairs the suction efficiency.

In the case of an opening where it is desired to blow air into rather than draw it out, about twice the amount of air can be carried in by laying a second pipe line and putting such a jet on the inner end. This arrangement not only secures the benefit of the compressed air, but also makes it suck in an equal amount of air through the second pipe line. Of course, this is suitable only for such distances within which it would pay to lay the second pipe line in order to save compressed air.

Collapsible Tank for Washing Blueprints

Often the engineering office is so crowded that there is little room available for the tank in which to wash blueprints. In such a case a great economy of space can be made by using a collapsible tank that is hinged to, and when not in use folds up against, one of the walls of the building.

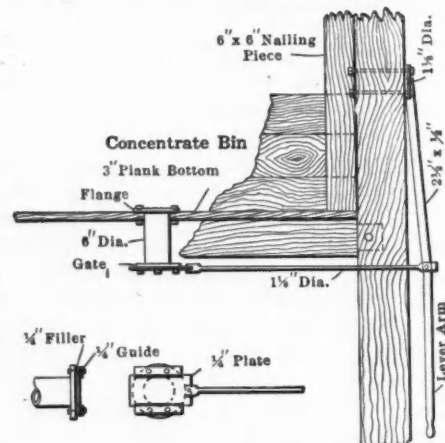
As the tank is not constantly filled with water, it must be lined with metal to keep it from leaking. At the Highland Boy mine galvanized iron, coated with paraffin paint, is used. The tank should be about 4 in. deep so as to avoid slopping while washing the blueprints, and the bottom should be given a slope of about one-quarter of an inch toward the drain hole. When down, the inside edge of the tank rests on a base board nailed to the wall, while the outer edge rests on two legs which are hinged to a cross piece on the bottom of the tank so that when the tank is closed against the wall the legs hang down under the cross piece and against the bottom boarding of the tank. The body of the tank is best made of inch pieces, and the bottom of matched wainscotting.

The size of the tank is determined by the amount of space available, and by the size of the largest blueprints that are to be made. The legs of the tank have sharpened nails in their bottom ends to prevent them from slipping, and it is well to bore two shallow holes in the floor for the nails to rest in when the

legs are down. The drain hole in the tank is placed in the corner and at such a distance from the back of the tank that, when the tank is in use, the hole is directly over the reducing pipe that forms the upper end of the drain-pipe proper.

Gate for Dry-concentrate Bin

Gates are constructed in the bottom of the flat-bottom bins at the Cheever Iron Ore Company, near Mineville, N. Y., to draw magnetic concentrates from the storage bins. A 14-in. length of 6-in. pipe is put through the bottom of the bin and a flange is screwed on flush with the pipe and bolted to the bottom planks inside. A flange is also fitted to the other end. Iron strips are bolted to this flange to act as guides for a sliding plate ¼ in.



CHUTE FOR FLAT-BOTTOM CONCENTRATE BIN

thick. The gate is opened by operating a lever arm which is attached to the uprights of the bin.

A Mine Surveyor's Spud

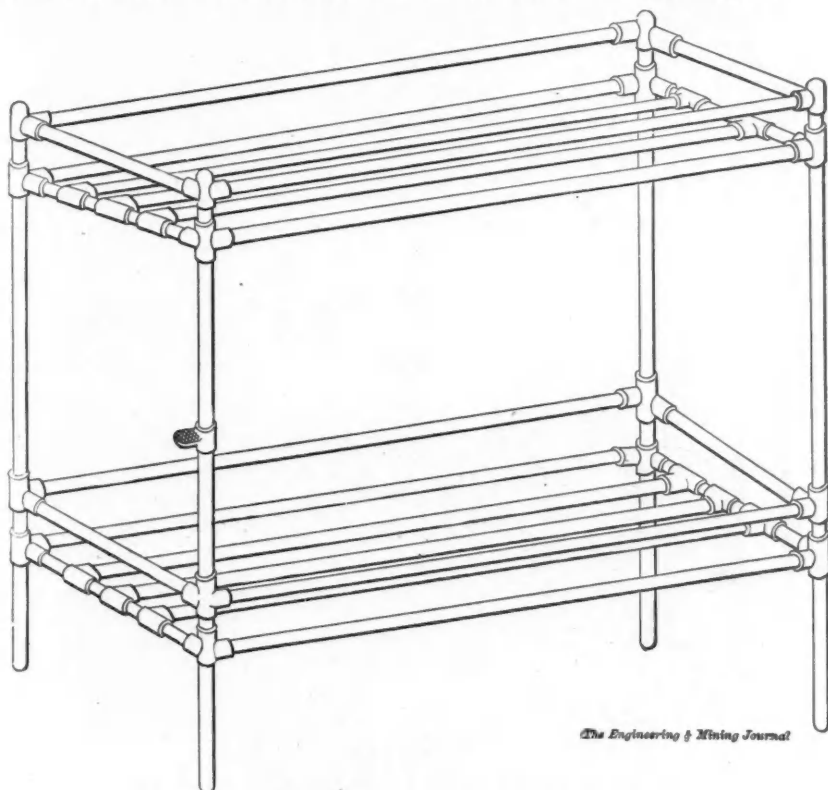
A cheap and efficient spud for marking reference points for underground surveys is suggested by J. W. D. Moodie, of Los Angeles. It is made by cutting a slot out across the head of an ordinary horseshoe nail with a hacksaw. The nail can be driven deeper than if the head is bored and slotted, as suggested on page 351, of the JOURNAL for Aug. 20, and it is less liable to be disturbed. The plumb-bob cord is fastened with a blackwall hitch (the cord simply passed around the nail with the loose end slipped under the taut one). It is easily adjusted and objectionable loops or knots are done away with.

*Mining engineer, Zacatecas, Mex.

Improvements in Mine Bunks

Sanitary conditions, coupled with comfort, for employees is a factor that is being seriously considered by operators in almost every line of business. Health and satisfaction among those employed at a mine is practically conducive to an increased and steady production. This fact has been given consideration at the Sunnyside mine, in Eureka gulch, San Juan county, Colorado. Here the mine has provided reading rooms, baths and every modern convenience.

The question of sanitary sleeping quarters within limited space has been solved by the following improvement in bunks, 26 of which have been installed uptodate. The improvement consists of a bunk, patented and manufactured by



SANITARY MINE BUNK BUILT OF PIPE AND FITTINGS

Charles Scheer, of Silverton, Colo. It is made up of piping with appropriate couplings and joints.

As shown in the illustration it can be used with any coil spring. It is provided with side rails for the protection of the sleeping occupants. The parts are entirely separable and can be readily transported on tramways or by any other means in common use. The healthful atmosphere that prevails in sleeping quarters at the Sunnyside mine is ample proof that it fulfils the desired object. In one feature alone, the elimination of the bed bug, the installation has repaid the company.

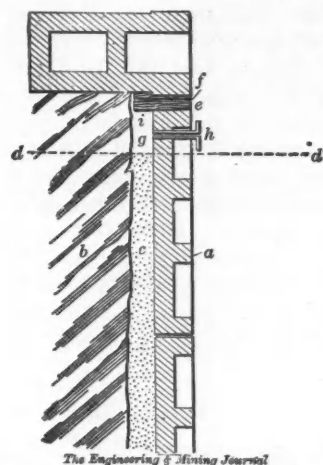
For the year ended May 15, 1910, an average of 4.71 tons were crushed per stamp per 24 hours in the 240-stamp mill of the Alaska-Treadwell.

Injection of Grouting behind Shaft Tubbing

An original method was employed at the Hildesia shaft at Diekholzen, Germany, for insuring a perfectly watertight joint between the upper ring of a set of tubbing and the bearing ring above it. As the tubbing is erected from below, resting on a similar bearing ring at a lower point in the shaft, a small space, of variable size, always remains around the top of the uppermost ring, and this has to be carefully closed, generally with pine or poplar wedging.

In the case under discussion, after the upper ring had been put in position, the space between it and the rock wall was filled with cement grouting to the level

80 to 90 atmospheres, were then applied, for the purpose of forcing the cement into every crevice of the rock wall, and also into the grain of the wedging. By



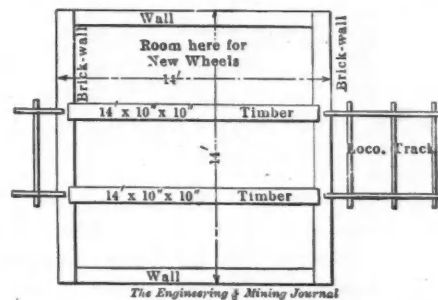
SHAFT TUBBING ARRANGED FOR INJECTION OF GROUTING

exercising this unusual precaution, the liability of leakage, especially during the winter when the tubbing contracts, was entirely overcome.

Electric Locomotive Repair Pit

By H. J. NELMS*

The accompanying sketch shows a convenient arrangement for a locomotive repair pit. The timbers shown in sketch are simply laid on the brick wall. When new wheels are to be put under a locomotive, the motor is run on the timbers and then jacked up and timbers are laid crossways over the pit under the end of locomotive. The wheels are then dropped



ARRANGEMENT FOR LOCOMOTIVE REPAIR PIT

down to the pit by chain block and new ones put on.

By leaving the timbers loose so they can be placed both ways across the pit, three men should be able to change wheels in four or five hours. Usually where no pit is used the locomotive is jacked up above the wheels and the old ones run out and new ones put in, it is a good 24-hour job for four or five men. The pit should be constructed about 4 ft. deep and made large enough so that the new wheels can be kept in it.

*Mining engineer, Castle Shannon, Penn.

$d-d'$, and the wooden wedging e was inserted in the usual manner. At four equidistant points around the shaft, 10-mm. holes f were bored through the wood. At four other equidistant points, 45-mm. holes g were bored through the web of the cast-iron lining, close under the upper flange; these holes were fitted with pipes and couplings.

By means of hose, one of the latter holes was connected to a pipe from a high-pressure pump, and cement grouting was forced into the space i . The three other holes of this set were closed as soon as cement began to come through them, with the escaping air. More cement was injected, until it began to escape through the holes in the wedging, and these were then tightly closed. Further additions of grouting, under a pressure of

Steel Ore Chute for Use in High-grade Stopes

When high-grade ore is being mined it is always advisable to exert every possible care to see that the fines, which often run high in gold and silver, are not lost. To this end in the square-set stopes of the Centennial-Eureka mine, at Eureka, Utah, every other floor is tightly boarded over so that the fines cannot drop through. All ore is handled to chutes on the tight floors. Steel ore chutes or passes are used between floors and to deliver ore to the haulage levels. Stope sets are 7 ft. 4 in., center to center.

PREVENTS LOSS OF RICH FINES

The ore is broken down on 8x8-in. shooting timbers and dropped one set to a tight floor, there sorted and shoveled, or wheeled, to the steel chutes into which it is dumped. These chutes are built in sections, that is, they are carried from one tight floor to the stope floor immediately below on which ore is broken, and terminate about three feet above the second floor, below which is another one that is tightly boarded. At each tight floor a temporary wooden hopper mouth is built to the chute so that ore above will drop into the lower continuation, and so that ore from that stoped floor can be easily shoveled or dumped into it. The chutes being in sections, can be easily moved to another portion of the mine when one stope is finished.

The steel ore passes are 14x14½ in. inside measure, the sides being 3/16-in. sheet steel, bolted at the edges to vertically placed 1½x1½x¼-in. angles. By placing the angles on the outside corners they are not subjected to any wear.

Such chutes are tight and durable, and their use in conjunction with tightly boarded stope floors insures the delivery of all ores from the stopes. Such refinements of practice (the additional costs thereby entailed) are unwarranted in handling large quantities of low-grade rock, but with such ore as is mined at the Centennial-Eureka, the loss that would result from careless handling of the ore through cribbed or loosely lagged chutes would probably be much greater than is the cost of the extra installation.

Steel Dredge for India

The Bucyrus Company, of South Milwaukee, is to instal a modern gold dredge of the continuous-bucket-line type in Burma. The new dredge will differ from those in California in that the hull and all structure above the deck will be of steel. This is one of the first American dredges of this type to invade foreign fields and is claimed to be one of the finest machines turned out by the Bucyrus Company.

Labor Saving Appliances in the Assay Laboratory*

BY EDWARD KELLER†

Under the title "Labor-Saving Appliances in the Works Laboratory," I published a paper¹ in which was described how multi-manipulations, in a works

er mechanical devices. For example, I now deposit in, or withdraw from, a muffle a set of 48 cupels as one unit. The front row (eight) of these are blanks or heaters; the other 40, when they have attained the proper temperature in the muffle, are charged simultaneously with the 40 lead-buttons. Three manipulations here accomplish an operation which by the customary method requires 136, and

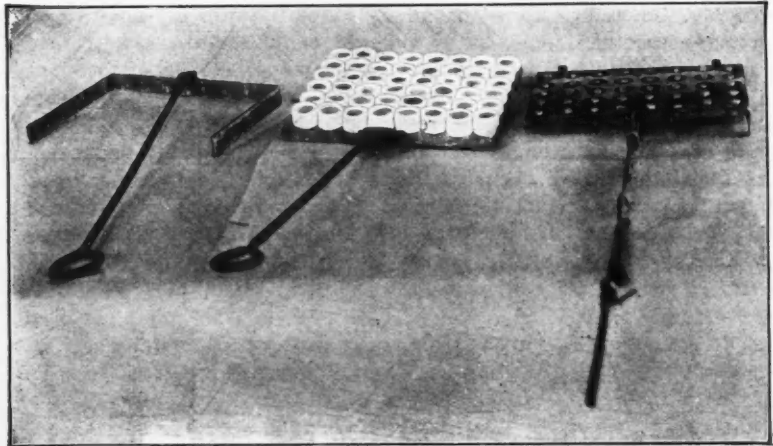


FIG. 1. DEVICE FOR HANDLING 48 CUPELS AS A UNIT

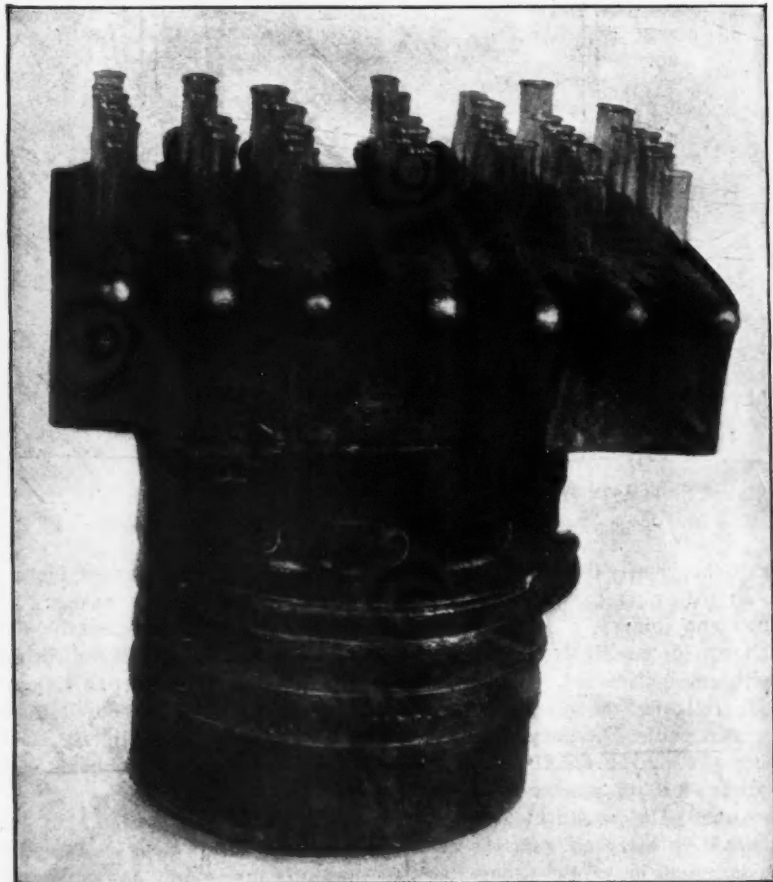


FIG. 2. PARTING BATH WITH SECTIONAL HOLDERS FOR TEST TUBES

laboratory, and in the furnace room of an assay laboratory, can be condensed into single manipulations by applying the prop-

this number is only limited by the size of muffle and cupels.

This operation is an enlargement of what I have already described in my former paper, and Fig. 1 shows the improved implements.

*Bull. A. I. M. E., Aug., 1910.

†Box 363, Perth Amboy, N. J.

¹Trans. A. I. M. E., Vol. XXXVI, 3-18.

PARTING BATH.

I previously described a gold-silver bead-parting bath, which is the last of the devices used in regular sequence in practice. This bath was designated as being convenient, but was not properly a labor saver. Fig. 2 shows a new device. Instead of the original tray, there are now sectional holders for the test tubes, each having a wooden handle on either end, so that the holders may be removed from the boiling bath, and the acid or water poured off from each set of tubes (in this case, seven) without waiting to cool. The tubes held in place by clutches, as shown in Fig. 3, rest in holes in the base strip, having a smaller diameter than the tubes. Each holder is stamped at either end with a number so that the bath becomes further useful by permitting several men to use it at the same time without interference. Apart

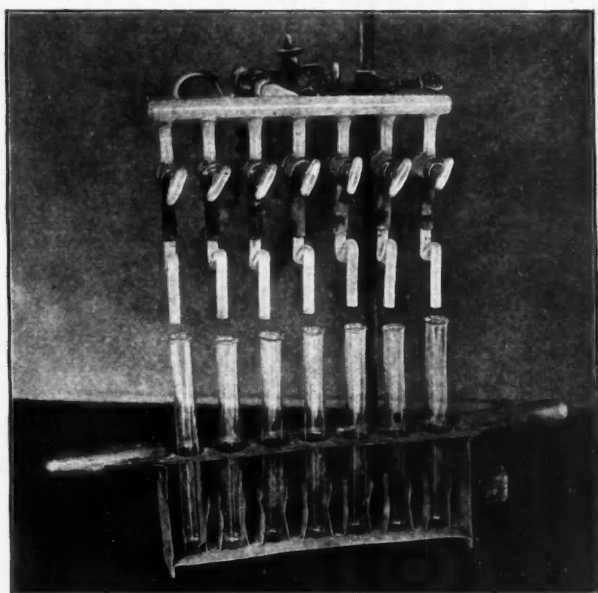


FIG. 3. TEST TUBE HOLDER AND DEVICE FOR FILLING TUBES

from the handles, the holders are made of sheet copper.

The temperature of the parting bath may be raised above the boiling point of the water by adding to the latter an adequate quantity of glycerin. Salts (sulphates) are not desirable for this purpose, since they have the tendency to creep over the bath.

TEST TUBE HOLDER WITH FILLING DEVICE

Fig. 3 shows also the device by which each set of tubes is filled with wash water. The supply water is turned on by means of a pinch cock, and the glass cocks of the individual outlets are set so as to insure an equal stream from each orifice. When in operation, the whole stands in a drain.

HOLDER AND TRAY FOR ANNEALING CUPS

Fig. 4 shows an annealing-cup holder, enabling the operator to transfer the gold

in sets from the tubes to the cups. The individual clutches are cut from brass pipe. The cup holder is placed over the tubes in their holder in such a manner that the mouth of each tube slips into a cup. With a little deftness the two holders are then inverted and left together long enough in that position to permit the gold to settle to the bottom of the cups, when the tubes are withdrawn carefully, so as not to spill any of the gold with the water. The glass rods, fastened to a hinged wooden bar, are then turned down over the tops of the cups, and the water from the latter poured off. Were the whole device constructed of metal, the cups with the gold contents could be dried and the latter annealed therein; instead, they are now transferred to a special sheet-iron tray

caps are necessary for each face. The day shift and the night shift each have a key to the box. These boxes are so distributed that they are not less than 75 ft. apart and at a safe distance from the working face. This distribution of powder prevents any serious explosions, such as may occur when many boxes are kept in one magazine.

Red Lights to Mark Winzes

Red lights are used to mark winzes and ore chutes on the various levels of one of the Mesabi iron mines. The mine is wired for electricity, and a red globe is hung directly over each winze. As a further precaution, light rails are placed

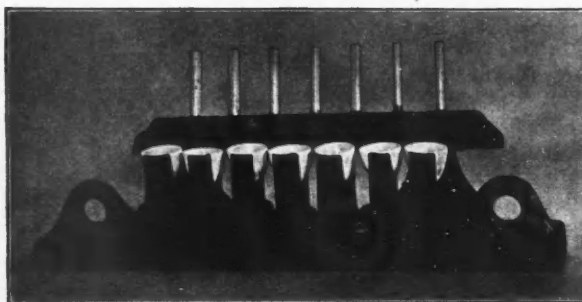


FIG. 4. ANNEALING-CUP HOLDER



FIG. 5. TRAY FOR HOLDING ANNEALING CUPS

with a wooden handle, Fig. 5, dried on a hot plate and annealed on a gas stove.

The description of labor-saving appliances given in the original and in this supplementary paper demonstrates that, with the sole exception of weighing, the idea of "working in sets" can be carried through every operation in the assay laboratory and furnace room.

Powder Storage Underground

At the Leonard mine, Chisholm, Minn., only one box of powder is taken underground for each working face. This powder is kept under lock and key in a box, 2x2x4 ft. In this box is also kept one box of candles and whatever fuse and

over these openings, forming a grizzly. With these precautions it would seem almost impossible for a man to fall down a winze.

The company is certainly doing its part to safeguard its employees. Even with all this, the miner being used to danger will be likely to neglect placing grizzly bars, or fail to replace a broken lamp. There should be a further protection in the way of a penalty for not keeping these safeguards in place.

Correction

The gin pole illustrated in the JOURNAL, Aug. 13, page 306, was given as 42 ft. 6 in. high. The drawing was of the upper half only, the total height being 85 ft.

Annual Report of Alaska-Treadwell Company

The twentieth annual statement of the Alaska-Treadwell Gold Mining Company comprising superintendent's report, balance sheet and profit and loss account, with detailed statement of disbursements and receipts, etc., for the year ended May 31, 1910, is now made public. As usual this report reflects great credit upon the management and technical skill of the operating force of the company. The report of Robert A. Kinzie, general superintendent, on the operations of the company for the year ended May 15, 1910, is complete in all details, leaving no important information to be desired.

DEVELOPMENT OPERATIONS ALL BELOW 600-FOOT LEVEL

No work was done in the open pit nor was any development work done on the levels above the 600 on which a chute raise, station and short drift were run to facilitate drawing ore from the stopes. The total exploration and development operations for the year were as follows: 600-ft. level, 41 ft.; 1050-ft. level, 68; 1250-ft. level, 2640; 1450-ft. level, 8889; 1600-ft. level, 928; 1750-ft. level, 170; shaft No. 2, 275. The total footages made in the various kinds of work were: Drifts, 2581 ft.; crosscuts, 478; raises, 4727; intermediate drifts, 3227; stations, 1723; shafts, 275; total, 13,011 ft. In addition to the above, the Treadwell company did the following work in the Alaska United Gold Mining Company's 700-ft. claim mine: Drifts, 1198 ft.; crosscuts, 125; raises, 593; intermediate drifts, 54; stations, 421; shaft No. 2, 588; total, 2979 ft. A tabulation of the development work done in the mines from 1894 to 1910 inclusive is also given. The total advance for the period is stated as 107,030 ft. More development work was done in 1909-10 than in any previous year.

DEVELOPMENT WORK FURNISHED 15.46 PER CENT. OF TONNAGE EXTRACTED

The table of tonnage of ore mined and sent to the mills during the year also shows the percentage of ore extracted from the different levels. A total of 744,226 tons was sent to the mills, of which the 1050-ft. level furnished 41.46 per cent., the 1250-ft., 25.57; 440-ft., 2.57; 600-ft., 3.51; 750-ft., 6.70; and 1450-ft., 4.73; all of the above being from stopes. The 600-ft. level also furnished, from development work, 0.03 per cent. of the total tonnage extracted; the 1050-ft., 0.04; the 1250-ft., 2.51; and the 1450-ft., 12.88 per cent.

The estimate of ore reserves on May 15, 1910, shows that there were 4,897,238 tons of ore in place developed, and 1,002,126 tons of broken ore in the stopes, making a total of 5,899,364 tons of ore in

reserve, the average assay value of which was estimated at \$2.85 per ton. In the above reckoning ore that must remain in the mine in the shape of pillars is included.

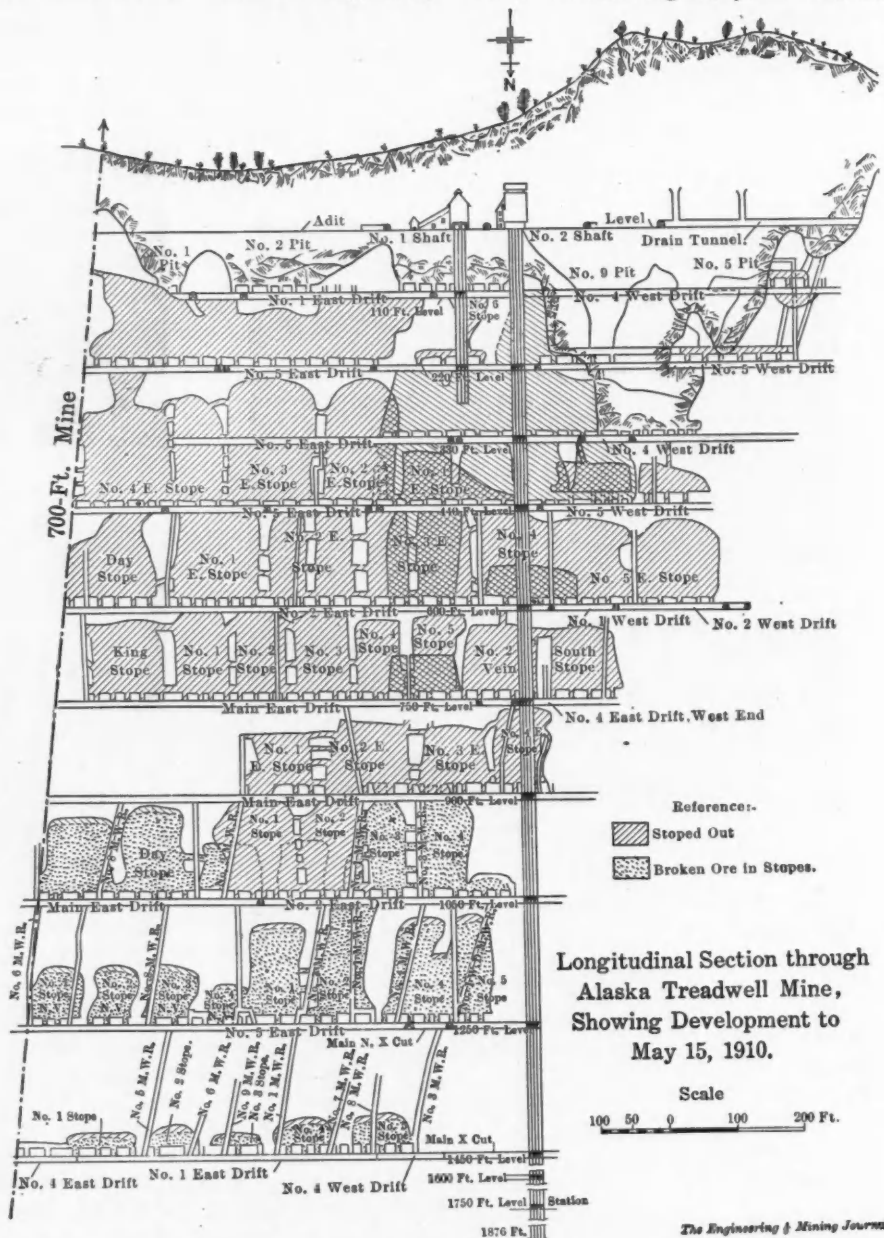
AVERAGE TENOR AND MAGNITUDE OF ORE RESERVES HIGHER THAN EVER BEFORE

The historical statement of ore reserves and ore milled shows that the tonnage of estimated ore reserves, the average assay

per ton is derived by adding the tailings value to the returns from the mill. Other tabulations of interest are given which show complete data on the mining-operations for the year under review.

SULPHURETS REPRESENT 42 PER CENT. OF YIELD

The mill records for the year show that the 240-stamp mill lost 14 days 6 hours and 11 min. during the year. The 300-



value per ton of the ore so classed and the average assay value per ton of the ore sent to the mill in 1910 were higher than in any previous year. The total number of tons sent to the mill in 1910 was, however, slightly less than in several of the previous years. In 1910 744,226 tons of ore averaging \$2.95 per ton were milled. The average tonnage milled for 10 years is 739,665 tons, the value being \$2.40 per ton. The average assay value

stamp mill lost 157 days 20 hours and 26 min. The latter was operated only by water power. The cost of milling the 744,226 tons of ore was \$133,941 or \$0.1799 per ton. The ore yielded in free gold including base bars; \$1,203,988 or \$1.6177 per ton, and from 14,046.36 tons of sulphurets treated, \$875,329, or \$1.1762 per ton of ore milled, making the total returns for the year \$2,079,318 or \$2.7939 per ton of ore milled.

EXTENSIVE POWER DEVELOPMENT

During the year a new bath house and swimming tank were added to the club house, which is stated to be popular with the employees and considered by the company an important adjunct to the plant. The Alaska-Treadwell company's proportion of the electric-power construction account amounted to \$78,200 during the year. The Westinghouse-Parson steam-turbine plant, mentioned in last year's report, was installed and tested and will be put in regular service as soon as motors are installed in the mines and on the surface. The development of electric power on Lake Turner has not been prosecuted.

A hydroelectric plant consisting of two units of 1000 kw. each is now being installed at Sheep creek. The flume, pipe line and transmission line are in course of construction. This plant will carry the load during the water season, and the steam-turbine plant on Douglas island will take care of the load during the winter months. It is stated that the plant will be completed and in operation in the

fall. The company has obtained an option on a water-power site on Nuggett creek. Labor supply is stated as having been satisfactory for all departments of the mine and mill.

PROPERTY AND PLANT ASSETS INCREASED BY 2.88 PER CENT

The secretary's balance sheet shows that capital and liabilities, including \$5,000,000 in capital stock, total \$5,368,787 which is balanced by the property and assets of which the property and plant represent \$4,783,857. During the year 1909-10 improvements valued at \$137,870 were added to the property and plant of the company.

In the profit and loss account the total operating costs for the year ended May 31, 1910, are stated as \$1,166,511; construction and repair costs, \$23,453; and coal suspense, meaning loss on coal sales during the year, \$244. The receipts were: From bullion account, \$2,076,903; interest, \$9523; commercial profits, \$85,077. A net profit for the year of \$981,295 is thus shown. Dividends representing 17

per cent. on the par value of the capital stock, amounting to \$850,000, were paid, \$13,853 written off for personal accounts and \$178,165 for depreciation on the plant. A balance of \$74,687 was carried forward.

TOTAL COSTS \$1.599 PER TON OF ORE MILLED

The operating costs per ton of ore milled during the year ended May 31, 1910, were: Mining (development 13,011 ft.; stoping, 901,325 tons of ore and 14,582 tons of waste) \$1.1766; milling (744,226 tons of ore crushed) \$0.1799; sulphuret expense (14,046.36 tons treated) \$0.1219; general expense, Douglas island, \$0.0567; San Francisco-office expense, \$0.0109; London-office expense, \$0.0019; Paris-office expense, \$0.0003; consulting-engineer expense, \$0.0018; taxes, \$0.0035; bullion charges, \$0.0139, making a total operating cost of \$1.5674. To this must be added a construction and repair cost amounting to \$0.0316, bringing the total costs up to \$1.599 per ton of ore milled.

Scheftels & Co. Raided by Federal Authorities

George Graham Rice and B. H. Scheftels & Co. have long figured in the newspapers of Nevada, Colorado and New York, because of their promotion of mining companies. They first appeared in New York as sellers of the stock of the Rawhide Coalition company, over which there was a collapse and scandal in the early part of 1909. Later they brought out Ely Central and Bovard, the latter being a prospect near Rawhide, Nev., upon which they succeeded in selling a large amount of stock. In the JOURNAL of Oct. 9, 1909, and Nov. 6, 1909, we exposed their manipulation of Ely Central, showing how they had optioned the majority of its capital stock at a relatively low figure and had boomed it to \$4¼ per share, representing upward of \$5,000,000 for what was merely a prospect, showing that the so called "Mining Financial News," masquerading as the "Wall St. Authority on New York and Boston Curb Stocks," but always saying good words for Scheftels & Co. and "hollerin'" for its readers to buy Ely Central, Bovard, etc., was in reality published by the same ring and that Rice was back of it all. These connections had previously been kept in the background, but our exposure showed the Ely Central property for what it was, viz., a prospect, not a very good prospect, and very far from being a mine almost certain to have 33,000,000 tons of ore and a probable ability to produce copper for 6 to 8c. per pound.

Long before our disclosures the operations of Scheftels & Co. had been a pub-

lic scandal, at the stench of which decent people had to hold their noses. The market transactions were the subject of frequent complaints to the Curb Agency, and on Jan. 1 the concern ceased to be recognized at the Curb Agency by a ruling that no corporation would be accepted as a subscriber.

In the sale of its stocks Scheftels & Co. have employed many "litterateurs," many high-salaried officials, and hundreds of clerks, typewriters, telegraphers, etc. The office and advertising expenses have been enormous. Out of the proceeds thus expended a number of daily newspapers have benefited, but among the New York dailies, only one—the *Commercial*—accepted this business right along, and most of them would never touch it at all. The stocks of the "mines" vended by Rice have never yielded any dividends; nor have the "mines." Did any of the buyers ever ask himself whence came all of the promotion money? The wonder is that this thing has been allowed to go on for so long. Action by the authorities, however, has been taken.

The office of B. H. Scheftels & Co., Incorporated, in Broad street, New York, was raided about noon, Thursday, Sept. 29, and simultaneously the branch offices of the concern in half a dozen cities were raided. The raids were directed by the Bureau of Investigation of the Department of Justice and that in New York was conducted by George Scarborough, special agent of the bureau, assisted by de-

tectives from the central office of the New York police.

According to the newspaper accounts, when the police wagon halted in front of the offices of the concern, which directly overlook the Curb market, it was greeted with cheers by the crowd of brokers there, and shouts of "You're late in coming, but we're glad to see you;" "Good thing you've come;" "You're here at last;" and to the prisoners as they were taken away, "Glad to see you going."

Entering the offices, Scarborough caused the doors to be locked and ordering the telegraphers to leave their instruments, to prevent them from warning the branch offices, his officers went through the offices picking out the men for whom they had warrants. They were Bernard H. Scheftels, president of the company, Clarence McCormack, Charles F. Belser, Charles B. Stone, John Delaney, William T. Seagraves, and George F. Sullivan, alias "Red Letter" Sullivan. The officers had a warrant to arrest George Graham Rice, but he apparently got wind of the impending raid and escaped. Remaining in hiding over night, he gave himself up on Friday afternoon.

The investigators seized the books and papers of the concern which they dumped into two more patrol wagons and carted to the Federal building.

Arraigned before Commissioner Shields, the complaint made by Mr. Scarborough charged the men arrested with misuse of the mails, operating a bucket shop, making false quotations, charging interest on

fictional accounts, and conversion of securities belonging to customers. Rice and Scheftels were held in \$15,000 bail, Sullivan in \$10,000, Belser in \$7500, and the two others in \$2500 each. Sullivan and Belser failed to secure bail and were detained. On Friday application to reduce their bail to \$7500 and \$5000 respectively was granted, but upon the release of Sullivan he was immediately arrested by Lieut. B. McConville, of the central office, on the strength of an indictment found against him in New York county in 1901, charging grand larceny by the stealing of 100 shares of Republic Steel stock from a man in Long Island. "Red Letter" Sullivan is said to have gained his soubriquet as the writer of flamboyant and roseate "literature."

This raid was made as the result of the attention of the Bureau of Investigation of the Department of Justice to the operations of Scheftels & Co., which has been going on for many months, under the direct supervision of Stanley W.

Finch, chief of the bureau, and of Attorney-general Wickersham, while George Scarborough, special agent, has been immediately conducting the investigation. The orders to make the raid were issued from the Department of Justice, at Washington, and its action is apparently a part of the policy of the administration to eliminate shady "financiering," "bucketing," and swindling operations from our business affairs. Immediately after the raid, the following statement was given out from the Department of Justice:

"Acting under the direction of the Department of Justice, United States Attorney Wise at New York today, as the result of information secured by the bureau of investigation of this department, caused the arrest of the principal persons connected with the firm of B. H. Scheftels & Co., on a complaint alleging a conspiracy to use the mail in furtherance of a scheme to defraud. Simultaneously with the arrest in New York, agents of the department at Boston, Providence,

Philadelphia, Chicago, Milwaukee and Detroit endeavored to effect the arrest of the managers of the branch offices at those places on warrants charging them with being parties to the conspiracy.

"The evidence in possession of the department tries to show that Scheftels & Co. have been engaged in the promotion of the sale of mining stocks of very questionable value, the price of which has been increased as a result of exaggerated and fictitious statements made by persons interested in the company; that they have been operating a bucket shop and reporting to customers alleged purchases and sales at other than the correct market prices, and that in a number of instances they have converted money and stock belonging to their customers.

"The evidence in possession of the department also tends to show that one George Graham Rice, whose proper name is said to be Simon Jacob Herzig, is the man principally interested in the concern known as Scheftels & Co."

Los Angeles Meeting, American Mining Congress

SPECIAL CORRESPONDENCE

On Monday, Sept. 26, at the Mason opera house, Los Angeles, Cal., President E. R. Buckley called to order the 13th annual session of the American Mining Congress. Owing to the enforced absence, through illness, of James F. Callbreath, Jr., the position of secretary *pro tem* was filled by Sidney Norman, of Los Angeles. The morning session was taken up by addresses of welcome to the delegates and members, the speakers being Alden P. Anderson, lieutenant-governor of California; George Alexander, mayor of Los Angeles; Joseph Scott, president of the Chamber of Commerce of Los Angeles; E. A. Montgomery, president of the Sierra Madre Club, of Los Angeles; and F. J. Tyrell, of Los Angeles. A motion conveying to Secretary Callbreath a message of sympathy, was passed.

STATE REPRESENTATIVES RESPOND TO ADDRESSES OF WELCOME

The afternoon session was devoted chiefly to responses to the addresses of welcome. A. S. Givens, Nevada, spoke of the zinc and lead resources of that State, and presented to the chairman a large specimen of zinc ore from the Good-springs district; also a gavel, in the form of a miner's pick, made from zinc from the same district. Col. L. W. Powell and Gen. A. J. Sampson responded for Arizona, telling of the vast mineral resources of that Territory. E. H. Benjamin, California, gave a review of the history of mining and discussed the dredging indus-

try of the State. David Ross, Illinois, called attention to the great resources of his State, setting forth that there was sufficient coal within its confines to last several thousand years. He thought there was little need of conservation with respect to Illinois coal. Responses were made also by J. W. Malcolmson, Missouri; James W. Abbott, Nevada; Rev. H. M. Shields, New Mexico; F. J. H. Merrill, New York; G. W. E. Dorsey, Nebraska; John Dern, Utah; and R. W. Brock, director of the geological survey branch of the Department of Mines, of Canada.

PRESIDENT BUCKLEY IN ANNUAL ADDRESS TREATS SUBJECT OF "CONSERVATION"

Monday evening, President Buckley delivered his annual address. Doctor Buckley reviewed the work of the congress for the year past; in speaking of financial conditions he made a plea for an endowment of \$500,000, which he thought could easily be contributed from the fortunes made in American mines. Reference was made to the necessity for revising the mineral land laws. He urged the enactment of State laws taxing mining companies on stock issued as one of the best schemes for reaching the fake promoter, and hoped that some way could be found to bring about a better, safer and sounder condition in the stock markets of the country.

On the subject of "conservation," Doctor Buckley said in part: "Four things appear to be perfectly clear in the

consideration of the problem: (1) As mining men, we cannot afford to have the Government enact legislation that will make the occupation of mining more hazardous than it is, either respecting the protection of life or the investment of money; (2) That nothing shall be done that will in any way retard the development of our manufacturing industries that depend upon the products of the mines for their business; (3) That everything possible be done to increase the percentage of metals that can be recovered from the ore deposits and the recovery from deposits of coal, oil and gas; (4) To bring about as quickly as possible the use of substitutes for the present sources of power and for the metals which are supposed to be limited in quantity. The question of the ownership of the public domain should, as far as possible, be considered apart from that of conservation. In doing this it should be remembered that ownership that may be otherwise desirable, may be undesirable from the standpoint of conservation, and *vice versa*. The question of ownership is political and sociological, while conservation is technical and scientific."

PINCHOT ADVOCATES THE LEASING OF GOVERNMENT OIL LANDS IN CALIFORNIA

Following Doctor Buckley, Gifford Pinchot delivered an address on conservation. Regarding the California oil situation, Mr. Pinchot said he believed that men who had made *bona fide* locations pre-

vious to withdrawal and had proceeded to discovery, in good faith, will receive patents; oil lands, however, that have not been located should remain the property of the Government. He stated that the present withdrawals should be maintained long enough to secure legislation adapted to the needs of the oil industry and a conserving of this great resource. Such legislation should provide for a prospecting permit good for, say, three years, during which the prospector should be secure in the possession of a reasonable amount of land on condition that he goes ahead diligently to prospect and develop it. Upon discovery the Government should issue a permit entitling the holder to possession of the land for, say, 25 years, or long enough to make the oil business attractive and profitable. The permit holder or lessee should, under the regulation, pay a royalty to the Government in amounts small enough not to hamper or prevent development. The leasing system, which is not designed to interfere with the rights of the prospector, must facilitate mineral development rather than check it.

Speaking generally of conservation, Mr. Pinchot said: "The people of the United States have the conservation idea in their heads. The opposition to it is dwindling rapidly in effectiveness and quantity. Would it not be wise for the mining men, instead of following the procession which cannot be stopped, to get at the head of it and steer it as they would have it go?"

RESOLUTIONS REFERRED TO COMMITTEE

The Tuesday session was opened by announcements by the secretary. The resolutions committee was announced at a meeting called for the afternoon. The following resolutions were read and referred to the committee on resolutions: Providing for the lessening of accidents in mines and fixing the employer's liability; providing for an expression of thanks to the President of the United States for the establishment of a Bureau of Mines (immediately passed under suspended rules); recommending the continuation of the desert wells and water-saving devices; recognizing conservation principles and providing for a leasing system for the disposition of oil lands; providing for more simple procedure in the location of mining claims in forest reserves; protesting against the segregation of surface and mineral rights, protesting against the present bureaucratic method of disposing of timber lands; recommending that the American Mining Congress refuse to commit itself to any policy regarding the disposition of public oil lands.

THE FEDERAL GOVERNMENT AND THE OIL INDUSTRY DISCUSSED AT LENGTH

The balance of the morning session was occupied with discussion of the sub-

ject "The Federal Government and the Oil Industry." Congressman S. C. Smith, California, pointed out the fallacy of the leasing system or of a system whereby the operator would receive a percentage of his earnings from the Government. He upheld the acquisition of public oil lands by location and patent. Charles P. Fox, California, believed that the oil men of California were capable of working out their own problems without the assistance of the Mining Congress. Ex-Congressman C. A. Barlow, California, opposed conservation, believing in the present laws with a few amendments. S. C. Graham, California, made a strong plea for the principles of conservation, believing that such legislation should be enacted as would secure for the Government the largest revenue consistent with the prevention of monopoly. T. A. O'Donnell, California, favored a return to the laws that have been in force for the last 30 years.

At the afternoon session resolutions were submitted providing for protection against unscrupulous promoters; recommending such changes in the Sherman anti-trust law as would provide for the conservation of coal lands; and urging legislation looking to the regulation of freight rates charged by railroads for hauling ores.

The discussion of the oil industry was resumed. George E. Baker, California, opposed conservation and set forth the injustice of recent decisions by the Land Office, and expressed the belief that the situation could be cleared by simple amendments to existing laws. F. H. Short, California, spoke in favor of leaving public lands open to location. T. E. Gibbon, California, favored conservation that will give the Government the benefit of land still owned by it, but that will not withdraw land already located.

FOUNDATION OF THE BUREAU OF MINES COMMENDED

E. W. Parker, of the U. S. Geological Survey, read an address on "Conservation as it Affects Coal Lands." George S. Rice, of the Bureau of Mines, read an address on "Investigation of Mine Accidents." A resolution was passed under suspended rules congratulating President Taft on the appointment of Dr. J. A. Holmes as director of the Bureau of Mines. At eight o'clock in the evening a reception was given by the Los Angeles Chamber of Commerce to the delegates and members and their wives. An address was delivered by Joseph Scott, president of the Chamber of Commerce. Doctor Buckley replied.

REVISION OF MINERAL LAND LAWS DISCUSSED

A telegram from the Coalinga Chamber of Commerce was read, requesting that the American Mining Congress take no

action in the matter of California oil lands. The report of the committee on revision of mineral-land laws strongly urged a general revision of laws, pointing out that the present laws are obsolete and entirely inadequate. The resolution providing for the investigation of freight rates was reported favorably and passed. As part of the discussion on this subject T. C. Becker, of Los Angeles, read an address entitled "Railroads and Mining Development."

Congressman Frank Mondell, Wyoming, chairman of the public-lands committee of the House of Representatives, sent a communication on "Private Ownership or a Leasing System." He directed attention toward the growing sentiment in favor of a leasing system of public lands, but declared it to be unpopular among a majority of the people in the States affected, as representing a direct tax on mineral production not imposed upon like production in other states. Mr. Mondell inclined to favor a continuation of private ownership under certain restrictions.

C. Colcock Jones read a paper entitled "Iron Ores of the Southwest," describing many iron deposits of the region and setting forth the certainty of the establishment of iron furnaces in this district. At the afternoon session J. W. Abbott, Nevada, delivered an address on "Railroads and Mining Development." L. E. Aubury, San Francisco, spoke on the subject "The Elimination of the Fake Promoter." Adjournment was taken at 3:30 o'clock.

DOCTOR HOLMES ON THE CONSERVATION POLICY OF THE GOVERNMENT

At a luncheon given by the Chamber of Mines of Los Angeles, Dr. Joseph A. Holmes, director of the Bureau of Mines, delivered an address on the conservation policy of the Government. Mr. Holmes prefaced his remarks with the statement that his comments were not official. He said in part: "It is not the purpose of the administration in withdrawing mineral lands and proposing a revision of the mineral-land laws to derive a revenue from the mining industries of the West. If the leasing and royalty system of distributing the mineral lands should be adopted it would be merely with the idea of giving them to the people under the most favorable conditions. It is my understanding that the lease granted to the discoverer of minerals would be practically perpetual, and it is a matter of record that President Roosevelt proposed a maximum royalty of 20 per cent. which would not be a tax on the mineral production to the extent of a burden nor a check on the mining industry of the West."

The sessions of the American Mining Congress have been well attended, and much interest is being evinced in the subjects under discussion. The deliberations will continue until Oct. 1.

New Plant for Washing Iron Ore, Mesabi Range

Oliver Company's Washery to Comprise Five Units of 100 Tons per Hour Capacity Each. Log-washers and Overstrom Tables Used

B Y E. K. S O P E R*

The iron ore that is mined on the Mesabi range in northern Minnesota is for the most part quite free from sandy or shaly impurities and of unusually high grade. Where streaks or zones of low-grade, lean ore and sand occur in the deposits, they can usually be separated from the merchantable ore during the process of mining and either stock-piled or thrown on the dump according to the percentage of iron and silica that the material carries. Toward the western end of the range, however, there occur a number of extensive deposits of ore which contain zones of low-grade sandy hematite so scattered through the mass as to render separation from the better class of ore impracticable, by any of the present methods of mining in use in the locality.

This sandy or "wash ore," as it is called, is a mechanical mixture of hematite and sand, or of hematite and a highly silicious shale or paint rock which runs low in iron and high in silica. Some of the ore carries a fairly high percentage of iron, but the silica content is too great to class it as a desirable shipping ore. This difficulty is often overcome by mixing with high-grade, ore low in silica thus giving the desired average silica content to the mixture. But, it is not always convenient to make the proper mixture and occasionally the silica is too high even for that, especially in the western end of the range.

CONCENTRATION OF SANDY ORE NECESSARY

The sandy ore first becomes noticeable in considerable quantities just west of Nashawk, and is found at intervals from that point to Coleraine, the western limit of operations. Exploratory work has been done as far west as Grand Rapids and even beyond, and while it is reported that some of the drill holes show favorable indications of an extension of the ore-bodies, no actual development work has been attempted west of Coleraine. At present there are five mines near Coleraine which are producing; namely, Canisteo, Walker, Hill, North Star and Holman. These are all being operated by the Oliver Iron Mining Company, a subsidiary of the United States Steel Corporation, although the property is not owned by this company, but is being worked on a royalty basis. More or less of the sandy ore occurs in all of these mines except the Holman, and in places

*Department of geology, University of Minnesota, Minneapolis, Minn.

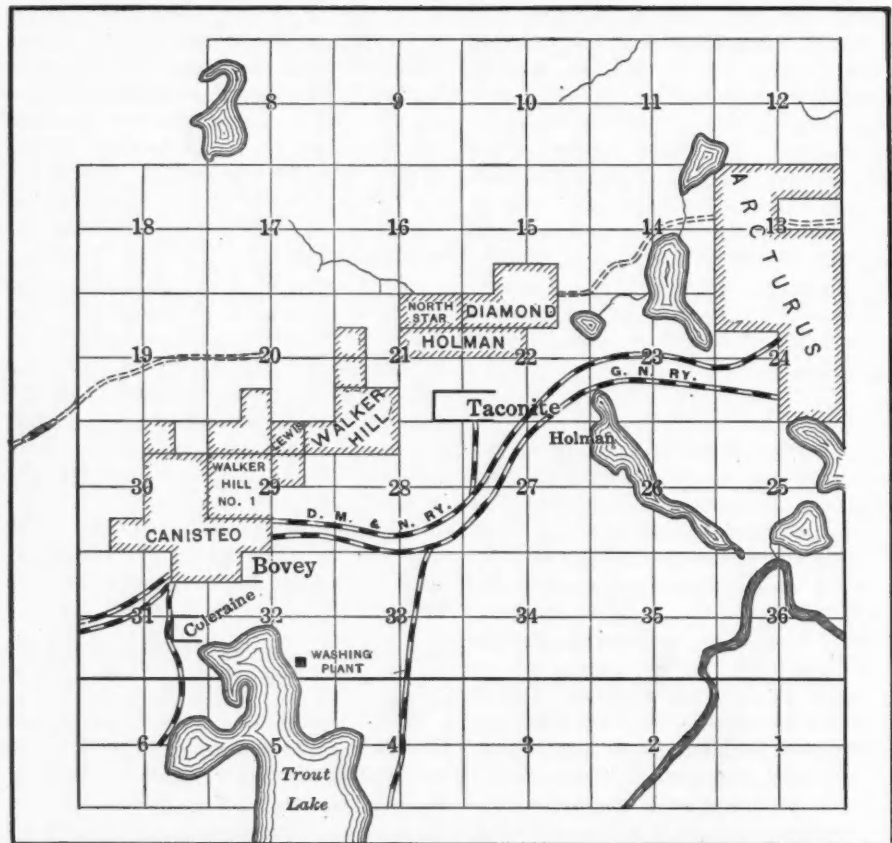
this impure material was found in such large quantities as to cause the operators to seek some method whereby the iron contents of the material could be raised sufficiently to produce a shipping ore without mixing.

In 1908 the Oliver company made a table of arbitrary limits for separation of the ore into bessemer and non-bessemer grades for use in making ore reserve estimates for the ensuing five years. This scale is as follows: Bessemer, 61.55 per cent. iron, 0.052 phosphorus, 4.65 silica,

could be separated from the sands both quickly and cheaply. Furthermore, the nature of the material demanded a process that could be applied on a large scale.

EXPERIMENTATION BASED ON KNOWLEDGE GAINED IN SOUTH

Experiments in washing the ore were begun in 1907 and continued under the direction of J. C. Greenway, until recently general superintendent of the district for the Oliver Iron Mining Company. The

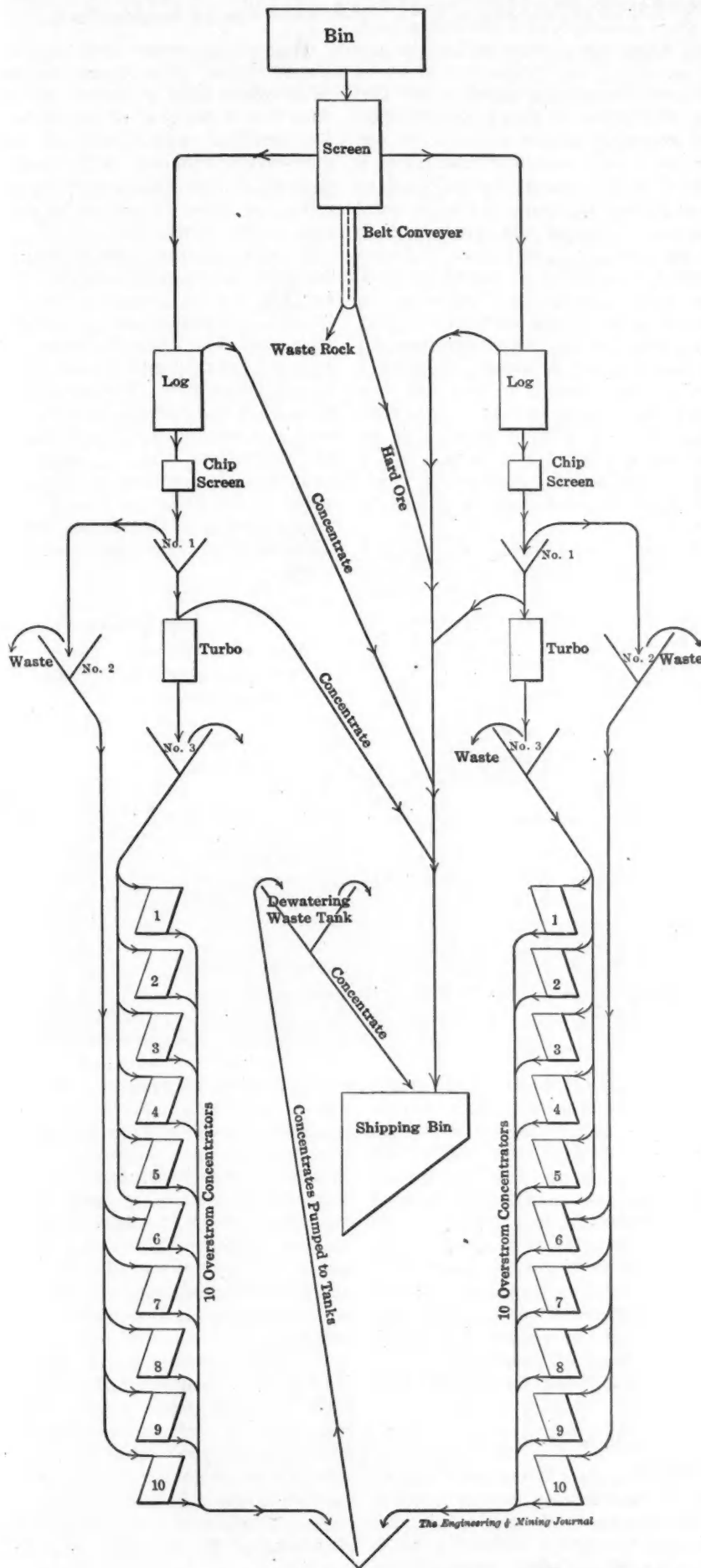


MAP OF WEST END OF MESABI RANGE IN VICINITY OF COLERAINE

1.59 manganese; and non-bessemer, 57.20 per cent. iron, 0.099 phosphorus, 7.15 silica, 1.04 manganese. All ore above 49 per cent. in iron is considered to be of commercial grade.

All of the properties mentioned above are worked as open pits, the ore being loaded directly into railroad cars by steam shovels. To separate the ore from the sand in the pits would be impossible on account of the state of intimate mixture in which the materials occur. Obviously, if the ore was to be mined and marketed at a profit, some method of concentration had to be devised whereby the ore

results of the experiments were considered so satisfactory as to warrant the erection of the washing plant which was completed recently. William Nicols is superintendent. In experimenting on the Mesabi ores advantage was taken of knowledge gained from practice in log-washing the iron ores of the Birmingham district in Alabama. The work carried on in the South is similar in principle, but the Coleraine plant contains radical departures from the Alabama practice, the chief of which is the use of concentrators to save the fine ore sands. In the Birmingham district, tables are not used, the



FLOW SHEET FOR ONE UNIT OF OLIVER WASHERY AT COLERAINE, MINN.

finest product saved being that from the log-washers.

COMPLETED PLANT TO HANDLE 25,000 TONS PER DAY

The Oliver washery is located on the northeast shore of Trout lake (see accompany map), about 1½ miles south of the towns of Coleraine and Bovey. The distance the ore must be hauled from the mines varies from two to four or five miles. Frequent samples are taken from the pits just ahead of the steam shovels and as soon as the analyses show a "wash ore," the material is loaded into separate dump cars and hauled to the washery.

The trains of wash ore are run out on a high steel trestle, directly over the bins which are situated at the top of the plant. The structure stands on fairly level ground; hence in order to handle the ore entirely by gravity through the various steps in the process, a building of considerable height was required and heavy steel construction employed. The accompanying flow sheet will make clear the various steps during the washing process. Only one unit is represented. The plant is divided into five units, each with an estimated capacity of 100 tons of crude ore per hour, giving a total of 10,000 tons per day of 20 hours. Only two units are in operation at the time of writing (June, 1910), but the machinery for the other three is being installed and will be started as soon as completed. Provision is also made for seven additional units, the steel framework for which is already up. This would give the plant a capacity of about 25,000 tons per day.

SPECIALY CONSTRUCTED LOG-WASHERS USED

The ore falls directly from self-dumping cars into five steel bins, each of which has a capacity of 500 tons and supplies one unit of the plant. The ore is drawn from each bin by sluicing with a hose, and passed through 2-in. revolving screens, 18 ft. long, 9 ft. in diameter at the large end and 4 ft. at the smaller end. The oversize from each screen, which consists of taconite rock and hard ore, is run over a short 3-ft. belt conveyor, traveling 45 ft. per min., from which the rock is picked by three men, and dropped down a chute into cars hauled by an electric locomotive to the dump, a distance of only a few hundred feet. The remaining hard ore on the belt goes to the shipping bin, where it is mixed with the fines. The sand and ore passing through the revolving screen go to two log-washers, each 25 ft. long, and of a special design devised by Mr. Greenway.

The log-washers are constructed of steel (some made of cast iron are being tried) and are trough shaped, one end being slightly elevated. Within the trough, two "logs" revolve at a speed of 13 r.p.m.

These logs are heavy rods carrying four sets of blades so set as to act like a screw, carrying the heavier particles comprising the ore to the upper end of the trough, where it is discharged and conveyed to the shipping bin below. The finer particles of ore, together with nearly all of the sand, pass with the overflow from the log-washers through wooden launders to two chip screens, where the chips, splinters, etc., which get mixed with the ore in the pit, are removed. From here the mixture goes to two small settling boxes (No. 1), where the heavier material is separated and conducted to two 18-ft. turbos, making about 13 revolutions per minute.

FINES TREATED ON OVERSTROM CONCENTRATING TABLES

These turbos are essentially of the same design as the log-washers, but are smaller. There are two products from the turbos; (1) concentrates which go direct to the bin, and (2) overflow which is conveyed to two dewatering boxes. Here the fines settle and go to feed the first six tables. The overflow from the small settling boxes, No. 1, goes to larger dewatering boxes, No. 2, where the heavier particles settle and go to feed the last five tables; the overflow runs to waste.

There are 20 standard Overstrom concentrators to each unit. Each table has a capacity of 400 lb. per hour. Each of the No. 3 settling boxes from the turbos feeds six tables, and each large No. 2 settling box feeds five tables. Thus it is seen that two of the tables in each row overlap. The concentrates from the tables are pumped to a dewatering box on the floor above, from which they go to the concentrate shipping bin and mix with the coarser products. The overflow from the dewatering boxes is conducted back to the tables, where it is used again after mixing with more clean water.

The ore as it comes to the washer varies greatly in size, but no crushing is attempted for the reason that most of the larger pieces which are sandy will readily crumble, while those that do not break up in the screens are either hard ore or taconite and do not require washing.

COMPANY GENERATES OWN POWER

The power to operate the plant is generated by the company in its power house on the shore of Trout lake. The amount of water used in the mill is 1000 gal. per min. per unit. The water is pumped from Trout lake, the power house being about 1½ miles from the washery. The suction pipe is 40 in. in diameter, the water being carried in a 30-in. main to the plant, where it is stored in a steel tank of 100,000 gal. capacity. It is then distributed under a pressure of 115 lb. through 14-in. feeders to each unit. The tailings are run through a concrete tail-

race into the lake. At present there are about 75 men employed. The plant is worked in two shifts of 10 hours each.

Since operations on a commercial scale only began a few weeks before the date of my visit, it was impossible to secure accurate information regarding the saving effected and the ratio of concentration. The extremely variable nature of the ore, even in a single train load, also makes it difficult to get accurate figures regarding these points. In general, it may be stated that the ore treated will run from 35 to 48 per cent. iron, with some of higher grade but containing an excess of silica. The washed product will probably run around 56 to 60 per cent. iron. There will always be an unavoidable loss, for the waste water is certain to carry a considerable amount of iron and this water may run as high as 1.8 per cent. iron. Much of this, however, may be from the pulverized paint rock which it carries away, and this could not be saved. The water in the tailrace runs high in silica.

The operators on the Mesabi range will await further results from the plant with great interest. With the rapid mining of the higher grade ore, the time may not be far distant when methods for utilizing the large quantities of low-grade material will be sought and already many of the mines are stock piling for further use the rock that assays below shipping grade.

Increased Use of Cement

More cement was made and used in the United States in 1909 than in any preceding year and the price per barrel was lower than ever before. The production in 1908 was 52,910,925 barrels, valued at \$44,477,653; the production in 1909 was 64,196,386 barrels, valued at \$51,232,979.

INCREASE CHIEFLY IN PORTLAND CEMENT

The increase was mainly in the output of portland cement—62,508,461 barrels, valued at \$50,510,385, as against 51,072,612 barrels in 1908, valued at \$43,547,679. The output of natural and puzzolan cement formed only a small percentage of the total cement production.

The average price of portland cement per barrel in 1909 was less than 81c.; the average price per barrel in 1908 was 85c. Portland cement cost \$3 per barrel in 1880, but by reason of improvements in methods of manufacture it can now be profitably sold for 80c. per barrel.

NUMBER OF PLANTS

In 1909 there were 103 portland cement plants in operation, an increase of five over the number working in 1908. Of these plants 21 were in Pennsylvania, 12 in Michigan, 10 in Kansas, eight in Ohio,

seven in New York, six in Indiana, five in Illinois and five in California.

SMALL FOREIGN TRADE

Most of the cement was used in the United States. This country has only a small export trade in cement, consuming from 1 to 3 per cent. of the production. The immense natural resources of cement-making materials and its many well equipped cement plants, however, should make it a strong competitor for the outside world's cement trade.

A report on the cement industry in the United States in 1909, by E. F. Burchard, has recently been published by the U. S. Geological Survey, showing the production of all kinds of cement, the imports and exports, and the recent development in the industry. The report includes notes on white portland cement, on cement as a road material, on cement in art and architecture, and on paints for cement, and also sections on cement materials in the Philippine islands and on cement making in Canada, as well as a bibliography of cement and concrete materials.

The Mechanigraph

The mechanigraph is the name given by Topping Brothers, 122 Chambers street, New York, to a machine, the use of which should effect a large saving in the expense of drafting in engineering offices. The apparatus is designed to treat ordinary white paper of any quality so as to make it transparent enough to blue-print through quickly. The necessity for the use of tracing cloth or paper is claimed to be thus eliminated as penciled drawings can be treated and prints made directly from them.

The whole machine set up ready for work occupies a floor space less than four feet square. It consists of a series of electrically warmed rolls, a bath (warmed from the wire that heats the rolls), a series of traveling tapes and a pair of drier rolls. The drawing to be treated is passed between the first pair of rolls which carry it through the bath containing the "transparantor" liquid, whence it runs along the series of moving tapes through the drier rolls. The machine is operated by turning a crank and the entire treatment of a drawing is said to require only the time that would be taken in passing it through a clothes wringer.

The transparantor liquid is stated as costing only one-quarter of a cent per square yard of paper treated, and the entire cost of treatment as about one-third of a cent per square yard. The chief advantage in the use of the mechanigraph would be in the reduction of drafting through the elimination, in many instances, of the necessity of making tracings.

Mines and Mill of Montezuma Mines, Costa Rica

Fifteen Veins Prospected. Forty-stamp Mill and Cyanide Plant
Only Operated in Rainy Season. All Power from Water Wheels

B Y S . F . S H A W *

The Montezuma mines of Costa Rica are situated about 15 miles northeast of Puntarenas, a seaport on the western coast of Costa Rica. Considerable attention has been attracted to this property in the past by the unsavory manipulations in the stock market which eventually caused it to be placed in the hands of a receiver. The property has passed through many stages of the wildest speculation. Reports were sent out stating the quantity of ore that could be considered in sight would reach 2,000,000 tons with possibilities of uncovering other bodies fully as large.

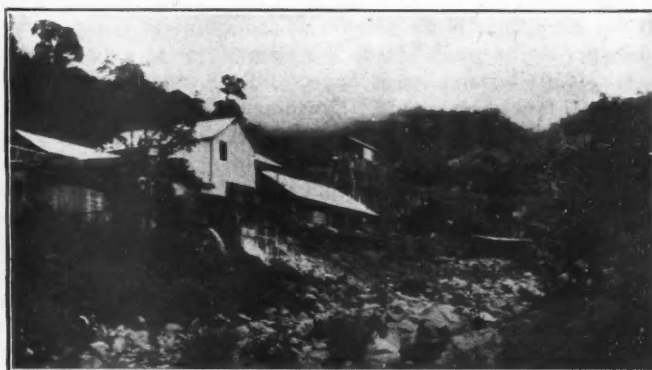
Many legends are related by the natives about the property being worked in the early days by the Spaniards; tales are told of how Montezuma, the one-time king of Mexico, extracted much gold from numerous veins along the western coast of Costa Rica, and in the vicinity of the mines there is a heap of stones

place, but it is with the greatest difficulty that a fault line can be traced on the surface, owing to the deep soil covering the rock and the dense growth of trees, shrubbery and vegetation. The hills are quite precipitous and the country as a whole is rugged, but the rapidly growing trees and plants permit an accumulation of soil in the most precipitous places.

The country in the vicinity of the mines has been broken up by a series of northeast-southwest fractures, connected by cross-diagonal fractures. These openings have been filled with quartz through which, where still unoxidized, are scattered bunches of iron pyrite, chalcopyrite, galena, sphalerite and stibnite, carrying varying amounts of gold and silver. For a depth of about 300 ft. these sulphides have been largely leached out, and the ore in this oxidized portion is always found to be of considerably higher grade

VEINS DEVELOPED BY ADITS AND OVERHAND STOPPING

As nearly all of the veins are approximately parallel and follow the ridges of the mountains, it is found best to approach them with crosscut tunnels. By this means an extreme depth of 500 ft. is obtained on some of the veins by the present adits, and a possible 200 ft. additional can be obtained by driving longer tunnels. With the present tunnels about 20,000 ft. of work has been done. The veins being parallel and from 20 to 200 ft. apart, one tunnel answers for opening up several veins. Drifts are extended both to the right and left when a vein is reached, and raises put up about 100 ft. apart. Chutes are put in about 20 ft. apart, and where the vein does not exceed 5 ft. in width, it is worked out by overhand stopping, using stulls to hold the walls. Headboards are used with the stulls to assist in preventing pieces of



GENERAL VIEW OF STAMP MILL, CYANIDE AND POWER PLANTS AT MONTEZUMA, COSTA RICA

which is pointed out as the last resting place of the Indian king. In some places graves have been dug up, and Indian relics of gold found, which may lend some semblance of truth to these tales, but it is very likely that the majority are only mythical in their origin. At least, the story of Montezuma cannot be true, and the work that has been done in recent years by various mining companies would indicate that there are few veins of great richness to be found in the region.

QUARTZ VEINS IN IGNEOUS ROCKS

The entire surrounding country is igneous in origin, and the rock in the immediate vicinity of the mine is probably an andesite. In places faulting has taken

than in the sulphide zone. The ratio of gold to silver by weight in these upper levels is about as 1: 2½. Indications point to an increase in the silver content as the lower levels are approached.

NUMEROUS VEINS OCCUR ON PROPERTY

At the present time there are fifteen veins which have been or are being prospected, namely, Montezuma, San Rafael, Thayer, San Rafaelito, San Antonio, X, Proximo, No. 1, No. 2, Pochote, San Maximo, San Juan, Leal, Quedrada and Cabuya; many others are yet untouched. These veins vary in width from 1 in. to 20 ft. As prospecting on the surface is attended with considerable difficulty, owing to the heavy soil and dense undergrowth, this work is limited mostly to drifting on the veins where they are encountered when driving crosscut tunnels.

wall from falling. Planks are laid to provide a place for the miners to stand while drilling. The ore is rather soft and the drilling is easy. The walls are also soft and crumble off easily, as care must be taken to use light charges of powder in order to prevent too great a mixture of wall rock with the ore. During the rainy season, which extends from June to December, much water finds access to the working places and makes drilling an unpleasant occupation.

The ore is drawn from the chutes into mine cars, holding about three-fourths of a ton, and trammed by men to the general chutes. From these chutes the men tram the ore to the scales in cars holding about one ton, where it is weighed and then delivered to the mill. On the tracks throughout the drifts, 12-lb. rails are used and 18-lb. rails on the general tracks. An

*General manager, Montezuma Mines of Costa Rica, Montezuma, Costa Rica.

electric locomotive was purchased with the intention of using electric haulage from the mine to the mill, but it is not being used at this time.

The tunnels are about 5x6½ ft. and need to be well timbered in many places. Tunnel sets consisting of two vertical posts with a cap are used. No standard size of timber is employed as the posts are cut from round timbers hauled in by timber contractors, but generally vary from 6 to 12 in. in diameter. Owing to the alternating dry and wet season and to wood-destroying insects, the timbers deteriorate rapidly and require frequent replacing. For lagging split timbers and 2-in. sawed planks are used.

ORE CRUSHED IN 40-STAMP MILL

The ore from the mine is dumped into the mill bin having a capacity of 8300 cu. ft., falling first on a flat grizzly floor, which has a superficial area of 960 sq. ft. The spaces between the grizzly bars are about 2 in. The ore is usually quite wet and does not readily fall through, so must be raked over the floor to remove the fines from the coarse lumps. The large pieces are fed to two 9x15-in. Blake crushers and the crushed product falls into the bin with the fines which drop through the grizzly. From the bin the ore is fed by eight Challenge feeders to eight batteries of five stamps each. At this point, lime to the amount of about 10 lb. per ton of ore is added. The stamps weigh 1050 lb., and are dropped 6 in., 96 to 100 times per minute. Crushing is done through 20-mesh screens in cyanide solution of approximately 0.10 per cent. strength. The solution is supplied by a reservoir 30 ft. in diameter by 13 ft. deep, leaving a capacity of 9190 cubic feet.

SANDS AND SLIMES SEPARATED

From the batteries the pulp flows to two 60-in. cone thickeners, from which the thickened product goes to two 4½x22-ft. Abbe tube mills, provided with silix lining and using Danish pebbles as grinders. The overflow from the classifiers joins the tube-mill discharge and flows to two 50-in. cone thickeners, from which the thickened pulp is returned to the tube mills by a 6-in. centrifugal pump. The overflow from these 50-in. classifiers goes to a large settling cone. A Dorr classifier is also in use in handling the discharge from the tube mills, and the feed to the cone and Dorr classifiers so arranged that they can be used separately or together. The overflow from the Dorr classifier is also delivered to the large settling cone. The sands from the Dorr settler go to four leaching tanks 28 ft. 8 in. in diameter by 5 ft. deep, where a five-day treatment is given. The strong gold solution from the sand tanks flow to a tank 29 ft. in diameter by 8 ft. deep, having a capacity of 5500 cu. ft. A weak-solution wash is given, after which the sands are sluiced to waste.

The steel cone settler receiving the overflow from the classifiers is 21.5 ft. deep and 25 ft. in diameter, in the conical portion and is raised an additional 4 ft. on the side; its capacity is 5500 cu. ft. The settled pulp flows to two Brown agitating tanks, 15.5x45 ft., having a capacity of about 6500 cu. ft. each. An air lift is used to assist in delivering the pulp to the agitators. The overflow from the settler, which is quite clear, flows to an overflow tank 29x8 ft. and then goes to the strong-solution gold tank. The pulp is agitated for from six to 10 hours, after which it is pumped to a cone tank used as a reservoir and having the same dimensions as the cone settler. The agitators are provided with decanting pipes, which terminate 20 ft. from the top and are used at such times as the filter is out of commission.

A 60-LEAF BUTTERS FILTER USED

The pulp in the reservoir is kept in continuous agitation by an air pipe near the apex of the cone, and is drawn off when needed by a Butters 8-in. centrifugal pump to a Butters 60-leaf vacuum filter. The vacuum is maintained by a 14x14-in. Gould duplex vacuum pump. After a cake is formed the excess pulp is discharged into two tanks, each 15x6 ft. and having a combined capacity of 2120 cu. ft., from which it is pumped by a 6-in. centrifugal pump, either to the pulp reservoir or to a distributing pipe placed along the side of the filter box. Sixteen-inch spray pipes extend from this distributor to the center line of the filter. The weak-solution wash is pumped from a storage tank, 35x7½ ft., having a capacity of 7200 cu. ft., by the 8-in. Butters centrifugal pump and the excess solution after the wash is completed, is returned partly by gravity and partly by the 8-in. pump. After the weak-solution wash is completed the filter is filled with water and the cake discharged by introducing water under pressure inside the filter leaf.

The strong solution from the filter goes to the strong-solution gold tank, 39x7½ ft., having a capacity of 9000 cu. ft. from which it flows through six rows of zinc boxes, six in a row, each compartment being 2x2x2 ft. From the zinc boxes the barren solution flows to the strong-solution sump 35x7 ft. 6 in., having a capacity of 7450 cu. ft. From this sump it is pumped by a Gould 8x8-in. triplex pump to the battery-solution reservoir. The weak-solution wash goes to a weak-solution gold tank 30x5 ft., having a capacity of 3530 cu. ft., and then to three rows of zinc boxes, five in a row, each compartment being 2x2x2 ft. The precipitated solution goes to a small sump 9x6 ft., having 380 cu. ft. capacity and is pumped by a 3-in. centrifugal pump to the weak-solution reservoir. A cleanup is made monthly when the zinc precipitate is rubbed through a 60-mesh screen and the product passing through is pump-

ed into a Perrin filter press. The short zinc is returned to the zinc boxes and the pressed precipitate is shipped to smelters in New York.

MACHINERY ALL DRIVEN BY WATER WHEELS

The stamps and crushers are driven by a 15-ft. Pelton water wheel; the tube mills by a 5-ft. Pelton; the sand-return pump and Dorr classifier by an 18-in. water wheel; the Butters 8-in. centrifugal pump by a duplex 4-ft. Pelton water wheel, under a head of 76 ft.; the Gould 14x14-in. vacuum pump by a 4-ft. Hug water wheel, so arranged that the Butters 8-in. pump can be driven by it also; the Gould 8x8-in. triplex pump, a 100-h.p. dynamo, 14x10-in. Rand duplex compressor, and 3-in. centrifugal pump by a 7-ft. Pelton wheel; the 6-in. pulp-return centrifugal pump by an 18-in. Pelton wheel. A 10x14-in. Clayton air compressor is set up ready for service at any time that the Rand compressor requires repairs. The Clayton is driven by the 7-ft. water wheel. The first three wheels are driven under a head of 470 ft., and with the exception of the wheel driving the Butters pump all others are operated under a head of 550 feet.

During the rainy season there is sufficient power for all purposes, but from February to May or June, the present facilities are not such as will permit operating the mill. The water is conducted through a ditch 3 ft. wide and 3 ft. deep, to a penstock 30x12 ft., from which it is drawn through a 16-in. pipe to the mill, a distance of 2200 ft., under a head varying from 470 to 550 feet.

OPERATING COST ABOUT \$4 PER TON

At the present time the ore in sight amounts to about 30,000 tons, averaging \$7.40 per ton. The extraction obtained is about 90 per cent. The costs so far derived cover only a short run and so can be stated as only approximate. Conditions vary so greatly during the different seasons that an accurate estimate could be made only after two or three years' continuous run. Exclusive of development the cost of mining is about \$2.50 per ton, while milling costs are about \$1.50 per ton, making a total operating cost of approximately \$4 per ton. Development costs are impossible to estimate as no accurate record has ever been kept during the last 10 years of intermittent operation.

Tungsten occurs in several Australian States, the chief supply being obtained from Queensland and Western Australia, according to U. S. Consul John F. Jewell, of Melbourne. The exports of wolfram from Australia in 1908, the latest statistics available, amounted to 14,080 cwt., most of which went to the United Kingdom and Germany, the latter taking about one-third of the production.

Electrolytic Copper Refining in Australia—I

Tanks at Lithgow Efficiently Insulated, and Arranged in Cascade in Series of Eight. Fresh Electrolyte Supplied to Each Series

BY G. H. BLAKEMORE*

The literature on the subject of the electrolytic refining of copper is very meager, although the method is in general use in Europe and America. In Australia there are three plants in operation, a small one at Wallaroo, in South Australia, and one each at Lithgow and Port Kemble, in New South Wales. The latter plant is the largest and most modern, embodying all the latest appliances and improvements in electrolytic practice. Having been associated for some years with the plant and methods in use at Lithgow, the experience obtained may be of interest to the profession.

POWER PLANT EFFICIENT BUT INADEQUATE

The power plant at Lithgow consists of six tandem engines in 100-h.p. units, belt-driving six shunt-wound, four-pole dynamos with commutators at one end. Each dynamo generates 1200 amp. at 60 volts pressure, 350 r.p.m.; and one dynamo of 25 volts and 600 amp. at 450 r.p.m. The latter is two-pole with commutators at both ends. Each circuit has an output of 300 amp. at 25 volts. The commercial efficiency of all the dynamos was guaranteed by the makers at 90 per cent. Steam is supplied at 120 lb. per sq.in. by multi-tubular boilers.

Although the plant is not at all modern, yet with water costing 4d. per 1000 gal., delivered at the works, and coal for 2s. 10d. to 3s. per ton in the boiler coal bins, not much saving can be effected in the coal and water bill, even with high-grade condensing engines. However, an installation capable of securing a greater amperage per square foot of cathode surface is desired. This would secure a greater output of copper per tank, thereby materially reducing the stock of copper in course of treatment as well as the interest charges.

AMPLE CROSS SECTION OF CONDUCTORS INSURES LOW RESISTANCE

Current from the six large dynamos deposits copper from copper anodes and the current from the small one takes the excess copper from the electrolyte using insoluble lead anodes. The copper bus bars with a section of about 4 sq.in. are cast on the premises. Although too large, the increased section insures low resistance in the connections. The cathode conductors are also made at the works,

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*Mining engineer and metallurgist, 10 Castlereagh street, Sydney, N. S. W.

and consist of a copper head cast on a $\frac{7}{8}$ -in. copper pipe which is long enough to give supporting contact for the cathode. This pipe is strengthened throughout by a $\frac{5}{8}$ -in. iron bar, long enough to project out of the copper pipe a few inches so as to rest on a glass insulator on the wall of the tank. These details are shown in the accompanying illustration.

TANKS ARRANGED IN SINGLE ROWS OF THREE TIERS OF EIGHT TANKS EACH

The depositing tanks shown in the illustration are of Oregon pine, 4 ft. $2\frac{3}{4}$ in. by 2 ft. $6\frac{1}{4}$ in. by 2 ft. $9\frac{1}{2}$ in. deep, inside dimensions. In construction, the $2\frac{1}{4}$ -in. planks were dipped for about 10 min. in boiling paraffin wax at a temperature of 140 deg. F. The tanks are lined with 6-lb. sheet lead which extends over the top edge of the tank to preserve the wood from the attack of the strongly acid electrolyte.

The tanks are arranged in single rows of three tiers, each tier containing eight tanks with a difference of elevation of three inches between adjoining tanks. The electrolyte escapes from one to another in cascade through a compound pipe, the first part of which is lead, burned to the lining of the delivery tank and projecting far enough beyond to allow of joining on a piece of good rubber hose, which at the other end takes a glass tube of about one inch internal diameter. This precludes to a certain extent the leakage of current from tank to tank.

METHOD OF INSTALLING TANKS INSURES GOOD INSULATION

Efficient insulation is one of the most important requisites of electrolytic refining. To this end, each tank, as shown, is carried upon two hardwood joists treated with paraffin, which rest upon six square glass drip insulators of the type used in the storage batteries. These insulators are supported by six square blocks of Oregon pine, which were also treated with boiling paraffin wax before having been placed upon placed upon six brick tiers built up to the height required. As this construction permits ready access to all parts of the tank, any leakage of electrolyte is soon detected and repairs quickly made. The conductors are insulated from the tank by resting in glazed porcelain holders, held in brackets on the outside walls of the tank.

Cleanliness is of next importance and a little emery cloth in the hands of in-

terested employees will keep all connections clean and bright.

CIRCULATION OF THE ELECTROLYTE BY GRAVITY

The electrolyte flows from one tank to another in each row until at the eighth tank it overflows into the sump launder, which returns it to the collecting tanks from whence it is elevated by compressed air to sand filters. These in turn deliver the electrolyte to feed tanks which supply fresh solution at about $1\frac{1}{2}$ gal. per min. for circulation. By this system each tier of eight tanks has its own supply of solution and this assists in maintaining a uniform temperature in the electrolyte.

The sand filter removes the small quantity of slime carrying silver and gold in suspension. The assay of the electrolyte before filtering in grains per gallon for gold averages about 0.024, and for silver 0.159, and after filtering for gold, a trace, and for silver about 0.007 oz. per ton.

TEMPERATURE OF ELECTROLYTE AFFECTS THE SPEED OF DEPOSITION

Of equal importance is the temperature of the electrolyte. The lower the temperature the greater the resistance to the passage of the electrical current. The temperature at Lithgow, varying from 120 to 130 deg. F., is obtained and easily regulated by passing waste steam through hard-lead coils which are placed in the supply tanks. Besides materially reducing the resistance offered to the passage of the electrical current, the increased temperature causes a more even deposition of copper on the cathode, especially where the free acid content of the electrolyte is above 8 per cent.

If the temperature of the electrolyte was 80 deg. F. and contained only 8 per cent. of free acid, the face of the cathode would in a few hours be covered with a growth of copper in hair-like form, projecting in all directions in the electrolyte. The result would be a large number of short-circuits between the anodes and cathodes. This could only be avoided by reducing the acid content, but then the resistance of the electrolyte would be still further increased.

GORE'S DEDUCTIONS FROM HOT AND COLD SOLUTIONS MISLEADING

Theoretically, hot liquors redissolve some copper. With a strongly acid electrolyte a high temperature is an absolute necessity, and whatever the loss of cop-

per by re-solution may be, it is more than paid for by the great reduction in resistance to the current and consequent larger output of copper. I do not think that the form of the experiments quoted by Gore and made with hot and cold solutions, is one that will give correct information. Gore finds what the loss of metal is in a cold acidified solution, then in a hot acidified solution, and the results quoted are apt to mislead people. The factor of an electric current passing in a hot solution makes all the difference.

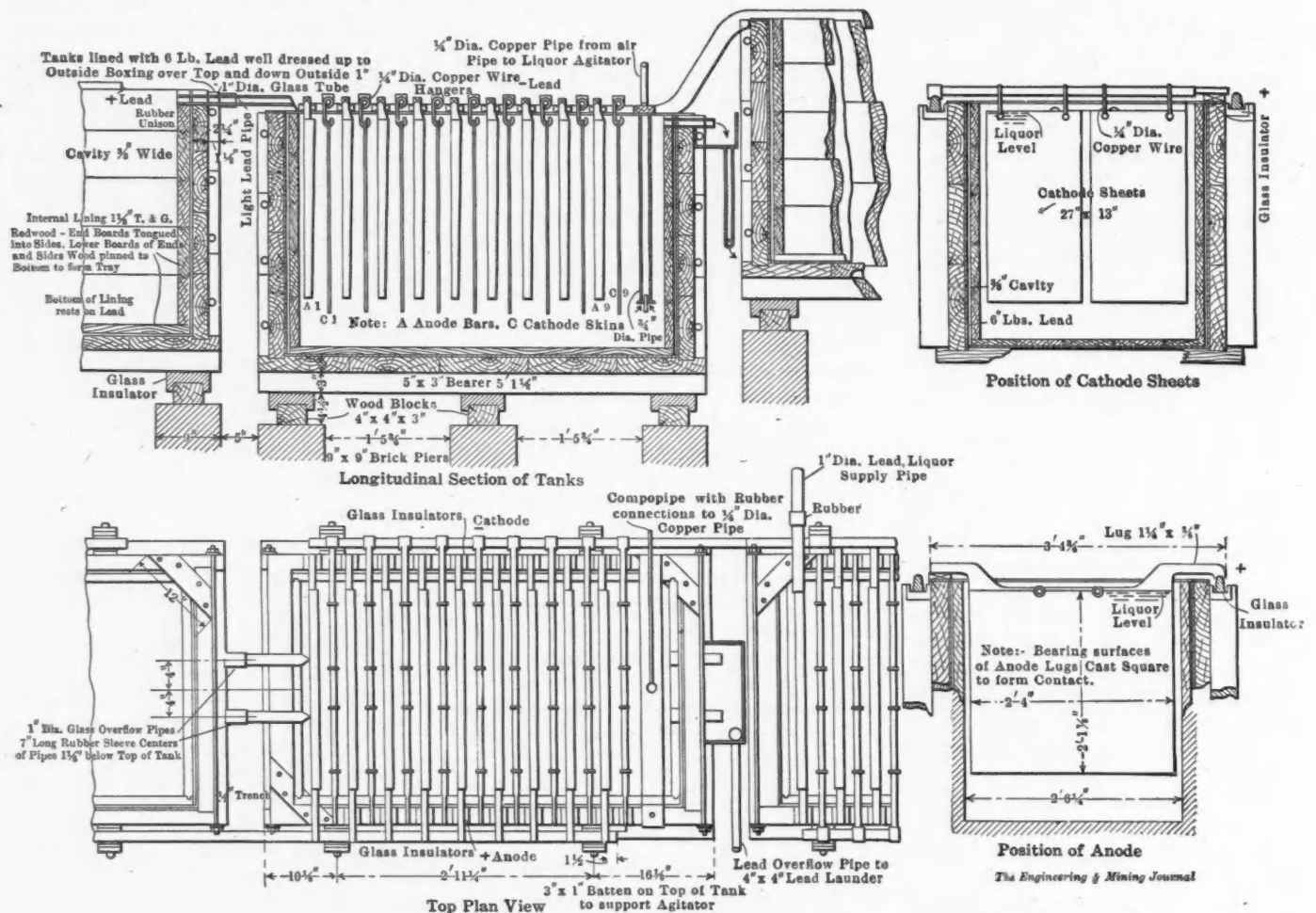
At Lithgow, by raising the acid content of the electrolyte and the temperature and seeing to the insulation, the plant now

therefore, not allowing for electrical loss, is 157 tons, and the possible output is 150 tons, it is quite clear that Gore's tests, showing 75 per cent. depositing increase for cold solutions over hot solutions, are wrong. It may be a misprint, but in the absence of extensive literature on electrolytic refining, one hesitates to try cold solutions in the face of such apparently positive proofs as to the low efficiency obtained with them.

Since hot solutions have been used the resistance per tank has fallen to less than 0.40 volt, so that although the present tanks number 672, it would be possible to use 864 tanks, and in that case the

could be secured; but difficulties, such as ventilation of rooms and construction of tanks, would have to be overcome. In a new construction, these could be provided, but in old buildings it would scarcely pay. Temperatures higher than 150 to 160 deg. F. might set up strong convection currents which would prevent the proper settling of slime with consequent losses of gold and silver in the cathodes.

A further important effect of the hot electrolyte is that the slime carrying the gold and silver with the insoluble impurities contains much less copper. This effect is also assisted by a high percentage of free sulphuric acid in the electro-



DETAILS OF CONSTRUCTION AND ARRANGEMENT OF TANKS AT LITHGOW, N. S. W.

can turn out 150 tons of electrolytic copper per week. With low acid and cold solution the same plant never exceeded 80 tons per week. The theoretical output of the plant, according to Gore's formula, would be: 1200 amp. \times 18.1164 grs. Cu per amp. hr. \div 7000 grs. \times 24 hrs. = 74.534 lb. per tank per day. And 672 tanks \times 74.534 \times 7 days = 156 tons per week. Diepel and Kilgours' formula is: 168 hrs. \times 1200 amp. \times 2.596 lb. \times 672 tanks \div 1000 = 157 tons output.

HIGH TEMPERATURE AND HIGH FREE ACID ESSENTIAL TO EFFICIENT OPERATION

If the theoretical output for 672 tanks

output of the plant would be about 200 tons of electrolytic copper per week. These figures demonstrate the great importance of high temperature and high free acid in the electrolyte.

HOT SOLUTIONS PROMOTE EFFICIENT DEPOSITION

The limit of free-acid content is about 14 or 15 per cent., but I do not know what is the limit of temperature. Up to 135 deg. F. has been used at Lithgow with excellent results. If it could be arranged, I would work with much hotter solutions than 120 deg. F., in fact, to as high a point below actual ebullition as

lyte. The following experiment will show clearly the importance of heating the solution to bring about a reduction of the copper content of the slime.

The test was made on a series of eight tanks. Electrolyte at a temperature of 120 deg. F. was fed into the first tank, then flowed successively down through each tank to the last. The escaping electrolyte at No. 8 showed a temperature of 90 deg. F., or a fall of 30 deg. in the initial temperature. The eight tanks were run for several weeks, and then the mud in each tank was analyzed. The results showed a steady increase in the copper content and a decided decrease in the

gold and silver content from No. 1 to No. 8 tanks.

The figures forcibly demonstrated the fact that a properly constructed electrolytic refinery should have hot electrolyte fed into every tank, or at least into every two tanks. Although the anodes were the same in metal content in all the tanks, yet there was a decided difference in the content of the slime in No. 1 as against No. 8 tank, due entirely to the difference of temperature in the electrolyte.

ELECTROLYTE AGITATED IN EACH TANK BY A JET OF AIR

The electrolyte in each tank is agitated by a jet of compressed air, at a pressure of 5 lb. per sq.in. The air is supplied by an arrangement, as shown in the cut, similar to a Pohle air lift. It consists of a $\frac{1}{4}$ -in. composition gas pipe leading from the compressed-air main to a $\frac{3}{4}$ -in. lead pipe, which is suspended in each tank at the discharge end and reaches to within 6 in. of the bottom. The end of this $\frac{1}{4}$ -in. pipe is turned up so as to discharge the air upward into the $\frac{3}{4}$ -in. lead pipe; the expansion of the air lifting the solution and discharging it at the surface, thus aerating the electrolyte as well as mixing it.

If no agitation is used, the electrolyte has a marked tendency to separate into layers, a lower one, heavy in sulphate of copper and low in free acid, and a top layer high in free acid and low in sulphate of copper. This condition not only causes a concentration of copper sulphate in the bottom layer, but also brings about an intense action of the top acid liquor at the junction of the two layers, which, if it does not cut in half the anode, will gradually dissolve the copper in the top half of the cathode, while the lower half of the cathode becomes rapidly thicker. If this happens bluestone will crystallize in the lower half of the electrolyte. This condition is liable to cause a heavy short circuit.

Such things should not happen in plants properly constructed and operated, but they have occurred. Where tanks have been standing for some time waiting to be charged with anodes, this separation of solution may occur, and even though agitation is started immediately, it takes time to mix a separated solution. Occasionally, in such tanks after admitting the current, the solution will boil, but the introduction of a stream of water through a hose will, in a few minutes, stir up the heavy solution and stop the boiling. The aëration of the electrolyte tends to oxidize some of the impurities.

FREE ACID IN ELECTROLYTE CAUSES IMPURE COPPER AND FOUL SOLUTION

Of further importance is the composition of the electrolyte. At Lithgow the composition was approximately 12 per cent. free sulphuric acid and 14 per cent. bluestone ($\text{CuSO}_4 + 5\text{H}_2\text{O}$), with a specific gravity of 1.18.

As stated before, low acid increases the resistance of the electrolyte. If the acid content falls below $3\frac{1}{2}$ per cent. it causes a deposition on the cathode of a mixture of metallic copper and cupreous oxide instead of metallic copper alone. At the same time a large amount of oxide of copper precipitates with the gold and silver slime. The mud, consequently, may contain as much as 80 per cent. of copper.

The cathode copper is brittle from the presence of this oxide of copper, and instead of having a bright pink color, it will be a dark brown, especially after being in the air for a time. The conductivity of such a cathode is low. If the acid is too high, polarization troubles are set up. I have found that a free acid content of about 12 or 13 per cent. was safe, and that good work was obtained with an amperage of 12 to 14 amp. per sq.ft. of cathode surface.

STARTING SHEETS DEPOSITED ON COPPER BLANKS

The starting sheet, as shown in the cut and used in the depositing tanks as cathodes, are grown from the ordinary auro-argentiferous copper anodes, in this case weighing about 300 lb., in tanks kept for the purpose. Rolled copper plates $\frac{1}{8}$ in. thick are cut to a size about $2\frac{1}{2}$ in. longer than the required cathode sheet, and about one inch wider. Two holes are punched in them at a point which will be above the electrolyte when they are suspended in the tanks. This is to prevent deposition of copper on the hooks and to enable the sheets to be readily stripped from the plates. The plates, which are supported by copper hooks, $\frac{1}{4}$ in. in diameter, must be flat and hang squarely in the tanks.

In preparing the plates they are first dipped in molten tallow, in a cast-iron trough with a false bottom, through which steam passes. The plates are then placed on end to drain off the surplus tallow. After the tallow has set, each blank is covered on both sides with a fine coating of graphite by moving about in a shallow box containing finely ground graphite. The sides and edges are then covered with a fresh layer of tallow about $\frac{1}{2}$ in. wide by dipping in a shallow tank of the molten substance. This prevents the copper from growing at any place except on the prepared graphite surface.

After the plates are prepared, 24 are hung in each vat to 12 anodes. In about two days they are withdrawn, and a sheet of thinly deposited copper weighing about 2 or 3 lb. is stripped off each side of the rolled blank. These starting sheets ought to be tough. We usually secured about 90 per cent. fit for use in the depositing tanks.

Boys punch the holes in each starting sheet for the hooks which suspend the sheets in the depositing tanks. In some refineries the Morrow clip machine is used

to rivet on a strip of copper instead of a hook. This saves a small cost in the purchase of wire, and it also makes a flat connection, which is preferable to a hook, for the latter, projecting beyond the sheet, receives a more rapid deposition of copper from the anode than any other part of the cathode, hence a nobby excrescence of copper grows on the hook, which in 12 to 14 days may extend across the space between the cathode and anode, thus causing a short circuit.

Figuring the usable sheets at 90 per cent. and with the cathodes in 672 tanks changed every 14 days, the number of sheets required daily would be 960. Two boys receiving 8d. per tank, attend to the growing of these sheets. As a rule, 41 tanks, of which 20 are charged one day and 21 the next, are required to grow the requisite sheets. Usually 2000 starting sheets are kept in stock.

I have seen poor results obtained when the starting sheets were grown in tanks with no circulation of electrolyte. At times the sheets, instead of being tough, would be brittle, and often the yield would be much less than 90 per cent.

Some years ago, at Lithgow, starting sheets were grown in non-circulating tanks using cold solution, and it has been recorded that the total available sheets for a day's growth was as low as 5 per cent. It has happened more than once that a part of the plant had to be stopped because the supply of sheets had run out.

BRITTLE SHEETS DUE TO NON-CIRCULATION OF ELECTROLYTE AND LOW FREE ACID

At that time the cause of brittle sheets was not properly understood. The cure consisted in giving the tank a dose of gelatin dissolved in water, which would produce tough sheets for a day or two, and then the particular tank would again grow nothing but brittle sheets. Analysis showed too low a percentage of free acid in the electrolyte. Finally, tests were made in circulating tanks, using the ordinary electrolyte of the depositing tanks, and the trouble at once ceased and has not recurred.

Instead of an average production of 40 per cent. the change produced regularly 90 per cent. of usable sheets daily. Of course the brittle sheets were not a loss, but they cost money for tallow, graphite, labor, etc. More modern methods of growing starting sheets are in use at the Port Kembla works, but what I am attempting to describe is the practice at Lithgow, which, as stated before, could easily be much improved by the erection of a new plant.

EXCESS COPPER IN SLIME SOLUTION REMOVED BY CRYSTALLIZING AS COPPER SULPHATE

Some of the excess copper in the electrolyte comes from the natural tendency of electrolysis to increase the strength of

the solution in copper. The decomposition of the anodes into sulphate of copper is more easily done by the current than is the return decomposition of the sulphate of copper to metallic copper. In fact, the current produces more sulphate of copper than it can decompose to copper.

Another source of excess copper is the copper sulphate produced in the mud treatment. This solution is returned to a storage pit, from which it is elevated to a series of flat, lead-lined tanks about 18 in. deep in which are hard-lead pipes carrying waste steam. Here it is evaporated until dense enough to crystallize the sulphate of copper. It is then siphoned into other tanks, containing strips of lead, upon which the crystals of sulphate of copper form.

The mother liquor is either kept evaporated to a point at which all salts in solution are precipitated, leaving strong sulphuric acid ready for use again, or run through boxes containing scrap iron to recover the balance of the copper, the liquor finally running to waste with all its impurities. The crop of sulphate crystals are redissolved and added to the supply of electrolyte. If there was a market, the crystals of copper sulphate could be sold.

EXCESS COPPER IN ELECTROLYTE REMOVED IN LIBERATOR TANKS

The excess copper produced in the depositing tanks absorbs acid, gradually increasing the volume of the electrolyte in circulation if the copper is not removed. As there is little demand for bluestone in Australia the excess copper is removed in liberator tanks, using insoluble lead anodes.

Twelve of these tanks were sufficient to keep down the excess of copper in the electrolyte, and to keep the amount of free acid and bluestone about stationary. The tanks are arranged cascade-fashion, receiving current from a dynamo at 25 volts and 600 amp. Insoluble lead anodes $\frac{1}{8}$ in. thick are used with copper sheets as cathodes.

In starting, the speed of the dynamo must be carefully regulated; if run too fast the current will buckle the lead anodes, causing instantly a serious short circuit. With light sheets in every tank, the dynamo may run 24 hours before the ammeter will register; and until it shows about 250 amp. it is not wise to speed the engine too much. In about two days the full reading of the ammeter can be obtained.

After deposition is well advanced the cathodes are removed at the rate of four (eight sheets) per day, taking 30 working days to remove the first lot charged. As they are taken out, eight starting sheets are put in their place. The voltage per tank runs from 1.7 to 2 with the anodes and cathodes placed 2 in. apart. The copper deposited by this dynamo is very

different in appearance from that in the depositing room. It is perfectly smooth and bright, having a conductivity of over 101.5 per cent. by Matthiessen's standard.

LIBERATOR PLANT RELEASES COPPER TO THE EXTENT OF $1\frac{1}{2}$ PER CENT.

This plant removes about 60 to 80 tons of copper per year from the electrolyte, so that the increase in copper by electrolysis is roughly about $1\frac{1}{2}$ per cent. The effect of this plant on the constitution of the electrolyte entering and leaving shows, for an average of eight determinations, a drop of 3.7 per cent in copper sulphate, a rise of 1.8 in sulphuric acid and a fall in temperature of 20 deg. F. The rise in acid is to be noted. The fall in temperature is caused by the cooling of the electrolyte in its passage through the series of six tanks before it discharges.

The plant is in a separate room, because the action of the current disengages a considerable quantity of hydrogen, and as this is generally wet with the solution, it is a most irritating gas to the nostrils, and causes violent sneezing until one gets used to it. The efficiency of the dynamo is about 80 per cent. It is lower than those using soluble anodes. Besides removing about 80 tons of copper per year, this machine also supplies current for the parting of the doré bullion.

The copper obtained from the liberator plant is melted with the cathodes from the depositing room in a reverberatory furnace, which is used only for refining the electrolytic copper. The conductivity of all the cathodes will average nearly 101 per cent. by Matthiessen's standard. In refining, however, the sulphur in the coal and other impurities from the bricks of the furnace reduce this to an average of 100 per cent. by Matthiessen's standard. After bringing to "pitch" the bath of molten copper is ladled, cast into ingots, and branded "E.L.C." on the bottom and "A.U.S.T." on each end. The ingots are sold principally to wire makers.

(To be concluded)

The Akins Classifier

The Portland Gold Mining Company at Colorado Springs, Colo., is reported to be using seven Akins classifiers for separating sands from slimes for cyanide treatment. The Akins machine is built after the scheme of the log washer and consists of a trough with a revolving helix. At one end is an overflow weir and hopper for the slimes, and at the other end a discharge hopper for the sands. When in place the trough is set at an inclination of about $2\frac{1}{2}$ in. to the foot.

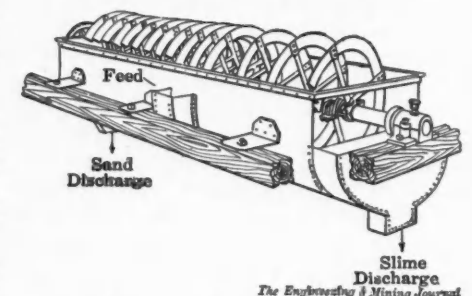
Revolving within the trough is a shaft carrying at the overflow end a single, continuous helix or spiral of about 4 ft. length, and a double interrupted helix or spiral the remainder of the length of the

trough. The spiral band is about four inches in depth, being constructed of steel. Arms radiating from the shaft are fastened to this band. The feed inlet is situated about four feet from the overflow as is shown in the accompanying illustration. It is so placed that the pulp enters below the surface of the charge.

SEPARATES AND DEWATERS SANDS

A thin stream of pulp enters the feed box and there meets a slowly moving spiral; the heavier solids settling to the bottom of the trough are gently advanced toward the sands discharge end. The intermittent spiral permits the contained moisture to drain off and flow back into the charge. The slow turning over of the sands washes the finest solids back and allows the sands to give up a large percentage of their moisture. The suspended slimes flow toward the weir and over it into the collecting hopper, then to the slimes launder.

Tests made with a 48-in. by 12-ft. machine handling 30 mesh or finer material of about 2.65 sp.gr., contained in water in the ratio of one of solids to eight to 10 of liquid, and a feed of $4\frac{1}{2}$ tons of solids per hour, showed, it is



AKINS CLASSIFYING MACHINE

claimed, that less than 5 per cent. of the sands discharged would pass a 200-mesh screen and less than 2 per cent. of the slimes were retained on a 100-mesh screen. The moisture contained in the sands varied from 16 to 20 per cent.

The spirals are subjected to little wear as they slowly pass through the sand. In practice it is claimed that it has never been found necessary to lift or dig out the spiral even after the machine has been stopped and the pulp continued to flow into the trough for some time.

Among the diseases incident to certain trades, there is a peculiar one to which workers in plants manufacturing chromates are subject. The thinnest portion of the septum of the nose is attacked and is gradually eaten away until the two nostrils form one channel for a portion of the space inside the nose. The disease then seems to have no further effect on the health of the worker. Preventive measures are the use of some bland oil or ointment in the nose and taking care not to touch the nose when any dust containing chromates is on the fingers.

Operations and Policy of Dolcoath Mine

LONDON CORRESPONDENCE

The report of the Dolcoath Mine, Ltd., for the half year ended June 30, 1910, shows that though sufficient profit was made to pay a dividend at the rate of 5 per cent. per annum, yet it has been decided not to distribute any dividend, but to use these profits to meet capital expenditure.

The accompanying table gives the results of the work done during this last half year together with the total results since the formation of the present company in 1895.

As is seen, the comparison is not favorable to present-day results. Working costs and royalties have both increased and profits diminished in spite of an increased revenue.

ONLY 65 PER CENT. OF NET PROFIT DISTRIBUTED

It is remarkable that among the profusion of other figures there is no mention made in the report of the amounts paid in dividends. Dividends are the index to the success of a mine and without a statement of them the other figures of profit are certainly misleading. In looking through the report it is seen that for every one of the 30 half years of the company's life, a net profit has been shown, the sum of which amounts to £483,942. It is not, however, stated that out of these so-called net profits only £314,500, or 65 per cent. has been distributed in dividends. The larger part of the difference between these two sums consists of amounts written off for depreciation. Sixty-five per cent. is, however, a low proportion of profit, especially when it is considered that nothing has to be deducted out of the net profit for royalty, this having already been deducted.

Moreover, it is now considered useless to hide the fact that depreciation forms a part of the working cost, and that only the amount distributed as dividends can be considered as profit, all the remainder being the cost of working. Considering the data under these more rational ideas of cost and profit, the following figures are obtained: Working cost, £1,764,783, or 85 per cent. of the total revenue; dividends, £314,500, or 15 per cent.; total, £2,079,283. It is thus seen that so far, 85 per cent. has been paid out to the community and 15 per cent. to the shareholder. Considering all the circumstances at the mine and the percentage extracted from the ore the proportion paid in dividends is lower than might be rightly expected. The proportion paid by ordinary railway companies in fixed-

interest charges and dividends is generally about 30 per cent.

THE SHAREHOLDER THE ONLY LOSER

Considering the interest obtained upon the money invested, it will be seen that over the life of 15 years the average distribution becomes just under 6 per cent. per annum, from which figure the fluctuations have been from 2½ per cent. to 17½ per cent. During three years there were no distributions at all, after working costs and royalties had been fully met, the shareholder being the only one disappointed. This fact is made the more poignant in that at the previous meeting the chairman stated that there was sufficient money on hand to complete necessary new equipment.

Under this rough treatment the shareholder may be excused if he begins to consider that the mine is being worked with too little consideration toward him. He sees the proportion of working cost advancing though it was reasonable to expect that with the treatment of larger quantities it would decrease, and that the

claims make first demand upon the revenue, it is a bad system for the shareholder. It would be better for him to have the good stakes worked when the prices rule high because, not only would more money be obtained for the tin, but in addition the profit in the mine would be more quickly turned into cash at interest.

Should there then be periods when no profits were shown, surely they could be easily tided over by forming a cash reserve in times of large profits from which dividends could be paid out during times of low returns. Shareholders would then receive regular dividends. At present, though Dolcoath always shows a profit, dividends are not always forthcoming, and, when they do come, they are, according to the experience of the past, most irregular. Such a condition of affairs is calculated to repel investors.

BETTER POLICY TO WORK GOOD ORE WHILE PRICES ARE HIGH

Necessarily the interests of the community have always to receive sym-

DATA ON OPERATIONS AT THE DOLCOATH MINE, CORNWALL.

	Half Year Ended June 30, 1910.		15 Years Ended June 30, 1910.	
	Total.	Per Ton.	Total.	Per Ton.
Working costs.....	£59,304 11s. 7d.	25s. 1d.	£1,486,077	22s. 0d.
Royalty.....	5,049 6s. 2d.	2s. 2d.	109,264	1s. 8d.
Net profit.....	13,018 17s. 5d.	5s. 6d.	483,942	7s. 2d.
Totals.....	£77,372 15s. 2d.	32s. 9d.	£2,079,283	30s. 10d.
Tons crushed.....	47,279	.....	1,349,778	.....
Lb. of tin recovered per ton.....	.....	40.40	.....	47.47

amounts paid out as royalty consume more and more of the revenue. The policy under which this lack of consideration has arisen and under which it will continue is indicated by a statement in the manager's report, which is as follows:

DOLCOATH POLICY TO SHOW PROFIT ALWAYS

"As heretofore, at the present price of tin, a considerable quantity of low-grade ore has been worked which, while having a small margin of profit, reduces the average produce of the output of tin stuff." In other words, when a high price is to be obtained, the policy is to produce less, and when a low price only can be obtained more black tin will be marketed.

This unsound policy of conservation is pursued in order that it may be said that Dolcoath always shows a profit, whatever the price of tin may be. However comforting this system of always showing profits may be to those whose

pathetic consideration, but a narrow view of this point should not be taken. In pursuing the policy of working the better ore when prices are high, the interest of the community would be served as well as that of the shareholders, for regular dividends would be paid and the enterprise would assume the character of a sound investment, attracting capital to this district where it could be employed to such advantage to the community.

NO STATEMENT OF ORE RESERVES GIVEN

Another remarkable point about the Dolcoath mine report is that no statement of the ore reserves is given. Some sporadic values of the ore are stated as occurring at the various development points, but these are worse than useless in estimating the value of the reserves. In the absence of the stability which a statement of the ore reserves gives, the mine's good name is at the mercy of every new showing. If it be desired that this enterprise attract any consideration

as a mining investment, a statement of ore reserves should on no account be omitted.

THE ELEMENT OF TIME MUST BE CONSIDERED

The important bearing of time upon the present value of a mine must also be considered. If the better ore be kept in the mine to sweeten the poor so that a profit may always be shown, then the mine might exist for another century with working costs still advancing and the lords taking their due. The shareholders alone would be unsatisfied and unconsidered. It might easily happen under such a policy that, a block of good ore such as would, if taken out quickly, yield a handsome return, would, when reserved to be mined only when the price of tin was low, yield no dividends although profits might be shown on paper.

It is stated in the report that when William's shaft is put into commission it will result in a saving of many thousands of pounds sterling per annum. It may therefore be said that, when the completion of this new equipment is not hastened by all possible means, an absolute loss is being incurred. The management is hence open to the charge of waste of valuable time in completing the equipment. The information given in the manager's report about the progress of this work is unsatisfactory. No time is set in the report for the completion of this important work. Although the directors have been allowed to state that it is confidently expected that the equipment will be at work in March next, this expectancy is not confirmed by the manager who is still free to take his own time.

Potash Industry in Austria

An Austrian syndicate has recently been organized for the development of the salt deposits near Kalusz, in Galacia. According to Consul-General Charles Denby, of Vienna, this region has up to the present been under government management. This syndicate, with an initial capital of about \$1,000,000, proposes to take over the existing government mines, extend the work into adjacent territory, and erect factories for the production of potassic salts, especial, fertilizing salts, chloride of potassium, bisulphate of potash and bisulphate of magnesia.

The laws of Austria forbid the manufacture of mineral salts by private persons, and the proposed business of the new company will therefore be conducted under the form of a government lease, authorizing the manufacture of the salt and its sale to the government at a fixed price. To save freight, the crude potassic salts will be prepared by the company at a factory to be erected in Kalusz. The mines have been worked to only a limited extent as yet.

Garrison-Whipple Condenser and Ball Machine

BY RUSSEL GARRISON*

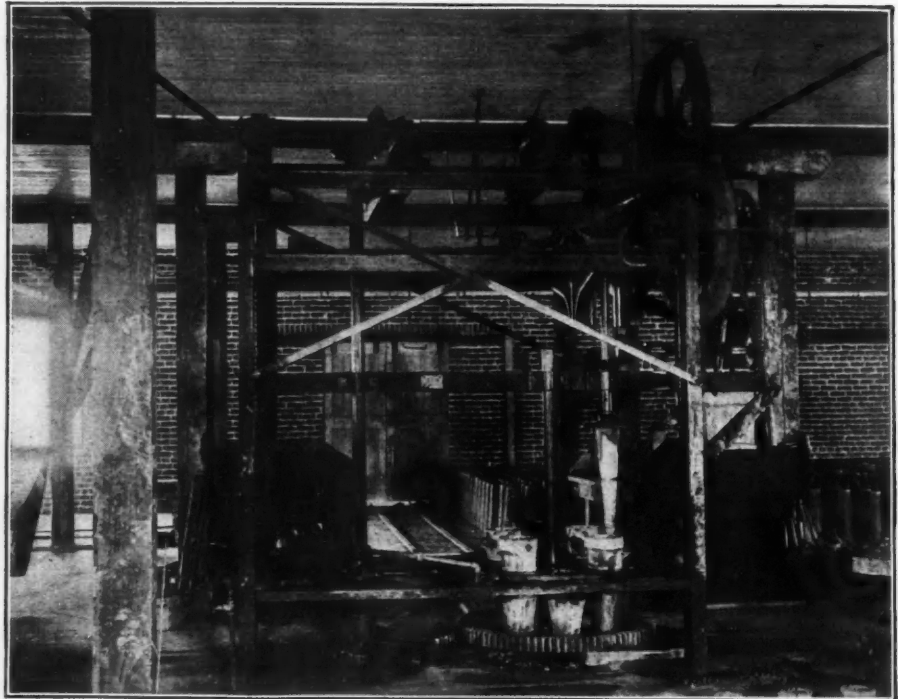
The Garrison-Whipple condenser machine and the Garrison-Whipple ball machine are patented under U. S. Pat. No. 915,848 and are manufactured by the Cherryvale Iron Works, of Cherryvale, Kan., in the center of the gas fields of southeast Kansas. As shown in the illustration, it consists of a rectangular steel frame, heavy enough to give the desired support and rigidity, which is essential for this class of machine, as the product must be true and of uniform thickness.

The machine, taking about 8 horsepower, is operated by a pulley and belt. The driving pulley is fastened to a counter-

number, are spaced around a table, and are secured at the top by the handholes on the mold, fitting into a keyway, and at the bottom by means of taper rings.

The table is rotated in time with the descending plunger by means of a segment gear engaging teeth on the perimeter of the table. The arm of the segment gear is mounted on a vertical shaft which receives its motion through bevel gears from the horizontal shaft driving the plunger. Referring to the illustration, it will be seen that when the machine is running, as the plunger lifts, this segment engages the gear on the table and places the condenser mold exactly under the descending plunger and die. The rapidly revolving die not only makes a symmetrical condenser, but keeps the clay from sticking as well.

The point of the die is removable and



GARRISON-WHIPPLE CONDENSER MACHINE USED AT KANSAS ZINC SMELTERIES

shaft and the power transmitted through a pinion and gear to a horizontal shaft. This shaft has a U-shaped crank to which is fastened the connecting rod and plunger, the latter terminating at its lower end in a die of the same size as the condenser to be formed.

PLUNGER AND DIE ROTATE AND RISE AND FALL SIMULTANEOUSLY

A bevel gear on a second countershaft belt-driven from the first, engages a bevel gear mounted on a horizontal member of the frame of the machine, as shown in the illustration. A key in the horizontal gear slides in a vertical slot in the plunger, rotating the latter at about 200 r.p.m. as it ascends and descends from the mold containing the form that holds the ball of prepared clay from which the condenser is made. These molds, eight in

as it is the only part that requires renewing, costing \$1.50, the expense of maintenance is low. As the point of the condenser is punched out, it drops into a pan below and is returned to the original material. The mold stand is locked by a latch that is operated by an eccentric on the segment shaft. The latch is pulled back as the table rotates and when the condenser is being formed, it locks the table by engaging a hole in its rim. These holes are countersunk and fitted with brass bushings that are renewed at a small expense when worn egg shaped.

THE MACHINE, READILY ADJUSTABLE, MAINTAINS A UNIFORM PRODUCT

Water is conveyed to the plunger through a small pipe mounted on the framework. The water is turned off and on as the die descends or ascends by means of an eccentric on the upright

*Cherryvale, Kan.

shaft operating a whistle valve. The water is regulated by this valve and eccentric so that just enough is thrown upon the plunger to clear it of any adhering material. As the wear can be taken up in a few moments and an exact adjustment maintained, a perfect condenser results.

One man and a helper can turn out in a 10-hour day, 2000 condensers that are better than those made by hand, as the clay is formed under pressure. If the material could be handled, four men operating one of these machines could make 4000 condensers per day. One man and a boy at \$2 and \$1.50, respectively, per day of 10 hours, can maintain a stock of several thousand condensers after the operation has been started.

The ball mill that goes with the condenser machine is built like a small pug mill. A taper screw forces the prepared

Work of Mines Trials Committee

JOHANNESBURG CORRESPONDENCE

The Mines Trials Committee, appointed by the mining group on the Rand to investigate new inventions and processes in mining and metallurgy, is doing useful work in many directions. At the Robinson Deep mine trials of various drill steels and of various methods of sharpening drill bits are being carried out; in the metallurgy the question of the factors affecting maximum economy in stamp and tube milling and in cyanide treatment are under particular consideration. The matter of grading ore into various sizes before feeding to the mortar box and of treating the fine sizes separately from the coarse is also engaging attention. The Bantjes mine is expected to start crushing with

the wage is higher than in some of the other Mexican districts. The district is supplied with electric power and is on a branch line from the main trunk railroad. The table is on the basis of 1000 metric tons per day, with the money units in United States currency.

METALLURGICAL RESULTS AT GUANAJUATO.

Extraction—metallurgical saving of metals.....	90 per cent.
Realization costs (state and federal) taxes and refinery charges.....	7 per cent.
Mining costs.....	\$1.25 @ \$1.75 metric ton
Milling costs.....	1.25 @ 1.75 metric ton
Transportation cost.....	0.25 metric ton

DUMP ORES.

Gross value per ton.....	\$4.00
Metallurgical loss—say 10 per cent.....	0.40
<hr/>	
Deduct for	
Milling cost.....	\$1.50
Realization expense (7 per cent.).....	0.25
Transportation.....	0.25
<hr/>	
Estimated profit per ton.....	\$1.60

Gross value per ton.....	\$5.00
Metallurgical loss—say 10 per cent.....	0.50
<hr/>	
Deduct for	
Milling.....	\$1.50
Realization expense (7 per cent.).....	0.25
Transportation.....	0.25
<hr/>	
Estimated profit per ton.....	\$2.50

FILLINGS.

Gross value per ton.....	\$7.00
Metallurgical loss—10 per cent. estimated.....	0.70
<hr/>	
Deduct for	
Mining.....	\$1.00
Milling.....	1.50
Transportation.....	0.25
Realization (7 per cent.).....	0.45
<hr/>	
Estimated profit per ton.....	\$3.10

Fillings—Ore having gross value \$8 per ton on same basis should yield profit....	\$3.95
Fillings—Ore having gross value \$9 per ton should yield profit.....	4.75
Fillings—Ore having gross value \$10 per ton should yield profit.....	5.63

MINE ORES.

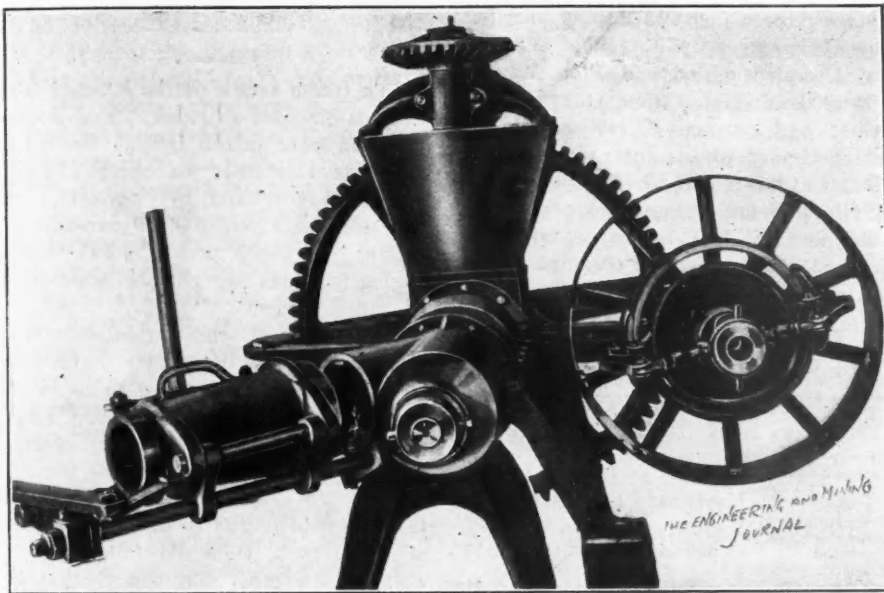
Calculated on same basis of milling and realization charges as dump ores and fillings, adding additional expense for mining:

Gross value per ton.....	\$20.00
Metallurgical loss, 10 per cent.....	\$2.00
Mining.....	1.50
Milling.....	1.50
Transportation.....	0.25
Realization charges.....	1.26
<hr/>	
Estimated profit per ton.....	\$13.49

\$10 ore should yield per ton.....	\$5.37 profit
12 ore should yield per ton.....	7.45 profit
15 ore should yield per ton.....	9.50 profit

These data may be applied with a proper factor of variation for general conditions to operations in other Mexican camps.

The Colorado State Geological Survey has announced that it will determine and name mineral specimens sent in by residents of Colorado. A letter stating the locality from which the mineral comes, and giving any other useful information should accompany the specimen. Sufficient material should be sent so that, if desired, a satisfactory sample may be kept as the property of the survey. Specimens should be addressed to the State Geologist, Boulder, Colorado.



GARRISON-WHIPPLE BALL MACHINE

clay under great pressure into the ball mold carried on the rods at the end of the mill. When the ball is formed, a clutch is thrown out by a foot lever, the mold is opened and the ball removed and thrown into the condenser machine. The making of these balls by hand is hard work. Previous to the use of the mill it was almost impossible to get men who could roll enough balls to keep the condenser machine supplied.

The highest price for spot tin in London this year was £166 per ton. In a period of 60 years this has been equaled once, in 1905, and exceeded four times, in 1887, when it reached £167; in 1888, when the highest price was £170; in 1906 by £200, and in 1907 by £215 per ton. The lowest price on record in the 60 years was in 1896, when £56 per ton was paid at one time.

100 head of 1650-lb. stamps in August. This plant has already been described in the JOURNAL of Jan. 15, 1910, with illustrations of some of its equipment.

Cost Data from Guanajuato

In the recently published prospectus of the Oro Grande Mining Company, one of the subsidiary companies of the Guanajuato Development Company, of Guanajuato, is given an estimate of costs and profits, based upon the results of operating companies in Guanajuato at the present time. This table is an interesting basis for comparison of costs between this important and typical Mexican district and districts in the United States, and also between various districts in Mexico. The labor conditions in Guanajuato are normal, except that

The Gold Mining Industry in Rhodesia

LONDON CORRESPONDENCE

The gold-mining industry in Rhodesia has lately received a large amount of attention from the speculating public in London and the United Kingdom generally. This revival of interest, after a long period of depression, followed the return to favor of the Transvaal mines which occurred in 1908.

CREDITABLE SHOWING OF GLOBE & PHOENIX

The remarkable improvement in the reef being worked by the Globe & Phoenix Company became noticeable in the latter

TABLE I. ORE RESERVES OF GLOBE & PHOENIX MINE.

Date.	Tons.	Assay Value.	Gross Value.
June 30, 1908..	122,408	\$12.29	\$1,504,394
Dec. 31, 1908..	144,348	16.00	2,309,568
June 30, 1909..	168,984	22.06	3,727,787
Dec. 31, 1909..	171,507	31.23	5,356,163
June 30, 1910..	174,788	32.26	5,638,660

half of 1908 and has continued to the present time. Table I shows the ore reserves of the Globe & Phoenix. It was, in large measure, this development that provided the necessary encouragement and justification for the upward movement of Rhodesian mining securities.

During the period covered by the statement of Table I, gold to the value of about \$2,700,000 was won.

The stimulus of this improvement was all the more effective because this mine was one of the first to be opened in the country and had been in its time in high favor on account of the good returns which it had made. This stage was followed by one of depression till this recent change for the better occurred when the workings had reached to the fifteenth level.

The total return from the other mines was at the same time maintained. The production for 1908 was \$12,124,833; 1909, \$12,593,802; and, for the first half of 1910, \$6,372,451.

SMALL OPERATORS CONTRIBUTE HEAVILY TO OUTPUT

It is interesting to note the proportions of the yearly production totals that are credited to the various groups into which the producers of this country may be divided. The segregation for 1909 was as shown in Table II.

Nearly one-half of the total output for 1909 originated in the operations of companies working their own ground, or small partnerships, which indicates that a large portion of the ores worked were won and treated without any great diffi-

culty. The fact that so large an amount was produced by tributers working claims belonging to companies also indicates the irregular character of some of the ore-bodies.

FUTURE OF COUNTRY IN LARGER OPERATIONS

Not long ago it was considered by many that the future of the country was with these small producers, but recently the feeling has grown that, while there will always be work for the individual, the proportion of operations maintained by companies will continually increase. Companies which have recently been formed have in more instances than one based their prospectuses upon results obtained by tributers, and in at least one case the fact is established that the company taking over the mine from the tributers continued and increased the success which the latter had achieved.

The case in question is that of the Queen mine which was let out on tribute for 3½ years by Willoughby's Consolidated, which period ended on May 31, 1908. During that time the tributers mined and crushed 57,746 tons of ore which yielded gold to the value of \$448,996, or at the rate of \$7.76 per ton; tributers left no ore reserves. From June 1, 1908, to April, 1910, the owners mined and crushed 25,299 tons and obtained gold to the value of \$321,201 or at the rate of

TABLE II. SEGREGATION OF GOLD PRODUCTION OF RHODESIA FOR 1909.

	Tons Crushed.	Total Value Recovered.	Value per Ton.
Companies working their own ground.....	971,585	\$6,555,441	\$6.74
Tributers working company ground.....	462,530	3,035,160	6.55
Syndicates and individuals...	373,316	3,003,201	8.04
Total.....	1,807,431	\$12,593,802	\$6.96

\$12.68 per ton and in April 21,940 tons of ore were blocked out.

TWENTY LARGER PRODUCERS

The actual number of separate producers in Rhodesia during the first six months of 1910 was stated as 195. This indicates in some measure the large distribution of the workings which are to be found in all districts and under many varied geological conditions. There are, however, only about 20 important operations and these are in greater part London companies, accounting between them for rather more than one-half of the total production.

A list of these companies with the value of the production for the first six months of 1910 is as follows: Globe & Phoenix, \$874,982; Eldorado, \$495,744; Giant, \$254,356; Jumbo, \$201,316; East Gwanda, \$192,100; Penhalonga, \$155,611; Rezende, \$147,388; Buchs Reef,

\$132,168; Battlefields, \$130,814; Gaika, \$128,577; Willoughby, \$123,883; Wanderer, \$112,267; Selukwe Columbia, \$108,820; Selukwe Gold, \$99,528; Thistle Etna, \$88,780; Surprise, \$80,942; Matabele Reefs, \$42,556; total, \$3,369,932. The average value of the ore crushed by these mines was \$7.32 per ton, and the working expenses are stated to have been about \$4.80 per ton, which figures express an adequate profit.

As to the future of Rhodesia much, of course, depends upon the results at the principal mines and I consider that the Globe & Phoenix and, in all probability, the Eldorado both show promise of profitable operations on a large scale, although in the latter mine no substantial statement of ore reserves is regularly made.

The Voorspoed Diamond Mine in 1909

JOHANNESBURG CORRESPONDENCE

In a recent article on the Premier mine¹ and the diamond situation, the Voorspoed diamond mine in the Orange River Colony was mentioned as being a future large producer and the annual output estimated at about 400,000 carats. The output for 1909 was 274,785 carats, among the finds being a blue-white stone of 116¼ carats.

The area of the mine is 804.8 claims; of these only 590 have been stripped of overburden and 485.5 worked to any depth. During 1909, 1,831,127 loads of ground were washed, yielding 14.97 carats per 100 loads, a decrease in grade of 1.63 carats. This fall of grade is due to the large amount of waste rock, from old falls from the walls of the pipe, that was treated and the grade is now expected to rise to 19 carats per 100 loads, most of the waste having been removed.

This large pipe will, in the future, be a large producer and its output will have to be reckoned with along with that from the De Beers, Premier and Koffyfontein mines.

COST DATA

The chairman, in his annual report, stated that no difficulty had been met with in disposing of the diamond output. The average price was 17s. 13¼d. per carat. The price received in 1908 was 18s. 1¼d. per carat. The total cost per load washed was 2s. 0.24d. The cost per load of mining, which includes breaking, hauling and loading, was 11.75d. These costs are higher than anticipated, owing to the amount of the waste hauled and the failure of the gear to treat the full estimated quantity. A profit of £31,930 was made during the year.

¹ENG. AND MIN. JOURN., Feb. 12, 1910, p. 369.

Electric Shocks in Coal Mines

An Interesting Recital of Many Actual and Unusual Cases where Fatal Results Have Followed Careless Handling of Charged Apparatus

BY SYDNEY F. WALKER*

The use of electricity in mines is rapidly extending in every part of the world. The higher efficiency, and the greater convenience of electrical apparatus, over compressed air, is producing the usual effect, that is, the older apparatus is being gradually pushed out of the market. In the United Kingdom, at any rate, with the continually increasing cost of marketing the coal, every item of economy that can be practised, is a godsend to both mine owner and manager. On the other hand, the increased use of electricity has brought in its train, a somewhat large number of accidents, many of them fatal; and with the Workmen's Compensation Act in full force, the question of whether electrical apparatus is really economical, seeing the amounts that have to be paid to relatives of men who are killed, is perhaps, still an open question.

The recently formed Institution of Mining Electrical Engineers, of which I have the honor to be president of the South Wales branch, was formed for the express purpose of enabling the men who are in charge of electrical apparatus in mines, to exchange experiences. A certain amount of jealousy has been caused in the old institutions, by its advent. To my mind, the jealousy is quite misplaced, as the new institution can only be supplemental to the older ones. The men who have become members of the new institution, in the great majority of cases, could not afford the entrance fees and subscriptions of the older institutions. Further, notwithstanding the formation of branches of the older institutions, in the different manufacturing districts of the United Kingdom, there is very little opportunity for the men in question, to give their views at even the branch meetings. There is no reason, where men can afford it, that they should not be members of the older institutions, as well as of the new institution.

THE ELECTRICAL INSTITUTE HAS MET EXPECTATIONS

The new institution has so far answered the expectation of those who joined it in the early days, in that it has been the means of giving a large amount of practical information to those who would have no other means of obtaining it. At the present time, every large mine, and every large iron works, tin-plate works, shipbuilding yard, etc., has its own staff of electricians. The larger con-

cerns have a comparatively large staff and the smaller ones have to be content with one or two men. The work of the electrical staff in any case consists in laying out electrical apparatus, as it is required, usually with the assistance of the manufacturers, and in addition, they have the far more important duty of keeping the apparatus up to its work.

ELECTRICIAN HAS TO BE AVAILABLE AT ALL HOURS

Mines exist for the purpose of turning out minerals, and everything has to give way to that. Consequently, electrical apparatus that is to be of service, must be kept going under all possible conditions, and against all accidents that may happen. The electrical staff have to be on hand, more or less at all hours of the day and night. It is nothing out of the common for one of them to be called out of his bed in the middle of the night, to go and put some apparatus in order. The new Eight-hour Day Act, which forbids work for more than eight hours, under any circumstances, has modified the working arrangements of mines, but under all circumstances, apparatus must be kept going, and if anything is at fault, or if any apparatus refuses to work, some electrical man has to be called to it immediately.

WORKING CONDITIONS DIFFICULT

The conditions of working underground, in all mines, are difficult for electrical apparatus. In a great many mines, water is somewhat abundant. In a great many others, falls of roof are common. Space is often limited. Further, the whole conditions of mine working are such as to bring severe strains upon electrical appliances. One of the great difficulties the electrical engineer has had to face, from the earliest days of the introduction of electrical apparatus, has been the fact that insulation of conductors of electricity was absolutely necessary, and insulating materials are all mechanically very weak. Further, all of them are subject to the action of electrolysis, the splitting up of the compounds of which they are composed, by the leakage currents which pass through them.

Mines also are subject to continual motion. Floors rise, walls press inward, roofs press downward. The atmospheric conditions of the mine are changing at certain parts of the year, from day to day, and they are very different during summer and during winter.

CONDUCTORS ARE SUBJECT TO SEVERE DUTY

The conductors that are employed to transmit current from the generators to the different parts of the mine where they are to be used, are subject to severe conditions. I observe that in America, in some mines, the bold policy has been adopted, of dispensing with insulation altogether. I understand also that something of the kind has been done in Germany. In the United Kingdom the Home Office would forbid anything of the kind. Conductors must be insulated, and well insulated; but when insulated as well as it is possible, regardless of expense, they still remain sources of weakness. The insulating envelop is liable to be damaged by falls, even by the cutting edge of a small piece of rock falling from the roof, unless protected by armor; if protected by armor, there is a great danger that a heavy fall will drive the armor through the insulating envelop, and connect it to the conductor itself.

USE OF HORSES UNDERGROUND IS DECREASING

The use of horses in mines in the United Kingdom is steadily decreasing, but in the early days of the introduction of electric light and power, the horse was a considerable source of trouble to cables. Sometimes he would rub himself against a cable, in the way horses have, rubbing off the insulating envelop, or rendering it so thin that some trifling accident or some trifling friction later on, exposed the conductor. Cases were somewhat frequent of horses biting cables, and being killed.

A more frequent source of damage to cables is accidents to the haulage. In the United Kingdom, endless-rope haulage is largely employed for the main roads, but the main haulage is fed by dip haulages, and sometimes by small main and tail haulages. With a properly arranged endless-rope system, it is not often that mine cars get off the road, but if the road is neglected, if the rails are allowed to get out of gage, and out of line, trams somewhat frequently get off, and may be thrown against cables, if they are within their reach.

THE CAUSES OF SHOCK

In the course of the discussion, at the South Wales branch of The Institution of Mining Electrical Engineers, upon a paper written by the president of the institution, William Maurice, about "Electric

*Consulting engineer, Bloomfield Crescent, Bath, England.

Shocks in Mines," the usual differences of opinion were expressed, but two points came out clearly. A large number of the accidents were due to want of care. The want of care might be described in some instances as even worse than carelessness, and it was not the men who may be supposed to be ignorant of the danger, to whom the want of care applied. In several instances men who were well qualified, who thoroughly understood, or should have understood the full danger of the apparatus they were handling, took grave chances, with often fatal results. Cases were reported, such as skilled men working behind switchboards, where necessarily conductors between which high pressures exist are exposed, made temporary connection between the conductors a little way from each other, for the purpose of testing, by means of a piece of bent, naked wire. The bent, naked wire, held in the hand of the experimenter, as it might be expected to do, accidentally came into contact with a conductor carrying a high-pressure current, the result being that the high pressure was set up between the hand of the experimenter and his feet, or occasionally between his two hands.

EXAMPLES OF CARELESSNESS

In another case, a qualified man made a somewhat similar temporary connection at the back of the switchboard, and came off with temporary blinding. The piece of wire with which he was making connection, was fused, a blinding flash following, he being knocked down, the sight of both eyes being temporarily lost, and the experimenter himself being laid up for some months. Possibly he will be more careful in future. In another case, a skilled man, I believe a college graduate, was making connections at the back of half of the switchboard, the conductors of that half having been rendered dead, the service being carried on from the conductors on the other half of the board, the back of that half being blocked off, so that one could not easily get to it. In spite of the knowledge that he had, or should have had, the man in this case deliberately went to the other half of the back of the board, accidentally made connection with a live conductor, carrying a high-pressure current, and was killed.

Another case came within my knowledge some years ago, not at a mine. It was at a town generating station. A young fool who ought to have known better, was playing with fuse wire. He threw a piece of the wire in the air, and on coming down it alighted on a pair of conductors between which a high pressure existed, fused with a flash, and blinded the young man for some weeks. In other cases, want of care has been due rather to strain. In one case that was mentioned at the South Wales branch of

The Institution of Mining Electrical Engineers, a man was killed through either his own caution having been dulled for the time, or by the carelessness of a boy who was manipulating the switch. An electric main-and-tail haulage plant stopped work, and an electrician was called to it. The plant was worked by a controller, and there was the usual arrangement that goes with apparatus of this kind, somewhat similar to those used on tramcars and electric locos. There is a barrel of insulating material, carrying a number of spring contacts, arranged to revolve inside a case, upon which are fixed other insulated contacts. As the barrel is revolved by means of a handle on the top, or at the side where the barrel is arranged in a horizontal position, as is sometimes done, different spring contacts engage with other contacts on the inside of the containing case, making different connections, and arranging currents to pass through resistances, to give increased or decreased speed, and so on. The spring contacts are liable to become bent, and to wear, and not to properly make connection upon the fixed contacts they should engage with, and consequently the haulage drum either does not work, or works badly. The remedy is to pull out the barrel, adjust the spring contacts carefully, replace the barrel, and try it, the process being repeated until things work properly. Before the barrel is withdrawn, before anything is done to the controller, it is absolutely necessary for the safety of the man who is working at the controller, that all conductors in it, or connected with it, should be rendered absolutely dead, that there should be no possible chance of his making a connection between any part of his body, and a conductor carrying a high-tension current. In the particular case reported, a lad was put to throw off a double-pole switch, provided to disconnect the service from the controller, and from the haulage plant altogether. The lad appears to have done this several times, but at last he apparently did not open the switch, and consequently when the barrel was placed in the controller, and the man who was working at it was giving his final touches to the springs, to get them nicely into their place, he received a shock which killed him.

SMALL JOBS REQUIRE PATIENCE

It should perhaps be explained that a job of that kind is what may be aptly termed a "fiddling" job. It is a troublesome job. Most jobs of the kind where electrical apparatus have to be put in order are troublesome and "fiddling." The man who is repairing the job has to gently bend the springs, so that they will make their proper connection, but he must be careful not to bend them too much, or he may have one of them broken off, and the whole plant would be stopped. There are a number of these

springs also, and it may happen that as he bends one, he may accidentally bend one adjoining it a little bit out of line, as they are close together. It is only by great patience that the job can be properly done.

I have had painful experiences in adjusting contacts under similar circumstances, and I know how difficult the matter is, what great care is required, and how easily a slip may be made. When I had everything of the kind to do, I always used to beg the colliery staff to go away and leave me to thrash the matter out alone, with my foreman or assistant. Electrical apparatus of the kind is exceedingly intricate. It demands a clear head indeed to reason out what may be the cause of the trouble, and it requires deft fingers, and the maintenance of a clear head, together with an almost unlimited amount of patience, to put the thing in satisfactory condition. If the colliery officials are nearby, possibly asking questions, it tends to disconcert the man who is testing, and to distract his attention, and make the job much longer in being done.

In the case under review, the haulage plant was badly wanted, coal was in great demand, and one can quite understand that the colliery officials were urging the electrician to do all that he possibly could to get it right quickly. One can easily understand also, that the electrician, after withdrawing the barrel several times, and noting that the boy threw the switch open each time, might relax his vigilance. It is easy to understand also, that the boy might not appreciate the terrible importance of the opening of the switch. His attention may have been taken off for the moment. Boys are boys, and it is difficult for them sometimes to keep a strained attention upon a particular object. Whatever the cause, however, the boy did not throw open the switch, and the death of the man repairing was the result.

THE IMPORTANCE OF INSULATION

The other point which came out strongly indeed in the discussion, was the absolute importance of insulation. In a large number of cases, the accident could be traced directly to insulation having broken down. One case that was reported will probably illustrate this. A joint in one of the wires of a high-tension three-phase motor had given out, and an electrician had been called to put it right. He repaired the joint and covered it with some jointing tape. Apparently either he made the joint by soldering, using salts for a flux, and leaving some of the salts upon the outside of the joint, or there was some moisture present from another cause, or again the tape with which he covered the joint was either wet, or a bad insulator. After making and covering the joint, he started the motor, which was also working a haulage plant, and then

left, the apparatus apparently working all right.

As frequently happens with electrical apparatus, the electrician felt doubtful as to whether the machine would go on working. I have had the same feeling myself, when putting in an electrical apparatus in the early days, and have returned to it again and again, to make sure that it continued working. In the present instance, the electrician returned to the motor and, while it was temporarily stopped, while the journey was at rest, he proceeded to examine the joint, being anxious naturally to see that it was all right. He seems to have touched the joint with his hand, receiving nearly the full pressure of the service, and was killed. This accident forcibly illustrates the importance of insulation, and the importance of rendering everything dead before you go to handle conductors through which high-pressure currents pass when the apparatus is at work.

Several accidents are reported, some of them fatal, where connection has been made between a conductor carrying a high-pressure current, and some perfectly innocent conductor, such as a haulage pulley, a girder, a haulage rope, a bracket, or something of that kind. The innocent conductor which has first made contact with the live conductor, becomes itself alive, and in its turn renders every conductor with which it is in contact, also alive. Thus the haulage pulley and the steel girder renders the rope that bears upon it or rubs against it, alive; the rope renders the iron cars to which it may be shackled alive, and so on. The result has been that some conductor that had apparently no connection whatever with the electrical service, and which it might be supposed could be touched with impunity, has been rendered alive, the full pressure of the service existing between it and the tram rails, or at least a large percentage of the full pressure, and some man touching the innocent conductor inadvertently, has been killed.

Electric signal wires, which should have no connection whatever with the electric power service, have been connected to it in some such way as this, and men going or returning from their work, taking hold of the wires, possibly out of mischief, possibly to help themselves along a steep part of the road, have received shocks and been killed.

CASES TO ILLUSTRATE

Perhaps the following cases will illustrate this: In the early days of electric lighting, when pressures were low, 65 to 100 volts, Mr. Sopwith, an eminent mining engineer of Cannock Chase, had introduced the method of using old wire ropes as conductors. He insulated them with coal dust and pitch, and the result was apparently satisfactory. A little while after his results were reported, I had fixed a small dynamo for lighting, at a

colliery on the side of one of the Welsh mountains. The lights were only placed on the surface at first. The engineer wished to take them down the pit, and asked my opinion as to the use of some wire ropes that had been fixed temporarily, as guides, during the sinking of the pit. I strongly advised that it should not be done. He thought otherwise, and made use of them, running insulated wires from the naked wire ropes in the shaft, into the workings. He then wrote to me in triumph, asking me to come up and see them. I went up, and went down the pit with him. The lights were burning all right, but we were very soon favored with a display of fireworks. The lights would go out, fireworks being displayed at the pit bottom, then would go in again. The cause of the trouble was the wire ropes which were touching galvanized-iron sheets occasionally, and an iron pipe which ran into the workings, also touched them occasionally, and apparently one of the conductors in the workings was in connection with the iron pipe. When the three connections were made at the same moment, which might happen at any time, with the vibration of the ascending and descending cage, the service was short circuited, the lights went out, the fireworks followed when the short circuit was broken, and the lights came in again. There was no gas at the pit bottom, and the pressure, which was only 100 volts continuous current, did not cause anybody any harm. With 500 volts, however, or the high pressures that are now employed, serious results might have ensued.

ANOTHER CASE IN A WARWICKSHIRE COLLIERY

Another case which occurred in a Warwickshire colliery is, I think very instructive. It occurred some years ago, but something similar has happened in other collieries quite recently. There was an electrically driven dip pump. It had been moved on from time to time, and cable running short, the delivery pipe of the pump had been used for a return for part of the distance. At a certain part of the road, by the side of which the two wires ran, and which was very wet, some men were engaged one day widening the road. Steel girders were employed as beams, and one of them, when the prop was knocked out from under it, had caught against the covered wire, its sharp edge cutting through the insulation of the wire, and making connection with the conductor. The men were working in the usual half-naked condition that is common in some pits. Their feet were also very wet, standing in running water. One of the men caught hold of the girder to pull it clear, and received a shock. Another man caught hold of him by his naked body, to pull him off, and also received a shock. The first man was killed.

Another case that occurred in Scotland

quite recently, is I think also instructive. A coal-cutting machine was working on a longwall face, and the usual flexible trailing cable connected its motor with a gate-end switch box. The trailing cable passed through a hole in the case of the motor, to the terminals of the coils inside. The hole in the motor should have been bushed with some insulating material, but the equivalent was done, a piece of rubber tube was slipped over the cable, where it passed through the hole. Rubber tubing unfortunately perishes, and this did so. The flexible trailing cable is also sometimes pulled rather tight. The result at any rate was, one of the conductors of the cable, I think it was a three-phase, came into connection with the case of the motor. The sharp edge of the hole in the case cut through the rubber tube, and the insulating envelop of the cable. The case of the motor and all that was connected with it, including the wire haulage rope, became alive, and when a laborer proceeded to take the haulage rope out ahead, for the next run, he received a shock which killed him.

ARMORED VERSUS UNARMORED CABLES

As indicated above, there is considerable difference of opinion even between experts, upon the question whether a cable should be armored or not. My own view is, that armor should only be used in special cases, and that the money spent upon armor, which is considerable, would be much better employed in giving greater thickness of insulation, and that the insulators might be protected, almost as well as by armor, by materials that are not conductors. The argument for armor is, that it protects from comparatively small falls, and that if the armor is driven through the insulation, on to the conductor, the fuse will blow and the conductor be made dead. Unfortunately there is a weak point in this argument. Assuming the armor to be earthed say at the pit bottom and the pit top, and that the armor remains intact everywhere, good protection is given in every way, because the armor itself being at the pressure of the earth, a man cannot get a shock by grasping it. This supposes, however, that the conductivity of the armor, right up to the face, is equal to carrying the whole of any leakage current that may pass through it, without appreciable charge upon the pressure. With well made cables, and well armored, this is usually insured. The weak point is, when falls occur, the cable and the armor are both parted.

With the three-core cables that are now commonly used for transmitting three-phase alternating currents, the jointing of the three cores is in itself a somewhat troublesome affair. It is necessary that the three joints shall be kept well apart, as the insulation of each individual joint cannot be made anything like as good as the original cable. Hence the length of the whole joint may be considerable. Then

comes the question of jointing the armor, or of bridging it over, and in such a manner that the point in the armor will not make an appreciable charge upon the pressure, if the armor becomes alive. This is very difficult indeed to insure.

Time for making joints is often very limited. The convenience for making joints is still more limited. A good deal is being done by using joint boxes, but they are heavy, and when, as in many collieries, falls are frequent, it would be difficult indeed to have a large number of them. Consequently the jointing of the armor is often not done, or done so badly, that the armor beyond the joint has very little connection with that between the joint and the pit bottom. The result is, that if connection is made between one of the conductors and the armor, beyond the joint, the armor is alive, and it is a greater danger than under ordinary conditions, because workmen would suppose that it was dead, whereas it would be alive, and if grasped, would kill.

TWO METHODS FOR AVOIDING THE LIABILITY OF SHOCK

Several methods are being arranged to overcome this difficulty. Two that were mentioned as being employed at a couple of the leading collieries in South Wales are worth mentioning. In one, where the roads are very long, some two miles from the pit bottom, good old wire ropes, of sufficient sectional area to carry the whole of any leakage current without appreciable charge upon the pressure, are laid by the side of the road, and are bonded to every joint box, and to the armor at frequent intervals. This, to my mind, which is carried out at Messrs. Nixon's Navigation Collieries at Mountain Ash, is the very best method that could be devised.

In another large colliery, galvanized strand wire, similar to that used for mechanical signals, is run along by the side of the cable and is connected to the armor at different points in the same way. In both cases the old wire rope and the galvanized strand are earthed at the pit bottom and pit top. This plan does not appear to me so good as the one with the old wire rope. One caution should be given, however, in connection with the use of old wire ropes. It is not so necessary with modern wire ropes as with some of the earlier forms. An old wire rope of the earlier form was a bundle of wires in short lengths, held together merely by the twist, and with often a quantity of rust between individual wires and sometimes a quantity of grease. Such a rope would have a very high electrical resistance, because the only conducting path would be from wire to wire, across the layer of rust or grease, there being an enormous number of such paths. In modern wire ropes, the wear is more even, particularly in the locked-coil and flattened-strand forms, so that an old wire rope would have fair con-

ductivity. I gather from Mr. Stone, the electrical engineer of Messrs. Nixon's Navigation collieries, that he was careful to obtain a good wire rope and that its electrical resistance was low.

THE USE OF WATER PIPES FOR EARTH CONNECTION

Another point that came up in the discussion was the question of the use of water pipes for earth connection. The general feeling was one of strong condemnation, though I understand that the method has been used in at least one large colliery, the precaution being taken to insure that the pipes used are always full of water. Water pipes do not make good conductors unless they are fairly large, and are constantly full of water. The reason is, a good watertight joint, between two lengths of pipes is often a bad electrical joint. Rubber is often used to insure obtaining a good watertight joint and even where rubber is not used, the electrical connection between two lengths of pipes is often bad. The great danger of the use of water pipes is, the possibility that one portion of the pipe may become alive, while it is supposed to be dead, another portion being dead, and that men who go to handle the live portion, for repairs say, under the impression that it is dead, may receive fatal shocks.

MEDIUM INSULATION VERSUS HIGH TENSION

Another point that was earnestly discussed at the meetings of the South Wales branch was the question of the pressure that should be employed. With the increasing distances over which power has to be transmitted in mines, and with the increasing amounts of power required at the end of the transmission line, either high tensions must be employed, or the cables must be large. At Nixon's Navigation collieries, where it is boasted that no accidents have taken place, high tension is employed for transmitting the power from the generating station to the neighborhood of each colliery, but nothing above 550 volts is employed in the pit. With the long roads at Nixon's collieries, the cables are necessarily large, but Mr. Stone, the electrical engineer, stated that he had worked out the question and that he had come to the conclusion that notwithstanding the increased size of cable, it was more economical to employ 550 volts pressure, than the higher pressures employed in other collieries. The higher pressures demand a considerably increased expenditure for higher insulation. The higher pressures also bring increased chances of shock, and taking all these things into consideration, he decided to adopt what is known by the home office, as medium pressure. At other collieries, pressures of 2000 and 3000 volts are employed, and they claim equal immunity, but it is

doubtful to my mind, if the claim can be substantiated.

THE MATERIAL USED FOR INSULATION

Rubber remains a favorite for insulation. It is the material which I certainly prefer, but there are two objections to the use of rubber. It is much more expensive than the other substances, and it is difficult to insure that you have good rubber. The rubber boom which has recently taken place is due entirely to the fact of the enormous demand for rubber produced by the automobile movement, with the pneumatic and other tires that are so universally employed, and the large demands made for it for the insulation of cables. There are two kinds of rubber, which may be broadly described as good and bad. The bad is tending to go out of the market, with the development of rubber plantations, and the putting on the market of large quantities of good rubber, but a few years ago the value of bad rubber, which came almost entirely from West Africa, was about one-fifth that of the good rubber, which came from South America, and was known as "para." The principal difference was really in the method of preparing the crude product. The natives of South America had carried out the practice for a considerable period, of preparing the crude rubber, the juice of the rubber tree, over a fire of nuts that grow in the district, the smoke of which killed a particular microbe that harbors in the rubber. If the microbe is not killed, the rubber when prepared for use in the factory, is more or less of a treacly mass, whereas the properly prepared rubber from the Amazon district, is in the hard form that everyone is familiar with, that can be cut by a knife. When worked up into insulating material for cables, however, there is no apparent difference between them, and there is no known test that will distinguish between a cable insulated with bad and with good rubber. The consequence is, that the English market was flooded with a large quantity of cable, at a low price, insulated with the inferior material, and the cables usually gave out in from a year to two years, while those insulated with good rubber would last for a great many years, except under special conditions. One hears very little of bad rubber now, but good rubber has increased enormously in price. Even after the boom has passed, the price still remains about double that which ruled when I made my inquiry into the whole question.

RUBBER IS INJURED BY DAMPNESS

Rubber also does not behave well in the presence of wet, nor of oil. The gums of which rubber is composed, oxidize freely in the presence of moisture. Good rubber, however, and with cables having a good thickness of pure and vulcanized rubber, the whole vul-

canized together, so as to form one continuous sheath, forms even now the very best insulator that can be had. In my opinion, the rubber covering should be thick. Cables which I put into shafts in Monmouthshire 11 years ago, having a radial thickness of $\frac{1}{8}$ in., I was informed the other day, are still in use, and doing their work well.

Bitumen has very largely taken the place of rubber, though its insulation resistance is much lower than that of rubber, from $\frac{1}{10}$ to $\frac{1}{20}$ the insulation. The manufacture of bitumen, and the method of placing it upon the conductor has been enormously improved during the last 20 years, with the result that it has been largely employed in mines. One great danger attendant on its use is, the possibility of its softening, in case a large current passes through the conductor it is protecting, the conductor then usually becoming decentralized, and the insulation resistance, and the resistance to sparking on the side to which the conductor has moved, being considerably reduced.

A form of bitumen insulation known as "dialite" was introduced some years ago, and I understand has done very well, though one hears little of it now. The melting point of dialite is much higher than that of ordinary vulcanized bitumen, and it is less liable to oxidation in wet situations.

PAPER COVERED CABLES

Paper-covered cables have also been introduced to a considerable extent in mines, principally for three-phase high-tension services. The insulating envelop of a cable has to perform two offices. It must prevent the egress of current in the form of leakage, and it must also prevent the passage of a spark between the conductor, and any other conductor in its neighborhood. Sparks tend to pass between the three conductors of a three-colored cable for instance, and from each conductor to the lead covering, or to the armor. The oil impregnated paper used in paper-covered cables offers a high resistance to sparking, higher than either rubber or bitumen, and hence it is of great value for high-tension services. Pressures of 2000 and 3000 volts are now quite common in British mines, and there are cases where 5000 and 6000 volts are employed. With alternating currents, a pressure of 6000 volts means a sparking pressure of 16,800 volts, under ordinary conditions, and a probable sparking pressure, when changes take place in the circuit, as when a large machine is switched off, that may be as great as 30,000 volts. Hence the resistance to sparking is of great importance. If once a spark passes from core to core, or more, from core to lead sheath or armor, considerable danger to life may result.

The weak point of paper-covered cables

is the fact that if only a pin hole is made in the lead covering, the moisture that enters may break down the whole of the insulation of the cable. It is necessary in fact to provide the ends of paper-covered cables with caps, to exclude the moisture that would enter and creep up the cable. The material used for insulation of cables has an important bearing upon the matter of shock, because a large number of the shocks that have taken place can be traced to a breakdown of insulation at some part of the system, followed by a connection between live conductors, and some of the metals used about the mine for other purposes.

THE EFFECTS OF THE SHOCK ITSELF

One of the most important results of the discussion we had at the South Wales Branch of the Institution of Mining Electrical Engineers was, the experience given by different members, who had either received shocks themselves, or who had witnessed the results of shocks upon others, as to the effects of the shock. There has been a common impression among electrical men generally, and probably the impression is widespread, that if a man receives a shock, and is not killed, he suffers very little afterward. The common idea has been, that a man might be knocked down by a shock, and get up and go away and be all right; that he might even be rendered unconscious for a time, but when brought to, he would again be all right.

The experiences given at our discussions showed how very erroneous this idea is. One case that illustrates the matter very forcibly was related by Mr. Stone, of Nixon's Navigation collieries. He was watching an alternator being tested, the pressure was 440 volts. A workman had left a bit of waste on one of the terminals, and without thinking, Mr. Stone took hold of the waste to remove it. As he expressed it, before he realized what he had done, he was lying on his back in a corner of the engine house, having been thrown there by the shock, and having struck his head a violent blow. He got up, however, and apparently felt no worse. He went home, and a little later he was taken violently sick and had to stay in bed three days. He could not keep anything down for that time, and as he expressed it, when he got up he felt as if he had had a bout with a prize fighter. Every muscle ached. He felt the effects for some time afterward.

ANOTHER CASE OF SHOCK

Another case was related by the manager of another colliery. His son had charge of the electrical appliances, and was attending to a transformer that was placed some distance above the ground, and had to be reached by a ladder. No one knew how the accident occurred, but they found him lying at the foot of the ladder unconscious. Evidently he had

touched some portion of the apparatus that was alive, and had received a shock. They worked over him for a long time, using the ordinary methods for resuscitation, similar to those employed on persons that are apparently drowned, before obtaining any result. Finally a slight return to consciousness was obtained, and his father managed to get him to take some warm liquid. This apparently caused him to vomit, and to regain consciousness for a short time. He asked his father how it came about, and then immediately went off to sleep. He slept for a considerable time, and when he awoke had no recollection of anything that had happened. During consciousness he told his father that something hit him a violent blow.

AN UNUSUAL ACCIDENT

A case which I investigated a few years ago, not at a mine, but in which the workman of an iron works was killed, may be of interest. The accident occurred at a music hall in Attercliffe, a suburb of Sheffield, largely inhabited by workmen. The music hall was fitted with electric lights, alternating current, at 200 volts. There was a bracket carrying a lamp fixed upon a wall in the lavatory. Two men who were engaged at Vickers Sons & Maxims, in connection with the electrical plant (they were practically electrical laborers, with very little knowledge of electricity) happened to go into the lavatory of the music hall, and one of them made a grab at the lamp bracket. The wires supplying the lamp were carried inside of the tube forming the bracket, and the man pulling the bracket down, must have caused the edge of the tube to cut through the insulation of the wire. The result was that the bracket itself became alive, and the man received a shock which caused the muscles of his hand to contract, and he was not able to let go. His friend tried to pull him off and himself received a shock. He succeeded, however, in pulling him down, but brought his head violently on to the concrete with which the lavatory was floored. The man died, but there was no post-mortem examination, and practically no effort to see what the actual cause was. I happened to be in Sheffield at the time, and investigated the matter at the music hall. I also communicated with the coroner. The impression I formed at the time was that the man was killed, not by electric shock, but by concussion of the brain produced by the violent fall. I mention this matter because it appears to me that the secondary effects of a shock are often of even more consequence than the primary. In a mine a man may receive a shock which throws him in the way of moving machinery, say under a moving tram, or something of that kind. I understand that rather a large number of accidents have been caused in this way.

i PERSONAL i

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. E. Race, formerly of Rossland, B. C., is now in Mexico.

James W. Abbott, of Pioche, Nev., has been in Los Angeles.

J. K. Turner, of Goldfield, Nev., has been visiting the mines at Ely.

Irving E. Slater, of Los Angeles, Cal., is on a visit to British Columbia.

Hector McRae, of Los Angeles, Cal., has gone to the state of Chiapas, Mexico.

A. D. Myers recently returned to Los Angeles, Cal., from a trip to Nevada and Utah.

Colonel John Carson has returned to Montreal after a three-months visit to Europe.

B. F. Fackenthal, Jr., has been re-elected president of the Thomas Iron Company.

K. C. Parrish has returned from Columbia, South America and will be until Nov. 1 at Des Moines, Iowa.

P. A. Alig, mining engineer, of Honda, Colombia, is stopping at the Hotel Breslin, New York, for a few weeks.

Charles C. Brackin recently returned to Los Angeles, Cal., from New Mexico, where he made several examinations.

Desaix B. Myers, of Los Angeles, Cal., will be in Philadelphia Oct. 1 to Oct. 15, and will return about Oct. 22 to Los Angeles.

C. McK. Campbell, mining engineer at the Granby mines, Phoenix, has returned to British Columbia from a holiday visit to Montreal.

L. W. Haselman has been appointed controller of the Lackawanna Steel Company, Buffalo, N. Y., in place of Marshall Lapham, resigned.

Samuel Lewisohn has been elected a director of the Kerr Lake Mining Company, Cobalt, Ont., in place of B. B. Lawrence, retired.

William H. Radford, who has been in Siberia for several months, is on his way home, and is expected in San Francisco about the middle of October.

E. C. Felton, president of the Pennsylvania Steel Company, has returned to Philadelphia after a vacation of several weeks spent in Massachusetts.

T. N. Keeler, of Chicago, recently visited Birmingham, Ala., to inspect property in the Warrior coalfield, recently purchased by a Chicago syndicate.

A. R. Reiche, president of the Orenstein-Arthur Koppel Company, Pittsburg, sailed from New York for Germany, Sept. 17, expecting to be absent several months.

G. H. Jones, vice-president of the Inland Steel Company, Chicago, has returned from a visit to his old home in England and a short tour of the Continent.

John Markle, a well known independent anthracite operator, has returned to this country from Europe, where he has been under treatment for an affection of the eyes.

A. Fournier, Kaslo, B. C., manager for the Selkirk Mines, Ltd., has lately, after some delay, received from France the Medal of Merit for 10 years' distinguished service in the French army.

James M. Platt, who has been at Mina el Refugio, in the State of San Luis Potosi for the past five months, has returned to Los Arcos, State of Mexico, to take charge of the Arcos mining operations at Sultepec and Zacualpam.

W. G. Ireland, formerly chief chemist and manager of the foundry department of Gulick-Henderson & Co., Pittsburg, is now connected with the Jamison Coal and Coke Company, Pittsburg. J. F. Esperon succeeds Mr. Ireland in his old position.

L. F. Loree, president of the Delaware & Hudson Company, has been elected a director of the New York, Ontario & Western Railroad Company. This election has given rise to reports of some agreement between these two anthracite roads.

W. H. Woodward, Birmingham, Ala., has been chosen president of the Warrior Coal and Fuel Company, in place of Walter Moore, resigned. C. E. Morgan has been chosen secretary and treasurer of the company, to succeed Charles Simmons.

C. S. Stevenson, formerly assistant in mining engineering at Ohio State University, and for the past year with the Tennessee Coal, Iron and Railroad Company at Birmingham, Ala., has been appointed instructor in mining engineering at the University of Illinois.

S. H. P. Pell, secretary of the International Nickel Company, has resigned and has been succeeded by James L. Ashley, who is now both secretary and treasurer. S. S. Jordan, formerly with the Orford Copper Company, has been named assistant secretary of the International company.

Carl Scholz, president of the Rock Island Coal Company, started from Chicago last week on a trip which will take in the leading coal mines of Europe. He goes on a special mission, as an engineering expert, to study the general safety of mines. Mr. Scholz was requested to undertake this work by Dr. J. A. Holmes, chief of the Bureau of Mines. The study of Mr. Scholz in mines abroad will include methods of preventing and fighting mine fires, but will extend beyond that to a general consideration of the safety of mines.

+ OBITUARY +

George Poole, president of the Poole Engineering and Machine Company, Baltimore, died Sept. 23, at Hartford, Conn., where he had been for the purpose of recuperating from a nervous breakdown. He was 54 years old. He succeeded his father, Robert Poole, deceased, as president of the Robert Poole & Son Company, changing the name of the concern. Robert Poole & Son Company was the successor of the firm of Poole & Hunt, who were noted for the manufacture of special machinery, including mining and smelting machinery.

SOCIETIES and TECHNICAL SCHOOLS

Eastern Oregon Mining Congress—A meeting of mining men and others interested in local mining will be held in Sumter, Oregon, Oct. 20 and 21. A large local attendance is expected, and it is hoped to secure an outside attendance also; the object being to call general attention to the possibilities of the mining region of eastern Oregon.

Pennsylvania State College—In the School of Mines of Pennsylvania State College the following appointments have been made: H. D. Pallister, formerly mining engineer with the Chisos Mining Company, Terlingua, Tex., and later instructor in mathematics, Case School of Appliance Science, has been appointed instructor in metallurgy; Victor Ziegler, of Iowa University and Columbia University, instructor in geology and mineralogy.

American Iron and Steel Institute—Referring to the visit of the American Iron and Steel Institute to Pittsburg, Oct. 20 and 21, a committee of arrangements has been appointed, consisting of W. L. King, vice president of the Jones & Laughlin Steel Company, chairman; A. C. Dinkey, president of the Carnegie Steel Company, and T. W. Guthrie, president of the Republic Iron and Steel Company. This committee has appointed a subcommittee, which will have in charge the preparation of the program. It is proposed to have an excursion up the Monongahela river, and also to visit a number of the leading manufacturing plants.

At the opening meeting in New York there will be four speakers: W. B. Dickson, first vice-president of the United States Steel Corporation, who will discuss economic labor conditions in the iron and steel industry, with special application to the seven-day week; James A. Farrell, president of the United States Steel Exports Company, on "Foreign Relations;" Willis L. King, vice-president of the Jones & Laughlin Steel Company, on "Contract Obligations;" and Charles Kirchoff, on "The International Metallurgical Congress at Düsseldorf"



EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on
Important Events From Many Important
Mining Centers of the World

San Francisco

Oct. 1.—In April, 1910, the Government notified the Bully Hill Copper and Smelting Company that its smelting operations must cease on July 1, or injunction would be sought, because the smoke was damaging the timber in the National forests. As the company could not possibly install a smoke-consuming device in that period of time, when the fixed date arrived smelting operations ceased, after having been carried on for about 10 years. About 400 men were thrown out of work, but it was supposed the company would eventually put in a baghouse and resume smelting. Now, however, it seems that the company has decided not to attempt to operate its smeltery again and is pulling up the tracks, removing machinery and curtailing its mining operations almost to the point of entire stoppage. It was thought that ore from the Bully Hill mines, at Winthrop, would be shipped to the Balaklala company, at Coram, but the Farmer's Protective Association of Shasta County has shut that plant down until the Cottrell process plant is completed, and this will take several months. Negotiations were carried on also with the Mammoth company, at Kennett, with regard to smelting ore from Bully Hill, but the parties did not agree as to terms. The Mammoth company has its baghouse in operation and continues smelting. It may be that the Bully Hill company has finally arranged to have the Mammoth company handle its ores, but nothing definite is ascertainable at this time on this point. Letters from employees at the mine, however, indicate a general stoppage of operations. The closing of the smelteries has had a disastrous effect on mining in Shasta county, as hundreds of small mines heretofore furnishing fluxing ores, now have no market for their ores and have no reduction plants of their own. The copper output of the State is greatly restricted as well as that of silver, as most of the California silver is derived from copper-smelting operations. Several hundred thousand dollars a year in gold are derived also from the smelting operations in the county and the amount will be greatly lessened this year.

Experiments are being made at the North Star mines in Grass Valley with sets of concrete "timbers." Fifty sets have been ordered by Superintendent Foote to replace old timbers in the shafts and drifts. These sets will be made at the mine, allowed to dry 30 days, and will then be wedged into place the same as

any ordinary timbers. The third dividend of 4 per cent. on the capital stock of the North Star has been declared, making 12 per cent., or \$300,000, which the stockholders have received this year. Another dividend of 11 per cent. is expected about Christmas, or 23 per cent. in all, which was the sum disbursed in dividends last year. The mine continues to be highly productive.

In Sierra county work has been going on at the Brandy City mines for the last three years, and the preliminaries are now almost completed after an expenditure of over a quarter of a million dollars, under supervision of George F. Taylor. The properties are 16 miles north of Camptonville and will be among the few permitted to mine by hydraulic system along the famous Big Blue gravel channel. The operation of the laws stopped hydraulic mining around Brandy City long since, and little has been done for 20 years until lately. In this new enterprise the water system comprises three ditches, the company owning the water in Cherokee and Cañon creeks. One ditch is 9 miles long and carries 2000 in.; another 5 miles long, carrying 800 in.; and the third $3\frac{1}{2}$ miles, carrying 500 in. The main flume is 4 ft. wide and 3 ft. deep and delivers water at the mine under a 240-ft. head. The main pipe line is 2500 ft. long and the pipe is 22 in. in diameter. The mine is equipped with six 15-in. monitors. About 1600 yd. of gravel per day will be moved. The bank of gravel is 240 ft. high. The company has provided storage for tailings or debris in worked-out mines, the capacity being about 7,000,000 cu.yd. The flume to one of the pits is 6000 ft. long, part of it passing through a bedrock cut 1200 ft. long. The mine has a hydraulic power plant which will be completed Nov. 1.

Denver

Oct. 2.—It now appears as though the Northern Colorado Coal Operators' Association had won against the United Mine Workers of America. The president of the latter, T. L. Lewis, proposed a conference between the former and the miners, with the object of establishing a wage agreement for two years. The answer of the operators is signed by F. F. Struby, president of the Northern Coal and Coke Company, and others, and is in part as follows:

"The operators of the northern Colorado coalfields are satisfied with existing conditions, which have been forced upon

us by the actions and demands authorized by the Cincinnati and other conventions held by your association, and under no circumstances will we enter into negotiations with the United Mine Workers of America, either through your national organization or the Colorado district officers. We are paying our present employees the former wage scale, and we suggest that you recommend your members now out of employment to apply for work before our mines are fully equipped, as in the very near future we will have no places for any of your members. The operators will treat with the men as individuals and not as members of your association. We will, however, give a preference to our former employees who are capable and desirable."

The United States Reduction and Refining Company has this week made its second cut in ore-treatment charges in the Cripple Creek district, and it goes from \$1 to \$1.50 per ton below former rates. The new rates covering freight and treatment charges are as follows: Ore up to \$10 a ton, \$4; from \$10 to \$15, \$4.50; from \$15 to \$20, \$5; from \$20 to \$25, \$5.50; from \$25 to \$30, \$6; from \$30 to \$40, \$6.50; from \$40 to \$60, \$7; from \$60 to \$100, \$8; from \$100 to \$150, \$9; from \$150 to \$200, \$10.

Butte

Oct. 1.—The Tuolumne company has recently filed its answer in the suit brought against it by the North Butte company. A general denial is made of the allegation that the defendant company has extracted any ore belonging to the plaintiff and a counter accusation is made that the North Butte has taken Tuolumne ore and an accounting is asked for. The answer sets up that owing to laches, the plaintiff is barred from asserting any title to the so called "compromise strip," which is a small fraction of ground lying along the border of the Tuolumne ground. It is further stated that in 1901 one Patrick Meagher owned an undivided one-fourth interest in said strip and that it was his intent to deed the whole of his interest to Edward Hickey, now president of Tuolumne, but by a mutual mistake the deed merely conveyed one-quarter of Meagher's interest. It is stated that John Moroney, who bought from Meagher the interest which the North Butte company now claims to own, might, in the exercise of reasonable diligence, have ascertained the true state of affairs, and asks that the deed be corrected to show the true interest transferred.

The Hudson Bay & Pacific railway will construct a line from Hudson Bay to Helena, Mont., and it is stated that work will be begun at once. The fact that the line will connect with the Great Northern suggests the possibility that President Hill and his associates are behind the new line.

Salt Lake City

Oct. 1—Negotiations have been under way for some time between the Utah Copper and the Bingham Mines company, and have resulted in an agreement whereby Copper Center gulch will be used as a dumping ground for Utah Copper overburden. Copper Center gulch is a convenient dumping ground, and will accommodate a large amount of waste. The surface equipment at the Bingham Mines Company Commercial mine, consisting of 12 buildings, has been removed to the mouth of the Niagara tunnel, owned by the United States Smelting, Refining and Mining Company. The work of removal began Sept. 15. The Bingham Mines Company will be obliged to abandon the use of the lower Commercial tunnel, and according to arrangements made with the United States company, will work through the Niagara tunnel, which extends near to the Commercial side lines. It will be necessary to drive the tunnel about 300 ft. to get under the Commercial workings, which will give an additional depth of 200 ft., and about 500 ft. on the dip of the orebodies. This will obviate the necessity of pumping water and hoisting. While the tunnel is being extended, shipments will be stopped. When the Niagara tunnel is in working shape, arrangements will probably be made for the handling of ores of the Silver Shield mine. The Utah Copper will soon begin dumping its overburden into Copper Center gulch. Additional shovels will be added shortly in removing waste from the Boston Consolidated side.

An effort is being made to arrange a good exhibit of ores and minerals of the State for the Utah State fair, which is held in October. A special building has been provided for the purpose. Fifteen cases of Utah ores and specimens that were at the Alaska-Yukon-Pacific Exposition will be used as a nucleus for the exhibit. Mining men and companies have been asked to see that ores for their properties are represented. So far the response has been more than good. There will also be an exhibit of mine safety appliances.

The Snake Creek tunnel in Summit county has been driven over 1200 ft. since the middle of May. The gasoline locomotive for hauling waste has arrived and been placed in commission. Sixteen-inch galvanized-iron ventilating pipe has been put in place on the floor of the tunnel to one side of the track. On the opposite side is a 4-in. air-pipe. The ven-

tilating pipe clears out smoke from a round of shots within 30 min. Two shifts only have been worked recently, on account of the delay in delivery of the pipe and locomotive. A third shift was put on Sept. 19. All the equipment necessary to carry the tunnel through to its objective point underneath the mines of Park City is now on hand, and rapid tunnel driving is expected.

Indianapolis

Oct. 1—The attorney-general of Indiana has given an opinion to State geologist W. S. Blatchley in which he holds that an original grantee of a mineral lease may transfer his rights to a third party, including a foreign corporation, before he has proved the finding of the mineral, providing the foreign corporation has complied with the foreign-corporation law permitting it to do business in Indiana.

Cobalt

Oct. 2—D. Lorne McGibbon, president of the La Rose Consolidated, states that the proposed merger of the principal Cobalt properties is now more remote than it was a few months ago. This is largely due to the better condition of the La Rose, which has been showing a marked improvement in the No. 3 vein of the original workings, and also in the Princess and Lawson claims. Personally, Mr. McGibbon believes in awaiting further developments, although he realizes the beneficial effects that would accrue from the merger. Although no change has been made in the dividend rate of this company, it is known that the annual report, shortly to be issued, will show greatly improved conditions.

Another sensational discovery has lately been made in the Porcupine on the claims owned by D. Lorne McGibbon and Frank C. Armstrong. The find was made about 150 ft. from the boundary line of the Crown Chartered Company, and the surface showings are stated to be even more spectacular than those of the Dome and Timmins properties. Only assessment work is so far being done on the properties, but a plant will be installed this winter. The opinion is steadily growing that Porcupine will be a permanent camp, and that it shows every promise of a remarkable future. Unlike the other boom camps of northern Ontario, it is entirely free from wildcatting, and the principal properties are in the hands of men who are abundantly able to finance them.

Toronto

Oct. 2—Prof. M. B. Baker, of Queen's University, Kingston, who was commissioned by the Ontario Bureau of Mines to investigate the recently discovered lignite deposits along the Metagami river in northern Ontario, has returned. He reports that the deposit is a poor grade of lignite, much broken and folded, and non-

continuous, the occurrence being in the loose accumulation of gravel, sand and clay, and not in solid rock foundation. It has therefore suffered insufficient pressure to produce a real coal, even of poor quality, and is only a loose lignite. Speaking of the iron-ore deposits at Grand Rapids on the Metagami, Professor Baker states that the ore is of excellent quality, free from sulphur and with only the smallest traces of phosphorus. It is found on both banks and across the whole river bed.

The party sent out by the Quebec Provincial Government to explore the Lake Chibogamon country has returned to Quebec after an absence of 3½ months. The party included Professor Gwillim, of Queen's University, Kingston; Prof. A. C. Barlow, of McGill University, Montreal; E. R. Faribault, of the Canadian Geological Survey and J. H. Valiquette, engineer of the Quebec Department of Mines. They brought back with them a large number of valuable mineral specimens, which will be at once assayed and analyzed by Professors Gwillim and Barlow. The explorers, while stating generally that the mineralization of many rocks in the area is apparently rich, do not care to express any definite opinions as to the economic value of the country until proper tests of the ores have been made.

Mexico City

Oct. 1—Official data just available for the 11 months to May 31, 1910, show imports of metals and minerals of 50,692,461 pesos as compared with the same period for the previous fiscal year 40,620,821 pesos. These imports are divided as follows, the 1910-11 period being given first: gold, silver and platinum, 3,024,773 pesos, 1,240,121 pesos; copper and copper alloys, 4,709,921 pesos, 4,623,794 pesos; tin, lead and zinc, 957,979 pesos, 1,031,217 pesos; iron and steel, 24,782,051 pesos, 18,593,362 pesos; other metals, 134,349 pesos, 170,027 pesos; stone and earth products, including glass and pottery, 17,083,386 pesos, 14,962,298 pesos.

The mineral and metal exports for the 11 months of the 1910-11 fiscal year were 139,308,538 pesos as compared with 132,938,893 pesos for the previous corresponding period. This is detailed as follows with the 1910-11 period given first: total gold, including coined and bullion, 35,887,487 pesos, 37,237,263 pesos; total silver, including coined and bullion, 69,473,931 pesos, 67,775,371 pesos; antimony, 2,021,737 pesos, 1,905,870 pesos; asphalt, 135,263 pesos, 552,333 pesos; copper, 23,562,904 pesos, 17,905,107 pesos; rough marble, 69,991 pesos, 81,788 pesos; plumbago, 61,630 pesos, 40,586 pesos; lead, 6,160,878 pesos, 5,879,419 pesos; zinc, 1,028,727 pesos, 915,200 pesos; other mineral products, 905,989 pesos, 645,955 pesos.



THE MINING NEWS

Reports of New Enterprises, New Machinery,
Installations, Development Work and Property
Transfers The Current History of Mining

Alaska

The gold so far received by the assay office in Seattle from the Haiditarod mining district is \$220,000. Other shipments will be made.

Golden Gate—The returns of a recent 20-day run of the stamp mill on this property, on Chicagoff, were \$4000. New machinery will be installed. Joseph Simmons, Sitka, is president.

Berner Bay—This property has been sold to Boston capitalists. Bert Thane, superintendent of the Eagle River company, is the representative. Improvements will be made.

Ebner—Work on this property, near Juneau, will be started. The company is considering the installation of new machinery.

Alaska-Mexican—For the month ended Aug. 15, the mill crushed 20,412 tons, yielding \$70,426 at an operating net profit of \$38,539. The yield per ton was \$3.45.

Alabama

The coal lands and mine owned by the Warrior Coal and Coke Company, were sold Sept. 24 under foreclosure and were bought by the Linton Coal Company, which intends to work the mine. The bonds include 6000 acres in Jefferson and Blount counties

Arizona

COCHISE COUNTY

Shattuck-Arizona—The annual report of the company shows total receipts for the year to Aug. 31, \$1,560,467, and net profit \$757,782, out of which dividends of \$350,000 were paid. President Bardon says: "The property is equipped in first-class modern manner to handle 1200 tons of ore per day whenever the market warrants. We have five miles of underground work and over 800,000 tons of oxide and sulphide ores shown up, with a small area of our zone developed."

GILA COUNTY

Superior & Globe—The churn drill on the 660-ft. level of the shaft is operating at 280 ft. below that level or about 950 ft. from the surface. The average progress made since the operation of the drill is 6 ft. a day.

Superior & Boston—The McGaw shaft is 870 ft. from the surface and in quartzite. The limestone formation left the shaft below the eighth level.

Arizona-Michigan—The winze on the 500-ft. level of the Telfair crosscut is down 70 ft. in vein matter.

MOHAVE COUNTY

Golconda—The first section of the mill with a capacity of 40 tons per day has been completed. Work has been started on the second section of the mill and 80 tons per day will be handled by Nov. 1. In the meantime shipping is continuing steadily at the rate of 600 tons of 48 per cent. zinc ore per month. The Golconda has shipped 17,000 tons of ore, netting about \$275,000 above freight and smelting charges.

Tub—In this mine, development has been stopped pending the erection of a large mill. The ore is copper pyrite with zinc sulphide, from which the zinc can be extracted only by magnetic separators.

Gold Road—Drifting east from shaft No. 2 on the 500-ft. level has disclosed another oreshoot with about 7 ft. of good milling ore.

Tom Reed—The 10 stamps are crushing about 45 tons per day, averaging a little over \$40 per ton. The stamps of the old mill will be moved to the new mill.

Ruth—At this mine a plant similar to that of the Gold Road will probably be erected.

PIMA COUNTY

Ajo—These mines have been leased by the Rendall Ore Reduction Company to M. G. Levy and Samuel L. Clark who will operate the mines and erect a reduction plant.

YAVAPAI COUNTY

Arizona Mines Company—These mines in the Bradshaw mountains are developing a copper-gold vein. David E. Dow is president. He says: "Several properties in the immediate vicinity are preparing to start up full time again, particularly the Bisbee Belle, Golden Eagle and Brooks Brothers, and it is estimated that over half a million dollars will be put into new equipment within the next six months in this range alone."

California

AMADOR COUNTY

Central Eureka—The main vein in this Sutter Creek mine was cut on the 2800 level recently. It is supposed to be a continuation of the vein opened in the South Eureka.

BUTTE COUNTY

Mammoth Channel—The work of taking out gravel from the channel will be commenced as soon as the electric power line destroyed by fire is rebuilt. New pumps have been installed.

CALAVERAS COUNTY

Kenross—This mine, owned by the Calaveras Mining and Development company, at Whisky slide near Mokelumne hill, is being opened under management of Mr. Hitchens who has succeeded G. W. Kirkley.

Newman—From this mine at West Point, high-grade ore is being shipped to San Francisco. Second-grade ore is being milled.

Alpha-Derrer—This group of claims on the Rock Creek slope of Bald mountain is being developed by W. A. Derrer, of Los Angeles, and the tunnel is in 300 feet.

NEVADA COUNTY

Birchville and Wisconsin—The parties holding bonds on these mines at Graniteville have decided to rebuild the burned mill and shafthouses at once. John A. Bunting, of Oakland, is the leading owner.

Andy Fitz—The installing the machinery at this mine, Moore's Flat, is completed, and operations will be resumed on a large scale.

North Star—This company at Grass Valley has purchased the Pratt and Duquesne claims.

PLACER COUNTY

Big Oak—This mine will be reopened by S. D. Valentine, of San Francisco, and a shaft is to be sunk to tap the vein.

SHASTA COUNTY

Afterthought—In this mine near Ingot, owned by the Great Western Gold Company, a body of copper ore has been found on the 500 level. The mine is being worked at a depth of 600 ft. S. W. Bretherton is general manager.

SIERRA COUNTY

Hayes—This mine at Sierra City has been bonded to S. W. Van Syckel, of Newark, N. J., and William Barker has been placed in charge. Compressor and drills will be put in. A 20-stamp mill is on the ground. The Essex Mining Company has been formed to carry on the operations.

Keystone—The mill at this mine, Sierra City, will be ready for operation by the middle of October.

SISKIYOU COUNTY

Keating—The Siskiyou Syndicate is grading for a mill for this mine, at Etna.

Highland and Diamond—These properties at Etna have been sold to a company of Holland capitalists and an electric power plant will be installed.

Black Bear—This mine, in Liberty district, is being reopened by a new company of which E. W. Varnum is superintendent. During the periods when this mine was worked by John Daggett and by the English company it yielded about \$3,000,000. Flumes have been put in to bring water for power, and machine drills supplied. Electric power will be used later. A new mill will be provided in the spring.

Highland—This mine, owned by J. M. Tetherow, of Etna Mills, has been sold for about \$200,000 to M. Mattern, of Ashland, Oregon.

STANISLAUS COUNTY

Durgan-Dodsworth—This company, of Jamestown, is opening the Chalino mine, near La Grange.

TRINITY COUNTY

Bonanza King—The receiver of the California Trust and Savings Bank has decided to reopen this mine at Trinity Center and resume milling at the 20-stamp mill. A new power plant will be installed. Joseph H. Porter is superintendent.

TUOLUMNE COUNTY

Nevills Investment Company—This company which has acquired the Rawhide and App mines, has also purchased from Capt. W. A. Nevills and wife, the Big Oak flat. J. L. Chaddock is president.

Ham & Birney—This mine at Five Mile creek near Columbia is about to be started under management of J. H. Alling.

Tuolumne Consolidated—This company at Phoenix Lake is preparing to put in a pipe line to take oil from tank cars for fuel.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Denver Mining and Reduction Company—This company is constructing a new concentrating plant at Black Hawk, capacity, 100 tons per day. It will be in operation in two months.

Mitchell Mining and Leasing Company—This company, composed of Central City men, has taken a lease and bond on the Mitchell mine, on Quartz hill, and has equipped it with a new hoist and shaft-house, and is working two shifts, with a good force. The company is said to be mining high-grade gold ore from a crevice 3 to 4 ft. in width. The smelting ore struck is 1 ft. wide, and yields \$30 per ton. This company has leased the Randolph mill, at Black Hawk, where the mill ore is being traced.

LA PLATA COUNTY

The Lucky Moon, Neglected, Incas and Tomahawk are shipping, and extensive development is in progress on the Columbus-Snowstorm. The Doyle properties over the line in Montezuma county are active. All of these are near Hesperus.

Idaho—This mine is shipping six or

seven cars of telluride ore per week to Durango which average \$7000 per car. The property is north of Hesperus, about 10 miles west of Durango, and is owned by the Valley View Mining Company. W. A. Stewart manager.

May Day—This property across the gulch from the Idaho is shipping. A. E. Reynolds, of Denver, is the principal owner.

LEADVILLE—LAKE COUNTY

Garibaldi—In this mine, on Ball mountain, the discovery is reported of a 6-ft. vein running 2 oz. gold and several hundred ounces silver per ton. Frank Eric, a lessee, has just shipped 100 tons of high-grade ore to the smeltery.

SAN JUAN DISTRICT

Camp Bird—The August crushing was 6813 tons, yielding \$210,487. The net mine earnings was \$151,771.

Bright Diamond—The cave was broken into in this mine, in the quartzite north of Ouray about a month ago, has yielded 225 tons, and it is stated that the net smeltery returns show \$100 per ton gold, so that \$22,500 has been extracted from this "vugh."

TELLER COUNTY—CRIPPLE CREEK

Golden Cycle—It is reported that the sale of the properties, to the Consolidated Goldfields of London and South Africa, for \$7,000,000, is definitely off. It appears that the big mill and some coal mines were tacked to the gold mines, and the London crowd did not want the latter at the price asked.

Idaho

LEHMI COUNTY

The Pittsburg & Gilmore railroad has been completed from Armsted, Mont., to Salmon, Idaho. A spur from Leadore, Idaho, is nearly completed to Gilmore, where are the Latest Out, Gilmore, and other smaller mines. The Latest Out mine shipped about 700 tons and the Gilmore about 800 tons of lead-silver ores during August.

Dark Horse—This company, operating 18 miles east of Salmon, is driving a tunnel through the main boundary range. Ore will be brought through it to the Idaho side and shipments made over the Pittsburg & Gilmore road.

Yellow Jacket—This mine, in the southwestern part of Lehmi county, is working 12 or 15 men retimbering the tunnels and putting the 60-stamp mill in shape.

Kansas

Empire—This company, A. O. Ihlseng, Joplin, manager, will build a 600-ton mill on the Murphy land at Galena. The ground has been partly drained, but the operators will install two large Texas centrifugal pumps and drain the ground to 200 feet.

Eureka—This mine, at Galena, Robert

Ping, manager, will make its initial "turnin" this week. The mine is operating in the Kinderhook lime below the sheet-ground formation.

Minnesota

COPPER

Houghton Copper—A concrete collar is being put in the shaft which is down 30 ft. It will go down in the footwall of the lode and the first opening to the formation is to be determined by conditions. It is planned to use electric power and an order is to be placed for a hoisting and compressor equipment.

Union—This company has completed its first drill hole after passing through the Allouez conglomerate lode but the cores show no copper.

Winona—No. 4 shaft is sinking below the 14th level and at this level the cross-cut entered the lode and found it well mineralized.

Contact—This company has started the third drill hole on section 13, which will complete the exploratory work in this section. The two previous holes encountered sandstone without mineral.

IRON

North Lake—This Cleveland-Cliffs mine has shipped its first train of ore. Development will be carried on all water preparatory for regular output next year.

Volunteer—This iron mine at Palmer lake has developed a large body of ore and will ship this season.

Iron Mountain—The Jones and Laughlin Steel Company is again testing this property, in the Ishpeming district. An exploratory shaft was put down to 90 ft. seven years ago. The shaft encountered an ore assaying only 35 per cent. in iron. It is the belief that ore of much better grade lies at depth.

Missouri

Melrose—This company, which has bought the Scholl prospect at Duenweg, has bought the Big Chief mill at Quapaw, and will move it to the lease. Wilbur Squires, of Joplin, is manager.

Mo-Ark-Nemo—This large sheet-ground mine, north of Webb City, has resumed operations.

Empire—This company, which bought a 52-acre fee in the West Joplin sheet-ground district, has decided to build a 300-ton mill. The ore is 20 ft. thick and found at 170 ft. Daniel Dwyer, of Joplin, is manager.

Fortune Teller—This company, at Granby, has made the largest shipment of calamine ore made in the district for many months. Six hundred tons of ore were sold on a \$27 base and one car brought over \$37 per ton.

Puxico Iron Company—A. J. Meyer, secretary and treasurer, Puxico, makes the following statement: "We have

taken over the holdings of the Big Muddy Coal and Iron Company in Iron county, on a long lease. This property comprises 25,000 to 26,000 acres, and embraces Pilot Knob, Shepherds, Cedar Hills, Shut in and Tip Top. There has already been 1,500,000 tons of specular ore taken from Pilot Knob. Work was abandoned during 1892, and never resumed. The dumps contain quantities of excellent ore, and the mines themselves contain large veins that have never been operated. The surface ore has never been largely worked. We are at present shipping hydraulic machinery for working these deposits, and will follow this up with a plan to operate the mines and dumps. We will likely install a compressed-air plant to operate drills, with electrical equipment. We have under consideration the enlargement of our water supply."

Montana

BUTTE DISTRICT

Bamar Copper Company—This company has filed articles with M. J. Scott, John B. Frisbee, F. H. Butler, J. L. Hannifen, Phil C. Goodwin, Theodore Hennesy and S. Hurvitch as incorporators. This is the culmination of the refinancing plans of the company. The property consists of 12 claims, 12 miles southwest of Butte. Much development has been done. It is the intention to sink the shaft, now 180 ft., to 1000 feet.

Anaconda—At the Leonard mine about 700 tons are being produced daily. The old No. 1 shaft, 1200 ft. deep, has been retimbered and the gallows is being jacked up, the surrounding ground having settled 10 inches. The shaft will be used to lower timber and supplies. At the West Colusa mine about 50 tons are being hoisted daily from the 1000-, 1200-, 1400- and 1600-ft. levels. At the Mountain View mine about 1000 tons is the daily output now as against 1500 tons when operating normal capacity. The Parrott mine, formerly one of the principal producers of the Amalgamated company has been shut down since December, 1909, only pumpmen and shaftmen being employed. The Little Mina mine is working 200 men and is a steady producer. At the St. Lawrence the orebins collapsed and no shipments are being made. It will take two months to rebuild them and the shaft will be retimbered at the same time. The mine has been producing about 1000 tons daily and this will be made up by an increase in the production of the company's other mines, leaving the total unaffected.

East Butte—The injunction resulting in the curtailment of production at the Ticon and Butte & Ballaklava mines has materially reduced the amount of custom ores which the East Butte company's smeltery has been treating and as a result one furnace has been shut down, leaving only one furnace in operation which is

sufficient to handle the East Butte ore. The company is only mining sufficient ore to pay operating expenses.

Great Falls Water and Power Company—The new sub-station on the hill near the High Ore and Mountain View mines is nearing completion and when in readiness will supply the electric power for all Anaconda company mines. Adjoining the sub-station is the new electric compressor plant in which the machinery is being installed.

Alex Scott—Mining is being carried on in the 1200-, 1400- and 1600-ft. levels and 40 men are employed.

Butte & Ballaklava—No ore is being hoisted from the mine, the operations being limited to development on the 300-, 500-, 600- and 800-ft. levels.

British Butte—Representatives of the London capitalists who financed the company are expected in Butte Oct. 1, when it is probable that a plan of action will be decided upon.

JEFFERSON COUNTY

Montana-Corbin—The Western Mining Supply Company has brought suit against the mining company to recover \$1379 and the Hidden Treasure and Copper King lode claims have been attached.

LEWIS AND CLARK COMPANY

Maggie Development Company—The company now has 400 acres of placer at the mouth of Maggie gulch. The machinery for the dredge, being built by the Union Iron Works, of San Francisco, is nearly all on the ground. Electricity will be used, being secured from Cañon ferry. The management states that operations will be begun Dec. 15. Steam heat will be used to thaw the ground in the winter. O. W. Vandergrift, Claysoil, is in charge.

Souvenir—This gold-mining company voted down the plan to assess the stock and instead decided to offer 100,000 shares of treasury stock for sale.

Jumbo—The main vein has been cut in the tunnel and a 2-ft. body of ore disclosed. The hanging wall has not yet been reached.

Tunnel—This mine is eight miles southwest of Wolf creek and is developed by a 225-ft. crosscut tunnel, which has cut a 4-ft. vein. The vein has been drifted on 100 ft. In the face of the tunnel a shaft is being sunk and is now down 30 ft.

Nevada

ELKO COUNTY

At Jarbidge, the Good Luck tunnel is in 50 ft. and the Amazon-Rainbow 80 ft. The Clark-Fletcher lease on the North Star has driven 160 ft. and the National has a tunnel in 100 feet.

ESMERALDA COUNTY

The merger of the Sandstorm and Kendall-Goldfield properties has practically been effected and stockholders of both the

original companies may now exchange their old certificates for stock in the New Sandstorm-Kendall Consolidated Company. George Wingfield is back of the proposition.

Goldfield Consolidated—Development on the 1000-ft. level of the Clermont workings is revealing high-grade ore. These workings are the deepest in the camp and the discovery of ore is considered significant.

Royal Flush—The property in the Gold Mountain district has become a producer. High grade is being shipped to Utah and milling ore is being placed on the dumps.

Spearhead—Since the discovery of paying ore on the Wheeler lease a leasing company has started operations through the Maloney shaft.

Great Western—The deal for this mine at Hornsilver has been completed and the property transferred to Andrew I. Trumbo and associates, under a bond and lease. The payment of \$15,701 to the sheriff's office redeemed the property sold last May by order of foreclosure.

HUMBOLDT COUNTY

Important strikes are reported on the Hyde lease on the National and on the Edmunds & Reinhart lease on the Mayflower. Both of these are north of the Stall Brothers' lease.

Chaffey—This mine has been sold at sheriff sale to W. S. McCronick, Salt Lake City.

LYON COUNTY

Nevada-Douglas—A payment of \$50,000 has been made on the Ludwig mine. The present payment makes a total of \$350,000 paid and the remaining deferred payments will not fall due until the mines are producing. The railroad through the Yerington district to the Mason Valley smeltery, at Wabuska, is graded to the mouth of the valley in which is the Nevada-Douglas property.

NYE COUNTY

Tonopah Belmont—It is hoped to have active operations transferred from the Desert Queen shaft to the new Belmont shaft by Oct. 15. A winze from the 1166-ft. level, the lowest in the mine, is the most important new work being done.

Tonopah Extension—The first semi-monthly cleanup for September yielded 1670 oz. of bullion valued at \$10.60 per pound.

New Mexico

Chemung Copper Company—The company has closed its mine at Tyrone, and has pulled the pumps, and taken up the tracks. It is stated that there are 10,000,000 tons of "porphyry" copper ore blocked out. No reason is given out. A railroad has been graded to Whitewater, on the Santa Fe, and it seems probable that the mines will not be reopened until

the railroad is complete, and the copper market becomes more settled. The pulling up of the rails in the mine is said to be owing to the very acid water, which would soon eat them up if left in the workings. There are 35 claims in this property, which is situated in the Burro Mountain district, about 14 miles from Silver City. Dr. L. D. Ricketts, of Cananea, has sampled the mine.

North Carolina

Silver Hill—This famous old mine, at Silverhill, Davidson county, has been reopened by T. A. M. Stevenson.

Ohio

Columbus & Hocking Coal and Iron Company—The amended organization plan submitted to the bondholders' committee provides for an issue of \$2,000,000 first-mortgage 5 per cent. bonds and \$4,600,000 common stock. Holders of first- and second-mortgage bonds of the old company will receive 75 per cent. in new first-mortgage bonds and 50 per cent. in common stock. Preferred stockholders upon paying \$10 assessment will receive par and new bonds to the amount of the assessment and 100 per cent. in new common stock. Common stock holders, upon paying \$10 assessment, will receive new bonds to face amount of money subscribed and 50 per cent. in new common stock.

Oklahoma

Lolita—This mill, at Miami, has been sold and will be removed.

Lanyon-Starr—This smeltery, at Bartlesville, has been sold to the American Metal Company. The plant has 3456 retorts.

Oregon

BAKER COUNTY

A boiler house and engine have been installed on the Gold Center dredge, and the dredge will be in operation again soon. J. Wetherel is manager.

Kansas—Operations will be started on this mine at Greenhouse by the owners, Oliver Failing and August Hornecker.

Simmons—The Rogue River Dredging Company is installing dredging machinery at this mine which it has leased.

Pennsylvania

For some time past explorations by diamond drill and test-pitting have been carried on in the district between Boyertown and Pottstown. Iron ore was mined in this region many years ago, but only in a superficial way. The result of the recent work has been to open what are believed to be large deposits of iron ore, and three companies have been organized to exploit them. The Boyertown Ore Company, of which William S. Harvey, of Philadelphia, is president, owns a tract near Boyertown; the Bethlehem Steel

Company is said to control this company. The Manatawny Bessemer Ore Company, Charles M. Allen, of New York, president, owns a tract along Furnace run. The Berks Development Company has property on Long and Stone Cave hills; Wharton Barker, of Philadelphia, is president. The ore found is chiefly red hematite, running well in iron and low in sulphur and phosphorus; there is also some magnetite.

South Dakota

Reliance—Plans for the reorganization company have been completed. The head of the trustees for the reorganization movement, Gen. S. E. Olson, of Minneapolis, is making arrangements for a resumption at the property on Annie creek near Deadwood. The Reliance, which was originally a combination of a number of properties in the Bald mountain district, operated successfully for nearly two years.

Tennessee

In the Federal court, Judge Sanford granted a new trial in the case of Paul E. Stevenson et al. vs. the Tennessee Copper Company. Complainants sued for \$75,000 damages as compensation for damage by sulphur fumes from the copper plant at Ducktown. The jury in the case awarded \$10 damage. The case will be reheard.

Utah

BEAVER COUNTY

Cedar-Talisman—Shipments of zinc ore will be resumed immediately. This ore is being mined on the 125-ft. level from a face of ore between 3 and 4 ft. in thickness. On the 225-ft. level, zinc ore has been opened for 75 ft. Development is confined to the main fissure, which extends north and south. Several hundred feet of drifting have been done on the 500-ft. level, and has opened ore 1 ft. and upward in thickness.

Arrowhead—Development at this property on Indian Peak is opening up more ore. The shaft is down 70 ft., and drifting on the vein will be started at the 100-ft. point. Two samples from the bottom of the shaft showed 52 per cent. lead and 28 oz. in silver.

Busy Bee—This company, recently incorporated, owns claims 14 miles north of Beaver. J. Greenwood is president.

Utah United—The shaft is down 385 ft., and will be continued to the 500 level. Drifting on the 360 level has opened ore carrying copper and iron.

Blackbird Copper—This company is operating two drills, which produce a 5½-in. core. Some mineralized rock has been cut.

Bradshaw—A 4-ft. vein of iron ore carrying \$10 to \$11 in gold and silver is being developed. The property is east of Milford, and is controlled by Portland and New York interests.

BOX ELDER COUNTY

Salt Lake Copper—Shipments of 140 tons of iron ore daily are being made from this property near Tecoma.

JUAB COUNTY

Eagle & Blue Bell—The new hoist was put in commission Sept. 23, and replaced the buckets used in shaft sinking. About 80 ft. more of work remains before connections are made with the raise from the 1000-ft. level. It is thought this will be completed by Oct. 8.

King William—One shift only is being worked, owing to bad air. When connections are made between the lower levels and new Eagle & Blue Bell shaft, the forces will be increased.

North Colorado—Development will be started on these claims in North Tintic this week. A wagon road has been built.

May Day—Leasers are reported to be mining good ore, of which several shipments have been made. Work is being done by contract for the company on the 1100 level.

Utah Consolidated—The wine which is being sunk to prospect below the cave is down 40 feet.

Scranton—A new body of zinc and lead ore has been opened from the lower tunnel workings, and has been crosscut for 90 ft. The Scranton is a close corporation, with a capital of 30,000 shares, owned largely by Pennsylvania people.

Colorado—A strong fissure was cut Sept. 21, east of the shaft on the 500-ft. level. No ore was encountered, but the fissure shows iron and manganese staining.

Opex—Drifting is being done on the 2150-ft. level. The ore cut by the diamond drill is thought to dip to the south, in which case the Opex has a chance of getting part of it.

Iron Blossom—A statement has been issued to stockholders in reply to inquiries regarding the reduced tonnage and subsequent drop in the price of the stock on the Salt Lake exchange. This says in part that shipments were discontinued from the No. 1 shaft on account of an advance of \$1.50 per ton on smelter treatment rates on silicious gold ores, which went into effect Sept. 24. The mine had been producing 150 tons per day from this shaft for some time, but has suspended operations from this end of the property. The south end of the mine is stated to have large reserves of ore.

Chief Consolidated—A financial statement dated Sept. 1 shows that since the incorporation 18 months ago, the company has shipped 4952 tons of ore, from which the receipts have been \$116,417, or an average price of \$23.50 per ton. The receipts from the sale of stock amounted to \$228,160. The ore sales have been \$2000 in excess of mining costs. The net earnings from September

shipments are expected to reach \$30,000. The largest net earnings for any month heretofore were \$22,900, in June. The shaft is 1775 ft. deep, with levels at intervals of 200 ft. The ore zone has a width of about 400 ft. The principal development has been on the 1400-ft. level. Down to the 900-ft. level the shaft has but one hoisting compartment, but has two from this level to the bottom. It will be enlarged later, with two compartments to the surface. A new hoist is being unloaded at the property, and is expected to be in use within 60 days. This will give four times the present hoisting capacity. The cages will be double decked and capable of lifting two tons at a load.

Opohongo—Drifting is being done on the 450-ft. level on an orebody which is reported to be 18 ft. in width, and to run well in gold and copper. Connections have been completed on the 400 with the 300-ft. level of the Gold Chain. The joint compressor plant is nearly ready.

PIUTE COUNTY

Shamrock—The lower tunnel has been driven 165 ft., the last 45 ft. being on the vein. A raise is 71 ft. in ore. The vein is 6 ft. wide with a streak of shipping ore from 1 to 3 ft. in thickness. Ore which is sorted out for shipment carries around \$20 gold, 45 oz. silver, 6 per cent. copper.

SALT LAKE COUNTY

Utah Copper Company—It is reported that the sulphide mine of the Boston Consolidated has been closed indefinitely, owing to the high cost of production. The ore has been going to the Garfield smelting works.

Bingham-New Haven—The mill is handling from 75 to 100 tons of ore daily, and is reported to be giving better satisfaction since the jigs were removed and the treatment of the ore simplified. The ore is passed through two sets of screens, classified, and then sent to Wilfley tables.

United States Mining—The compressor which has been in use for years at the Old Jordan mine is being overhauled. This has caused operations to be suspended.

Utah Copper—A cave occurred Sept. 26 in one of the porphyry tunnels in the Boston Consolidated section. One miner was killed.

SUMMIT COUNTY

Quincy-Thompson—At a meeting of the interests promoting this merger the question of selecting officials for the new company was discussed. F. J. Hagenbarth has been named for president, and W. S. McCornick for treasurer.

New York—Numerous bunches of galena have been encountered on the 800-ft. level. At the annual meeting Sept 13, the old board of directors was reelected.

During the year the shaft was sunk from the 800 to the 1000 level, but on account of water, development has been done largely on the 800.

Silver King—The new electric haulage system now being installed, it is thought will be completed by the first of the year.

Washington

FERRY COUNTY

El Caliph—John S. Bedier, of Republic, has obtained a two year lease on this property, and will develop it.

Swamp King No. 2—This company has been organized and has made purchase of the Peggy, Emily and Morning claims. M. C. McEntire, of Orient, and C. J. Johnson, D. D. McKay, Geo. W. Ansley and A. B. Railton, of Spokane, have been named as trustees

North Washington Power and Reduction—This company will, within 30 days begin the construction of a large cyanide plant at Republic.

Swamp King—Rich ore was recently struck at this mine. R. F. McEntire is manager.

OKANOGAN COUNTY

Molson—This company is planning extensive underground and surface development for the near future, including an increase in the capacity of the stamp mill. J. A. Plomert is manager.

STEVENS COUNTY

Empire Tungsten—This company has acquired leases covering 215 acres. Development will be started at once. W. M. Luther, W. V. Garrett and W. W. Meyers are the holders.

Blue Star—Mark Mitchell has been elected president and P. T. Peterson of Spokane, business agent. Work is being done.

Blue Grouse Tungsten—This company is considering the installation of a sampling plant at Loon Lake. W. A. Brockway is superintendent.

Canada

BRITISH COLUMBIA

A syndicate has been formed by S. J. Castleman and others, of Vancouver, for taking over the copper properties at Ikeda bay, Morsby island. The syndicate will enlarge the power plant, build a tramway and make other improvements.

An extensive coal deposit has been discovered on Khutzeymateen inlet, 16 miles north of Port Simpson, by Indian loggers, and staked by their employers.

A syndicate headed by Norton Griffiths, of London, has secured an option on iron and coal property near Vancouver. Plans are being made to develop and erect a reduction plant.

Rich placers from which pans giving \$15 in gold are reported on tributaries of the Naco river in northern British Columbia.

Granby—At the stockholders' meeting in New York, Oct. 4, President Langeloth, in reply to questions, said he did not know how the news of the adverse report on the mine had leaked in advance of the submission of the report to the directors and that neither himself nor any officer had bought or sold a share on the report. The stockholders asked if it were not possible to declare a dividend, since the company had cash and copper on hand amounting to \$900,000. President Langeloth said that, as the largest stockholder, he was opposed to any dividend at present. Mr. Langeloth withdrew as president and director and several directors resigned also. The directors who resigned were George Crawford Clark, George Crawford Clark, Jr., H. L. Higginson and Payne Whitney. To succeed these and President Langeloth in the directorate J. B. F. Herreshoff, G. W. Wooster, William Hamlin, E. R. Nichols and Northrup Fowler were elected.

Wilcox—This mine, on Wild Horse creek, will have a flume for a 10-stamp mill. W. B. Hundson is superintendent.

International—This company will purchase new machinery for its property near Lillooet.

Waterloo—This mine and stamp mill has been bonded to Victoria people.

Big Dump—Fred H. Oliver and associates, of Spokane, have purchased this property near Erie, and will install a stamp mill.

Ymir—Arrangements are being made to sink about 500 ft. more on this property.

Maestro—This lead-silver property will be operated again under the direction of Alexander Green, of Ainsworth.

Ore Hill—This property as well as the Second Relief mine will be largely developed in the spring. Minneapolis people have control. A. D. Westby is representative.

St. Eugene—The slime plant at this mine has been purchased by the Consolidated Mining and Smelting Company, of Nelson, and will be converted into an experimental mill.

Kootenay Bell—The contract for driving the 100-ft. tunnel on this property has been let.

Kingston Gold and Copper—This property, at Hedley, has been bonded to the Redeemable Trust Company, of Boston, which will make extensive improvements.

ONTARIO

Shipments from Cobalt for the week ended Sept. 24 were: Buffalo, 53,900 lb.; Chambers-Ferland, 64,000; Cobalt Townsite, 64,000; Crown Reserve, 201,820; King Edward, 42,110; McKinley-Darragh, 55,650; Nipissing, 471,870; Silver Cliff, 55,950; Trethewey, 42,150; total, 1,051,440 pounds.

Bailey—Some rich ore has been encountered in a drift at the 232-ft. level which is being run in the direction of the Cobalt Central workings.

Chambers-Ferland—A report of Sept. 22 shows a cash balance of \$106,456. The condition of the mine has not greatly changed since the annual report. The reserves are placed at 146,700 ounces.

Cobalt Lake—The raise from the 280-ft. level to the 190-ft. level on vein No. 6 passes through ore all the way. At 240 ft. a drift has been started on an intermediate level where the vein is 2 in. wide of high-grade ore with leaf silver in the wall rock. Another drift which is being run north from the East crosscut on the 280-ft. level has cut several Cobalt stringers.

Little Nipissing—A 4-in. vein has been struck at the 75-ft. level.

Kerr Lake—The annual report covering year ended Aug. 31 shows total net revenue \$1,542,194, expenses \$343,974—balance \$1,198,220 dividends, \$1,050,000; surplus \$148,220. This leaves a decrease in the surplus as compared with 1909 of \$480,827. The production of silver for the year was 3,046,295 oz., the total cost of production per oz. being 13.27c. and the mining cost 7.54c. per ounce.

Buffalo—The August mill report shows a recovery of 113,204 oz. from 3303 tons averaging 41.39 oz. per ton. Milling expenses were \$5468. The assay of the mill rock is much higher than formerly.

Scottish Ontario—This Porcupine company will put in a small stamp mill for testing. The shaft is down 100 ft. and crosscutting has commenced.

Porcupine Gold Mines—A small steam plant and one stamp for sampling has been ordered. There are 5 tons of picked ore on hand stated to be worth \$1000 per ton.

Allie Island—In this copper property in the Kenora district, owned by Doctor Scovil, a shaft is down 40 ft., at which depth the ore has improved.

St. Anthony's Reef—This gold mine was recently reopened. The shaft is down 146 ft. and free gold is being extracted. It is at Sturgeon lake in western Ontario.

QUEBEC

Amalgamated Asbestos—A meeting of directors called for Sept. 29 to decide upon the preferred-stock dividend due Oct. 1 was adjourned for a month, indicating that the dividend has been passed.

YUKON TERRITORY

The power plant of the Northern Light, Power and Coal Company, 40 miles from Dawson, is nearing completion. This plant will cost about \$2,000,000. This company holds large coal tracts in this section.

Dome Lode—Work on these properties will be continued in the hope of striking

the Lost Chord vein. D. J. McDoland is superintendent.

Atlas—The machinery for this mine has been installed, and shipping will begin at an early date. About \$45,000 was spent in improvements. Wilton Greenough, of Spokane, is president.

MEXICO

CHIHUAHUA

Rio Plata—The August production was 83,114 fine ounces and the September output is as large.

Republica—The lower levels are unwatered and mining is under way. Normal production will be made from now on. J. Gordon Hardy, consulting engineer, is at the property.

Calera—Since the cessation of milling operations, 35 men have been employed in development in the mine, F. J. Kyle in charge.

Lolita Mines Company—This company, operating several lead-copper-gold properties in the San Blas range in proximity to Barrila station of the Mexico Northwestern in the northern part of the State, is figuring on diamond-drill explorations. The manager is William C. Gruber, of El Paso.

DURANGO

La Coronada—This group, at Mapimi, has been sold to a Chicago and Detroit syndicate, by Messrs. Mitchell and Saviers. Development will be done.

Reyes Mining and Smelting Company—The El Paso Foundry and Machine Company has shipped a 50-ton silver-lead furnace to La Mancha station for the company. The company owns nearly a hundred mining claims in the Reyes district. O. O. Mattox, of Torreon, Coah., is one of the largest stockholders. W. H. Daily is in charge of the smelting department.

GUANAJUATO

San Angelo—Joseph Allan has sold his interest to C. W. Kahl and J. J. Lawrence also interested in the company. The property is at Guanajuato.

Los Gemelos—This Guanajuato mine has installed a 20-h.p. hoist and will sink the main shaft now down 200 feet.

Oro Grande—French capital will be largely interested in this company at La Luz.

HIDALGO

Arevalo—The Nepton tunnel at El Chico has cut this vein 2200 ft. from the portal encountering milling ore entirely across the vein and for four m. in the hanging wall averaging 1800 grams of silver and 8 grams of gold per ton. The tunnel will be extended to cut the San Pedro vein to the south of the Arevalo vein.

SONORA

Pacific Smelting and Mining Company—President Melbert B. Cary announces

that the company has acquired the lead-silver smeltery, at Guaymas, together with the concession from the State of Sonora, giving exclusive rights for a long term of years. The plant is on the Bay of Guaymas on tidewater and on the railroad. Its present capacity is 150 tons per day. While in no way delaying arrangements to start the Fundicion smeltery, General Manager De Kalb will immediately modernize the Guaymas plant and put it into commission, and is now making contracts for ores. As a result of this acquisition the company will not build a furnace for the smelting of lead-silver ores at Fundicion, as had been the intention, but will use that plant exclusively for copper ores. The construction of a converter plant at Fundicion is contemplated, and bids for the same are being received. The management announces the appointment of Walter Harvey Weed, as consulting geologist. The company has recently strengthened its position financially and announces that the present plans of starting operations will be carried out as fast as is practicable, and that there is no truth in the reports of a sale of the property.

Greene-Cananea—The 1500 kw. turbine, which yielded practically all of the electrical power supplied by the main power plant was so severely damaged by lightning last week that it may never be in commission again. With the exception of the Elisa mine, steam can be utilized with no curtailment in production, and all electrically driven units in the reduction division can be operated by the reserve engines. Work has started in the cañon below the concentrator with a view of raising all existing impounding dams to a height that will prevent the floods which occur during the rainy season from carrying the tailings away with the overflow.

Purdy Gold and Silver Mining Company—This company, operating at Pilaes de Teras, has ceased operations temporarily to permit the installation of 20 stamps and the placing of other machinery.

River Copper Company—This company is developing on the Yaqui river near the San Antonio mine. John R. Wood is in charge and Duluth capital is working the undertaking.

ZACATECAS

El Refugio—This gold mine in the Pinos district is being developed by an English company, which recently purchased it. A large tonnage of quartz milling ore is in sight.

San Roberto—This mine, at Zacatecas, is shipping to Aguascalientes. It was under bond to the Cape Copper Company, of London, for some time but has reverted to the owners, C. A. Bently and J. D. Petite.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, Oct. 5—In the West the coal mines are reported active almost everywhere. The demand is strong, and consumers generally have very small stocks on hand. Shipments just now are limited only by the supply of cars; as to this there are many complaints. The Illinois mines which lately resumed are not up to their full production yet, and probably will not be for 10 days or more. Besides Indiana and Ohio coal a great deal of West Virginia coal is still going to the West and Northwest. The Lake trade is still active, though the large shipments earlier in the season will probably be sufficient to prevent the rush which often comes at the end of the navigation season. Until the Lake shipments close not much improvement can be expected in car supply. Even then there will be trouble, as a large part of the West has a big shortage to make up.

The seaboard bituminous trade is showing an improvement in demand and prices, and looks better than it has for some time. Coal is being taken more freely. Prices are firmer accordingly, and the demand from the West has also had an effect upon them. In seaboard territory there is very little trouble about the car supply, which is an important element in the West.

The anthracite trade is moving about as usual, with only moderate degrees of variation. A better demand for steam coal is reported.

New Anthracite Road—It is stated that all the right of way has been obtained for the extension of the Lehigh & New England road from Danielsville, near Slatington, Penn., to Tamaqua, and that construction will soon be begun. This extension will be 31 miles long, and will furnish a direct connection from the collieries of the Lehigh Coal and Navigation Company to the Poughkeepsie Bridge line to New England. Such a connection has been desired for some time.

COAL TRAFFIC NOTES

Coal shipments over Norfolk & Western railway, two months of fiscal year from July 1 to Aug. 31, short tons:

Field:	Com- mercial.	Com- pany.	Total.
Pocahontas.....	1,861,817	158,679	2,020,496
Tug River.....	261,256	70,854	332,110
Thacker.....	283,389	97,368	380,757
Kenova.....	109,408	25,605	135,013
Clinch Valley.....	145,594	6,940	152,534
Total.....	2,661,464	359,446	3,020,910

The Pocahontas field furnished 66.9 per cent. of the total tonnage.

Coal delivered by the Virginian railway to tidewater at Sewall's Point in August was 116,870 short tons. For the eight months ended Aug. 31, the total was 102,611 tons in 1909, and 1,174,611 in 1910; increase, 1,072,000 tons.

New York

ANTHRACITE

Oct. 5—Trade locally is improving, and more coal is being taken for winter storage. Steam sizes are also more active than they have been. Production is increasing. The large Reading collieries are now running five days a week, a day more than for several weeks past.

Schedule prices for large sizes are \$4.75 for broken and \$5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes, current quotations are: Pea, \$2.95@3.25; buckwheat, \$2.15@2.50; No. 2 buckwheat, or rice, \$1.65@2; barley, \$1.35@1.50; all according to quality, f.o.b. New York harbor.

BITUMINOUS

There is a distinct improvement in trade, a better demand all around. Orders are coming in and there is no difficulty in placing coal. The demand in the West still has a strong reflex effect on the seaboard, taking much coal which would otherwise come here. For instance, it is not easy just now to get West Virginia coal, unless it is under contract; the mines are all busy on orders from the West, and are not shipping free coal to tidewater, because they have none to spare.

Prices are better. Gas coals bring at least 10c. per ton more, and low-volatile steam coals 10 or 15c. more. The advance has not checked demand.

Transportation is generally good, and car supply is sufficient for the trade on most roads. On the Baltimore & Ohio there are some delays, but this is chiefly due to the large amount of construction work in progress in the way of additional tracks, new yards, etc. This interferes temporarily with the free movement of trains and the distribution of cars.

In the Coastwise market vessels are in demand and rates have advanced. For large vessels from Philadelphia quotations are: Boston, Salem and Portland, 70@75c.; Portsmouth, 75@80c.; Lynn, Newburyport and Bath, 80@85c.; Bangor, 95c.@\$1. From New York harbor small boats are asking 60@65c. to points around Cape Cod; 40@45c. to Providence and Sound ports.

Birmingham

Oct. 4—The coal trade in Alabama continues active as it has been, and some mining companies claim that they could do even better if they could get more labor. The low water in the Ohio river, stopping shipments from Pittsburgh, has brought to Alabama mines a good deal of business from cities along the river. The extra demand which came from the West during the strikes there is about over, but the mines are still busy. Home consumption is improving.

Chicago

Oct. 4—Illinois coals are coming in more freely, and the market will soon come back to its usual condition. Buying is good, most consumers being low in stocks. There is some delay in deliveries and complaints are heard that cars are hard to get at the mines. Thus far there has been no fall in prices. Illinois and Indiana coals bring \$2.75@3.50 for lump, \$2.30@2.50 for run-of-mine and \$2.20@2.40 for screenings.

Hocking remains in good demand at \$3.25 for lump. Smokeless is about \$3.90 for lump and \$3.30 for run-of-mine, with only a moderate demand. There is little doing in anthracite.

Cleveland

Oct. 3—There is a good deal of coal still being shipped by Lake. In fact that trade is taking most of the coal coming in. The domestic trade is active, but supplies come in slowly owing to the shortage of cars. More cars is the cry everywhere.

Prices are firm. Middle district coal, f.o.b. Cleveland, is \$2.15 for 1¼-in., \$1.90 for ¾-in., \$1.80 for run-of-mine, \$1.55@1.70 for slack. No. 8 and Cambridge districts 5 or 10c. higher. Poca-hontas is quoted \$3.35 for lump and \$2.60 for run-of-mine, but is hard to get and 25c. premium has been paid.

Indianapolis

Oct. 3—The output of some of the Indiana coal mines has been seriously affected during the past week. This was due to a shortage of cars and the laying off by the miners who have been working incessantly all summer. The shortage began nearly two weeks ago, and is becoming more seriously daily. In the Linton field 2000 miners decided to have a holiday in order to attend the Buffalo Bill show. Nearly 300 men at the Freeman mine, in Gibson county, are out on a strike because the mining company refused to discharge the electrician, who

went to work May 14, the day before the temporary agreement was reached. He refused to pay the fines assessed against him and the men have refused to work with him. The Atwood & Peabody mine, near Shelburn, has been ordered closed by the State mine inspector because of bad ventilation; 100 men are idle because of this order.

The demand for domestic coal is more insistent and the price is moving upward. Every mine in Indiana could run at full capacity for a week or 10 days before clearing the order books as they read today.

Pittsburg

Oct. 4—There is no change in the coal situation. Demand is fair, and prices are about as well maintained as formerly. We quote as the regular market: Mine-run and nut, \$1.20@1.22½; ¾-in., \$1.30@1.32½; domestic 1¼-in., \$1.45@1.47½; slack, 75@82½c. per ton.

Connellsville Coke—The market has been quiet as regards actual transactions, but deliveries are well taken and no coke is pressing on the market. A few sales of moderate lots of furnace coke have been made for early delivery at \$1.60, and this remains the minimum of the market. There has been occasional inquiry from furnaces as to contracts for next year, but coke sellers are not ready to take up negotiations as yet, as the market would not promise materially better prices than those now ruling, and a waiting policy is regarded as the best. We continue to quote standard grades of Connellsville coke as follows: Prompt furnace, \$1.60@1.65; contract furnace (nominal), \$1.75@1.85; prompt foundry, \$2.10@2.25; contract foundry, \$2.25@2.50 at ovens.

The *Courier* reports the production in the week ended Sept. 24, at 344,765 tons, an increase of 1000 tons, and shipments at 3805 cars to Pittsburg, 5868 cars to points west and 852 cars to points east, a total of 10,525 cars.

St. Louis

Oct. 5—The market on steam coal during the past week has suffered a severe slump; screenings and mine-run were on the market in great profusion during the last few days. This is due partly to the natural conditions and partly to manipulation. Railways and large buyers have all stopped buying for a short time in hopes that the additional tonnage thrown on the market would break the price. In addition to this the tonnage has been extremely large and the weather unusually warm for this time of the year.

One of the biggest car shortages in the history of the coal trade is anticipated during the next few weeks. Railroads are having difficulty in keeping mines

supplied with cars now and already the most severe restrictions have been placed upon equipment ever known in the coal trade.

The Illinois Central, Belleville Electric, Louisville & Nashville, and a number of other roads will not let their cars go off their own rails or outside the switching limits of St. Louis. This will cause distress in the country and will make the jobbers use every possible trick they can to reconsign cars into the forbidden territory. This naturally forces a bigger tonnage on the St. Louis market locally.

Current prices on the St. Louis market are as follows:

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg.....	\$2.00	\$2.52
2-in. lump.....	1.85	2.37
Mine-run.....	1.60	2.12
Screenings.....	1.20	1.72
Trenton:		
6-in. lump and egg.....	2.50	3.02
3-in. nut.....	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump.....	2.00	2.52
2-in. nut.....	1.60	2.12
Mine-run.....	1.65	2.17
Screenings.....	1.50	2.02
Cartersville:		
6-in. lump or egg.....	2.00	2.67
3-in. nut.....	2.00	2.67
Mine-run.....	1.60	2.07
Screenings.....	1.25	1.92
Pocahontas and New River:		
Lump or egg.....	1.90	4.40
Mine-run.....	1.55	4.00
Pennsylvania Anthracite:		
Nut, stove or egg.....	.....	6.95
Grate.....	.....	6.70
Arkansas Anthracite:		
Egg or Grate.....	2.35	5.35
Coke:		
Connellsville foundry.....	.....	5.40
Gas house.....	.....	4.90
Smithing.....	.....	4.15

Anthracite—The market continues to be active and the demand for all sizes is exceptionally good.

FOREIGN COAL TRADE

French Coal—The official report of coal production in France for the half-year ended June 30, gives the following: Nord and Pas-du-Calais, 12,537,805; Loire and Gard, 2,929,685; Bourgogne and Nivernais, 1,025,725; other districts, 2,117,871; total, 18,611,086 metric tons, an increase of 402,921 tons.

Belgian Coal—Coal production in Belgium half year ended June 30 was 11,559,745 metric tons in 1909, and 11,828,990 in 1910; increase, 269,245 tons. There were 141,777 persons employed at the coal mines this year.

Welsh Coal Prices—Messrs. Hull Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on Sept. 24: Best Welch steam, \$3.90; seconds, \$3.78; thirds, \$3.60; dry coals, \$3.60; best Monmouthshire, \$3.54; seconds, \$3.36; best steam smalls, \$2.04; seconds, \$1.80. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON TRADE REVIEW

New York, Oct. 5—The opening of October seems to have brought greater activity to the iron and steel markets. Business is better, both in specifications on contracts and in new sales in different lines. This is the result of a complexity of causes. While the expectation of large and general reduction in prices has disappeared, on the other hand the market has been relieved of the incubus of any probable concerted effort to raise quotations, and rests in the belief that there will at least be an open competition. The crop reports are better, and a year of fairly good general purchasing power is to be expected. The deadlock in pig iron shows signs of breaking up, and makers are beginning to give way and take 1911 contracts on something like the current basis of prices. The drawback is the general holding back of the railroads, which some people think is a concerted movement, for effect on the rate situation. Whether this is so or not, railroad orders are almost entirely absent. An exception is an order from the Atlantic Coast Line for 15,000 tons of rails, which will be ordered at Ensley.

In pig iron there has been a fair amount of buying of foundry iron in Eastern territory, but chiefly in lots of moderate size. There are a number of inquiries for iron for first-quarter deliveries, and sellers are less insistent than they have been on higher prices for that class of business. While stocks are being slowly worked down at merchant furnaces, they are still large enough to cause some anxiety, and makers evidently begin to feel that it would be better to have empty yards, even at some sacrifice of profits. Buyers are not going to pay more as long as they know the stocks are there.

In finished material, small orders keep coming in for structural steel and some large tonnages are in sight, or actually under negotiation. Bars are fairly active, as are wire products, including nails. The leading interest announces an adjustment of the card prices of pipe and of sheets, which will make the nominal rates accord with those that have been actually paid. Otherwise the market has been rather quiet.

It is stated that the agreement, under which a number of large concerns using scrap iron and steel have been buying through a central agency, is to be given up; and the companies concerned will go back to the old plan of buying on the open market. One reason given is that several of the parties concerned are not satisfied with the way in which the buying has been managed; another and possibly a stronger one is that the authorities at Washington have intimated that the agreement will be investigated as a possible violation of the anti-trust laws.

Wire Rods—The American Iron and Steel Association reports the make of wire rods in 1909 at 2,335,685 tons. The production for 10 years has been in long tons:

1900.....	846,291	1905.....	1,808,688
1901.....	1,365,934	1906.....	1,871,614
1902.....	1,574,293	1907.....	2,017,583
1903.....	1,503,455	1908.....	1,816,949
1904.....	1,699,028	1909.....	2,335,685

In 1908 there were 509 tons rolled from wrought iron; in 1909 all the make was of steel. Wire rods were rolled last year in 32 mills, and two more mills were in course of erection.

Baltimore

Oct. 4—Exports from the port of Baltimore for the week included 172,220 lb. zinc dross and 3,940,800 lb. steel billets to Liverpool; 125,800 lb. spelter to Antwerp. Imports included 55 tons manganese ore from Rotterdam; 5800 tons iron ore from Cuba.

Birmingham

Oct. 4—Alabama ironmakers profess to see some improvement in the market. There are more sales, and a good many more inquiries right now. Buyers are asking for prices on deliveries in the first quarter and the first half of 1911, but the makers are not ready to take such orders at the prices now prevailing. The present quotations are \$11.25 and \$11.50 for No. 2 foundry. Some iron is said to have been sold at \$11, but it is believed to be iron bought for speculation, which the holders have to unload. The stocks in the furnace yards were reduced last month, sales absorbing the current production, and probably more.

Pipe works keep on doing well and melting a good deal of iron. Foundries and machine shops report more orders coming in. The steel works are doing better than they have been.

Chicago

Oct. 4—The buying of small lots for needs of melters from 30 to 60 days ahead continues to make up a fair aggregate. In business running beyond this year there is practically nothing, as sellers will not yet agree to take present prices on next year, and buyers will not give more. On the whole, it is a waiting market on such business. On short deliveries prices are unchanged at \$11@11.50 Birmingham (\$15.35@15.85 Chicago) for Southern and \$16.25@16.75 for Northern No. 2 foundry.

Cleveland

Oct. 3—It is understood that there will be an early closing of the iron-ore movement. The Pittsburg Steamship Company has given notice that deliveries to its chartered boats will close by Oct. 15. This means that most Steel Corporation mines will be shut down by that time.

Pig Iron—Inquiries are out for at least two large lots of basic pig, and for half

a dozen smaller lots of foundry. Several sales of No. 2 foundry have been closed for fourth-quarter delivery. Quotations remain \$15.65@15.90 for bessemer; \$14.50@14.75 for No. 2 foundry; \$14@14.25 for gray forge; \$18@18.50 for Lake Superior charcoal; all Cleveland delivery.

Finished Material—Now sales include several small structural orders, some trolley rails, some track supplies and iron bars. Specifications on contracts are coming in quite freely.

Philadelphia

Oct. 5—The only noticeable difference in the pig-iron situation is in the receipt of inquiries from a few large consumers in this and New England territory for iron for delivery early next year. Electrical plants and large consumers have gone so far as to state their prospective requirements for the first quarter, and to show a disposition to take advantage of the present situation. Eastern Pennsylvania makers have not modified quotations and show no disposition to attract late delivery business. Southern furnace interests are making attractive quotations and it is probable some pending business will be lost to furnaces in this territory. Malleable and forge iron is moving in moderate quantities for pressing needs. Southern forge has been quoted as low as \$14, and Northern as low as \$14.50. Southern No. 2 X foundry \$15.50, and best Northern \$16.25, which can be shaded on a large order.

Steel Billets—For various reasons users of steel billets are postponing definite action on large supplies and continue to buy in a hand-to-mouth way. Makers refuse the slightest concession.

Bars—The output of bars has been slightly curtailed, and further curtailment is predicted unless the slight accumulation of assorted stock is reduced. Quotations remain as heretofore, though concessions are occasionally heard of.

Sheets—The distribution of sheet iron is quite active on old orders. New orders are generally small. The larger consumers are awaiting developments. Stocks are ample but not depressing.

Pipes and Tubes—The heavy consumption of tubes continues and there are running understandings or contracts for supplies.

Plates—Plate capacity is not fully employed. Car builders are slow in calling for deliveries and the smaller plate consumers are hanging back.

Structural Material—The market is dull as to new business, which is made up of unimportant orders, but it is strong because the mills have quite a volume of work booked.

Steel Rails—The only orders reported relate to small quantities for industrial concerns and two or three orders for trolley rails.

Scrap—Scrap has weakened all around, with the exception of No. 1 railroad, which is held at full price.

Pittsburg

Oct. 4—The week has been fruitful of readjustments in prices. The American Sheet and Tin Plate Company adopted new scales, reducing its former official prices, which had become purely nominal through the extensive shading which began early in the year, and at the same time making material changes in the differentials between gages in galvanized sheets and in both painted and galvanized corrugated roofing. The old and new official prices are as follows:

	Old.	New.
Black sheets, 28 gage.....	\$2.40	\$2.20
Galvanized sheets, 28 gage.....	3.50	3.20
Blue annealed, 10 gage.....	1.75	1.65
Painted corrugated, 28 gage....	1.70	1.60
Galvanized corrugated, 28 gage	3.00	2.80

The open market had been about \$1 a ton lower than these new prices, all along the line, but had been showing signs of stiffening, and it is possible the new prices will hold. They can be quoted as the market for the time being. In the rearrangement of prices on gages, the differential between 30 and 29 gage is reduced from 25c. to 20c. per 100 lb., equivalent to a reduction of \$1 a ton more on 30 gage than on 28 gage. The spreads to the heavier gages were reduced, making the reduction on heavier gages less than on 28 gage. The same policy was followed in rearranging spreads between gages of corrugated material.

Effective Oct. 1, the National Tube Company promulgated a new list of discounts on merchant pipe, involving the most radical readjustments in relative prices of different sizes made for many years. Examples of extreme changes are that steel pipe 7 to 12 in., inclusive, is cut three points, or about \$6 per ton, while 4½ to 6 in., inclusive, is advanced one point or about \$2 per ton and 2-in. lap-weld is advanced two points, or about \$4 a ton. A feature of the new card is that separate discounts are named, for the first time, on butt and lap-weld, sizes 2 in. to 3 in., with higher prices on the lap-weld, when formerly mills could ship indiscriminately on such specifications. Sizes ¾ to 1½ in. are reduced one point or about \$2 a ton, while ¼ and ½ in. are reduced two points or about \$4 a ton. Altogether, the changes amount to between \$3 and \$4 a ton, as an average on the entire tonnage production of ½- to 12-in. sizes.

While the official reduction in sheets was made to establish a firm market after a long period of cutting, and at a slightly higher basis than the extreme of the cuts lately made, the pipe reduction came upon a market which was being fairly well held, and was for the double purpose of rearranging prices on different sizes to make them more in keeping with cost of manufacture, and to stimulate business.

The pipe trade has lacked snap, tonnage being taken only as absolutely required.

Steel bars continue to be well held at 1.40c., Pittsburg, the only cutting being by one small mill in the West, and only in its local territory. Plates are shaded about as much as formerly, 1.40c. being held on wide plates, with 1.35c. being done on ordinary widths and slightly lower on narrow plates, running into sheared-skelp sizes, which can be done at 1.30c., a price which is also possible on grooved steel skelp.

Pig Iron—The market has been about as active as last week, showing an improvement over previous weeks, with no change in prices. We quote at Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, \$15; basic, \$13.50 for prompt; No. 2 foundry, \$14 for prompt and \$14.50 for next year; forge, \$13.25 for prompt; malleable, \$14 for prompt and \$14.75 for next year. The regular pig-iron averages for September are announced at \$15.02 for bessemer against \$15.146 in August and \$13.833 for basic against \$14.022 for August.

Ferromanganese—The market is quiet, and regularly quoted at \$39.50, Baltimore, freight to Pittsburg being \$1.95, but there is likelihood that this price could be shaded.

Steel—Prices are a shade easier on bessemer steel, and notably lower on open-hearth, which now commands only a slight premium above bessemer, as follows, Pittsburg: Bessemer billets, \$24; sheet bars, \$25; open-hearth billets, \$25 @ 25.50; sheet bars, \$25.50 @ 26; rods, \$28.50 per ton.

St. Louis

Oct. 5—The spot demand for pig iron is light though a little iron is moving. Consumers are buying very closely and stocks on hand are low. There seem to be no indications that present conditions will change materially before the first of the year. Current prices remain unchanged at \$11.00 @ 11.50, Birmingham, or \$14.75 @ 15.25, f.o.b. St. Louis, for No. 2 foundry.

A number of inquiries are coming in for first-quarter delivery, though no business is being closed. Producers are not getting first-quarter business in at the present prices and, in fact, are not naming prices for that delivery. Consumers, on the other hand, do not seem to be inclined to pay an advance for first-quarter delivery.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports the production of pig iron in the German Empire in July at 1,228,316 metric tons, an increase of 9245 tons over July. For the seven months ended July 31 the total output was, in metric tons:

	1909.	1910.	Changes.
Foundry iron	1,375,387	1,639,125	I. 263,738
Forge iron	405,617	382,774	D. 22,843
Steel pig	614,404	770,555	I. 156,151
Bessemer pig	286,092	286,943	I. 851
Thomas(basic)pig	4,709,048	5,350,951	I. 641,903
Total	7,340,548	8,430,348	I. 1,089,800

The total increase was 14.8 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

METAL MARKETS

New York, Oct. 5—The metal markets continue quiet, with few changes in most lines. There are some signs, however, of an improvement in consumption.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1910..	\$3,150,423	\$12,818,606	Imp. \$ 9,668,183
" 1909..	9,230,273	5,348,757	Exp. 3,881,516
Year 1910..	53,495,605	42,489,786	" 11,005,819
" 1909..	89,726,392	28,764,235	" 60,972,157
Silver:			
Aug. 1910..	4,755,708	4,119,362	Exp. 636,346
" 1909..	4,494,552	3,190,988	" 1,303,564
Year 1910..	36,934,397	29,815,770	" 7,118,627
" 1909..	38,903,584	29,979,133	" 8,924,451

Exports from the port of New York, week ended Oct. 1: Gold, \$130,500, chiefly to London. Imports: Gold, \$69,978, chiefly from Central America; silver, \$53,317, nearly all from South America.

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

	1909.	1910.	Changes.
India	\$4,596,200	\$4,561,500	D. £ 34,700
China	1,555,200	1,118,500	D. 436,700
Straits	82,800	.....	D. 82,800
Total	£6,234,200	£5,680,000	D. £ 554,200

Gold—There was a demand for the supplies arriving in London the first part of the week, Germany, Egypt and Turkey competing, and a premium was paid, 77s. 9½d. per oz. for bars. Later the demand subsided and prices returned to 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. In New York about \$1,400,000 was taken for shipment to Canada.

Platinum—The market is very strong, partly on account of the good demand in the jewelry trade, and partly on account of higher prices abroad. The quotations have again advanced sharply, dealers asking \$36 @ 36.50 for refined platinum, and \$42 @ 42.50 for hard metal.

SILVER AND STERLING EXCHANGE

Sept.-Oct.	29	30	1	3	4	5
New York	53½	54	54½	53½	53½	53½
London	24½	24½	24½	24½	24½	24½
Sterling Ex.	4.8670	4.8650	4.8630	4.8630	4.8625	4.8650

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

The tone of the silver market continues good, with prospect of some advance in current figures. The attitude of China helps the situation, as it is reported now and then that that country is a buyer.

Copper, Tin, Lead and Zinc

NEW YORK

Sept.-Oct.	Copper.		Tin.	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.
29	12½ @ 12½	12.25 @ 12.35	34½	4.40	4.25 @ 4.30	5.52½ @ 5.55	5.37½ @ 5.40
30	12½ @ 12½	12.25 @ 12.35	34½	4.40	4.25 @ 4.30	5.52½ @ 5.55	5.37½ @ 5.40
1	12½ @ 12½	12.25 @ 12.35	34½	4.40	4.25 @ 4.30	5.52½ @ 5.55	5.37½ @ 5.40
3	12½ @ 12½	12.30 @ 12.35	34½	4.40	4.25 @ 4.30	5.52½ @ 5.55	5.37½ @ 5.40
4	12½ @ 12½	12.35 @ 12.40	35	4.40	4.25 @ 4.30	5.52½ @ 5.55	5.37½ @ 5.40
5	12½ @ 12½	12.40 @ 12.50	35½	4.40	4.25 @ 4.30	5.52½ @ 5.55	5.37½ @ 5.40

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept. Oct.	Copper.			Tin.		Lead, Span- ish.	Zinc, Ordinar- ies.
	Spot.	3 Mos	Best Sel'd	Spot.	3 Mos		
29	54½	55½	59	157½	157½	12½	23½
30	55½	56½	59½	156½	156½	12½	23½
1	.....	.....	.....	.....	.....	.....	.....
3	55½	56½	59½	157½	157½	12½	23½
4	55½	56½	59½	158½	158½	12½	23½
5	56½	57½	60	162	159½	12½	23½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb. with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¼c.

Copper—Until Monday of this week the market continued sluggish and dull, but on that day the statistics of the visible supply in Europe were issued and as they showed a diminution for September of 3545 tons and it is generally expected that stocks in this country will also show a decrease during September, more interest was shown. At the close there is a considerable inquiry and prices have already advanced somewhat. Lake copper closes at 12½ @ 12¾c., and electrolytic copper in cakes, wirebars and ingots, at 12.40 @ 12.50c. Casting copper is quoted nominally at 12¼ @ 12½ cents.

Copper sheets are 18 @ 19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

The standard market has also been more active and advanced steadily, closing at £56 5s. for spot, and £57 2s. 6d. for three months.

Exports of copper from New York for the week were 1990 long tons. Our spe-

cial correspondent gives the exports from Baltimore for the week at 1380 tons.

Tin—Contrary to all expectations, the London market declined after the Banka sale had taken place and in view of the large American deliveries reported for September. At the beginning of this week, however, a decided change took place in the London market, where the bull party once more took hold of the situation. The advance was very rapid and most pronounced in spot tin, which seems to be scarce and well controlled. In consequence thereof, three months tin is selling at a large discount. The market closes strong at £162 for spot, and £159 5s. for three months.

The interests which control the stocks existing in this market, outside of those owned by the largest consuming interests, were the principal buyers of spot tin in London, and this strengthened their hold on the spot situation. Consumers who are not well provided for and have to buy near-by tin are forced to pay the goodly premiums which are being exacted. While October tin can be bought at about 35¼c. per lb., spot tin cannot be had below 36¼ cents.

Visible stocks of tin, Oct. 1, are reported as follows: London, 13,420; Holland, 3158; United States, excluding Pacific ports, 2421; total, 18,999 long tons, of which 11,717 tons were in store and 7282 afloat. The total was 1056 tons more than on Sept. 1, but 2420 tons less than on Oct. 1 last year.

Exports of tin from the Straits in September are cabled as 4220 long tons, a decrease of 861 tons from last year.

Lead—There is a good demand at last prices, 4.25@4.30c. St. Louis, and 4.40c. New York.

The European market has advanced, Spanish lead closing at £12 17s. 6d. and English at £12 18s. 9d. per ton.

The American Smelting and Refining Company at the present time has the following number of furnaces in blast, the total number at each place being stated in brackets: Denver, 3 (7); Pueblo, 3 (13); Leadville, 5 (10); Durango, 3 (4); East Helena, 3 (4); Murray, 6 (8); El Paso, 2 (10); total, 25 (56). Besides these there are the works at Chihuahua, Monterey and Aguascalientes, in Mexico, which have a total of 23 furnaces. The average ore-smelting capacity per annum is about 50,000 tons.

Spelter—The market is quiet but firm. Manufacturers are busy and consumption of the metal is good. Stocks in the hands of producers are small, and buyers continue to purchase from hand-to-mouth. The market closes at 5.37½@5.40c. St. Louis, and 5.52½@5.55c. New York.

The European market is reported to be strong and advancing. Good ordinaries are quoted at £23 15s., and specials at £24 per ton.

Base price of zinc sheets is \$7.50 per

100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The American Metal Company, has taken over the control of the Lanyon-Starr Smelting Company.

The gas situation at Iola is now very bad, and some of the works in operation there on the limited scale will probably be closed before the end of the winter.

Other Metals

Aluminum—The market continues quiet and prices are unchanged at 21½@22c. per lb. for No. 1 ingots, New York.

Antimony—There is no change in the market, and business remains on a retail basis. Prices are nominally unchanged at 8¼@8¾c. per lb. for Cookson's; 7¼@8c. for U. S., and 7¼@7¾c. for outside brands.

Quicksilver—Business remains good and prices unchanged. New York quotations are \$46 per flask of 75 lb. for large lots; \$47@48 for jobbing orders. San Francisco, \$45.50 for domestic orders and \$2 less for export. The London price is £8 12s. 6d. per flask, with £8 6s. 3d. quoted by second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Cadmium—Current quotations are 60@70c. per lb. in 100-lb. lots, f.o.b. New York, according to quality of metal.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, eight months ended Aug. 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	85,543	54,093 Imp.	31,450
Copper, 1909	111,844	40,903 Imp.	70,941
Tin, long tons	27,908	27,383 Imp.	525
Tin, 1909	27,024	28,181 Exp.	1,157
Lead, long tons	145,090	32,502 Imp.	112,588
Lead, 1909	139,744	31,858 Imp.	107,886
Spelter, 1½ g tons	83,739	5,889 Imp.	77,850
Spelter, 1909	73,787	5,063 Imp.	68,724
Quicksilver, lb.	3,233,150	1,086,227 Imp.	2,146,923
Quicksilver, '09	2,998,551	666,572 Imp.	2,331,979
Ores:			
Tin ore and con.	17,195	..... Imp.	17,195
Tin ore, 1909	16,427	..... Imp.	16,427
Pyrites	538,671	..... Imp.	538,671
Pyrites, 1909	518,690	..... Imp.	518,690

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1910, the United States furnished in all 107 tons copper matte, 24,818 tons fine copper, and 20,031 tons lead. This lead was chiefly Mexican, refined in this country.

Spanish Metal Exports

Exports of metals and minerals from Spain, seven months ended July 31, reported by *Revista Minera*, in metric tons:

Metals.	1909.	1910.	Changes.
Pig and manuf. iron	35,238	27,407 D.	7,831
Copper	10,988	10,320 D.	668
Copper precipitate	10,083	9,182 D.	901
Lead	103,682	100,965 I.	6,283
Zinc	874	654 D.	220
Quicksilver	1,484	1,300 D.	184
Minerals.			
Iron ore	4,537,435	5,574,183 I.	1,036,748
Manganese ore	7,065	3,406 D.	3,659
Copper ore	656,251	554,020 D.	102,231
Lead ore	2,188	2,004 D.	184
Zinc ore	74,889	73,153 D.	1,736
Pyrites, iron	767,361	890,652 I.	113,291
Salt	390,552	344,708 D.	45,844

Imports of phosphate of lime 45,622 tons in 1909, and 68,565 in 1910; super-phosphates and basic slag, 56,726 tons in 1909, and 63,804 in 1910; nitrate of soda, 22,584 tons in 1909, and 23,146 this year.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 1—The highest price paid for zinc sulphide ore was \$47.50, the base ranging from \$42 to \$44.50 per ton of 60 per cent. zinc. Zinc silicate ore sold at \$21@25 per ton of 40 per cent. zinc. The average price, all grades of zinc ore, was \$40.90 per ton. The highest price paid for lead ore was \$56, and the average price, all grades, was \$54.90 per ton.

The buyers and sellers played a waiting game this week and very little ore was sold before Thursday noon, when \$44 base looked to be the top for the week, but by Friday noon several lots

SHIPMENTS, WEEK ENDED OCT. 1.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,089,510	776,740	\$109,184
Joplin	2,090,880	192,410	50,243
Alba-Neck	977,310	.....	22,478
Galena	855,100	110,290	20,505
Granby	827,200	6,570	13,583
Duenweg	544,740	65,210	11,836
Miami	130,170	305,750	10,230
Spurgeon	237,950	47,740	5,019
Carl Junction	183,070	.....	4,027
Badger	195,200	.....	4,000
Aurora	232,600	.....	3,615
Sarcozie	203,740	.....	2,870
Cave Springs	96,220	6,940	2,207
Stott City	60,000	.....	1,290
Quapaw	59,890	.....	1,037
Totals	10,783,580	1,511,650	\$262,124
40 weeks	447,633,050	65,194,660	\$10,486,023
Zinc value, the week	\$220,618;	40 weeks,	\$8,802,098
Lead value, the week	41,506;	40 weeks,	1,683,925

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	\$41.25	\$47.31	\$38.46	\$45.16	\$52.17	\$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	40.20	40.35	37.83	57.52	48.80
July	43.06	39.63	41.11	36.80	53.74	48.59
August	48.25	40.13	44.54	37.32	57.60	49.75
September	47.70	43.45	44.87	39.96	56.11	54.73
October	49.50	.....	45.75	.....	55.02	.....
November	51.31	.....	48.29	.....	53.94	.....
December	49.45	.....	47.57	.....	55.26	.....
Year	\$43.98	.....	\$41.20	.....	\$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

had brought \$44.50. Buyers evidently had small orders, as the shipment is a decrease of 1773 tons from the previous week, which was, however, an exceedingly large one. The lead shipment also decreased by 428 tons.

Platteville, Wis., Oct. 1—The highest price paid this week for zinc ore was \$45; the base price was \$43.50@44.50 per ton. The base price paid for 80 per cent. lead ore was \$52 per ton.

SHIPMENTS, WEEK ENDED OCT. 1.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	961,200	.....	.....
Galena.....	629,060	.....	.....
Benton.....	601,280	.....	.....
Highland.....	432,200	.....	.....
Platteville.....	360,480	.....	150,000
Cuba City.....	251,485	151,720	235,870
Linden.....	71,020	.....	.....
Bewey.....	63,300	80,000	.....
Harker.....	63,090	.....	.....
Total.....	3,433,115	231,720	385,870
Year to date.....	75,462,805	7,483,644	20,369,520

Shipped during week to separating plants, 2,188,340 lb. zinc ore.

Other Ore Markets

Iron Ore—Current quotations for Lake Superior ores, on dock at Lake Erie ports, are: Bessemer ore—base 55 per cent. iron and under 0.45 phosphorus—\$5 per ton for Old Range and \$4.75 for Mesabi; nonbessemer—base 51.5 per cent. iron—\$4.20 for Old Range and \$4 for Mesabi.

In the East there is no organization of sellers, and a wide range of prices exists, according to quantity and location of mines. A good nonbessemer ore, around 50 to 55 per cent. iron, can be had at \$3@3.50 per ton, f.o.b. mines; but no general quotations can be given.

Manganese Ore—The base price, as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent. or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess of phosphorus and silica.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, \$6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ores, 50c.@1.50 per unit less.

Zinc Ores—For Rocky Mountain blends, of good quality, especially as to iron and lead content, delivered at Kansas smelting points, the current price is for the zinc content, less eight units, at the St. Louis price of spelter, less \$14@15 per 2000 lb. of ore. See also Joplin and Wisconsin ore markets.

Pyrites—Domestic pyrites have recently advanced slightly and are now quoted at 11½@12c., per unit of sulphur at mines for furnace sizes. Spanish pyrites, furnace sizes, are 12@12½c. per unit, ex-ship. Arsenical pyrites are from ½@1¼c. per unit less.

CHEMICALS

New York, Oct. 5—The general chemical market reflects the effect of the long continued quiet by slight weakening in quotations.

Copper Sulphate—The quotations remain unchanged at \$4 per 100 lb. for car-load lots and \$4.25 per 100 lb. for smaller parcels.

Arsenic—The market for white arsenic has again weakened slightly. The inside quotations are now \$2.25@2.37½ per 100 lb.; and one large seller is reported to be soliciting bids at even a lower figure.

Nitrate of Soda—The spot quotation is unchanged at 2.12½c. per lb., while 2.12½@2.15c. per lb. is asked for futures. The market is exceptionally quiet.

Petroleum

Oil production of California for the eight months ended Aug. 31, reported by the Oil and Gas Journal, in barrels of 42 gal. each:

	1909	1910
San Joaquin Valley.....	25,329,700	37,998,186
Coast district.....	5,509,300	5,170,889
Southern fields.....	6,474,900	7,061,849
Total.....	37,313,900	50,230,924

The total increase this year was 12,917,024 bbl., or 34.6 per cent.; nearly all this gain being in the Coalinga, Sunset and Midway districts, in the San Joaquin Valley field.

MINING STOCKS

New York, Oct. 5—While the general stock market continues to be mainly professional, there has been an improvement in tone and a general hardening in prices. This upward movement has been made in the face of a stiffer money market, with higher rates for loans. There have been advances in most of the active stocks.

There were several sales of Homestake of South Dakota during the week, at \$85@86.50 per share.

On the Curb there was more active trading. In the Cobalt stocks, La Rose, Nipissing and Kerr Lake sold well, at fractional advances. There was some trading in the Nevada stocks, especially in Tonopah, Tonopah Extension and Montgomery-Shoshone, but no advance in quotations. The copper stocks were fairly active, with small gains in British Columbia, Butte Coalition, Chino and Miami. Ray Central, however, showed a fractional decline.

Boston, Oct. 4—Copper shares continue to mend, although there is still the lack of outside dealing. The so called Clark-Coolidge and Dow stocks have led in point of activity. Of the former American Zinc and U. S. Coal and Oil have

had active periods and both show good advances. Algoma, Indiana and North Lake of the latter class also received good support particularly Indiana which is favored with good reports. Lake Copper on small trading fluctuates widely at times but gains ground all the time. The Cole-Ryan stocks, North Butte and Calumet & Arizona especially have done well and would probably lead, were there any concerted movement.

U. S. Coal and Oil reacted \$2.50 to \$29 after the announcement was made that the company was to be taken over by the Island Creek Coal Company. The latter company is a Maine corporation with 100-

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	July.	August.	September.
Arizona, Ltd.....	2,910,000	2,620,000	.....
Balakhala.....	1,100,000	.....	.....
Boleo (Mexico).....	2,272,600	2,039,520	.....
Copper Queen.....	10,730,372	9,426,763	9,115,294
Calumet & Ariz.....	2,705,000	2,560,000	.....
Cananea (Mexico).....	4,500,000	3,526,000	.....
Detroit.....	1,800,000	2,100,000	2,128,000
Imperial.....	800,000	400,000	.....
Nevada Con.....	6,896,429	5,800,000	.....
Old Dominion.....	2,000,000	2,693,000	.....
Shannon.....	2,207,000	1,546,000	1,418,000
Superior & Pitts.....	2,224,000	2,520,000	.....
Utah Copper Co.....	8,677,000	7,440,035	.....
Butte District.....	23,750,000	23,750,000	.....
Lake Superior.....	19,000,000	18,800,000	.....
Total production.....	90,804,411	85,221,318	.....
Imports, bars, etc.....	17,714,034	.....	.....
Imp. in ore & matte.....	6,637,836	.....	.....
Total.....	115,156,281	.....	.....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
X, 1909.....	124,657,709	66,359,617	56,261,238
XI.....	121,618,369	66,857,873	55,266,595
XII.....	117,828,655	69,519,501	59,546,570
Year.....	1,405,403,056	705,051,591	680,942,620
I, 1910.....	116,547,287	78,158,387	61,691,672
II.....	112,712,493	66,618,322	37,369,518
III.....	120,067,467	62,944,818	40,585,767
IV.....	117,477,639	67,985,951	31,332,434
V.....	123,242,476	59,305,222	45,495,400
VI.....	127,219,188	53,363,196	65,895,948
VII.....	118,370,003	56,708,175	59,407,167
VIII.....	127,803,618	67,731,271	61,831,780
IX.....	.....	.....	.....

VISIBLE STOCKS.

	United States.	Europe.	Total.
X, 1909.....	151,472,772	210,224,000	361,696,772
XI.....	153,509,626	222,566,400	376,076,026
XII.....	153,003,527	236,857,600	389,861,127
I, 1910.....	141,766,111	244,204,800	385,970,911
II.....	98,463,339	248,236,800	346,700,139
III.....	107,187,392	254,150,400	361,337,792
IV.....	123,824,874	249,625,600	373,450,474
V.....	141,984,159	246,870,400	388,854,559
VI.....	160,425,973	239,142,400	399,568,373
VII.....	168,386,017	232,892,800	401,278,817
VIII.....	170,640,678	222,320,000	392,960,678
IX.....	168,881,245	218,444,800	387,326,045
X.....	.....	211,276,800	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported from the first day of each month, as brought over from the preceding month.

000 shares of 6 per cent. cumulative preferred and 100,000 shares of common stock. The par is a nominal sum, \$1. The Island Creek Coal Company is to take over the U. S. Coal and Oil Company on the basis of five preferred and 10 common shares for each 18 shares of Coal and Oil stock. For each \$450 of the latter company's bonds the same terms are offered. Fifty thousand shares of preferred and 100,000 shares of common have been set aside to exchange for the 120,200 Coal and Oil shares and the \$1,495,000 bonds. A nominal quotation of 85 1/2 c. for Island Creek Coal preferred has been made and 30 1/2 c. for the common.

Isle Royale and Hancock have also been favored with a higher range of prices.

Assessments

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

*One-half mill.

Monthly Average Prices of Metals SILVER

Table with columns: Month, New York (1909, 1910), London (1909, 1910). Shows monthly price trends for silver.

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

Table with columns: NEW YORK (Electrolytic, Lake), London. Shows monthly price trends for copper.

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton. standard copper.

TIN AT NEW YORK

Table with columns: Month, 1909, 1910. Lists monthly tin prices for New York.

Prices are in cents per pound.

LEAD

Table with columns: Month, New York, St. Louis, London (1909, 1910). Lists monthly lead prices for New York, St. Louis, and London.

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

SPELTER

Table with columns: Month, New York, St. Louis, London (1909, 1910). Lists monthly spelter prices for New York, St. Louis, and London.

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

PRICES OF PIG IRON AT PITTSBURG.

Table with columns: Bessemer, Basic, No. 2 Foundry (1909, 1910). Lists monthly pig iron prices at Pittsburgh.

STOCK QUOTATIONS

Table with columns: Name of Comp., Bid. Lists stock quotations for Colorado Springs and Salt Lake.

SAN FRANCISCO. Oct. 4.

Table with columns: Name of Comp., Clg., Bid. Lists stock quotations for San Francisco.

N. Y. EXCH. Oct. 4

Table with columns: Name of Comp., Clg., Bid. Lists stock quotations for New York Exchange.

N. Y. CURB Oct. 4

Table with columns: Name of Comp., Clg., Bid. Lists stock quotations for New York Curb.

BOSTON CURB Oct. 4

Table with columns: Name of Comp., Clg., Bid. Lists stock quotations for Boston Curb.

LONDON Oct. 5

Table with columns: Name of Com., Clg., Bid. Lists stock quotations for London.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—			COPPERAS—Bulk.....100 lb. \$0.55			POTASSIUM—		
Carbons, good drill quality, carat	\$50.00@75.00		In bbls.....	.65@.80	Bicarbonate crystal.....lb.		\$.08	
Carborundum; f.o.b. Niagara			In bags.....	.60@.75	Powdered or granulated.....		.08	
Falls, powd.....lb.		.08	CRYOLITE (carload).....lb.	.06	Bichromate, Am.....	.07	@.08	
Grains.....	.10	@.17	FELDSPAR—Ground..sh. ton.	6.00@14.00	Scotch.....		.10	
Corundum.....	.07	@.10	FIRE BRICK—		Bromide.....		.20	
Crushed Steel, f.o.b. Pitts-			American.....per M.	30.00@40.00	Carbonate (80@85%).....	.03	@.04	
burg.....	.05	@.06	Imported.....	30.00@45.00	Caustic, ordinary.....	.03	@.05	
Emery, in kegs; Turkish			St. Louis.....	16.00	Elect. (90% KOH).....	.05	@.06	
flour.....	.01	@.02	Extra.....	20.00@23.00	Chloride (muriate), 100 lb..		1.90	
Grains.....	.03	@.04	Special extra.....	30.00@35.00	Chlorate, powdered.....	.08	@.09	
Naxos flour.....	.01	@.02	FIRE CLAY—F.o.b. St. Louis.		Crystals.....	.09	@.09	
Grains.....	.03	@.04	St. Louis, extra quality per ton.	5.00	Cyanide (98@99%).....			
Chester flour.....	.01	@.02	" ordinary.....	2.50	Carloads (30,000 lb.).....		18c.	
Grains.....	.03	@.04	FLUORSPAR—		5-ton lots.....		18c.	
Peekskill flour, f.o.b.			Domestic f.o.b. Pittsburg;		Less than 5 tons.....		.19	
Easton, Pa.....	.01	@.01	Lump.....ton.	8.00@10.00	Kainite, long ton, bulk, 7.50; bags,		9.25	
Grains, in kegs.....	.02	@.03	Ground.....	12.00@14.00	Permanganate.....lb.	.09	@.10	
Garnet, per quality..sh. ton.	25.00@35.00		Foreign crude ex. dock..	8.50	Prussiate, yellow.....	.13	@.13	
Pumice Stone, Am. Powd., 100 lb.	1.60@2.0		FULLER'S EARTH—Lump, 100lb.	.80@.85	Red.....	.29	@.32	
Italian, powdered..per lb.	.01	@.01	Powdered.....	.80@.85	Sulphate (basis 90%)...100 lb.	2.18	@2.21	
Lump, per quality..	.03	@.03	GRAPHITE—Ceylon.		PYRITE—			
Rottenstone, ground..	.02	@.04	Flying dust, finest to best..lb.	.02@.04	Domestic, non-arsenical, furnace			
Lump, per quality..	.05	@.20	Dust.....	.02	size, f.o.b. R. R.....per unit.	11	@12	
Rogue, per quality..	.05	@.30	Chip.....	.04@.08	Domestic, non-arsenical, fines,			
Steel Emery, f.o.b. Pitts-			Lump.....	.05	per unit, f.o.b. mines.....	10	@11	
burg.....	.07	@.07	Large lump.....	.08	Imported, non-arsenical, furnace			
			GYPNUM—		size, ex-ship, per unit.....	.13		
			Fertilizer.....sh. ton.	5.00	Imported, arsenical, furnace			
			Ground.....	4.00@7.00	ex-ship, per unit.....	.12	@.12	
			INFUSORIAL EARTH—		Imported fines, arsenical, ex-ship,			
			Ground Am. Best.....lb.	.01	per unit.....	.09	@.10	
			German.....	.02	Imported fines, non-arsenical,			
			LEAD—Acetate (sugar of) brown,		ex-ship, per unit.....	.11	@11	
			.....lb.	.07	Pyrite prices are per unit of sulphur. A deduc-			
			Nitrate, com'l.....	.08	tion of 25c. per ton is made when ore for furnace			
			MAGNESITE—Greece.		is delivered in large lumps.			
			Crude (95%).....lg. ton.	7.50@8.50	SALT—N. Y. com. fine 280 lb. bbl.	.72	@1.13	
			Calined, powdered...sh. ton.	26.00@37.00	N. Y. agricultural.....sh. ton.	3.80	@4.50	
			Brick, domes, per quat. f.o.b.		SALTPETER—Crude...100 lb.	4.00	@4.50	
			Pittsburg.....M.	160@200	Refined, crystals.....	5.00	@5.75	
			MAGNESIUM—		SILICA—			
			Chloride, com'l...100 lb.	.90@1.25	Ground quartz, ord'ry..lg. ton	7.00	@15.00	
			Sulphate (Epsom salt)...100 lb.	.90@1.00	Silex, ground.....	7.00	@15.00	
			MANGANESE—		Silex, floated.....	35.00	@40.00	
			Foreign, crude, powdered:		Lump quartz.....	5.00	@5.50	
			70@75% binocide.....lb.	.01@.01	Glass sand.....		2.75	
			75@85% binocide.....	.01	SILVER—Nitrate, crystals...oz.	.33	@.36	
			85@90% binocide.....	.01	SODIUM—Acetate.....lb.	.04	@.05	
			90@95% binocide.....	.06	" Alkali," per 100 lb., 58/48..	.90	@.95	
			Ore, 80%-85%.....sh. ton.	16.00@32.50	Bicarb. soda, per 100 lb.....	1.00	@1.30	
			MARBLE—Flour.....sh. ton.	7.00@9.00	Soda, caustic, per 100 lb., 78/60	1.72	@1.85	
			MINERAL WOOL—		Soda, caustic, powdered.....	.02	@.03	
			Slag, ordinary.....sh. ton.	19.00	Salt cake, per 100 lb., bulk....	.50	@.60	
			Selected.....	25.00	Salt cake, bbl.....	.65	@.85	
			Rock, ordinary.....	32.00	Soda, monohydrate, per lb....	1.30	@1.75	
			MONAZITE SAND—		Bichromate.....lb.	.05	@.06	
			Guar. 97% with 5% Thorium		Bromide.....	.20		
			oxide, normal.....lb.	.08 and up	Chlorate, com'l.....	.08	@.09	
			NICKEL—		Cyanide, 120-130% KCN, per 100%			
			Oxide, crude, lb. (77%) for fine	.47	Carloads (30,000 lb.).....lb.		18c.	
			metal contained.....		5-ton lots.....		18c.	
			Sulphate, single.....lb.	.10	Less than 5 tons.....		.20	
			Sulphate, double.....	.05	Hyposulphite, Am.....	1.30	@1.50	
			NITRATE OF SODA—		Phosphate.....100 lb.	2.10	@2.40	
			100 lb. 95%.....	2.12	Prussiate.....	.08	@.09	
			95% for 1910.....	2.12	Sal soda, f.o.b. N. Y.....	.60	@.75	
			96% is 2 1/2 @ 7 1/4 higher per 100 lb.	@2.15	Foreign, f.o.b. N. Y.....	.80	@1.00	
			OZOKERITE—best.....lb.	.14@.17	Silicate, com'l.....	.65	@1.00	
			PAINTS AND COLORS—		Sulphate, com'l (Glauber's salt)			
			Litharge, Am. powdered.....lb.	.05	.....lb.	.60	@.80	
			English glassmakers'.....	.08	Sulphate, com'l, calcined.....	.65	@.85	
			Lithophone.....	.03	STRONTIUM—Nitrate.....lb.	.07	@.08	
			Metallic, brown.....sh. ton.	16.50@30.00	SULPHUR—Louisiana (prime) to			
			Red.....	14.00@18.00	New York.....lg. ton.	22.00	up	
			Ocher, Am. common.....	10.00@15.00	To Boston, Philadelphia or			
			Best.....	12.00@15.00	Baltimore.....	22.50	up	
			Dutch, washed.....lb.	.02	Roll.....100 lb.	1.85	@2.15	
			French, washed.....	.01	Flour.....	2.00	@2.40	
			Paris green, pure, bulk.....	.17	Flowers, sublimed.....	2.20	@2.60	
			Red lead, American.....	.06	Powdered commercial, bags		1.55	
			Foreign.....	.08	Sicilian, extra qual., unmixed			
			Turpentine, spirits bbl., per gal.	.72	seconds, crude brimstone			
			White lead, Am. dry.....lb.	.05	to New York.....lg. ton.	\$22.00		
			American, in oil.....	.07	TERRA ALBA—Fr.&Eng. 100lb.	.70	@1.00	
			Foreign, in oil.....	.09	TALC—Domestic.....sh. ton.	12.00@20.00		
			Zinc white, Am. extra dry..	.05	French.....	15.00@25.00		
			French, proc's, red seal, dry	.07	Italian, best.....	30.00@40.00		
			dry.....	.10	TIN—Bi-chloride, 50°.....lb.	.10	@.12	
			PHOSPHATES—Acid.....55@60c. per unit		Crystals.....	.23	@.24	
			*Fla., hard rock 77%.....	6.00@6.50	Oxide, lb.....	.37	@.40	
			land pebble 68%.....	3.75@4.00	URANIUM—Oxide.....	2.20	@4.25	
			†Tenn., 78@80%.....	5.00@5.50	ZINC—Chloride sol., com. 20°		.02	
			75%.....	4.75@5.00	Chloride, granular.....	.04	@.04	
			68@72%.....	4.25@4.50	Dust.....	.06	@.06	
			†So. Car. land rock 60%.....	3.50@4.00	Sulphate.....	.02	@.02	
			*F.o.b. Florida or Georgia ports.	†F.o.b. Mt.				
			Pelasant. †On vessel Ashley River, S. C.					

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as a matter of private contract.