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## Ore Dressing by Adhesion of Liquid Films

Principles of Elmore Process and Other Systems Based upon Surface Tension and the Property of Minerals to Attract or Repel Different Liquids

B Y R . S T Ö R E N\*

The pioneers in the field of the so-called oil process for ore dressing seem to have thought that a special quality of oil was the beginning and end of the process; hence its name. The positive quality upon which this process rests is, however, a property of the mineral treated; in this respect the principle of the process is like all other principles of ore dressing. The oil is only a single one of the several factors which take part in the process, a part which, in the case of a couple of the minerals treated by the process, is even unnecessary. A. S. Elmore's apparatus marks the turning point in the history of the process under review, a process which depends upon the quality possessed by some minerals, when in a finely divided state, of adhering to liquid films, thus permitting the particles to be separated by flotation from other particles of the same or even lower specific gravity.

### PROPERTIES OF LIQUID FILMS

It is well known that the condition of the molecules or particles along the surface of a liquid is different from that prevailing in the interior. In the surface layer the molecules, by reason of the freedom from molecular attraction on the free side, are held together more firmly, thus forming a thin membrane or film, known as the liquid film, which has a greater resistance to rupture than the liquid inside. A drop of liquid may be thought of as being inclosed in a thin membrane like the gas in a rubber balloon. The thin membrane or film-like rubber is elastic, and exerts a pressure on the inclosed liquid, a surface tension varying with the nature of the liquid.

The same is true in regard to the surface of a gas bubble surrounded by a liquid; the bubble's surface is in contact with the inclosing film, the inward tension of the film and the outward pressure of the gas being in equilibrium. If such a bubble, situated for example at the bottom of a glass of water, rises to the surface of the water, it will during its progress keep the same inclosing film of water, the identical molecules, as if it were a tiny balloon, held more firmly around the gas than the surrounding water.

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### SURFACE TENSION AND ADHESION

When a needle is placed gently upon the surface of water, it floats, although its specific gravity is many times that of water. If the needle is oiled slightly so that the water will not wet it, it will be easier to place the bit of steel upon the water without breaking the surface film. The needle is supported by the liquid film, which does not break because the oiled surface does not adhere to the water and thus does not break the continuity of the film. In the same way all small bodies having suitable surface properties will remain in contact with the film, and if the weight is not too great and the area sufficiently large, they will be supported by the film, either the layer of molecules stretched over the surface or that forming a bag around a gas bubble formed in the interior of the liquid.

If a little fine and dry chalcopyrite is poured on the surface of water, it will be observed that some of the particles remain floating upon the surface. This principle is employed in a machine recently described in the JOURNAL, and employed in the United States for concentrating chalcopyrite ore by constantly bringing the finely crushed material in contact with the free surface of water. Returning to the experiment it will be observed, that some pyrite particles which have fallen to the bottom and have, therefore, become wet, adhere to bubbles of air. If the pyrite particles are of suitable dimensions more of them, and perhaps nearly all, may be made to attach themselves to bubbles, by heating the water or diminishing the atmospheric pressure so as to cause a more copious evolution of bubbles; then by cautiously moving the liquid the agglomeration of bubbles and mineral particles may, if the combined weight be not too great, be made to rise to the surface.

In Norway experiments have been made in concentrating chalcopyrite and pyritiferous ore by means of the air bubbles developed in a column of water under partial vacuum without other aid. About 23 per cent. of the chalcopyrite has in this way been separated in the concentrate. Experiments made with other minerals prove that they do not all behave like chalcopyrite. The difference is very con-

siderable, the form and luster of the surface being vital factors. Minerals such as graphite and molybdenite, which feel greasy to the touch and are thinly laminated, float upon water surfaces easily; others, such as quartz and granite do not float at all.

These peculiarities of minerals may conveniently be tested in a glass or beaker of water, using 1 gram crushed to pass a 40-mesh screen. By carefully heating the water to about 60 deg. C., an abundant development of air bubbles is produced, and the mineral's ability to adhere to the bubbles and be brought to the surface will appear. Graphite and molybdenite are floated with great ease; chalcopyrite, pyrrhotite, and iron pyrite separate easily; bornite, zinc blende and mica fairly easily; less easily galena, hematite, magnetite and chalcocite; hornblende and feldspar with difficulty, and quartz and granite not at all.

### CONDITIONS OF OPERATION

To obtain suitable conditions for ore-dressing by means of the adhesion of pyrite particles to gas bubbles, it is evident that the operations must be done in, or by means of, a liquid having better cohesion than water, at the same time having the property of wetting the valuable minerals and forming a stronger film round the gas bubbles. Such a liquid is oil. Particles of metallic minerals which are wetted by oil have no capacity of adhesion to gas bubbles in an oil medium, just as quartz particles immersed in water do not rise in water; but since oil repels water and cannot be mixed with it, oil has no surface attraction for bodies wet with water. This fact is an important factor in the process.

If a few cubic centimeters of thick oil are poured into a beaker of heated water containing  $\frac{1}{2}$  gram chalcopyrite and  $\frac{1}{2}$  gram feldspar, both crushed to pass a 40-mesh screen, and the beaker is then well shaken, the chalcopyrite will be wet by the oil, and the particles will adhere to the oil foam or bubbles. On the other hand, the water-wet feldspar will not adhere to the oil films. In the same way the interior of the beaker will be wet with water or oil, according to which of the two liquids first touches the glass, for where the glass is not wet with water, the oil will adhere

and where the glass is water-wet the oil will not adhere or wet it.

The pyrite particles mostly adhere to the surface of the liquid film of oil. By agitating the mixture the oil may be thrown about in the water, separated into drops smaller and smaller in size, and finally converted into a foam consisting of air bubbles inclosed in films of oil, giving the particles of pyrite more opportunity to attach themselves to oil films and to be borne to the surface.

By heating the liquid to, say, 80 deg. C., chalcopryite and feldspar may be completely separated provided that there are no particles containing both minerals. In the heated mixture bubbles become more plentiful; air bubbles with water films and others with oil films are mingled, the oil films bearing pyrite grains. These bubbles expand with the increase of heat, and the whole sponge-like mass rises to the surface. The water-wet particles of feldspar do not adhere to the films of either oil or water about the bubbles, and remain unaffected at the bottom of the beaker.

If mixed particles are present, i.e., true middlings, containing both minerals, the concentrates will carry some feldspar and the tailings some pyrite. In any ordinary crushed product there will also be more or less fine dust which, as slime, will neither sink nor rise in the water and will thus interfere with the process.

#### CHEMICAL CONDITIONS

The property possessed by pyrite and other minerals of being easily wet by oil and of adhering to liquid films is most apparent in particles having fresh lustrous or crystalline surfaces. When the surface of a pyrite particle becomes coated with a layer of oxide from long exposure to the air, its property of selective adhesion to liquid films is impaired or entirely lost. Tarnished particles may, however, be restored to their original activity by treatment with dilute acids which dissolve the layer of oxide. This effect of the acid is similar to that of a soldering fluid which cleans the iron plate so that the solder can come in actual contact with the surface.

In the operation of the flotation process the admixture of acid is beneficial only to a certain point. Too large a proportion of acid has a harmful influence upon the oil itself, destroying its capacity to foam. Thick oils resist this action of acids better than light oils.

A sulphide dissolved in nitric acid, sp. gr. 1.40, gives a mass of free sulphur, sp. gr. 2, which floats upon the surface of the liquid. Very dilute acids have not, of course, the same effect, but they do, however, have an important effect upon the surface of the pyrite particles. Sulphuric acid has an appreciable effect on pyrite coatings in dilutions as weak as 1 per cent.  $H_2SO_4$  and less. This action of

dilute sulphuric acid is intensified by heat. Violent boiling should be avoided.

When particles of hematite, taken from the surface of tarnished rock or ore, are placed in a beaker filled with dilute sulphuric acid, the acid attacks some of the particles, namely those that have weathered surfaces; small bubbles of air or steam in a nascent state are formed; these bubbles grow larger and finally masses of them with adhering mineral particles rise to the surface. This action is facilitated and hastened by heating the liquid or by diminishing the atmospheric pressure above it. On the other hand when particles taken from freshly fractured surfaces are put into the weak acid solution, little or no development of bubbles occurs at ordinary temperatures for the shining crystal planes are not easily attacked by dilute sulphuric acid.

Richards and Thoulet state that an addition of acid to a mixture of slime aids in obtaining a better and more rapid deposit of the material, and that the deposit is more rapid in a thick than in a thin mixture. This phenomenon may be explained as follows: The acid attacks the weathered surface of the minute pyrite particles and causes the evolution of gas bubbles; then the slime thus partially freed from the most plastic particles deposits more readily.

Very dilute acid probably has little chemical effect on pure crystalline pyrite minerals; at least it does not attack clean fracture planes of the copper sulphides, chalcocite, bornite and chalcopryite. Nor does it attack galena, pyrrhotite, iron pyrite, magnetite, hematite and zinc blende.

#### THE ELMORE PROCESS

Considering what has been said about the physical and chemical reactions which take place when oil and acid are applied to a mixture of fine-grained mineral and water, and the effect of agitation and warming upon this mass, it is plain that an ore-dressing apparatus for the use of the oil-acid process must have two chief parts, the mixer and the concentrator or separator, also that the separator must be a vertical cylindrical or conical tank, and that a slow movement of the mixture from below upward is the best arrangement. The fact that ores have very different properties, different degrees of fineness and dissemination of particles, different forms and dimensions of crystals, and different capacities for resisting surface weathering, make it practically impossible to devise a single system suitable for all classes of ore. A. S. Elmore's vacuum concentrator is capable of treating a fairly wide variety of poor ores, using variations within the limitations of the system.

The method of operating the Elmore apparatus is as follows: By reducing the atmospheric pressure in a conical tank, finely crushed ore, previously mixed with acid and oil and a minimum of warm

water, is drawn into the apparatus together with additional water at ordinary temperatures. The air and gases, absorbed in the water, are set free by the partial vacuum and the rise in temperature, and the bubbles covered with films of oil or water rise, carrying with them the particles of metallic mineral to the surface. Thus the particles which have become wet with oil during the previous agitation in the mixing tank of the machine are separated from the gangue in the bottom of the cone, borne to the surface, and discharged as concentrates.

To obtain a more rapid and more complete separation, the mixture is stirred by means of a revolving rake at the bottom of the concentrator. This prevents the formation of an inactive zone about the center of the cone. The teeth of the rake also push the tailings outward toward the discharge openings of the machine. The methods of obtaining the vacuum, of feeding and of discharging pulp, have been described in a recent issue of the JOURNAL. One of the advantages of the apparatus is that the process can easily be made continuous. The factors which may be varied to suit the peculiarities of the different ores to be dressed are: Fineness in crushing; the use of acid, or oil, or both, and the quantities added; the temperature of the mass in the mixer; the degree of vacuum; the water supply; the vertical and horizontal velocity; the circulation, etc.

In Norway and Sweden experiments with the process have been made chiefly with chalcopryite and cupriferous iron pyrite, and with zinc blende. Installations of Elmore machines are in operation at Nautanen in Sweden, and in Sulitelma, Beitstaden, Lökken, Traag, and Hadeland in Norway.

#### SIZE OF THE PARTICLES

The size of the particles is of great importance in the operation, for it greatly affects the results obtained. The fineness to which the ore should be crushed depends upon the size and distributing of the mineral particles, a maximum of purely metallic mineral particles being the aim, or rather a minimum of middlings containing both metallic and nonmetallic minerals in the same particle. There is a maximum and minimum size, between which ore is suitable for concentration by the oil-acid process. Classification may be advantageous, but it is not necessary except for removing the more plastic slime-forming material. The size of the particles ought not to exceed 20-mesh, or about 1 millimeter. Ten-mesh material has been tried, but particles of this size do not adhere readily to bubbles.

The water supply must be in proportion to the size of the ore. The larger the particles the more water must be used in the feed pipe, to increase the velocity and to prevent lodging; this also increases the velocity in the concentrator and aids in



holding the material in suspension. The settling of the tailings against the rising current limits the supply and the velocity of the feed water.

The percentage of slime produced determines the degree of crushing permissible. The surface of the slime particles is very great in proportion to the volume. The fine material is easily brought into suspension, and long remains in that state. Still finer slime has a plastic consistence, which has an important effect upon the working of the process. When the volume of the minute slime particles approaches zero, the area must also approach zero; and a body which has practically no surface cannot adhere to anything. The finest slime, therefore, cannot be enriched by means of the adhesion process. The addition of acid, as already explained, has some regulative effect; but the finest slime, chiefly the pyrite particles not wetted by contact with oil in the mixer, passes into the concentrator, and by means of its plastic consistence hinders separation in the central region of the cone. This fine plastic material should, therefore, be removed before the ore enters the mixer. For this purpose a thickening tank has been employed.

The pyrite slime which carries gold and silver may contain a higher proportion of these metals than the original ore. Tests on a Norwegian ore gave the following results:

	Copper, Per Cent.	Silver Grams per Ton.	Gold Grams per Ton.
Original ore.....	1.36	10	1
Slime.....	1.79	18	2

An explanation of this phenomenon may be found in the mode in which the precious metals occur in the pyrite, as microscopical particles, often upon the surface of the crystals and between the pyrite particles and the inclosing rock minerals. The statement made by certain eminent authorities that the precious metals are bound to the sulphides, cannot be accepted without question. During the crushing a relatively large proportion of the precious minerals will detach from the pyrite and, because of their extreme fineness and high specific gravity, partly pass into the slime, and partly into the tailings. The detached gold may be without bright surfaces, the so-called black gold, similar to that formed by the reduction of gold from a solution.

The crystalline form of the minerals may play a rather important part in ore dressing by the adhesion process. The mode of crystallization may be divided into two types: Forms which produce numerous planes, such as prismatic and tabular crystals; and the more globular forms, polyhedrons, etc. The form may be of considerable importance when the individual crystals are small enough to pass 30- to 40-mesh screens; and also the cleavage planes of such minerals as molybdenite and mica.

THE USE OF OIL AND ACID

Although the so-called oil process was first brought into practical prominence by the introduction of the Elmore vacuum concentrator, the vacuum chamber is not the chief feature of the apparatus; the mixer remains the fundamental factor in the process. Errors made in the mixer, in crushing, in the addition of acid and oil, cannot be remedied in the concentrator. It would be quite as sensible to try to correct the mistake of feeding unclassified material to Wilfley tables by regulating the supply of water. It is, therefore, necessary to examine the ores carefully to determine the properties of their constituent minerals, which may require more or less adjustment in the mixer to obtain the best possible result in the concentrator.

As stated before, the effect of the acid is chemical; it removes the weathered surface of the mineral. According to Elmore, mine water with acid reaction may be used instead of the dilute sulphuric acid. Ores with oxidized surfaces require more acid in the mixer than ores with fresh surfaces.

Ore from a Norwegian mine which had been stored for some time and had become weathered, was treated with 0.45 per cent. raw petroleum and 0.9 per cent. acid, and concentrated in an Elmore apparatus. The ore before treatment contained 1.15 per cent. copper and 6.89 per cent. sulphur. The extraction of copper was 56 per cent. and sulphur 46 per cent. The same ore crushed and screened through 35-mesh, and treated with the same quantity of acid and oil yielded an extraction of 75 per cent. copper and 76 per cent. sulphur. The better extraction was due to the fresh fracture planes produced during crushing.

A Swedish ore, also weathered, and containing 1.18 per cent. copper, 1.76 per cent. sulphur, and about 25 per cent. magnetite, after treatment with 0.8 per cent. Texas oil and 0.3 per cent. acid, yielded in the Elmore apparatus, an extraction of copper 65 per cent. and sulphur 15 per cent. Fresh ore from the same mine, with the same percentage of minerals and mixed with the same quantities of oil and acid, gave an extraction of 79 per cent. copper and 25 per cent. sulphur.

Chalcopyrite resists surface oxidation better than iron pyrite; the latter requires more acid in the mixer, even when the surfaces are rather fresh. The presence of magnetite in large proportions causes low extraction of iron pyrite, for it neutralizes the acid leaving the particles of pyrite covered with a coating of amorphous oxide. In this case it is better to remove the magnetite by means of magnetic separation before treatment by the Elmore process.

In the regular operation of the process it has been remarked that ores with pyrites oxidized on the surface are concen-

trated by acid as much as by oil. The gas bubbles, formed during the solution of the coating, adhere to the cleaned surface and float the particles with the expenditure of less oil than in the case of fresh pyrites. It may be said, that chalcopyrite is separated by means of oil; iron pyrite, by means of acid. It is important that the agitation in the mixer be not so violent as to destroy the gas bubbles formed on the pyrite particles by the acid.

The treatment of bornite in the mixer should be similar to that outlined for pyrite ores. Bornite belongs to that class of minerals which, when exposed to the air, are soon covered with a coating. A larger proportion of acid is required than for chalcopyrite and, as in the case of iron pyrite, bornite ore is best treated when fresh. By using more acid and warm water in the mixer, bornite ore should give as good extraction as chalcopyrite.

Concerning the quantity of oil to be used, it may be said in general that a minimum of oil gives a clean concentrate, but also rich tailings. This is, of course, due to the fact that the cleanest pyrite particles have better adhesion to the oil foam than the particles which contain gangue minerals. If a large proportion of oil is used, the middlings will begin to float, and, after still greater additions of oil, some rock minerals, chiefly mica, enter the tailings as well as magnetite and hematite.

The use of warm water in the mixer aids the action of the acid; it also increases the tendency of oils to foam. Heating the water for the feed pipe of the concentrator outside the mixer is, however, not to be recommended, for heat causes the emission of more or less of the absorbed air, and this air furnishes bubbles required in the concentrator.

APPARATUS FOR FLOTATION WITHOUT VACUUM ARRANGEMENT

A Norwegian concentrating plant treating zinc blende in limerock, employs a process based on the development of bubbles from the carbonate in the ore, the so-called Krupp process. Without going into details, the principles of this process are briefly as follows: From an oil mixer the material is transferred to a high and narrow cylindrical tank, having an overflow for the concentrates regulated by the flow of water or very dilute acid from lead pipes opening near the bottom. A rising, hot, 1-per cent. solution of sulphuric acid meets the descending pieces of limestone, and the bubbles of carbonic acid rise in the tank carrying the oil foam burdened with mineral particles. The concentrates are discharged as an overflow, while the tailings are removed at the bottom of the tank. For the ore treated at that particular place the process has not been successful because of the difficulty of making it continuous. The presence of carbonates in the ore also interfered

with the cleaning action of the acid. The plant is to be equipped for the Elmore process.

Attempts have been made to employ an apparatus operated by water pressure instead of by the partial vacuum used in the Elmore process. One inventor employs a high, narrow tank for vertical treatment of the mixture, but without arrangement for horizontal circulation at the bottom. Ore from the mixer and water are introduced through pipes, discharging somewhat above the overflow of the concentrator. In the absence of lateral agitation a neutral zone soon develops, and because of the short interval between the feed and the tailings discharge and the absence of gas bubbles the separation is not satisfactory. In an experimental plant in Sweden based on this principle, ore from the mixer is introduced into the concentrator by means of an injector, and the wide bottom of the conical concentrator is fitted with a rake.

Warming the water in the concentrator by means of double walls and currents of hot water or gases should be as effective for the development of air bubbles as the partial vacuum. The waste gases from a smelting plant might be used for this purpose in places where the concentration is carried on at the same plant. This plan would have the advantage that no high building for the vacuum pipes would be required, but the method has several disadvantages, which the Elmore system has successfully overcome.

The Elmore system has practically set aside the old laws of ore dressing. Like the Gröndal process for magnetic separation, it has revolutionized our ideas concerning the economical dressing of non-magnetic mixed ores, a class of ores in which the earth's surface is very rich.

Overhand stoping is mainly used on the Rand, South Africa, but, owing to the low dip of the orebodies and the way of carrying the face of the stope, most of the holes drilled (probably 90 per cent.) are wet holes. This drilling of wet holes is due to several things: (1) The inability of the Kafir to drill an upper; (2) the effect of the dust upon the miner's health; (3) the dip of the reefs. The Rand is one of the few places where wet holes are drilled in overhand stopes.

The life of the Barry or "honeycomb" tube-mill liner used at the Waihi mill, New Zealand, is, according to the report for 1907 of the Waihi Gold Mines Company, from 12 to 15 months, and the cost for liners per ton milled is less than one-sixth of what it was when silex blocks were used.

In 1907, a little more than 10,000 lb. of metallic bismuth were produced, in the United States from Mexican ores. An electrolytic process was employed.

## A Judicial Definition of "Lake Copper"

In his decision in the case of the Calumet & Hecla Mining Company against the Osceola Copper Mining Company, Judge Knappen, of the United States Circuit Court at Grand Rapids, Mich., summarizes as follows the facts developed in the testimony in regard to the different grades of Lake copper: "Lake copper differs from most other copper in that it is 'native' or usually 'free' and substantially pure, arsenic and other impurities being with rock where elsewhere united with the metal. Till recently practically all copper was furnace refined, and impurities were more readily removed from Lake copper and a better product was obtained. But by electrolysis practically absolute purity is now obtainable, and as a result much lake copper is now refined electrolytically. Calumet refines its highest grade mineral by furnace; other grades by treating a lower grade electrolytically and mixing it with another grade not electrolytically treated, thus diluting the percentage of impurities. Its copper, however treated, is entirely Lake copper and sold as 'Best Lake' copper (not electrolytic) and at one price. Osceola, Tamarack and Ahmeek mix their minerals with cathodes of Western copper produced by Boston & Montana, usually in equal proportions. The product is sold as 'Best Lake,' not as electrolytic, though but half Lake. Some other Lake coppers are likewise treated.

"Of 224,000,000 lb. of Lake copper Calumet's 95,000,000, Quincy's 16,000,000, Osceola's 18,500,000, Tamarack's 10,000,000 and Ahmeek's 3,500,000 are conceded 'Best Lake,' 24,000,000 lb. of seven other mines (including Centennial's 2,250,000 and Wolverine's 10,000,000) are capable of use for all purposes as Lake copper; and no reason appears why most of the remaining Lake product too arsenical for high furnace refinement cannot be electrolytically refined.

"There is no inherent chemical or physical difference between equally pure furnace refined and electrolytically refined copper, if the latter is subjected to the same final furnace process, as it usually is. Electrolytic is capable of use for any purpose for which best Lake is used. The ¼c. premium of the latter is probably due to the long existing good reputation of Lake. With electrolytic improvement this preference is diminishing. The Government originally specified Calumet alone for cartridges, but now indicates a willingness to take the best electrolytic. In the last five years Calumet has sold the Government only 1,000,000 lb. Attempts to raise the price of Lake as against electrolytic would be offset by larger use of electrolytic. If the distinction between Lake and electrolytic is as sharply identified as complainant claims, his marketing yearly 60,000,000 lb. as Lake, which is but

half Lake, raises the question as to his right to relief against monopoly in Lake. But neither Lake nor 'Best Lake' is so far a distinct commodity as to make Calumet control of Osceola, Allouez and Centennial necessarily tend to restraint of trade or monopoly in Lake or 'Best Lake'; hence there is no violation of Federal laws."

## Transvaal Mine Earnings and Dividends

SPECIAL CORRESPONDENCE

In view of the great interest that is now being taken in the Transvaal gold-fields it may be useful to point out that there is usually a wide margin between declared working profits and dividends. The difference is likely to be marked this year owing to the policy now widely adopted of increasing the plants out of revenue. The New Modderfontein company for example, is putting up 60 stamps at an estimated cost of £104,000, to come out of revenue. The payment of dividends is not to be interfered with, consequently the income of the company is really much larger than the dividend declaration would imply and when the plant is completed the shareholders may look forward to largely increased returns. The Nourse Mines directors, in the same way, are appropriating part of the profits for erection of additional machinery, and necessary expenditure will be met without interfering with the current rate of dividend. Thus the shareholders in some of the mines are providing out of profits capital for extensions and this method of finance accounts to some extent for the discrepancy between declared profits and dividends. On what this discrepancy is the returns for the six months January to June throw some light. The total working profits were £5,594,865 and the dividends during that period £3,949,968, or about 61 per cent. of the profits. The balance goes to capital account, interest and redemption of loans and debentures and to office expenditure outside Africa. According to Matson, "Mines of the Transvaal," (edit. 1908 p. 16) the working profits of the mines for 1907 were £9,727,000, while the dividends according to the Chamber of Mines were £7,131,612, leaving a difference of £2,595,388, or 26 per cent. of the so-called profits.

According to W. H. Gaze, a good tar varnish for coating wooden cyanide tanks is made by heating 80 lb. of tar in a water bath at 160 deg. F. until all water has been evaporated. Then add, with constant stirring, 80 lb. of hydraulic lime and apply hot. This varnish is acid resisting and flexible.

During 1907 the United States imported 9,922,870 lb. of white arsenic, valued at \$553,440.



# Turquoise Mining, Burro Mountains, New Mex.

Country Rock Is Granite and Turquoise Occurs between Well Defined Walls in a Zone of Alteration; Mining Is Conducted in Open Cuts

BY EDWARD R. ZALINSKI\*

In a former paper published in *Economic Geology*, Vol. 2, No. 5, July-August, 1907, I described the Burro mountain turquoise deposits, principally from a geological and mineralogical

Turquoise occurs in various parts of the United States, but most of the material produced on a commercial scale comes from New Mexico. Cerillos, southwest of Sante Fe, has furnished valuable gems.

esteemed as a gem. It has largely replaced the Persian and foreign turquoise used by the leading jewelers, and has established a reputation for holding its color.

Other localities in the United States where turquoise has been found are Turquoise mountain, Cochise county, and Mineral Park, Mohave county, Arizona; in southern Nevada, near Columbus; in Fresno county, California, and in Saguache county, Colorado. In New Mexico, besides Cerillos and the Burro mountains, turquoise is found at Hachiti, Grant county, and in the Jarrilla mountains, Otero county. As at Cerillos, the Burro mountain turquoise was known and worked by the Indians; turquoise beads and ornaments are frequently found in their graves throughout this section. At Fort Bayard, near Silver City and on Bear creek, some interesting pendant-shaped turquoise ornaments were obtained.

### DISCOVERY OF THE BURRO MOUNTAINS DEPOSIT

The modern discovery of turquoise in the Burro mountains is generally accredited to John E. Coleman and dates around 1875. While on a hunting trip he came across some old excavations which were partly filled and grown over with vegetation. Coleman made his locations and did his first assessment work in 1880. The first claim located was the Calliate and covered the largest prehistoric workings. Nicholas C. Rascome also located a number of claims in the neighborhood. It proved later the most productive ground; the Sante Fe and Gem claims, were not marked by prehistoric dumps. M. W. Porterfield bought Coleman's property and became interested with Rascome. They sold to C. Armény, of New York, who, with others, organized the Azure Mining Company in 1891.

A large number of rude stone hammers, four to eight inches in diameter were found in the old excavations. The hammers are of rounded form and were evidently used without a handle. Traces of fire are still to be seen, and it appears probable that heating and rapid cooling were used in the primitive mining.

### GEOLOGY

Only the main geological features will be given here. The geology and occurrence, also some remarks on the possible genesis of the turquoise have been treated more fully in *Economic Geology*, in the

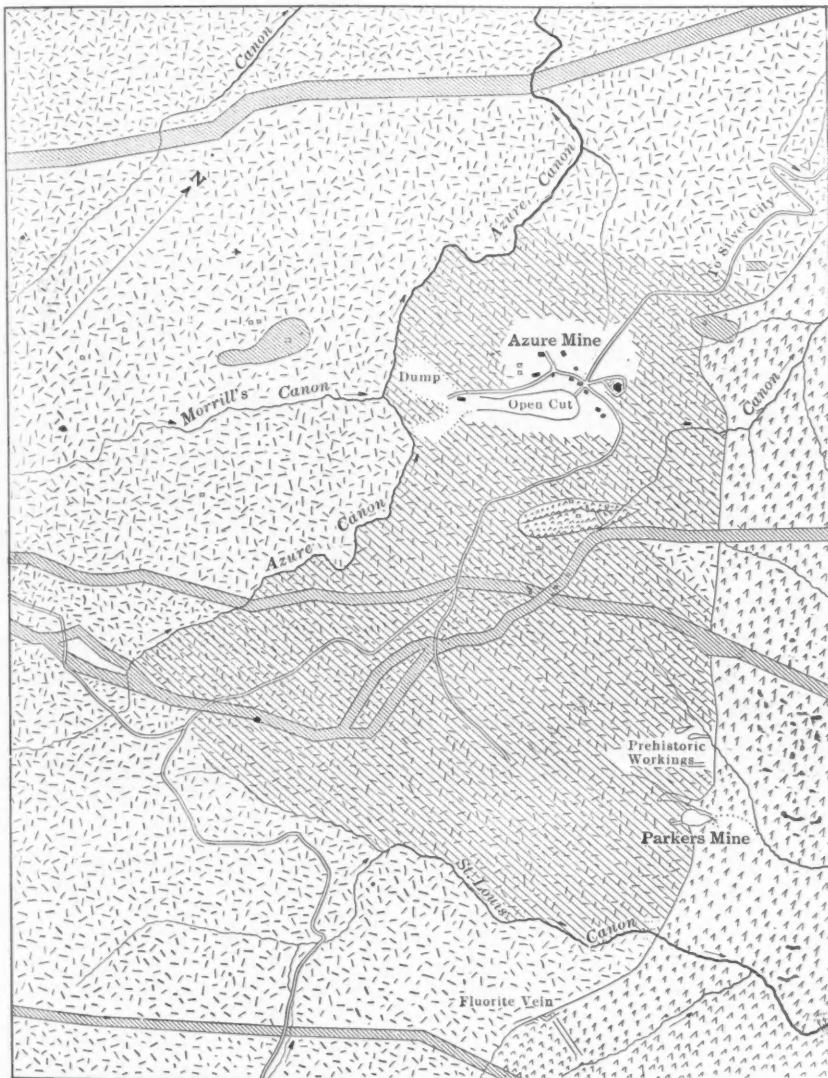


FIG. I. GEOLOGIC MAP OF COUNTRY SURROUNDING AZURE MINE

standpoint. No mention was made of the mining operations. It is the purpose of the present article to give some notes on how turquoise is mined, including a review of the main geological features.

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These deposits have long been known and were worked by the early Spaniards and Indians. In recent years the mines of the Burro mountains, Grant county, New Mexico, have been the most active producers. The turquoise from here is of good color and quality and is highly

article before referred to. The geologic map, Fig. 1, was published in this article and is reproduced by permission. This shows the Azure mine and surrounding workings, also the geology in the neighborhood of the turquoise deposits. The dikes, contacts, roads, etc., are plainable locations.

The turquoise deposits are situated 15 miles southwest of Silver City. The country rock in the neighborhood of the mines is biotite granite, into which has been intruded mica-andesite porphyry and later andesite dikes. Across the Mangus valley to the east are sedimentary rocks: lime, shale, sandstone and quartzite. Fossils found here in the lime and sandstone prove these beds to be of upper Cretaceous age. To the west lies the eruptive region in the neighborhood of Bullards peak.

The Burro mountains are largely granite, and on account of the main topographic features are spoken of as the Big

copper minerals, but cuprite and chalcocite are found in the mines of the Burro Mountain Copper Company.

The Azure mining camp is situated in the Little Burros at an altitude of 6200 ft. For some distance surrounding the turquoise deposits the granite is much altered. The feldspar is kaolinized and biotite has disappeared, while secondary quartz veinlets cut the rock in various directions. It is in this kaolinized area that turquoise is found. The magnetic variation on the Azure Mining Company's claims is 20 deg. 20 min. east. Directions referred to here are magnetic readings.

Turquoise occurs in a strong vein or fissured zone which strikes north 47 deg. east and dips 45 deg. south. It has a well defined foot- and hanging-wall, both of which show evidence of movement. The turquoise is found only between the well defined walls. Two sets of fissures cut this vein or sheared and altered zone.

eral hundred feet from the granite. A fluorite vein, one to two feet wide can be traced for 200 ft. on the surface near this point. It is on the contact of granite and porphyry. Small amounts of turquoise are found through the altered granite, and some turquoise staining occurs in the porphyry, but it has not been found in paying quantities except in the well defined Azure vein.

Later andesite dikes cut the above mentioned rocks, and are roughly parallel to the Azure vein. It is difficult to say whether the dikes are normally mica-andesite or dacite. In places large phenocrysts of orthoclase occur and also quartz in dihexahedral crystals showing magmatic corrosion. The dikes are 40 to 90 ft. in width and stand nearly vertical. Some copper staining occurs along their walls, but no traces of turquoise were noted. Besides the Azure camp and Parker's mine, mentioned above, turquoise occurs at three other points in the



FIG. 2. OPEN CUT SHOWING FISSURING

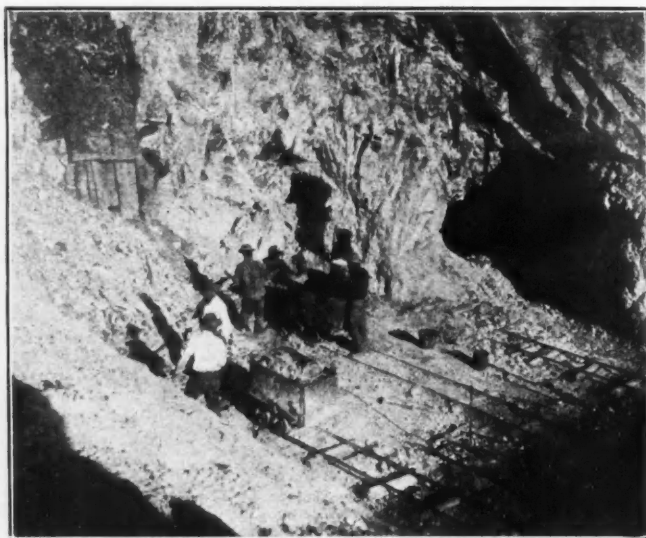


FIG. 3. LOADING TURQUOISE-BEARING ROCK

and Little Burros. The Little Burros rise gradually from the Mangus valley to an altitude of 6500 ft. The surface is rounded. Behind these as foothills the Big Burros reach an altitude of approximately 8000 ft. There are three main peaks with rugged slopes.

It appears that the Burro mountain uplift took place after the Cretaceous and previous to the great volcanic activity of Tertiary times. A period of erosion was followed by the intrusion of andesite porphyry into the granite, and last of all andesite dikes which cut the porphyry and also the sedimentary rocks of the section. The last intrusions are doubtless of Tertiary age, and were accompanied by fracturing and mineralization. Copper occurs over an area three miles east and west by two miles north and south. The turquoise-bearing section is included in the northwest portion of this ground. Malachite and crysocola are the principal

These strike in the same direction as the vein and one set dips 45 deg. south, parallel to the walls, while the other crosses the first set and dips to the north at a somewhat steeper angle. The fissuring can be seen in Fig. 2 and is of interest regarding the genesis of the turquoise. Two sets of fissures were noted in Dead Man's cañon, half a mile to the south.

Porphyry was intruded into the granite in the form of a stock or belt. Thin sections show this to belong to the mica-andesite series. The general direction of the contact near the Azure mine is northwest and southeast. The prehistoric workings on the Calliate claim lie in the granite near this contact, and Parker's turquoise mine is both in granite and porphyry. The porphyry crosses the St. Louis cañon and then strikes southeasterly to near the Chief, of the Burros copper mine, which lies in the porphyry sev-

Burros, and in the Cow Spring district a few miles to the southeast.

#### THE AZURE MINE

The Azure mine is worked on the largest scale of any of the turquoise properties. The vein is 40 to 60 ft. between walls and on account of the extreme kaolinization forms a saddle along the outcrop. The discovery was made in a small gulch leading into Azure cañon. Development proceeded through four adits driven northeasterly on the vein, and resulted in the production of turquoise equal to the best Persian gems. The turquoise was found in two forms, as vein turquoise filling cracks and fractures in the altered granite, and as nuggets or concretions imbedded in kaolin. It was mostly of a deep sky-blue color, and of a slightly translucent quality, being above 6 in hardness and making ideal gems.



In 1893 Feix Vogel, then superintendent, opened the famous Elizabeth pocket, which produced a large amount of high-grade turquoise. As much as 10 kg. of the finest material was mined in one month. The Elizabeth pocket extended from the second level to the surface, 40 to 60 ft., and the same quality of turquoise was obtained for about 150 ft. along the vein, the distance between the walls at this point being 40 ft. This pocket was found at the southwest end of the open cut, shown in Fig. 1.

The character of the turquoise varies along the vein. Nearly all shades of blue and green are found, and these are the most common colors. The green is not used in jewelry. The best quality of nuggets are covered with a white skin or coating. The average vein turquoise is from  $\frac{1}{8}$  to  $\frac{3}{8}$  in. thick, and the nuggets  $\frac{1}{4}$  to  $\frac{3}{4}$  in. in diameter. An irregular-shaped piece of greenish turquoise measured approximately 14x9x6 in. This was not of gem quality.

Chemically, turquoise is a complex hydrous phosphate of aluminum and copper. The following is an analysis by M. Carnot, of bright blue Burro mountain turquoise: H<sub>2</sub>O, 18.24 per cent.; Al<sub>2</sub>O<sub>3</sub>, 34.32; P<sub>2</sub>O<sub>5</sub>, 28.29; CuO, 7.41; FeO, 0.91; CaO, 7.93; Insoluble, 2.73; total, 99.83 per cent.

#### MINING

At first all the turquoise was obtained from underground workings, but it was so thoroughly distributed at the Elizabeth pocket that an open cut was driven from the first level across the entire width of the vein. Connections were made with the second level 40 ft. below and much of the rock was handled by chutes and afterward passed through a sorting house on the second-level dump. The coarse material and fines were separated by grizzlies and screens, and the turquoise picked out by hand. The open cut was afterward extended to the second level, and at the present time has been driven on the vein for a distance of over 600 ft. Some good turquoise was developed on the third level and sparingly on the fourth. On the latter level, however, the turquoise is associated with copper minerals, malachite, chrysolla and black oxide, and the best quality is scarce. So far all the finer grades of turquoise have been found practically 100 ft. or less beneath the surface.

The first work was done through four adits driven from the Azure cañon northeast on the vein. The cañon furnished good dumping ground and made hoisting equipment unnecessary. Later it was determined by the fourth level adit that the valuable turquoise did not extend to this depth. The levels are approximately 40 ft. apart. Most of the turquoise was obtained from the first and second levels, and as before mentioned, an open cut was driven on the vein from the second level.

Underground development is constantly kept in advance of the open-cut work and the character and quality of the turquoise determined, some lean portions of the vein being left standing where possible. The development work also is of use in removing the drift and weathered rock in the upper part of the vein. Chutes to the second-level tunnel provide for the removal of the dead rock at a minimum of time and cost. The chutes are connected with the first level, and the surface, and the dirt and rock are worked in through a large funnel-shaped opening of gradually increasing size, until good turquoise rock is encountered in the bottom part of the funnel, and everything has been removed from this point to the surface. The bottom part of one of these chutes can be seen in Fig. 3, to the left, in the face of the open cut. Fig. 3 also shows the turquoise-bearing rock being loaded into the cars. The buckets in the center are used to hold the turquoise. The pillar between the second-level tunnel and the small west crosscut in center furnished valuable material. An effort is made to keep the good turquoise-bearing rock separate from the dead rock, and the rock which carries green turquoise, though the latter is always sorted for possible blue.

After the surface rock has been removed the open cut is worked by benches. These vary from 8 to 12 ft. according to the character of the rock. In general a series of 10-ft. holes are drilled. These are sprung by  $\frac{1}{2}$  to  $1\frac{1}{2}$  sticks of powder, sometimes twice or three times, and 40 to 80 sticks of powder used in each hole; 35- and 40-per cent. dynamite is used. The charges are fired simultaneously by electricity, and are figured to barely remove and not throw the rock; little or no turquoise is destroyed. The benches are worked successively from the top of the cut to the second level. From the necessity of sorting over the rock as loaded on the cars, the progress is slow. The open cut at the top measures approximately 143 ft. across. The vein dips 45 deg. south and it is necessary to remove a portion of the hanging-wall. This ground is often dangerous. In past years a number of Mexicans have been killed by falling rock from this side.

The face of the cut is advanced along the vein from 50 to 80 ft. in a year. Four tracks are used. Before blasting these are covered with logs near the face. After a bench shot has been fired the tracks are cleared and the turquoise-bearing rock shoveled into cars. It is carefully looked over and the turquoise picked out, and thrown into buckets.

As a rule but two tracks are worked at once. These are graded enough to allow the run from the face of the cut to the dumps to be made by gravity. The cars used are of 16 to 17 cu.ft. capacity. Coarse rock is broken by sledges or adobe shots. The latter consist of one-half

to two sticks of powder laid on top of the rock and covered with 3 to 4 inches of mud. On the altered vein-rock this gives satisfactory results. Turquoise seldom occurs in these large blocks, and when it does the rock contains fissures and can usually be broken with a hammer. In loading the finer rock, care is taken to avoid loss of turquoise, and if this is plentiful the shoveling is slowly done and two men frequently watch each car, rake over the dirt and pick out the turquoise. In exceptionally good ground two or three buckets of rough turquoise have been obtained in one day. The daily output varies, but the average is considerably less than this.

#### SORTING

The sorting house on the second-level dump was abandoned as it was found more satisfactory to sort out the turquoise as the material was being loaded onto the cars. At the present time the sorting house is situated near the superintendent's house north of the open cut. On account of the many shades of turquoise and fine gradations in color, a uniform untinted light is desirable in sorting. The ceiling is covered with white cheese-cloth. Four windows with white shades throw a good light on the sorting tables which are covered with white oil-cloth. The white reflected light enables the distinction of some of the shades of blue and green which under less favorable conditions would be hard to determine. Without practice it is difficult to distinguish between some of these shades.

The turquoise buckets are brought from the mine and their contents emptied into boxes, each of which has its date and number. Sorting is done on the oilcloth-covered tables, generally under the superintendent's direction. It is customary, in case of fine turquoise, for him to go over it roughly first, picking out the best material, before giving it to the Mexicans for further sorting. It might be mentioned here that Mexican human nature is the same as any other kind, and some turquoise finds its way to the Silver City market which does not pass through the company's hands. However, most of this is taken from the mine and is unavoidable, though this practice is kept down to a minimum. No change rooms are required. It is but fair to say in referring to the sorting house, that Mexicans put on this work seem to feel on their honor, and no trouble has been experienced. I have left Mexicans alone, sorting turquoise of good quality, for an hour at a time, and had no cause to regret my action.

The first-class turquoise is kept separate, and comprises nuggets and vein turquoise free from flaws and of good color and quality. Second-class material is blue turquoise of any quality which will pay to ship, also mottled or spotted turquoise and turquoise matrix, i.e., turquoise intimately mixed with silicious portions of

the inclosing vein rock. All the green shades, and the soft, earthy classes or irregularly colored varieties are not shipped. The adhering vein rock, when not suitable for matrix, is removed on a small iron plate with a sorting hammer, or with special cutting pliers. Some turquoise is shipped without sorting, as it comes from the mine. In any case the final gradations as to quality and color are made in New York after the gem is cut and polished, and the sorting at the mine is done to take out undesirable material and facilitate handling. The percentage of the best turquoise to the amount mined is relatively small.

#### EQUIPMENT, LABOR, SUPPLIES, ETC.

The nature of the work makes hand labor the best practice. A compressor and steam shovel would undoubtedly facilitate the amount of ground handled, but the greater part of the rock has to be thoroughly looked over, and loading into cars by hand, while slow, secures a satisfactory recovery of turquoise. Moreover, the mines are 15 miles from the nearest railroad, with some steep grades between, and neither fuel nor water is plentiful. Mexican labor is employed. From seven to twelve men are worked in the mine under a white foreman.

Good accommodations are made for the Mexicans, and they live with their families at the Azure camp. No water is to be obtained at the mine, and the company owns a well property below the camp in the Mangus valley. Water is pumped by a windmill and hauled to the mine in barrels; it contains no alkali. Mine supplies, also grain, groceries, etc., are brought by the company's team twice a month from Silver City. Frame and adobe houses are provided for the miners, and a nominal charge for water rent and team is made. Wages are \$2 per day, which is higher than paid by other mines of the neighborhood. Blacksmiths get \$2.50 per day and upward, and teamsters who live at the well, \$65 per month.

The mine equipment is simple. Besides the sorting house, water house, office, miners' houses, etc., are a carpenter, machine and blacksmith shop on the second-level dump near the mouth of the cut.

Prospecting work with a diamond drill has been attempted at various times, and on one occasion turquoise was located. In general, however, it has been unsuccessful on account of the irregular distribution of turquoise even in the vein.

First-class turquoise is shipped in sealed cans; second-class in 150-lb. cases. Turquoise is commonly cut *en cabochon*, or elliptical with a convex surface. It is also cut *marquis*, or pointed at both ends. The price ranges from \$6 to \$25 per carat and higher, \$15 per carat being an average price for turquoise of good quality and color. The standard shape is oval and of medium height. The most popular size is from 5 to 10 mm. longest diameter, and

gms of these dimensions weigh from  $\frac{3}{8}$  to  $2\frac{1}{2}$  carats. Turquoise brooches, etc., are often cut larger.

The Azure mine has probably produced more turquoise than any other single property. Stones to the value of several million dollars have been obtained. The demand for the turquoise of the best quality is constantly in excess of the supply.

## Minerals at the Toronto Exhibition

### SPECIAL CORRESPONDENCE

The display of mineral products at the Canadian National Exhibition, which opened in Toronto, Ont., recently, is by far the most extensive and interesting ever shown in Ontario. The largest exhibit is that furnished by the Provincial Department of Mines in charge of Prof. Wm. Nicol, of which the most noteworthy feature is a nugget of native silver weighing 1600 lb. from the Crown Reserve mine at Cobalt, the silver content of which is estimated at \$5000. Large collections of ore from other Cobalt mines are shown, including a slab of native silver about 4 ft. in length from the O'Brien, carrying about 90 per cent. silver; a silver nugget of 850 lb., and a specimen of a calcite vein from the same mine showing the mode of the occurrence of silver. There are four large masses of ore from La Rose, showing silver in association with calcite, niccolite, chloanthite and smaltite. The Coniagas is represented by a fine collection of ore and a silver bar 998.4 fine produced at the Thorold, Ont., smelter of the Coniagas Reduction Company; also specimens showing how the smelter has succeeded in saving the by-products in the form of pure commercial cobalt oxide and white arsenic. The progress of the smelting industry is also illustrated by six large silver bricks turned out by the smelter of the Deloro Mining and Reduction Company from ore from the O'Brien mine, and samples of the speiss produced after the extraction of the silver and the cobalt and nickel oxides yielded by the speiss. The Laurentian gold mine, Manitou Lake, Ont., contributes 60 oz. of gold nuggets, almost pure metal, valued at \$4000. There is a full display of nickel products and copper-nickel ore from Sudbury, and iron ores from the Helen mine on the Michipicoten; from Bessemer, Hastings county; from Calabogie, Renfrew county; from Moose Mountain and other sources. The cement and oil industries are well represented.

The government of New Brunswick makes a comprehensive display of economic minerals in charge of Dr. L. W. Bailey, the exhibits being largely of a non-metallic character. The collection, however, includes a showing of iron and copper ores, manganese and gypsum. One of the most interesting features is a display of albertite from the neighborhood of Hillsboro, in Albert county, where it

was at one time profitably worked and distilled for oil and gas.

The Province of Nova Scotia shows a collection comprising some rich samples of auriferous quartz from Montague, Halifax county; from the Eastwill and Withrow mines, South Unjacket; the Ophir mine at Brookfield, and the Gold River mine. A prominent feature of the display is an obelisk some 12 ft. high, supposed to represent the amount in bulk of all the gold produced in the Province to Sept. 30, 1905, amounting to 857,566 oz. extracted from 1,783,174 tons of quartz. Many samples of coal are also shown.

Specimens of asbestos are shown from King's mine, Thetford, the American Asbestos Company, Black Lake, the Dominion Asbestos Company, Black Lake, and other mines in Quebec.

## Silver Cyaniding in Mexico

According to Prof. G. H. Stanley<sup>1</sup> the cyanide practice at the Hacienda de San Francisco, Pachuca, Mexico, is as follows: The treatment tanks are 10 ft. deep. After agitation for 24 hours, the charge is allowed to settle six hours. Then about 3 ft. of the solution is decanted off. It is filled up with fresh stock solution plus lime and lead acetate and agitated until mixed, then it is settled half an hour, and 18 in. in depth is decanted. Six other similar washes are given as well as two final washes with water, making nine decantations in all. Finally it is pumped to tall settlement tanks, where it remains as long as possible. The clear solution is then decanted, and the residue, running 70 per cent. moisture, is discharged. It is proposed to install filters with the view of saving time and recovering more dissolved silver and cyanide.

The mill work is as follows: Crushing is done in 0.025 per cent. K Cy solution with 1050-lb. stamps through slot screens equivalent to 50 mesh, the duty being 3.3 metric tons per 24 hours.

About  $2\frac{1}{2}$  per cent. by weight of concentrates are taken out of the pulp by Wilfley tables and Frue vanners. These concentrates carry about 50 per cent. of the silver in the ore.

The tailings are separated by classifiers into 45.8 per cent. sand, 51.7 per cent. of the dry weight of the ore of slime, and treated by percolation and agitation respectively. The sands get 14 days' treatment and the slimes are washed and dealt with as described above.

The weight of solution precipitated per ton of pulp treated and the strength of solution used are as follows: The sand treatment of 7 tons of 0.35 per cent. K Cy, 1.4 tons of 0.10 K Cy and, 0.7 ton of wash water; in slime treatment 6.4 tons of 0.10 per cent. K Cy. A recovery of 87 per cent. is made.

<sup>1</sup>Journal, Chem. Met. and Min. Soc., of South Africa, June, 1908, p. 385.



# Construction of 100-ton Copper Smelting Plant

Furnace Capacity Depends Chiefly upon Quantity of Fluxes Required, Volume and Pressure of Blast and Fusibility of Charge

BY CHARLES C. CHRISTENSEN \*

There are many mines for which small smelting plants, especially matte-smelting plants, are desired. It has seemed to me that a description of some of the essential features of such a smelting plant would be useful.

## SIZE OF FURNACE AND CALCULATION OF POWER PLANT REQUIRED

The size of a blast furnace is determined by its internal area at the tuyere level. For rectangular furnaces the width should not exceed 54 in. Furnaces have been built as wide as 60 in., but the tuyere pipes, being water-jacketed, were then extended 6 in. into the furnace, making the actual width 48 in. No advantage was gained by this experiment except that the limit of width was discovered. For the length there seems to be no limit.

The capacity of a furnace depends to a great extent upon the quantity of fluxes necessary, the volume and pressure of the blast (the wider the furnace the higher the blast pressure) and the fusibility of the charge. The smaller size of rectangular furnaces will smelt approximately 3/4 to 3 3/4 tons of ore and fluxes per square foot of area at the tuyere level; in larger furnaces the capacity per square foot increases. Following this rule, a furnace for copper ores, having 100 tons capacity per 24 hours, with a width of 40 in., should be 96 in. long, giving an area at the tuyere line of 26.7 sq.ft. The cubic feet of blast required per minute is 260 x area, or square feet of smelting space, or in this case, 260 x 26.7 = 6942 cu.ft. The nearest blower on the market is one of 45 cu.ft. displacement per revolution and 175 r.p.m. = 7875 cu.ft. of blast per min. We may figure on 16 oz. or 1 lb. pressure for a furnace of this size, and 5 h.p. for each 1000 cu.ft. of blast needed, plus 10 per cent.

$$\frac{7875 \times 5}{1000} + 10 \text{ per cent.} = 43.3 \text{ h.p.}$$

The horsepower could also be worked out as follows:

$$\frac{7875 \times 16 \text{ (oz.)} \times 0.003}{11} + 25 \text{ per cent.} = 42.95 \text{ h.p.}$$

To run this blower, then, use a 45-h.p. electric motor, making 650 r.p.m. The pulley should be 18x12 in., and the belt 11x5/16 inches.

Driving the blower direct from this motor the size of the blower pulley is found from the equation:

$$\frac{18}{x} \times 650 = 175,$$

from which  $x$  is found to be 66.8 in. The pulley, then, should be 67x12 in. face. The belt speed will be

$$\frac{18 \times 3.14 \times 650}{12} = 3,061$$

ft. per min., or 51 ft. per sec. At this speed an 11-in., 5-ply belt will transmit: 3.43 (area of belt in square inches) x

$$51 \times 0.3 = 52.47$$

h.p.; hence, it is ample to run a blower at 16 oz. pressure.

For a suitable sampling plant the following machinery will be required: One 7x10 Blake crusher, 24x8 1/2-in., tight and loose pulleys to run at 250 r.p.m.; for this 7 h.p. will be required; one pair of 24x8-in. belt rolls, pulleys 60x8 1/2 in. and 30x8 1/2 in., to run at 95 r.p.m., requiring 5 h.p.; one pair 12 1/2x12-in. belt rolls, pulleys 36x8 1/2 in., 150 r.p.m., 3 h.p. required; one sample grinder, 16x4 1/2 in., tight and loose pulleys, 150 r.p.m., 3 h.p. required.

Allow 2 h.p. for shafting and use a 20-h.p. electric motor making 775 r.p.m., with 12x8-in. pulleys and 7-in. belt. The circumference of a 12-in. pulley =

$$1 \times 3.14 = 3.14$$

ft. At 775 r.p.m., this would give a speed of 775 x 3.14, or 2433 ft. per min. = 40.5 ft. per sec. The area of a 7-in., 4-ply belt would be

$$7 \times 7/4 = 1.75$$

sq. in.

$$1.75 \times 40.5 \times 0.3 = 21.26$$

h.p. The belt will transmit 21.26 h.p., and hence is ample to drive the sampling machinery. The sampling plant line-shaft, then, will run at 150 r.p.m., and will transmit 20 h.p. Diameter of shaft =

$$\sqrt{\frac{20}{150}} \times 125 = 2.55$$

in. To be safe, make the shaft 2 11/16 in. diameter, in lengths to suit. Diameter of pulley on line shaft to receive power is found from the equation:

$$\frac{12}{x} \times 775 = 150,$$

from which  $x$  = 62 in., face to be 8 in. Diameter of pulley to drive 7x10 crusher is found from the equation:

$$\frac{24}{x} \times 250 = 150,$$

from which  $x$  = 40 in.; to have 17-in. straight face for tight and loose pulleys on crusher; 8-in., 4-ply belt to be used.

Diameter of pulleys to drive 24x8-in. rolls will be

$$\frac{60 \times 95}{150} = 38$$

in., face to be 8 1/2 in.; and

$$\frac{30 \times 95}{150} = 19$$

in., face to be 8 1/2 in.; 8-in., 4-ply belt to be used. Diameter of pulleys to drive 12 1/2x12 in. rolls and sample grinder will be the same as on these machines, both running at the same speed as the line shaft, 150 r.p.m. The pulley to drive sample grinder, however, should have a 9-in. straight face for the tight and loose pulleys on that machine.

It is now desired to find the dimensions of the generator necessary to run the above mentioned electric motors, as well as one dynamo for one hundred 16-c.p. incandescent lights and four arc lights. Summing up, we have one electric motor delivering at the pulley 45 h.p., one delivering 20 h.p., and one dynamo for the incandescent lights and arc lights, representing 15 h.p., or a total of 80 h.p., to which add 15 per cent. for loss in motor and dynamo efficiency and 10 per cent. for loss in transmission. Say the generator is placed 1000 ft. distant in the water-wheel house; then a generator which will transmit 101 h.p.—say, 100 effective h.p.—is required. Allowing 15 per cent. for loss in generator and 3 per cent. for loss in transmitting power by belt from water-wheel to generator, and we have a total of 119 h.p. to be delivered by the water-wheel pulley.

Assuming that we have 200 ft. head in 650 ft. and 500 cu.ft. per min. of water available, we will use a single-nozzle water-wheel of 5 ft. diameter, delivering, with 200 ft. head and 412 cu.ft. of water per min., 132 h.p., figuring 80 per cent. efficiency for the water-wheel. The surface line is 650 ft., hence the pipe line will be that length, and figuring a 15-in. diameter pipe, loss of head friction will be 7 ft., leaving an effective head of 193 feet. This will give about 125 effective h.p., with 408 cu.ft. of water per min., running the water-wheel about 214 revolutions per minute.

The pulley on the 100-h.p. generator is 20x16 1/2 in., running 650 r.p.m., and hence will require a 60 3/4-in. diameter pulley on the water-wheel. The belt speed

\*1380 North Fairfield avenue, Chicago, Ill.

will be  $20 \times 3.14 \times 650 = 3400$  ft. per min., or 56.6 ft. per sec. Area of belt, 16 in. x 7-ply =  $16 \times 7 / 16$  in. = 7 sq.in.  $7 \times 56.6 \times 0.3 = 118.86$ , or, say, 119 h.p., which is required to be transmitted to the generator.

joint efficiency, the following equation will give the thickness of plate to be used in the pipe line:

$$\frac{7.5 \text{ in. (radius)} \times 83.56}{16,000 \times 0.7} = 0.055 \text{ in}$$

SPECIFICATIONS

The following are the specifications for a recently constructed plant of the character indicated:

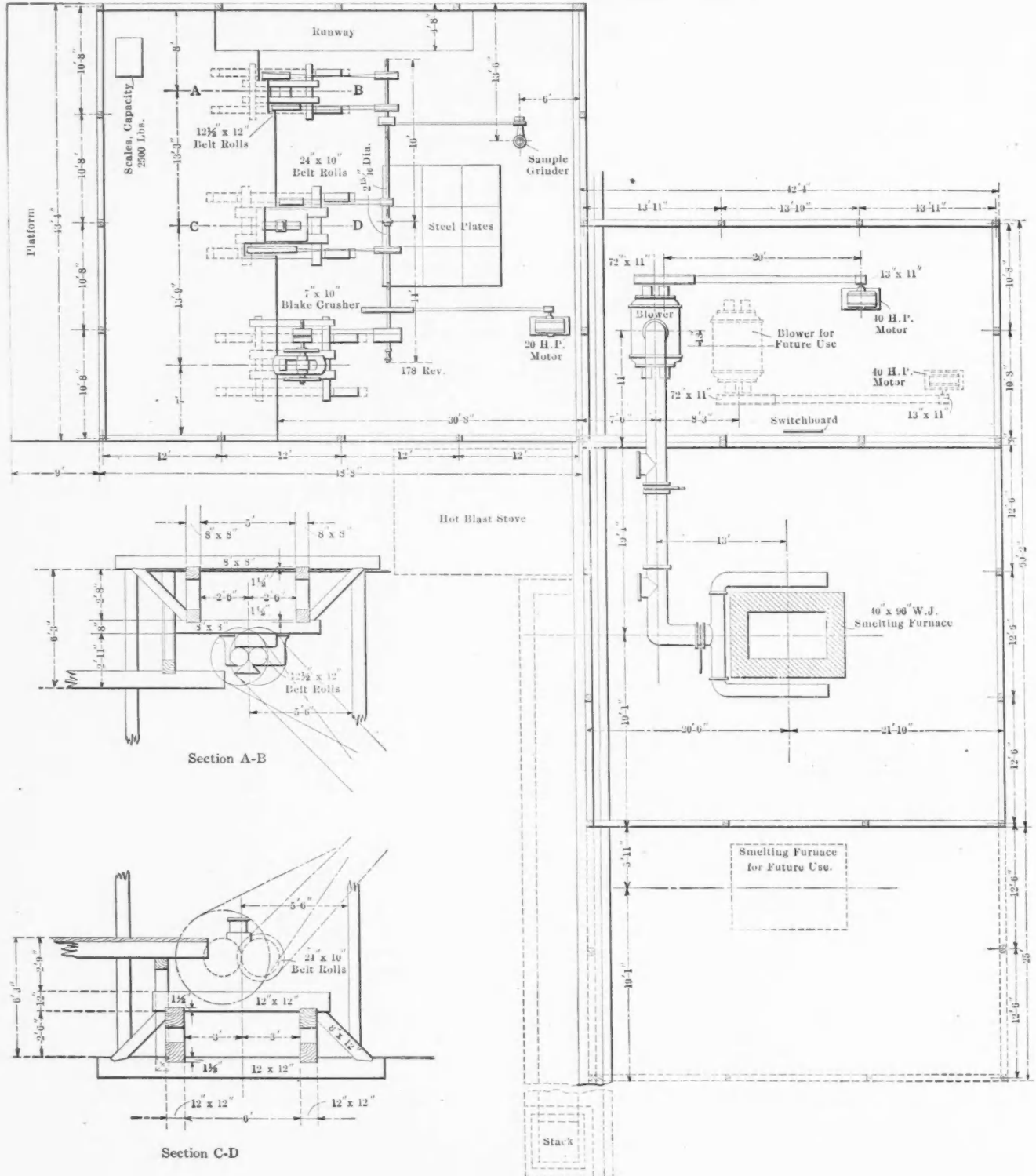


FIG. 1. ARRANGEMENT OF 100-TON SMELTING PLANT

The maximum pressure in the pipe line will be 193 ft. (head)  $\times 0.433 = 83.56$  lb. per sq.in. Figuring a tensile strength of 60,000 lb. for steel plates, a factor of safety of  $3\frac{3}{4}$ , and for double-ripped lap

No. 16 steel plates, B.w.g, are 0.062 in. thick, and are the nearest to be had. It would be better to make the lower half of the pipe line of No. 14 steel and the upper half of No. 16 steel.

**Blast Furnace**—All iron and steel work for one rectangular steel water-jacketed furnace, measuring 40x96 in. at the tuyere line for smelting copper ores, complete in details as follows: The curb



to be built of steel plates, strongly braced with steel angles and provided with proper slag and copper spouts; curb to rest upon a heavy cast-iron bottom-plate, supported by six short cast-iron columns. Resting upon the curb will be the steel water-jackets, 6 ft. 6 in. high, with two side and two end-jackets, leaving, when assembled, a smelting space of 40x96 in. at the tuyere level; the side jackets only to be boshed; the lower part of these jackets,

thick; all joints flanged, riveted and calked and the water-jackets to be tested to a few pounds water pressure before shipment, to see that they are perfectly water tight; all jackets to be provided with hand-holes, flanges for inlet and outlet water connections, all necessary binders and bolts and a complete set of piping, valves and fittings necessary for supplying cooling water and for conducting discharge water to pockets cast

three I-beams on sides and three on ends, connected by steel angles at corners, and provided with cast-iron spacers between the beams which must be bolted together. This mantle-frame is to be supported by four cast-iron columns 11 ft. 4 in. high, 8 in. outside diameter, 1-in. metal, with 16-in. square caps and bases and pockets cast on for receiving the discharge water. (Or instead of cast-iron columns, structural-steel columns, made up of Z-bars,

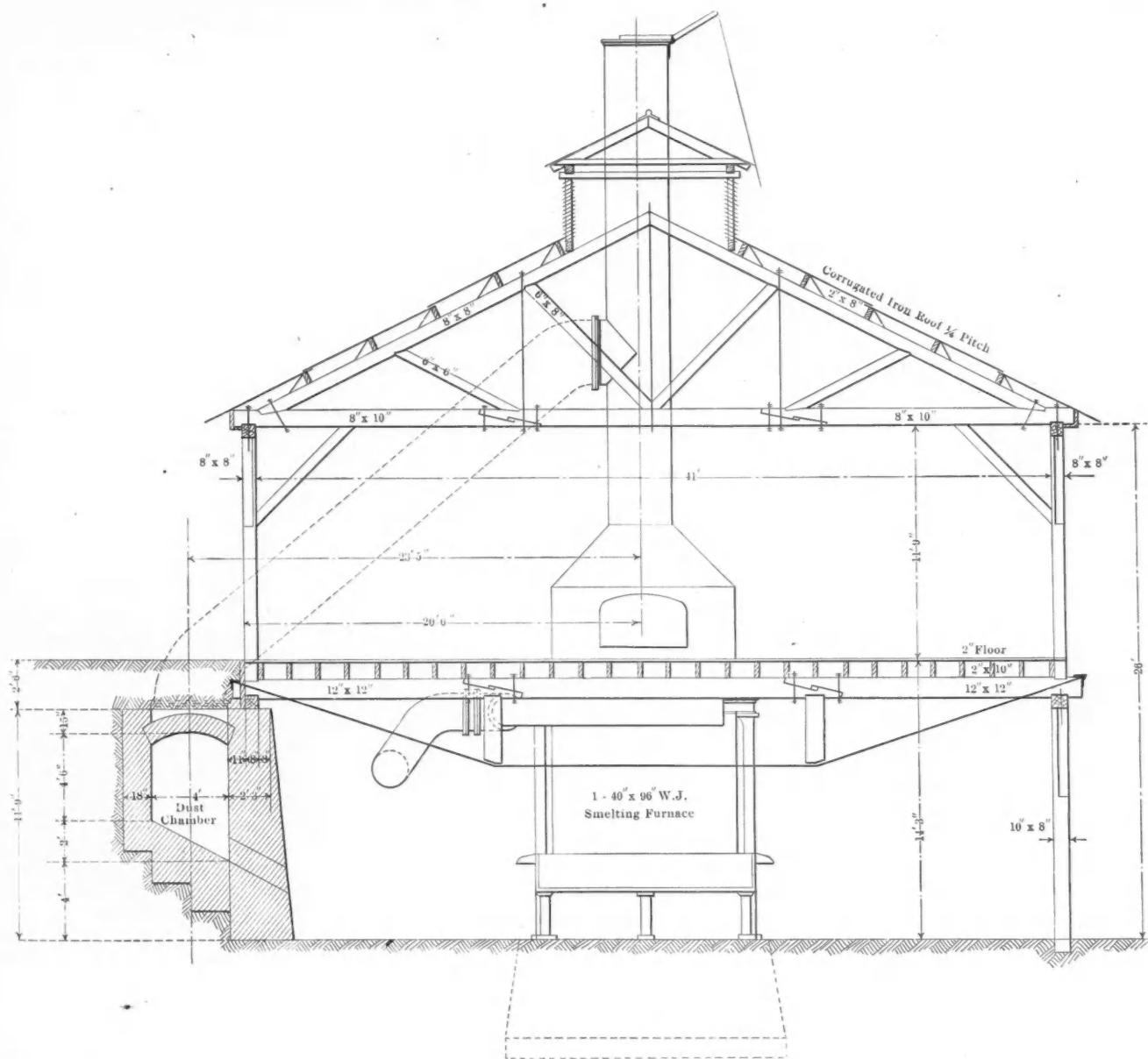


FIG. 2. SECTION THROUGH FURNACE ROOM

18 in. from bottom, to be straight, the upper part departing from the vertical  $8\frac{1}{2}$  in. in 60 in.; both the end-jackets to be straight, 6 ft. 6 in. high, and to be provided at their lower ends with a semi-circular cut-out of proper size to accommodate a tapping jacket. Two of these tapping jackets are required, one for each end of furnace to be furnished; all jackets to be of the best flange steel, the inside plate  $\frac{3}{8}$  in. and the outside plate  $\frac{5}{16}$  in.

on the supporting columns of the furnace; each side jacket to have six tuyeres, each 4 in. diameter and each tuyere to be provided with an independent tuyere-box and connection to bustle-pipe. Bustle-pipe to be 16 in. diameter with an inlet of 24 in. diameter, made of No. 14 steel and supported from mantel-frame of the furnace.

Above the jackets, to support the upper ironwork, a mantle-frame, made of 7-in. I-beams, should be placed, consisting of

could be used.) A cast-iron deck-plate to be furnished to rest on mantle-frame, to support brickwork to and above charging floor. Brickwork of shaft to mantle-frame to be provided with a sheet-steel casing; charging-floor plates to be  $\frac{3}{8}$ -in. checkered steel, extending 4 ft. on each side of the furnace and 18 in. at both ends. Above the charging floor will be a sheet-steel hood 3 ft. 7 in. high, each side of which is to be

provided with a charging opening 4 ft. 6 in. wide by 2 ft. 4½ in. high; cover of hood to be made of steel, cone shaped, 3 ft. 2 in. high, and resting upon this will be a steel stack 40 in. diameter by 24 ft. 6 in. high, provided at top with a damper. Brick stack casing to be made of 3/16-in. steel, hood and cover of No. 10 steel and stack of No. 12 steel.

The general dimensions of the furnace will be: size inside of jacket at tuyere level, 40x96 in.; floor-level to top of bottom-plate, 2 ft. 5 in.; floor-level to top of curb, 4 ft. 3 in.; height of jackets, 6 ft. 6 in.; floor-level to charging-floor, 14 ft. 3 in.; floor-level to top of stack, 45 ft. 6 in. Furnace to be erected in the shops of the contractor and all parts properly marked and fitted into place, so that same may be easily assembled at destination. All drawings necessary for the erection of the furnace to be furnished by the contractor.

**Blower**—To be of the two-impeller type, belt driven; 45 cu.ft. displacement per revolution; 175 r.p.m.; 67x12-in. pulley; top discharge. One best brand rubber belt to drive blower to be furnished.

**Blast Pipe**—To be 24 in. diameter, tapering to 21 in. at blower end, made of No. 14 steel with flanges at both ends; bolts and gaskets for connections, and a relief valve.

**Blast Gates**—There will be furnished two blast gates, one at the furnace 24 in. diameter, and one at the blower 21 in. diameter; both to be of the standard cast-iron pattern.

**Forehearth**—One 36x48x24-in. rectangular cast-iron forehearth made of 1-in. well ribbed plates, mounted on four unflanged wheels and provided with cast-iron spouts.

**Slag Pots**—Twelve cast-iron standard pattern slag pots, 2 cu.ft. capacity complete with wheels provided with roller bearings. Wheels to have cast-iron rims and wrought-iron spokes.

**Furnace Tools**—Three steel charging barrows, each having a capacity of 10 cu.ft.; wheels provided with roller bearings; two 2-wheel coke charging barrows, complete with wheels fitted with roller bearings; six No. 7 steel wheelbarrows; two coke forks; four No. 2 scoop shovels; 12 long-handled square-point shovels; three sledges, 6, 8 and 10 lb. respectively with handles; 750 lb. of assorted sizes and lengths of furnace bars; one 6-beam charging scale. Twelve cast-iron dust-chamber doors and frames 24x24 in. to be furnished for dust chamber.

In addition to the above specified machinery, there is, of course, required crusher, rolls and grinder for the sampling mill, platform weighing scales, wheelbarrows and the usual tools, and the shafting, bearing and power-transmitting machinery.

In the case of the plant under consideration, the power was generated by a

water-wheel driving a dynamo. That portion of the specifications applying to a particular case is omitted.

To the above specified machinery I should add: One steel water-tank about 10 ft. diameter by 8 ft. high, to be placed near the plant on level with top of the water-jackets. To take the water direct from the water-wheel pressure-pipe would not do, because modern furnace jackets are no longer provided with stay-bolts (which burn out and cause endless trouble). Consequently, they could not stand any pressure. They are simply tested to 3 or 4 lb. pressure before shipment to see that they are water tight. I should further specify: One set of blacksmith's tools; one set of machinist's tools; one set of pipefitter's tools; one set of carpenter's tools; repair parts for six months for the crusher, rolls and sample grinder; extra lamps and repair parts for the electric lighting plant; extra jackets, spouts and tuyere parts for the furnace; pipes and pipe fittings, duplicate valves of all sizes used in and around the plant; assay outfit; drawing tools; office furniture, fixtures and telephones.

The cost of such a smelting plant would be approximately \$40,000, which amount would cover the machinery as specified, freight to smelter site, excavation, wooden buildings erected, installation of the machinery, tools and supplies. With steel buildings the cost would run up to about \$48,000. The approximate shipping weight of the machinery is 90 tons.

## California Petroleum Notes

### SPECIAL CORRESPONDENCE

The petroleum interests of California are on the increase as far as production and importance are concerned. No new fields of importance have lately been opened, but development on the older fields has been carried on actively, with the result of increased production. Oklahoma now holds first place in oil yield, but California is the second largest producer among the States. The wells of this State are now producing about 112,000 bbl. daily, and this amount is steadily increasing. Prospecting in new fields is going on, and some of these may be brought to a productive stage and probably will. All through the Salinas valley and over into Fresno county, more or less well boring is going on, though this is not a proven field. Much of this work is being done by the Standard Oil Company, which has bought up the mineral rights on the ranches in that region.

Some 33 of the 58 companies listed on the California Stock and Oil Exchange in this city are now paying dividends, the total being about \$300,000 per month. The increase in the price of oil is making money for companies which were hard put to it for a long time. The "wild-cat-

ting" has about ceased in California, hundreds of useless concerns having gone out of business. Of course, there are numbers of companies still in the prospective stage, but the Californians are learning more about the oil business than they knew a few years ago, and are not investing in every advertising company which comes along. More and more land is monthly being bought up by the larger companies, all of which are extending their operations.

The Union Oil Company, one of the largest in the State, has bought the old Thomas Bell ranch near Los Alamos, in Santa Barbara county, paying \$500,000 for it. Although purchased only last May, the wells since developed have brought the ranch up in value so that it is considered worth at least \$4,000,000. The late Thomas Bell, who long owned this ranch, was an extensive investor in California and Nevada gold and silver mines, but never suspected the presence of oil on his ranch property.

## Iron Ore Statistics of Dickinson County, Mich.

The annual report of Inspector Trestail contains statistics of the mines in the most important county of the Menominee range. There were 2445 men employed—1602 underground and 843 on surface—and only four fatal and six non-fatal accidents occurred. The production of the 13 operating mines amounting to 1,617,824 tons. The production per man at the principal mines was as follows:

Mine.	Production Tons.	No. of Men.	Tons Produced Per Man.
Chapin.....	514,193	555	926
Pewabic.....	398,784	438	910
Aragon.....	269,400	284	948
East Vulcan.....	159,614	450	355
East Central Vul..	82,703	200	414
Munroe.....	30,400	57	533
Calumet.....	27,644	47	588

Assuming 300 working days per year the daily production per man at the Aragon was 3.16 tons; at the seven mines enumerated, 2.43 tons; and at the 22 mines in the county, 2.21 tons.

## Gold in Madagascar

A British consular report gives the gold production of Madagascar at 73,097 oz. in 1905, 64,844 oz. in 1906, and 72,100 oz. in 1907. Practically all of this is obtained from alluvial or placer workings. About 30 per cent. comes from the district of Diego-Suarez in the northern part of the island, where rich placer deposits were found by two French prospectors, MM. Grignon and Mortages, three years ago. The Government charges a royalty of 7 per cent. on all gold mined.



## Short Talks on Mining Law—XII

By A. H. RICKETTS\*

A lien signifies a string, tie or claim, which one person has upon the property of another, as security for the payment of some debt or charge or the performance of some act, and may be said to be divided into two classes, namely: Statutory liens and equitable liens. The term "lien" includes mortgages, judgments, mechanics' liens, etc. It is created by contract, as by a mortgage or may be imposed by law without the consent of the owner of the property upon which it rests, as by proceedings under the Mechanics' Lien law, or by a judgment for the payment for a debt, or it may exist between members of a mining partnership for debt due to others or for money advanced by one of the members to the partnership. No lien which has attached in any way whatever to any mining property is impaired by the issuance of a patent therefor. But the lien may be waived by an express or implied agreement between the parties or the right of lien may be lost by failure to assert it or by lapse of time, or possibly be inoperative because subsequent to a prior recorded mortgage, unless by local statute the lien is made superior thereto.

What is termed a mechanics lien is the creature of a local statute, which should be consulted and strictly followed. It is intended to secure the unpaid wages of those doing manual labor in or upon a mining claim, as a miner, surface workman, or a person employed in a mill as an amalgamator; or a custodian, overseer or mining superintendent, doing some manual labor upon the property; but not to a superintendent, general agent, or general manager, geologist and mining expert doing no manual labor upon the claim. The courts are not in accord as to whether a teamster hauling rock from the claim is entitled to a lien for such services. This law also extends to the "material man," that is one who furnishes materials actually used in the improvement, alteration or repair of a mine or mill. The work must be done by the laborer or the articles be furnished by the material man under a contract, express or implied, with one in lawful possession of the property as the owner, agent, receiver, lessee, or bondee thereof. It is usually provided by law that property worked by another than the owner is subject to lien unless the latter posts a written notice in a conspicuous place or places thereon, stating such fact, and that he will not be responsible for debts contracted by such other person. It does not follow that work done upon a "mine" is work done within the purview of the law giving the right of lien upon a "mining claim." For example, land

held under a Spanish or Mexican grant, or an agricultural patent, is not a "mining claim" within the meaning of the lien law giving such right.

A fixture may be an article which was a chattel, and which is physically annexed or affixed to a mining claim so as to become a part of the realty, and, therefore, immovable, or it may be a thing which can thereafter be severed from the claim, or a thing which is used in the working or development of the property, but not as a fact annexed thereto as a mining car, or a "giant." For the purpose of a lien, work done on tools or machinery is work done upon the claim.

## EMINENT DOMAIN

Eminent domain is the power to take private property for public use on compensation made in the manner provided by law. The term "public use," as used in the law of eminent domain, means one which concerns the whole community and implies a possession, occupation and enjoyment by the public at large or by public agencies. The power to exercise the right of eminent domain can be conferred upon a corporation or an individual acting in his own interest and for purposes of private gain only by virtue of a constitutional provision of a State or Territory, as the Federal Government does not represent general sovereignty of eminent domain within a State or Territory. In the absence of such provision specially authorizing the condemnation of property by a miner, a local legislature has no power to authorize the taking of private property to be used by another for mining purposes; for example, for the purpose of building a flume on the lands of another to carry off the tailings from his mine, or to enable him to deposit the tailings on such land, or to enable the owner of a mining claim to obtain water for his own use in working such claim, though the intention may also be to supply water to others for mining and irrigation purposes, nor to obtain a right of way through a mining claim for the private use of another mineowner in working his mine. But when mining is expressly declared by constitutional provision to be a public use, as in Nevada a statute authorizing the taking of land by a mining company for its own purposes, is a taking for a public use.

## THE STATUTE OF LIMITATIONS

The mining act provides that when mining claims have been held and worked for a period equal to the time prescribed by the statute of limitations for mining claims of the State or Territory where the case may be situated, evidence of such possession and working for such period shall be sufficient to establish a right to a patent thereto, under the act, in the absence of any adverse claim. In other words, under the provisions of the act proof of possession for the statutory

period, in the absence of any adverse claim, is to be taken by the land department as equivalent to an establishment in detail of all the facts necessary to constitute a valid location. The local statute thus becomes the foundation upon which actively to assert a right and is not limited, as in other cases, to be used as a defense against an adversary's attack.

A patent issued by the United States is not subject to attack by the Government after the expiration of six years from its date. The time for the commencement of actions between individuals in regard to mining claims is controlled by the local statute of limitations.

## LEGAL PROCEEDINGS

As a mining claim is real estate, the rules of pleading and evidence relating thereto are applicable to it with such modifications as the peculiar nature of the property, the provisions of the mining act or local statute may require.

Actions in relation to mining claims may be confined to the court or to the land department, or may engage the attention of both tribunals, or may pass from a State court to a United States court by removal, or from a State supreme court to the United States Supreme Court, on writ of error, or pass from the land department to either a State or Federal court on questions of law. This complexity of procedure does not create a conflict of judicial authority. The courts alone determine questions concerning locations and possession of a mining claim while there are some questions affecting such a property, which are wholly within the jurisdiction of the land department, for example, the character of the land, or the party entitled to purchase it from the Government. The functions of the land department are mostly administrative and only incidentally judicial. The courts take judicial notice of its rules and regulations regulating the sale and exchange of the public lands, but the courts are not necessarily controlled thereby, but may set aside, reverse, or annul the same when it appears they are in excess of the jurisdiction of the land department, or are arbitrary, unjust, or an invasion of public rights, or reverse its decisions upon the law as contrary thereto. While a contest is pending in that department a court will not ordinarily proceed with a case involving the property. It should dismiss the action, or stay proceedings until the matter before the department has been finally determined by it.

Actions in relation to mining claims may be brought either in a Federal or a State court, or be removed from the latter to the former court, subject to remand if it appear that it was improperly removed thereto. The mere fact that the action is authorized by an act of congress does not vest jurisdiction in a United States court. The presumption always is that a Federal court is without jurisdiction in any given

\*Member of the San Francisco bar, San Francisco, Cal.

case. Jurisdiction cannot be conferred by consent and the court may at any time dismiss or remand a case on its own motion, for want of jurisdiction.

If the action is brought in a State or territorial court, it is subject to the local statutory provisions and practice prevailing therein. An action at law pending in a Federal court is also subject to such provisions and practice, but a suit in equity therein is conducted under the equity rules promulgated by the Supreme Court of the United States and the practice of the High Court of Chancery, of England. There can be no union of a legal and equitable action in a Federal court.

In a way, there are two distinct classes of cases affecting mining claims, viz:

(1) An action brought in a court of competent jurisdiction to determine the right of possession to a mining claim, that is, a right to a patent therefor, pursuant to the terms of the mining act and in which it may appear that neither party is entitled to a judgment. If neither party is entitled to relief, the jury or court shall so find, or a nonsuit may be entered, or the action may be dismissed, without verdict or decision, or the case may be remanded for a new trial with leave to amend. This proceeding does not affect the possessory right of either party to the ground in dispute. It simply prevents either party from proceeding to patent. The gist of such an action is that each party may prove his right against his adversary as well as against the United States, and neither party can depend on the weakness of the title of the other. This action arises out of proceedings in the land office, has its inception therein, and is a continuation thereof, and may be in the form of an action in ejectment, or a suit to quiet title, and is generically termed an "adverse claim suit." The pleadings of each party should set forth the facts upon which he relies to show that his is the better right as each party is plaintiff or actor therein. In addition to the usual allegations in the pleadings, in, say, a State court, there should be an allegation of citizenship, or its equivalent, the acts constituting the location, a description of the several properties involved in the controversy showing their relative position, as well as the area in conflict. Also a statement showing when the "adverse claim" was filed, and that the action was commenced within the statutory period of 30 days after such filing, which latter should be within the 60-day period of newspaper publication of notice of the intention to apply for a patent. This, although the court has really nothing to do with the proceedings in the land office, and has no power to determine as to the regularity or irregularity, sufficiency or insufficiency thereof, as the courts determine the "right of possession" as if no contests had been initiated in the local land

office. If the action is commenced in, or removed to a Federal court, the jurisdictional facts must be alleged in the initial pleadings if an original proceeding in the Federal court, or in the petition for removal if the case is sought to be removed thereto. The jurisdictional facts may be said to be the existence of diverse citizenship, or of a Federal question, and that the value of the property, that is, that part of it in dispute exceeds the value of \$2000, exclusive of interest and costs. The judgment on the merits is conclusive upon the Government as to the rights of the respective parties to the litigation, although it still remains with the land department to determine the right to the patent, that is, whether there has been a compliance of the provisions of the mining act, because the judgment establishes merely the right of possession and it remains for that tribunal to determine all other questions touching the right of patent.

The "adverse claim" suit must not only be based upon an adverse claim, for if there is no adverse claim there can be no adverse-claim suit, but must be commenced without regard to any judgment previously obtained or pending litigation, else the rights obtained or sought under such judgment or litigation will be lost, as the mining act expressly declares that if no adverse claim is filed, it must be conclusively presumed that none exists and that the applicant is entitled to a patent. Of course, a prior judgment may be made the basis of the "adverse claim." Furthermore, the suit must be prosecuted with reasonable diligence to final judgment, or the suit be subject to dismissal. "Reasonable diligence" is a question of fact. The filing of the adverse claim and the commencement of the adverse-claim suit may be waived by the parties in interest and the applicant for patent contract to convey after such patent issues.

(2) The other class of actions relating to mining claims excepting cases involving the law of the apex, may broadly be said to be in the nature of such cases as affect real estate generally, and are to determine the right of the parties between themselves without regard to the acquisition of patent by either of them. Judgment therein is available in patent proceedings only when made the subject of adverse claim proceedings therein, unless the judgment is in favor of the applicant for patent. Also to cases concerning rights under a patent already issued, as where the patentee has acquired the legal title affected with fraud, or a trust in relation to it, in which case he is regarded in equity as the trustee of the true owner. In such cases it must appear that the plaintiff is so connected with the legal title as to have a right to its control. In the second class of cases it is not generally necessary to aver the citizenship of the plaintiff.

## Oil Wells in Chihuahua, Mexico

C. M. Leonard, vice-consul, reports as follows regarding the oil wells in the Mexican State of Chihuahua:

For several years persistent reports of the existence of oil in the eastern part of the State of Chihuahua have been current. For the last three years an American company has been carrying on operations with a great deal of secrecy, but it is learned on good authority that it is sinking three wells, varying in depth at the present time from 1400 to 3285 ft. In one well oil-sand to a depth or thickness of 40 ft. has been encountered; in the second it is reported three strata of oil-sands have been cut, and in the third the oil-sand strata is said to be 120 ft. thick. Oil has been found twice in the latter.

Adjacent to the lands mentioned the governor of Chihuahua, Enrique C. Creel, owns large tracts of oil lands. Mr. Creel states that he has received very favorable reports from engineers who have examined his property, showing that the existence of oil is strongly indicated. He has given options on these lands to an American, and drilling is expected to begin soon.

Following is an analysis of a sample of oil obtained from this field: Naphtha and light oil, 14.38 per cent.; kerosene light (flash point 110), 31.05; kerosene heavy (flash point 128), 22.06; lubricating oil, 20; paraffin, 10; total, 97.49 per cent.

The oil discovered is a fine paraffin base, said to be equal to the best Pennsylvania oil. The oil-sand resembles that known in Pennsylvania as Bradford chocolate sand. The lands upon which this oil is found are on the line of the Kansas City, Mexico & Orient Railroad, now under construction, and the line will reach the oil-fields within 12 months.

The government of the State of Chihuahua has offered \$5000 gold for the first oil well brought in producing a minimum of 60 barrels of oil per day. The benefit to the State of Chihuahua, and in fact to all northern Mexico, should oil be found to exist in commercial quantities, is incalculable.

The platinum output of Columbia is second only to that of Russia (H. G. Granger, *Trans. A. I. M. E.*, Sept., 1908). This precious metal, washed from the gravels of the Choco, is always found mixed with gold, sometimes one or the other metal greatly predominating. Although platinum occurs to a small extent in other parts of the Choco, its main sources are the Platina and Condoto rivers, with a few tributaries, and some of the streams running into the Cajon, all being tributary to the San Juan river. The metal is also obtained from the Agua Clara river and certain sections of the Berbera river, both of which flow into the Atrato, and from the Certegui, which is the main affluent to the Quito river.



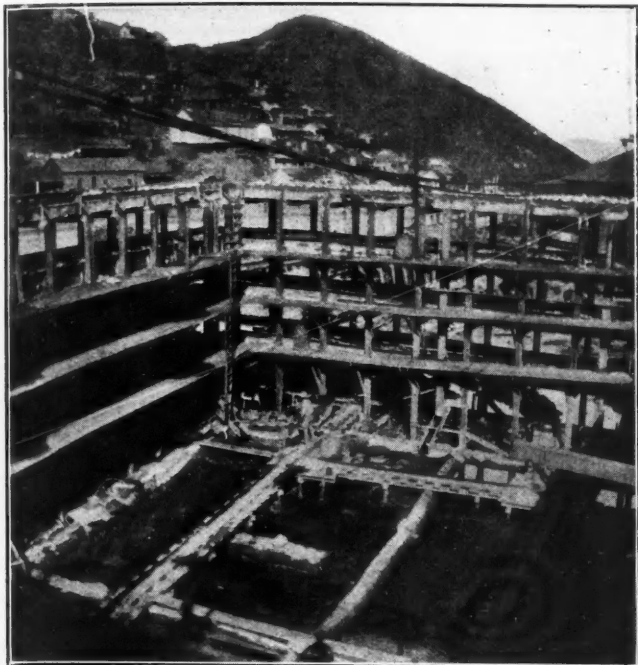
**A Copper Precipitating Plant**

By H. W. CHITTENDEN\*

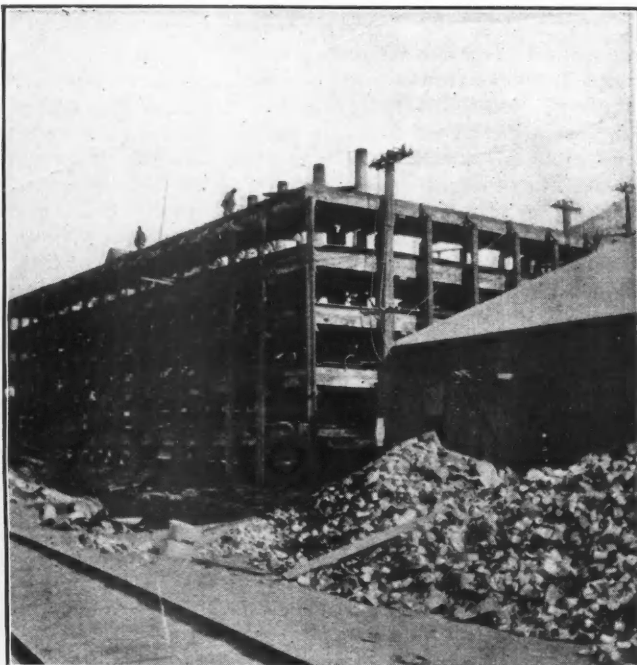
One of the most successful plants in the United States for the recovery of cop-

of 500 ft., the ore near the surface is highly oxidized and the mine water contains considerable copper. At the deeper mines, the Gardner, belonging to the Copper Queen, and the Irish Mag, belonging to the Calumet & Arizona company,

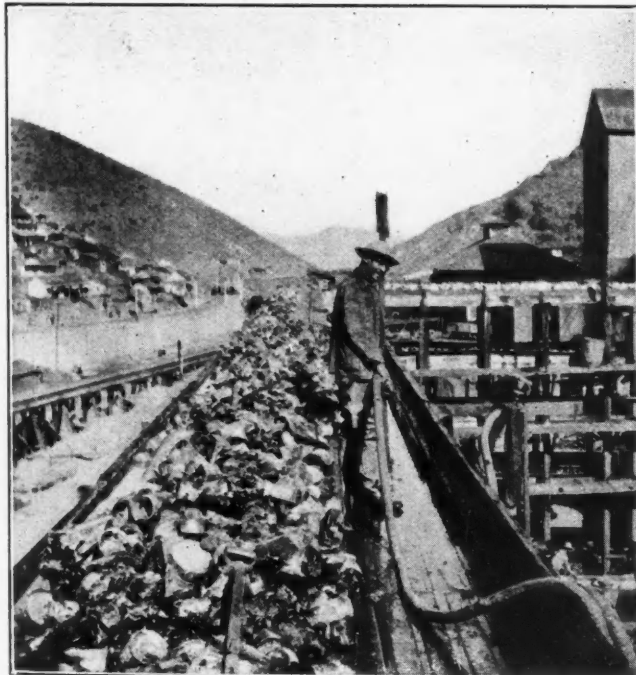
enough copper to pay for recovery are the Czar and Holbrook. The water at the Holbrook is pumped from the 500 to the 400-ft. level and flows to the Czar shaft, where it is raised to the surface with the water from the Czar mine. The



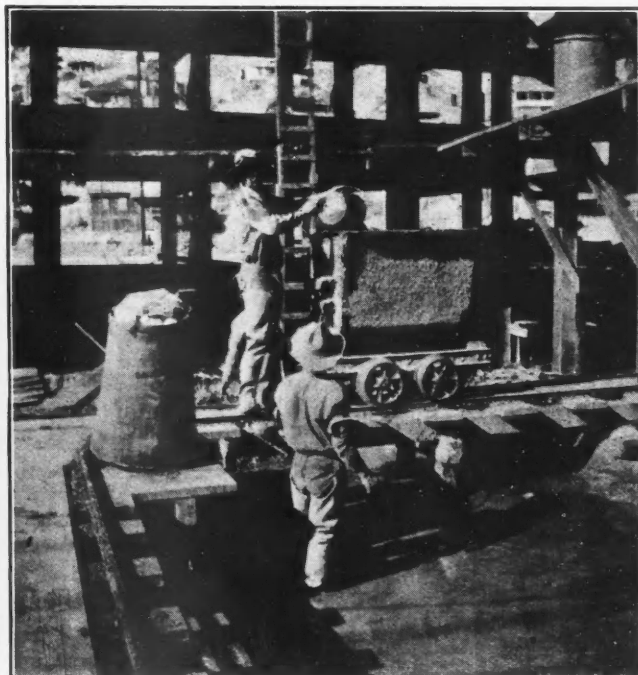
VIEW OF INTERIOR OF COPPER QUEEN PRECIPITATION PLANT



GENERAL VIEW OF COPPER QUEEN PRECIPITATION PLANT



A MONTHLY CLEAN-UP



BOILING PRECIPITATE FROM SETTLING TANKS

per from mine waters, has been in operation for the last two years at the mines of the Copper Queen Consolidated Mining Company, Bisbee, Arizona. In the older mines belonging to this company, the Czar and Holbrook, where the ore-zone extends from the surface to a depth

\*Box 72, Cananea, Sonora, Mexico.

where the ore-zone lies from 600 to 1110 ft. below the surface, the mine water contains much less copper, while at the Cole shaft of the Superior & Pittsburg company, where the orebodies are much deeper and more widely scattered, the copper in the water is almost negligible. The only mines where the water contains

amount of water pumped at this shaft is approximately 300 gal. per min., averaging about 10 grains of copper per gal. All this water flows through the precipitating plant.

The plant consists of five tiers of troughs on three sides and four tiers on the other side, forming a rectangle, the



outside dimensions of which are 78x108 ft. The troughs, which are made of 2-in. planks, are of rectangular cross-section, 3 ft. wide by 20 in. deep. In the troughs, at intervals of 2½ ft., are 2x4-in. cross-pieces raised 2 in. above the bottom; lengthwise on these cross-pieces are laid four 1x4-in. boards. This arrangement leaves a place for the copper to deposit until washed down into the settling tanks. In each tier there are two sets of troughs set side by side. These join together at each corner so that all the water can be made to flow through one, while the other is being cleaned. The troughs are supported by 8x8-in. posts and 6x8-in. stringers. The tiers are 6 ft. apart vertically, making the total height of the structure about 30 ft. The slope of the troughs is from ¼ to 2 in. per 12 ft., increasing gradually through the successive tiers.

The water enters at one corner of the upper tier, and flows through the two troughs around the rectangle to the corner where it entered. At this point the water passes down a slide and flows in a similar manner through the successive tiers, until at the end of the last tier it flows into a flume. This flume takes the water to settling tanks, 17x9x9 ft. deep, a few hundred yards below the plant. These last tanks catch a small amount of the finest particles of copper and slime suspended in the water coming from the main plant. The total average length that the water flows in the troughs is about 1650 ft.

The precipitation is effected by means of tin cans which loosely fill the troughs of all the tiers. Scrap iron is used to a small extent, but the results are much less satisfactory than with the cans, principally because of the greater surface exposed by the cans. The reactions which take place in the precipitation are well known, and can be represented by the following simple equation:  $\text{CuSO}_4 + \text{Fe} = \text{FeSO}_4 + \text{Cu}$ . The resulting product is a thick yellow material containing in addition to copper, the replaced iron, some little silica, unconsumed fragments of cans, etc.

In the three upper tiers the clean-ups are made every second day, but less frequently in the lower two tiers, owing to the smaller amount of copper precipitated. While collecting the copper the flow of water is shut off from one trough at a time. This trough is then drained and the cans washed thoroughly with water from a hose under pressure. The water containing the copper product is run into settling tanks where in about two hours the metal settles sufficiently so that the water can be siphoned off. After these clean-ups, occurring every other day, more cans are added as required. Once a month each trough is emptied and a thorough clean-up made. The troughs are then refilled with a new supply of cans.

The clean-up settling tanks, of which there are four placed in the interior of the rectangle, are 25x40x2 ft. deep. Once

a month these tanks are cleaned out; the wet mud is bailed up in buckets, emptied into a car and dumped into a drying tank, where it remains for about one month before being shoveled up and loaded into the railroad cars, to be taken to the smelter at Douglas. There are two of these drying tanks 18x25x2 ft. deep.

The cans which are collected in Bisbee are contracted for at a nominal price per ton. Mexican labor is used entirely, the amount required being very small, as only two men are working steadily. For cleaning out the settling tanks, three extra men are required four or five days a month. The precipitate handled by these three men is loaded, when dry, by five others into a railroad car, holding 45 tons, in one day. The product when shipped contains about 40 per cent. moisture; the dried samples assay 35 per cent. copper; 6, silica; 17, iron; 13, aluminum; and 1.5 per cent. sulphur.

The saving in this plant is high, at present averaging more than 90 per cent. of the copper in the water. This high extraction is obtained when the flow of water is low, and it is possible that it is obtained at the expense of excessive iron consumption. When the flow of water is greater, the extraction is somewhat less.

### Slime Settlement

In discussing the methods of slime settlement, H. L. Sulman stated<sup>1</sup> that he has experimented extensively with apparatus for continuous slime settlement with satisfactory results. Suppose a vertical glass cylinder is filled with a homogenous slime pulp mixture, one in which the slime particles are uniformly suspended through the liquid and where no settlement has commenced. When settlement begins, each particle subsides at the same rate, be it at the top or bottom of the cylinder. After a short time, a thin layer of clear water appears at the top, and a thin layer of fine sediment at the bottom. This means that in the same unit of time every particle has fallen an equal amount; each particle originally in the narrow zones or layers (of a thickness equal to the clear layer of liquid produced) with which the column might hypothetically be divided, has fallen through into the zone immediately beneath. The last zone, having no further space to subside into, deposits its particles on the bottom of the cylinder as sediment.

If a series of shelves had been interposed in the cylinder between each such zone it is obvious that in the same time complete clarification of the liquor would have been effected, because all the particles in that time would have settled upon the intervening shelves.

This is the principle of the Howatson filter, which is used for the deposition of the highly-divided precipitate obtained by

neutralizing calcium bicarbonate with milk of lime, which requires a considerable time for ordinary settlement. The liquor containing fine suspended sediment is distributed under a head, over the bottom of a rectangular tank. It is caused to rise upward through a series of closely-spaced partition slots, which are made of slate or other smooth material placed at an angle of about 60 deg. from the vertical. In passing up the narrow flattened columns between the slots at greatly diminished velocity due to the increased area of the total ascending column, the solid particles settle on the slots. The apparatus thus practically becomes a series of shallow continuously-acting deposition zones, the liquor above the plates passing off absolutely clear.

Not only do the particles readily and completely deposit, but, the slots being fixed at a greater inclination than the sliding angle, the settled slimes slide downward constantly. They become agglomerated and, although falling into turbid liquor beneath the slots, do not break up, but sink heavily into the hopper-shaped bottom of the tank, whence they are intermittently removed.

Settlement further depends upon the actual mass of the particle, upon its specific gravity, upon the ratio of its surface to its mass; also upon the friction between the surface of the particle and the liquid, which is variable both in regard to the nature of the surface and that of the liquid wetting it.

Very small quantities of soluble material produce physical results in regard to immersed particles out of all relation to the alteration in density due therefrom, sometimes even in a contrary direction.

Some time ago Sulman measured the contact angles which various liquids formed with given solids, and found that a rise in temperature modified the angles quite out of proportion to the slight change in density due to heat. He consequently believes that heat is a factor which produces results that are inexplicable by alteration in density only.

A small fraction of, say, one per cent. of sulphuric acid makes a great difference when added to water in which the various oil separations of mineral particles are effected. This amount of acid does not sensibly affect the density of the solution. It, however, makes all the difference between success and failure.

Again, small quantities of ammonium chloride and other ammonium salts have been shown to exert marked coagulation effects on many of the precipitates obtained in the laboratory. In using ordinary waters containing from 20 to 40 grains of calcium bicarbonate per gal., or mine waters of sensible acidity, marked effects not necessarily following in extent or direction, the small differences due to density, may be produced. Small amounts of dissolved salts, also, exercise pronounced effects upon suspended particles.

<sup>1</sup>Bulletin No. 42, Inst. Min. and Met.

# The Present Position of Cobalt, Ontario

This Famous Camp Has Increased Canada's Annual Silver Production from Three Million to Nearly Thirteen Million Ounces in Four Years

BY HAROLD P. DAVIS\*

Until recently little underground exploration work has been attempted at Cobalt. The discovery at depth of many rich "blind" veins, notably in the Temiskaming mine where orebodies of great richness have been found at the 200-ft. level, offers encouragement for the expenditure of a portion of the earnings in underground prospecting. It has been demonstrated in this camp that where a vein depreciates in value, or even pinches out entirely at a moderate depth there

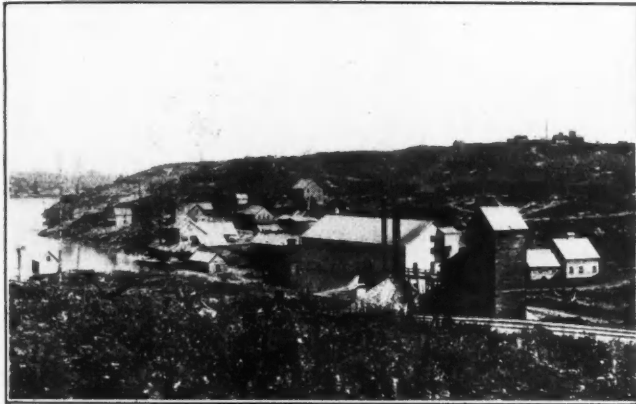
whole is encouraging especially for labor. Steam plants have been installed at 92 properties, 57 of which have also installed compressors. The market conditions for disposing of the ores of the camp, while still unsatisfactory, are steadily improving.

#### STATISTICS OF PRODUCTION AND SHIPMENT

Until late in 1906 little attempt was made at any of the mines of Cobalt to operate economically, the problem of treating the low-grade ore and the wall rock,

Until 1907 practically all the ore from Cobalt went to smelteries in the United States. Since January, 1907, the output was divided as follows:

A large percentage of the ore shipped to the United States went to the American Smelting and Refining Company's plant at Perth Amboy. The ore shipped to Canadian smelteries went to the Canadian Copper Company, at Copper Cliff. The former company paid nothing for the cobalt content, the latter paid on the basis



NIPISSING MINE



SILVER QUEEN MINE



LA ROSE MINE



O'BRIEN MINE

may be found within a few feet a blind vein of equal or greater richness. It has also been shown that veins which carry only little silver or none at all on the surface often develop into rich oreshoots at depth.

Within the last year the proved area of enrichment has been extended. The discouraging features which undoubtedly exist in some of the mines are more than overbalanced by the greatly improved conditions in others. The outlook on the

and the proper classification of the ores for shipment being almost neglected. Three mines, the Buffalo, Coniagas and Cobalt Central, now have concentrating plants in fairly successful operation. The Muggley concentrator, a custom mill, is handling ore from a number of mines. The mill at the McKinley-Darragh mine is being enlarged and a 10-stamp mill at the King Edward is well under way. The silver content of the ore extracted varies from less than 100 oz. to 7000 or 8000 oz. or more per ton.

of \$10 per ton for ore running 6 to 8 per cent. cobalt, \$20 for 8 to 12 per cent., and \$30 for 12 per cent. and more. Neither company paid for the arsenic content. The ore shipped to England was purchased for the cobalt content only, no payment being made for the silver.

Ten shippers were added to the list in 1907, and in the first six months of 1908 six more—the Little Nipissing, Cobalt Lake, Provincial, Silver Cliff, Crown Reserve and Casey Cobalt—shipped ore. Since the first of the year the ore has

\*Cobalt, Ontario, Canada.

been sent to a larger number of smel-  
teries, and slightly better terms are being  
obtained. The following companies have  
received shipments of ore this year: Can-  
adian Copper Company, Copper Cliff,  
Ont.; Clifton Sand, Gravel Construction  
Company, Thorold, Ont.; Consolidated

Scotland; Beer Sondheimer & Co., Ham-  
burg, Germany.

During the first three months of 1908,  
according to the Bureau of Mines, there  
were shipped 4402 tons of ore containing  
3,673,047 oz. silver, valued at \$1,938,841.  
The total ore shipments for the half-year

more than 5 per cent. of the world's pro-  
duction; this places Canada fourth in the  
list of silver-producing countries.

**Eichhorn Trigonometric Slide Rule**

M. J. Eichhorn, Chicago, Ill., has de-  
vised a new slide rule intended especially  
for the solution of triangles.

The face of the Eichhorn slide rule is  
especially arranged to solve the general  
trigonometric equation for the third side  
of a triangle, the other two sides and the  
included angle being given. This relation  
is expressed by the familiar equation

$$C^2 = A^2 + B^2 - 2AB \cos. c.$$

If in this equation we make

$$2AB \cos. c = X^2$$

SHIPMENTS AND DIVIDENDS PAID TO JULY 1, 1908.				
MINE.	Capital.	Par Value.	Tons Shipped to July 1.	Paid in Dividends.
1. Buffalo.....	\$1,000,000	\$1.00	2,781	\$216,000
2. City of Cobalt.....	500,000	1.00	338	.....
3. Cobalt Central.....	5,000,000	1.00	201	.....
4. Cobalt Silver Queen.....	1,500,000	1.00	984	195,000
5. Cobalt Lake.....	5,000,000	1.00	124	.....
6. Colonial.....	6,000,000	5.00	55	.....
7. Cobalt Townsite.....	1,500,000	1.00	185	.....
8. Crown Reserve.....	2,000,000	1.00	49	70,000
9. Coniagas.....	4,000,000	5.00	3,218	680,000
10. Drummond.....	Close Corporation		506	Amount not stated
11. Foster.....	1,000,000	1.00	602	45,779
12. Green-Meehan.....	1,500,000	1.00	135	.....
13. Kerr Lake.....	3,000,000	5.00	809	660,000
14. King Edward.....	6,000,000	5.00	246 (a)	.....
15. Little Nipissing.....	1,000,000	1.00	20 (b)	.....
16. McKinley Darragh.....	2,500,000	1.00	2,106	298,017
17. Nancy-Helen.....	500,000	1.00	100	.....
18. Nipissing.....	6,000,000	5.00	6,282	2,080,000 (c)
19. Nova Scotia.....	2,000,000	1.00	446	.....
20. O'Brien.....	Close corporation		3,163	250,000 (d)
21. Provincial.....	Government mine		76	.....
22. Red Rock.....	1,000,000	1.00	46	.....
23. Right-of-way.....	500,000	1.00	355	105,000
24. Silver Cliff.....	650,000	1.00	27	.....
25. Silver Leaf.....	5,000,000	1.00	154	.....
26. Temiskaming.....	2,500,000	1.00	517	75,000
27. T. & H. B.....	7,850	1.00	346	777,150
28. Trethewey.....	1,000,000	1.00	1,902	110,000
29. LaRose, now included in LaRose Consolidated Mines Co.....	7,500,000	7.50	6,062	1,066,904 (d)
Other mines.....			528	.....
Paid in royalties to T. & N. O. Ry., and Province of Ontario.....				300,000
<b>Total.....</b>			<b>32,363</b>	<b>\$6,950,765</b>

- (a) Consolidation of the King Cobalt mine and 80 per cent. of the stock of the Watts mine. Ore was shipped from the Watts.
- (b) From Peterson Lake lease of Little Nipissing.
- (c) \$400,000 of this total was paid to original owners.
- (d) Paid to owners.

**DISTRIBUTION OF COBALT ORE SHIPMENTS.**

LOCATION OF SMELTERIES.	YEAR 1907.		JAN.-JUNE, 1908.	
	Tons.	Per Cent.	Tons.	Per Cent.
United States.....	12,099	81.47	6416	70.73
Canada.....	2,585	17.40	2564	27.45
Great Britain.....	167	1.13	133	1.53
Germany.....	.....	.....	31	0.29
<b>Total.....</b>	<b>14,851</b>	<b>100.00</b>	<b>9144</b>	<b>100.00</b>

**STATISTICS OF PRODUCTION.**

Year.	No. of Shippers.	Tons.	Gross Value.	Value per Ton.	Percentage Increase in Tonnage.
1904.....	5	191.55	\$136,217	\$862	.....
1905.....	17	2,336.01	1,485,570	636	1,210
1906.....	19	5,836.59	3,573,908	613	150
1907.....	29	14,851.34	6,155,391	415	154
<b>Total to Jan. 31.....</b>		<b>23,215.49</b>	<b>\$11,351,086</b>	<b>\$631.34</b>	.....
First quarter, 1908.....		4,402.65	1,938,841	440.45	.....
Second quarter, 1908.....		4,741.35	2,200,000	Estimated	.....
<b>Total to July 1, 1908.....</b>		<b>32,359.49</b>	<b>\$15,489,927</b>	.....	.....

Mining and Smelting Company, Trail,  
B. C.; Deloro Mining and Reduction  
Company, Deloro, Ont.; American Smelt-  
ing and Refining Company, Perth Amboy,  
N. J., and Denver, Colo.; United States  
Metals Refining Company, Chrome, N. J.;  
Anglo-French Nickel Company, Swansea,  
Wales; R. C. Farrell & Co., Glasgow,

amounted to 9144 tons, including concen-  
trates.

The decrease in value per ton during  
1907 is accounted for by the larger per-  
centage of low-grade ore shipped; the  
increase in 1908 by a small quantity of  
concentrates. In 1907 Cobalt produced  
10,023,311 oz. of silver, which constitutes



A TYPICAL CALCITE VEIN AT COBALT

the equation will read

$$C^2 = A^2 + B^2 - X^2,$$

which is in a quadratic form and is solved  
directly by the upper scale on the rule  
and the upper scale on the slide; both of  
these scales are graduated to the func-  
tions of the square. The scale on the  
slide has its zero at the center and is  
graduated alike in both directions.

For convenience in the case of right-  
angled triangles the back of the slide is  
provided with the usual scale of log-  
arithmic tangents from 6 to 45 deg. A  
scale of equal parts enables the user to  
read the values of the squares, the trig-  
onometric functions or the logarithms as  
desired.

The mineral colemanite is the most im-  
portant source of California borax.



### Mine Signaling by Compressed Air

The pneumatic system of signaling of the Westinghouse Air Brake Company, which has been in use for many years on passenger trains, has been introduced at various mines in different parts of the country to replace the pull-bell or electric systems. In the Westinghouse apparatus there is only one moving part, i.e., the small lever of the "discharge valve." Another advantage is the fact that the signal sender has always the means of knowing whether the signal has been delivered to the engineer. Changes of temperature, likely to occur from change of air currents, do not affect the working of the system. If any accident should injure the signal pipe, or any other parts of the apparatus which would allow a part of the air to escape, a warning would at once be automatically given to the engineer. In the matter of cost for maintenance, the compressed-air system also has advantages. This system has been in operation for several years in some of the prominent mines of this country, and during that time has required almost no repairs whatever.

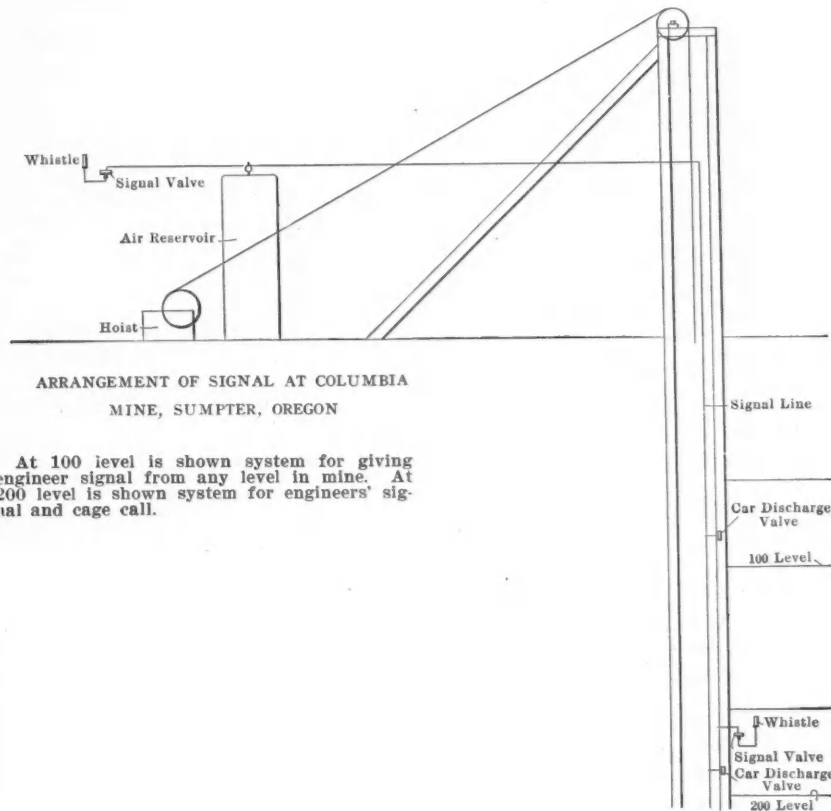
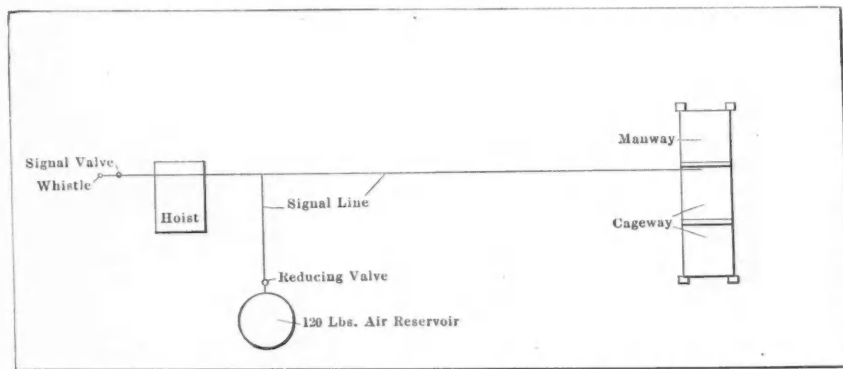
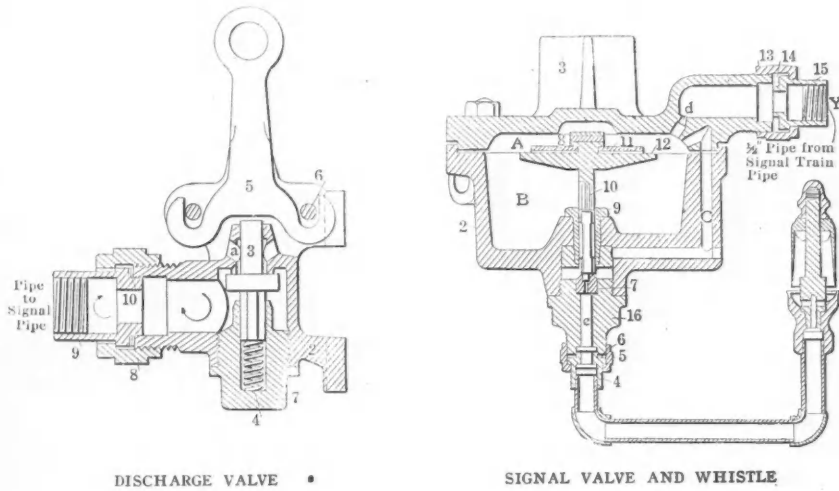
The accompanying diagram shows in a general way the simplicity of arrangement of the apparatus. The system is practically the same as that used by express trains with slight modifications in installation. A small, shrill whistle in the engine room is the sounding device which conveys to the engineer the signal sent from the mine workings. Where signals controlling more than one hoisting shaft are received, the whistle is tuned or chimed differently from the others.

A signal valve is placed near the whistle and connected by piping with the source of supply for compressed air, and also to the various workings and levels of the mine. This pipe is called the "signal pipe," and is usually 1/2 or 3/4 in. in diameter. The signal valve causes the whistle to sound whenever reduction in air pressure occurs in the signal pipe. A reducing valve is inserted in the supply to the signal pipe so as to reduce the pressure carried in the compressed-air mains of the mine to that required by the signal system, which is usually 40 pounds.

A discharge valve is inserted in the signal pipe at a point close to each signal station. A moderately light cord is attached to the lever of the discharge valve. Each pull of this cord opens a valve, permitting a small quantity of air to escape. This reduction of pressure travels rapidly through the pipe to the signal valve, causing it to sound the whistle. The escape of air from the discharge valve is easily heard by the signal sender.

By this means signals may be given to the engineer from any station or signaling point in the mine by a quick, short

pull of the cord attached to the lever of the discharge valve. Signal blasts may are not only unnecessary, but likely to confuse the engineer.



At 100 level is shown system for giving engineer signal from any level in mine. At 200 level is shown system for engineers' signal and cage call.

be given at the rate of two per second. Long discharges of air at the signal valve During 1907 Trinidad exported to the United States 4145 tons of land asphalt.

## Fighting an Underground Fire with Oxygen Breathing Apparatus

By F. W. GRAY

The ENGINEERING AND MINING JOURNAL of Oct. 12, 1907, page 695, contained a brief account of the rescue station of the Dominion Coal Company, at Glace Bay, Cape Breton. A successful demonstration of the usefulness of such a station has recently taken place. A fire broke out in No. 1 mine of the Nova Scotia Steel and Coal Company, at Sydney Mines on Sept. 9. It originated from a blown-out shot in a partly driven room off the back deep. This room is situated about  $2\frac{1}{4}$  miles from the shaft, near the barrier of the Nova Scotia company's submarine areas under the waters of Sydney harbor. Owing to the inadequate supply of water, the fire, which on the morning of Sept. 10, seemed to be under control, gained on the parties who were endeavoring to extinguish it, and commenced to creep up the back deep. At this juncture the assistance of the Glace Bay rescue station was asked. The message was received at Glace Bay at 8 p.m., and about 11 p.m. a party of 24 trained men equipped with 10 Draeger apparatus, electric hand lamps, and sufficient oxygen and potash reserves to last for 12 hours' use of each apparatus, left for Sydney Mines.

### THE RESCUE STATION CALLED INTO SERVICE

The journey from Glace Bay to Sydney Mines is partly by tram line, partly by water, and partly by rail, and occupied somewhat over two hours. It was not until 5 a.m., Sept. 11, that the seat of the fire was reached. The apparatus was all taken down the mine and a base was established not more than 50 ft. from the burning room. The fire was attacked by relays of three men at a time. Other men were detailed to brattice and timber. The combating of the fire was directed by N. MacKenzie, one of the district superintendents of the Dominion Coal Company.

### METHOD OF ATTACK

The superintendent of the rescue station remained at the base of operations and fitted his men with their apparatus as required. The fire by this time had jumped the back deep and had extended along the room on the opposite side. The entrance to this room was blocked by a heavy fall, on the other side of which the fire was burning fiercely. It was necessary to mount this fall in order to bring the hose to bear on the flames. The heat was intense, and none of the men was able to withstand it for a period longer than 10 minutes. As they retreated, their places were taken by others. The instructor relieved the retiring parties of their apparatus and put it upon the fresh

relay. He states that the metal parts of the apparatus became so hot that his hands were burned in handling them. It was found necessary to provide the apparatus men with oilskins to protect them from the scalding of the steam.

The fire fighters were greatly hampered by the feeble water supply. For some 500 ft. the water was carried in an ordinary fire hose, which was unable to withstand the head of pressure and was constantly breaking and interrupting the supply. By working steadily, however, it was found possible to drive back the fire, and by 3 p.m. it had been confined to the room where it had originally started on the other side of the back deep. A wooden dam, backed with clay, was constructed across the mouth of the room, and it was slowly flooded. This work was done by the workmen of the Nova Scotia company after the Glace Bay men had left the mine, which they did as soon as the fire was seen to be under control and capable of being easily confined by the dam.

### EXACTING CONDITIONS SUCCESSFULLY MET

When all the circumstances are considered, the achievement of the Glace Bay corps is a remarkable one. It was the first time they had been called upon to use the apparatus under the actual conditions of an underground fire; they had had no sleep the previous night, and had taken no refreshment beyond coffee and biscuits for over 12 hours, and they worked for over eight hours under the most exacting conditions imaginable. Had they been able to tackle the fire within a reasonably short time after it had originated, their task would have been much easier; but under the conditions above described, the work was most serious in its aspect.

The results accomplished are practical proof of the utility of oxygen breathing apparatus in fighting fires or in dealing with any conditions underground where the presence of smoke or noxious gases precludes the ordinary methods. Previous to the arrival of the Draeger equipment, three men had been carried out of the mine insensible, and the fumes and smoke would very quickly have killed any person who had endeavored to penetrate them unprotected. Apart from severe muscular pains superinduced by the extraordinary exertions the men of the Glace Bay corps had made, they suffered no other ill effects. Their confidence in the apparatus is now unbounded, and it is realized that the original cost of the station and its equipment, and the trouble of training has already been amply justified by the results.

Some of the causes which contributed to the success of the Dominion Coal Company's men in this instance may be emphasized. Each of the 24 men was an experienced pitman, several of them having had considerable previous experience in fighting underground fires. They had

all trained conscientiously in the smoke practice chamber, and were physically fit. The instructor remained at the base of supplies, and allowed no man to go into the danger zone before he had made sure that his apparatus was all working properly. This was all the instructor did, and all that he is supposed to do. The actual direction of the fire fighting was under an experienced official, and every man was working to orders, so that no confusion ensued.

## Value of Flue Gas Analysis

In a recent boiler-plant test made by the coal department of the Arthur D. Little laboratory, Boston, the loss due to unburned gases from a thick, uneven fire was illustrated by an interesting occurrence in connection with the flue-gas analyses. The test showed the following relative conditions:

	1	2
Sample of gas taken.....	5:00 p.m.	5:30 p.m.
Carbon dioxide CO <sub>2</sub> per cent.....	11.3	14.3
Oxygen O <sub>2</sub> per cent.....	6.5	5.5
Carbon monoxide CO per cent.....	2.4	0.0
Nitrogen N <sub>2</sub> per cent.....	79.8	80.2
Air excess per cent.....	45.0	36.0
Temperature flue gas, deg. F.....	545.0	700.0
Heat loss due to CO, per cent.....	9.7	.....
Heat loss due to increased temperature of flue gas, per cent.....	.....	4.3

The first analysis shows a considerable amount of CO to be present. Before taking the next sample the CO started to burn through the passes of a 600-h.p. Aultman & Taylor boiler and the CO was being entirely consumed. The flue temperature rose 155 deg. on account of the burning of the CO through the passes of the boiler instead of in the furnace. There was no combustion chamber and the fire was so thick that it came close to the bottom row of tubes.

A number of facts can be drawn from this instance:

1. Had the boiler been set with an ample combustion chamber, all gases would have been burned before coming in contact with the heating surface, resulting in a gas analysis like No. 2, but with a temperature corresponding to No. 1.
2. The fire should not be carried so thick that CO will be formed, as it is very difficult to burn it all in a boiler furnace when once formed and the loss due to small percentages of CO is very great.
3. The determination of CO<sub>2</sub> alone is not sufficient to determine whether the boiler is being properly fired. In the case of No. 1 sample, a CO<sub>2</sub> indicator should have shown 11.3 per cent. CO<sub>2</sub>, which would ordinarily have been considered good, but there would have been no indication that CO was present, while the loss due to it was as great as if the CO<sub>2</sub> had been only 7.5 per cent. with no CO.

\*Mining engineer, Glace Bay, Nova Scotia.

## Underground Haulage in Coal Mines

Where there was one electric locomotive in the anthracite coal mines of Pennsylvania a decade ago, there are a dozen now; the hundreds of feet of trolley wire have grown into thousands. Millions of dollars have been spent upon the electric locomotives, the power houses and the strengthening of tracks necessary to the improved system. The network of tracks in the anthracite mines has spread until the underground mileage is almost as great as the mileage of the so-called "anthracite roads" on the surface.

Some 17,000 horses and mules are still employed in and around the anthracite mines, but in many cases the distance has disqualified mulepower. Compressed air locomotives, though used in considerable number, have proved less economical than electric locomotives, and their use is not apt to be extended. There are few steam locomotives in the mines, and there will be still fewer in the future. Combustion in any form is not desirable in coal mines, on account of the risk of gas explosions.

Within three years, 1903 to 1906, the number of electric locomotives in the anthracite mines—this does not include those at the top of the shafts—grew from 84 to 205. There were only 41 locomotives operated by steam in 1906 as against 49 in 1903, a decrease of 16 per cent. Compressed-air locomotives increased from 67 to 104 in the three years.

### FOUR KINDS OF MOTIVE POWER

There are four separate and distinct kinds of motive power, exclusive of rope haulage for steep slopes, used in the mines: mules, steam, compressed air, and electricity. In the volume of work done, mules, at this time, remain far in the lead. Steam is going backward. Compressed air is about stationary, probably destined to lose its importance in the future. Electricity is the coming factor, and will make headway steadily.

Managers of anthracite-coal-mining companies say that the mules will never be eliminated altogether. There will always be certain kinds of work which can be done more satisfactorily and more economically by animal muscle than by any form of mechanical power. In the gangways producing small quantities of coal the installation of electricity would be impracticable and wasteful.

Every one of the several kinds of motive power has greatly increased in expense in recent years. A mine mule that cost \$125 in 1897 cost \$240 in 1907. The rise in the prices of materials ran up the cost of installing mechanical appliances. The lengthening of the gangways and the exhaustion of the more accessible seams of coal, however, have been the greatest factors, for they have caused a direct increase in the amount of hauling to be

done. It is certain that transportation in the mines will be more and more costly as time passes.

Stables are fitted up underground, and when a mule goes down into a mine he usually goes to spend the rest of his life there. He has to be well taken care of if he is to do the work properly. In the newer mines he has stables of concrete (except the floors, which must not be hard for his feet), lighted by electricity, with perfect drainage and ventilation. Sanitary conditions are better in a mine stable than in the average stable above ground.

The cost of maintaining one mule one day comes to about 80c. The expense of feeding has gone up 35 per cent. in the last five years. The statistics of several anthracite mines show that a mule consumes in a day 10.61 lb. of hay and 9.37 lb. of corn and oats. This is one of the costs that continues during the suspension of work as at other times, for the mule must eat whether the coal is being mined or not.

### COMPRESSED AIR FOR HAULING

When it became advisable to substitute mechanical power for mules, compressed-air locomotives were adopted because they were secure against fire or explosions of gas. Furthermore, they were low and could get through gangways which were not high enough even for mules. Comparatively simple in their working, they did not require much training in operating them. The cost of operating compressed air is very large. The air is compressed, first, to 800 or 900 lb. per square inch, and is transferred from the pipes to the locomotive at, say, 125 lb. The waste, in manufacturing unused power, is enormous.

The distance which an air locomotive can travel without replenishing depends upon the capacity of the tanks. A mile and half is a long journey for a single charge. Smaller locomotives cannot go more than half a mile. The compressor in the power house above ground has to be going all the time. The tanks have a capacity of from 40 to more than 200 cu. ft., all according to the type of locomotive. The locomotive may weigh from 10,000 to 50,000 pounds. It is in very gaseous mines, principally, that compressed air is superior to other forms of power. It is absolutely safe so far as fire is concerned. Hence the air locomotive will always find a place in some of the gaseous mines.

### ELECTRIC LOCOMOTIVES

The first electric mine locomotive was built in 1887. At that time it was a startling innovation, and general doubt as to its usefulness was expressed. In appearance it was very unlike the one of today. Among other things, its height was too great for the low gangways found in many mines.

In the early nineties came the "terrapin back," more nearly approaching the squat

machines now in general use. Like the type that preceded, it was equipped with one motor and the axles were coupled together by connecting rods. Then came the locomotive with two motors, the axles being driven independently. In general character this is the locomotive of the present day.

Electricity demands a much firmer and stronger track than does the mule. Manufacturers of electric locomotives invariably urge the adoption of heavier rails. "For animal and rope hauling," says one, the prevailing light rails are satisfactory; but for the locomotion of traction haulage the rails should be much heavier, in fact, the heavier the better." With the miles of track that have to be laid, this means great expense. For a 10-ton locomotive, a rail weighing 25 lb. to the yard is prescribed as a minimum, but a 45-lb. rail is recommended.

### GRADES MUST BE REGULATED

Electric traction introduces new engineering tasks in the matter of grades. The capabilities of a locomotive are the same at all times, and grades have to be reduced accordingly. It is the adverse grades that determine the size of a locomotive in any particular mine. Though they can climb a 12-per cent., or even a 15-per cent. grade, with heavy rails, the locomotive cannot be called upon to perform economically, on long runs, against grades of more than 3 per cent. Consequently, there has had to be a great deal of work toward leveling the floors in the gangways.

In a mine gangway, the location of the trolley wire is not as simple a matter as it is on the streets and on country roads, for space is limited. The wire must be installed in such a manner that it will cause the least possible interference with free passage of men and animals.

A mine-haulage system should have a regular schedule, just like a street railway or a subway. If one locomotive is going from the shaft with a train of "empties" while another goes toward it with a loaded train, it means a saving in the size of generator and engine. Keeping such schedules involves employing well paid men, who are capable of running things smoothly and avoiding the confusion which means loss of time and money.

Car samples of lignite coal show a larger percentage of moisture than do mine samples, though the gain is slight. High-moisture-content bituminous coals show less moisture in car samples than in mine samples; the loss is about 1.5 per cent. Car samples of small-moisture-content semi-bituminous and bituminous coals gain about 1.5 per cent. in moisture.

Sulphur has its own heating value equal to about one-half that of the amount of coal it replaces.



# The Prevention of Mine Explosions\*

Precautions as to the Handling and Use of Explosives, Wetting the Dust and the Employment of Electricity in Underground Operations

## REPORT OF FOREIGN EXPERTS

The Geological Survey issued on Oct. 22 a report on the prevention of mine explosions, submitted by three foreign experts, Victor Watteyne, inspector-general of mines, Belgium; Carl Meissner, Germany; and Arthur Desborough, H. M. inspector of explosives, England. These engineers have been in the United States for six weeks, coming at the invitation of the United States Government to assist the Federal authorities in beginning the investigations authorized at the last session of Congress. The report was presented to Secretary Garfield, who transmitted it to President Roosevelt, stating that the report with its recommendations will be of the highest importance in aiding Congress and the different State governments in providing legislation to insure more efficient and careful operation of coal mines, by the adoption of mining methods and safety appliances that will materially aid in preventing such terrible losses of life as have occurred through mine explosions in recent years. The President ordered its immediate publication and distribution among the coal-mine operators and miners of the country.

### REPORT

In response to your request that we cooperate with the United States Geological Survey in the inauguration of its investigations looking to the prevention of mine explosions, and that we submit for the consideration of those connected with the coal-mining industry in the United States such recommendations as experience in our own countries and observation among American coal mines indicates may be useful in providing for greater safety, we beg to submit the recommendations given below.

Since coming to the United States, we have given careful attention to and approve the investigations in relation to this subject begun by the Geological Survey. We have visited typical mines in the more important coalfields of the United States, and have discussed the mining problems with many coal operators, miners, and State inspectors.

To be effective, investigations for the benefit of mining must be continuous. The opening up of new mines, the deepening of old mines, the meeting with new conditions, the changing of explosives, and the inauguration of new processes and methods will call for continuous investigations, to be followed by continuous educational work.

\*United States Geological Survey Press Bulletin.

Our investigations and recommendations relate primarily to questions of safety in mining; but in this connection we have been greatly impressed with another closely associated phase of the industry, viz., the large and permanent loss of coal in mining operations in many portions of the United States. This is a serious, permanent, and national loss. It seems to be a natural outcome of the ease with which coal has been mined in the United States and the enormously rapid growth of the industry.

The active competition among the operators and the constant resulting effort to produce cheaper coal has often naturally led to the mining of only that part of the coal which could be brought to the surface most easily and cheaply, leaving underground, in such condition as to be permanently lost, a considerable percentage of the total possible product. Certainly much of this loss can be prevented through the introduction of more efficient mining methods, such as the longwall system, more or less modified, and the flushing method.

In the preparation of these recommendations we have recognized fully the great differences between the mining conditions in Europe and those in America, where the industry has developed so rapidly that thorough organization has not yet been possible; where a large percentage of the men entering the mine are unfamiliar either with mining methods or the English language; and where the price of coal at the mine is less than half that in Europe. Nevertheless, we believe that these recommendations will be found useful in the further development of the American coal-mining industry for safety and efficiency. The cordial reception everywhere accorded us leads us to believe that these recommendations will be received by the operators and miners in the same spirit of good will as that in which they have been prepared. But the success of this movement for greater safety and efficiency will depend upon the hearty and patient cooperation of the operators and the miners, working together for the accomplishment of this purpose.

### RECOMMENDATIONS

#### A. SELECTING THE EXPLOSIVES TO BE USED

(1) We recommend that the Government of the United States examine the explosives now and hereafter used in mining, with a view to eliminating the more dangerous explosives and to improving and standardizing such explosives as may be considered most suitable for such use,

these to be designated by the Government "permissible explosives."

The term "permissible explosives" is suggested for the reason that no explosives are entirely safe, and all of them develop flame when ignited; and we advise, therefore, against the use in the United States of the terms "safety explosives" or "flameless explosives," as these terms may be misunderstood and this misunderstanding may endanger life.

(2) We recommend that the operators and miners of coal use only such explosives as are included in a list of "permissible explosives," when the same has been published by the Government, in all mines where there is risk of igniting either dust or gas, selecting that one which their own experience indicates can be used to the best advantage under local conditions.

(3) We also recommend that investigations be conducted to determine the amount of charge of such "permissible explosives" which may be used to the best advantage under different conditions with a view to reducing danger to the minimum.

#### B. CARRYING THE EXPLOSIVES INTO THE MINES

(1) All explosives should be made into cartridges and placed in closed receptacles before being carried into the mine, and the quantity carried into the mine during one day by any miner should be limited as nearly as practicable to the quantity needed by him for use during that day. Handling loose explosives and making them into cartridges by an open light in the mine should be prevented.

(2) Detonators or caps should be handled with great care, and should be carried only by a limited number of responsible persons.

#### C. USE OF EXPLOSIVES IN THE MINE

(1) Shooting in or off the solid should not be practiced.

(2) The depth of the shot hole should be less by at least 6 in. than the depth of the cutting or mining. The use of very deep shot holes should be avoided as unnecessarily dangerous.

(3) The overcharging of shots (the use of a larger charge than is required to do the work satisfactorily) should also be avoided as unnecessary and dangerous. The proper standardization of explosives used in coal mining will greatly facilitate the carrying out of this recommendation.

(4) Shots should never be tamped with fine coal or material containing coal. Clay

or other suitable material should be supplied and used for this purpose.

(5) The firing of two or more shots in one working place, except simultaneously by electricity, should not be allowed until a sufficient interval has elapsed between the firings to permit an examination of the working place, in order to see whether any cause of danger has arisen.

(6) Before a shot is fired the fine coal should be removed from the working place, as far as practicable, and the coal dust on the floor, sides and roof, for a distance of at least 20 yards from the place where the shot is to be fired, should be thoroughly wet, unless it has been demonstrated that the dust in the mine is not inflammable.

(7) If gas is known to occur in the mine, no shot should be fired until, in addition to the watering, an examination made immediately preceding the time for firing, by a competent person, using a lamp which will easily detect 2 per cent. of gas, has shown the absence of that amount of gas from all spaces within 20 yards of the point where the shot is to be fired.

(8) Believing that such will be one of the greatest advances which can be made in safeguarding the lives of the miners, we recommend the adoption of a system of electric shot firing, in all mines where practicable, by which all shots in the mine, or in each ventilation district of the mine, may be fired simultaneously, at a time when all miners and other employees are out of the mine.

#### D. KEEPING THE MINE ROADWAYS CLEAN

(1) The roadways of the mines should be kept as free as possible from loose coal which may be ground into dust, and of rubbish in which such dust may accumulate, in order to facilitate the removal and wetting of the dust.

#### E. WETTING THE COAL DUST

(1) In all coal mines where explosives are used it is desirable, and in all mines containing gas it is highly important, that the dust on the walls, timbers, and floors of the working places and roadways should be kept continually wet prior to and during the work in the mine. If, however, conditions of roof or lack of water render this general watering impracticable, at least the dust within 20 yd. of each shot should be wet before each firing, and other precautions against explosions should be practiced with unusual care.

It is our opinion that a system of watering which occasionally sprinkles the floor only and leaves dry the dust on the walls and timbers of the roadways is useless and is also dangerous in that it may generate an unwarranted feeling of security against an explosion.

#### F. SPECIAL PRECAUTIONS FOR MINES CONTAINING GAS

(1) In any mine where as much as

2 per cent. of gas can be detected by a suitable method, only locked safety lamps of an approved type should be used so long as such condition exists or is likely to recur.

All safety lamps should be maintained in good condition, cleaned, filled, kept in a special room at the surface, and carefully examined both when delivered to the miner and when returned by him at the close of each day's work. A defective safety lamp is dangerous because of the false feeling of security it engenders.

In the filling of lamps with benzine, or other low-flash oils, which should always be done at the surface, special precautions against fire or explosions should be taken.

#### G. USE OF ELECTRICITY

(1) Electricity in mining operations offers so many advantages, and has been so generally adopted, that no reasonable objection can be made to its use under proper restrictions. The electrical equipment, however, should be installed, maintained, and operated with great care, and so safeguarded as to minimize danger from fire or shock. The fact that the effectiveness of some insulating materials is soon destroyed in most mines should not be lost sight of.

We recommend the following precautions: For distribution underground the voltage should not exceed 650 direct current, or 500 alternating current; these voltages being intended for transmission to machinery operating at 500 volts direct current and 440 volts alternating current, respectively. Even lower voltages are preferable. The trolley wires should be installed in such manner as to render shocks least likely; that is, placed either high enough to be beyond easy reach, or at one side of the track and properly protected.

Where current at a potential of more than 650 volts is employed for transmission underground, it should be transmitted by means of a completely insulated cable; and where a lead or armored covering is used, such covering should be grounded.

In all mines having electric installation special precautions should be taken against the setting on fire of coal or timber. Inclosed fuses or cutouts are recommended, and each branch heading should be so arranged that the current may be cut off when necessary.

No live electric wire should be permitted in that part of any mine in which gas is found to the amount of 2 per cent.

In all mines producing gas in dangerous quantities, as indicated by a safety lamp which will detect 2 per cent. of gas, the working places should be examined for gas by a qualified man, using such a lamp, immediately before any electric machine is taken or operated there.

#### H. PRECAUTIONS AGAINST MISCELLANEOUS ACCIDENTS

(1) In all new construction, shaft lin-

ing and superstructures about the entrance of the shaft (or slopes or drifts) should be built as far as practicable of noncombustible materials.

About the entrances to mines every possible precaution should be taken to prevent fires, or the injury of the equipment for ventilation and haulage. Ventilating fans should be placed at one side of the mine opening, and hinged doors or light timbering should render easy the escape of the explosive force in direct line of the shaft or slope.

Proper precautions should be taken for immediately preventing the entrance into the mine of heat and gases and for facilitating the escape of the men in case of surface or shaft fires.

(2) The surface equipment for handling the coal should be so arranged as to prevent coal dust from entering the mine shaft.

(3) In all new mines, and in all old mines as far as practicable, suitable man roads should be provided for the men separate from the main haulage roads.

(4) In connection with the system of ventilation it is recommended that in the more frequented roads connecting the intake with the return-air courses, two doors be provided, these doors to be placed at such a distance apart that while one is open the other is closed.

(5) In view of the large number of accidents from falls of coal or roof, under the existing practice with single props, more attention should be given to the introduction in mines where the roof is bad of better systems of timbering, such as have been long in use with economy and safety in many well managed mines.

(6) In undercutting coal by hand, the premature fall of the coal should be prevented by sprags or other suitable supports.

(7) We believe that the difficulties and dangers encountered in the working of coal seams which are thick and steeply pitching, or of which the coal is highly inflammable in character or subject to firing from spontaneous combustion, and in mines where the subsidence of the surface must be avoided, may be successfully and economically overcome in many cases through the adoption of the flushing system of mining—that is, the filling with sand or other similar materials of the space from which the coal is removed. This system originated in the United States and is now successfully practiced in portions of Germany, Austria, Belgium, and France.

#### I. MINE SUPERVISION AND INSPECTION

(1) We cannot too strongly emphasize the fact that thorough discipline about the mine is absolutely essential to safety, and that thorough discipline can be brought about only through the hearty coöperation of the operators, the miners, and the State.

(2) We are of the opinion that the

responsibility for safety in the mine should primarily rest with some person, such as the manager or superintendent, clothed with full authority; and that such person can greatly facilitate the attainment of safety through the employment of a sufficient number of foremen, and also of one or more inspectors whose special duty it shall be to see that the regulations are strictly enforced.

(3) The State cannot exercise too much care concerning the experience, technical training, and selection of its inspectors. Their positions should be made independent of all considerations other than that of efficiency; and their continuance in the service should be coexistent with good behavior and proper discharge of official duty.

#### J. TRAINING FOR MINE FOREMEN, INSPECTORS, ETC.

We are of the opinion that the cause of both safety and efficiency in coal mining in the United States would be greatly aided through the establishment and maintenance in the different coal regions of special schools for the training of fire bosses, mine foremen, superintendents, and inspectors. The instruction in such

### Temperature of Coal Piles

The old method of determining the temperature of a coal pile by driving pipes and hanging thermometers in them has been greatly improved by means of a special coal augur designed and used by the coal department of the Arthur D. Little laboratory, Boston. It is similar in form to that used in the mines, but is provided with a means of inserting a small maximum thermometer near the point. Extensions, 4 ft. in length, for convenience in carrying, may be attached to the augur so that the thermometer can be readily inserted into any depth in a pile. The point of the augur can be driven 20 ft. in 3 to 5 min. About 10 min. is required for the thermometer to attain the temperature of the surrounding coal. Temperatures taken in this manner are much more accurate than those obtained by hanging a thermometer down a pipe where there is more or less circulation of air, making it impossible to locate the hottest spot. Temperatures obtained by means of the augur have been found to be 40 deg. F. higher than by the pipe method.

the vertical movement of the rail itself, the weight of the car, loaded or empty, or of mule, acting as the motive power. The weight of the track and ties is balanced by a movable cast-iron slide which can be adjusted with exactness. The only contingency which may result in the failure of the door to operate, is dirt under the ties, which trouble can be quickly remedied.

#### CONSTRUCTION OF THE DOOR

The door proper consists of canvas attached to strips of wood, a light wooden bar forming the bottom, so that a trip of cars should readily go through the door without serious damage to even the motorman, much less the motor. The ties are floored over in order that the weight of a mule will open the door, which may also be readily raised with one hand; on being released the door closes itself.

The inclined timbers on which the canvas is attached to cleats, slides up and down, are boxed in against the entry ribs. With the track filled in level with the top of the rail, as usual with the common door, there should be practically no leakage. A mov-

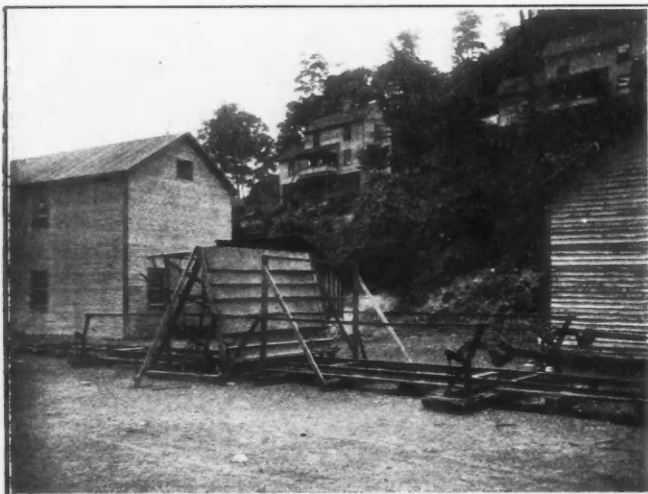


FIG. 1. SHOWING POCAHONTAS AUTOMATIC MINE DOOR WHEN CLOSED

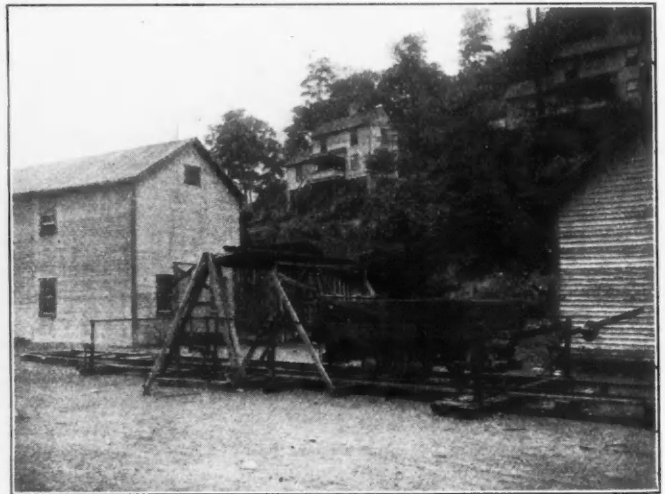


FIG. 2. SHOWS THE DOOR OPEN AND MINE CAR ABOUT TO PASS THROUGH

schools should be practical rather than theoretical.

The work of these schools would supplement most effectively that of the colleges already established in many parts of the country for the more thorough training of mining engineers.

Of the more than 100 supposedly non-coking coals from the Mississippi valley and Eastern States, tested by the Geological Survey, all except six were found capable, under careful handling, of making coke fit for foundry use. Of the 37 Rocky mountain region coals tested, all but three were good coke producers.

In Europe coal is being mined at a depth of 3,773 feet.

### The Pocahontas Automatic Mine Door

BY AUDLEY H. STOW\*

This device seems to have aroused considerable local interest, and promises to be of material assistance in simplifying the problem of reliable methods for ventilation. The illustrations shown include framing which could not well be avoided on the outside, with a full sized working model. As seen in operation on the inside, there are but two inclined timbers on either side. The levers shown are essential, but may be placed well out of the way.

The action of the door is the result of

able section of trolley wire is ingeniously arranged so that it is in position when the motor reaches the door. The two lever stands, one on either side, are placed at such a distance that the door may be approached at considerable speed without any fear as to the certainty of its action, and without unnecessary loss of air.

R. S. Ord, vice-president and general manager of the Elkhorn Coal and Coke Company, has control of the Pocahontas automatic mine door. Trial orders have been given by the Empire Coal and Coke Company and by James Ellwood Jones, general manager of the Pocahontas Consolidated Collieries Company, for two each. The Mill Creek Coal and Coke Company and the Big Sandy Coal and Coke Company have also given orders.

\*Mining engineer, Switchback, W. Va.



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**The Consumption of Lead in the United States in 1907**

We have collected statistics of the consumption of lead in the United States in 1907 according to the purpose for which used, this being the first time that this investigation has been made. Although the returns received from the consumers are incomplete, nevertheless they represent so large a part of the total that they throw interesting and valuable light upon this important industry.

The total consumption of lead in 1907, as reported in "The Mineral Industry," Vol. XVI., was 330,738 tons, which figure was determined by difference in the usual way. Unfortunately there is some uncertainty respecting this, owing to the failure of one of the large refiners to report its stock on hand at the end of the year. The total stock of domestic lead was estimated at 50,000 tons. The reports of the consumers indicate that this estimate was too low, but being unable to correct it, we shall continue to assume that the total consumption was 330,738 tons.

The reports that we have received from the consumers foot up to 286,020 tons, divided as follows: For white lead and oxides, 113,372 tons; for pipe, 33,127 tons; for sheet, 16,345 tons; for shot, 23,232 tons; for other purposes, 99,944 tons. The reports from the corrodors were nearly complete. Estimating that the unreported consumption of lead was in the same ratio as reported in the cases of all the uses other than white lead and oxides, we obtain the following classification of the consumption in 1907:

Purpose.	Tons.	Per cent.
White lead and oxides ..	115,000	34.77
Pipe.....	41,000	12.40
Sheet.....	21,500	6.50
Shot.....	28,000	8.46
Other purposes.....	125,238	37.87
Total.....	330,738	100.00

The striking feature of the above figures is the immense quantity of lead used for "other purposes," which makes it interesting to mention their nature. First in importance appears to be the manufacture of solder, babbitt metal, type metal, and other alloys. However, the lead consumed for covering electrical cables is but little inferior in amount. A large tonnage is used for jointing cast-iron pipe. Cartridge manufacture also consumes a

large amount. A surprisingly large amount is employed for coating iron and steel, i.e., making terne plate. It is also surprising to find how much lead is bought by the manufacturers of brass, who introduce a small amount of lead in certain grades of that alloy. Even some of the galvanizers appear as purchasers of lead. There is a considerable consumption for minor purposes, such as car seals, as yacht ballast, and weights of various kinds, the manufacture of plumbers' articles (other than pipe), etc. Finally, a good deal of pig lead is bought by municipal water works for jointing cast-iron pipes, which is a form of consumption that it is difficult to report statistically.

**A Tale of Woe**

Revision of the tariff is going to be the great topic at the forthcoming session of Congress. The Committee on Ways and Means is actively devoting its attention to the matter, and already there is a marshalling of the clans that want special tariffs reduced, raised, or left unchanged. The hearings are to come off in short order, and the plan of the committee is to introduce the new bill immediately after the assembling of Congress and pass it in about three months.

In this connection a tale of woe that comes from Washington in recent press despatches excites commiseration. It appears, as is gravely stated, that the efforts to secure data as to cost of production abroad with the view of using them in the preparation of the new tariff have practically broken down. The consuls were directed to investigate this important subject and special agents were sent abroad to study it. But, alas! the consuls now assert positively that the manufacturers to whom they have applied will not give the information desired, but on the contrary "have become more guarded as attempts to get the details have been more and more insistently made." So, the unhappy consuls have been unable to secure "material that is worth anything in response to the elaborate list of questions that was prepared for them by the Congressional people, assisted by domestic manufacturers, which was sent out by the State department."

How misguided are these foreign manufacturers! Obviously, the gentlemanly thing for them to do was to invite the consuls and the special agents to an in-

spection of their works and account books, so that the new American tariff could be designed to exclude their goods which heretofore have been allowed to slip in through loop-holes left ignorantly in the schedules. Is there any American manufacturer who would not welcome the visitor to his works and lay before him all the details of manufacture? Of course not. The bureaucracy at Washington in conducting its census and other investigations knows how easy it is to obtain from our courteous manufacturers frank statements as to their cost of production. Why, then, should these benighted foreigners be less responsive?

But we easily find the explanation when we read further in the press despatches that some are inclined to blame certain consuls who "went about their work with a brass band." For example, one exuberant and intelligent representative of our consular service circularized the manufacturers of his district, stating that the information was wanted for tariff revision purposes, and that by furnishing it they would be rendering aid to Congress. Some other wise heads hit upon the same scintillating scheme. When their superiors at Washington learned of this, they regarded it distinctly as a *faux pas*, but of course it was no such thing. Indeed, we fancy that good jobs as members of the detective police, or investigators on the staffs of the audit companies will be awaiting these gentlemen at home. Strange to say, the net result of their honest inquiries was to arouse fear in the minds of the producers abroad who have contracted the reprehensible habit of competing with American manufacturers in this market, or who feel American competition in their own markets. Some of the consuls admit that they are not sufficiently trained from a technical standpoint to be able to handle such an inquiry, involving as it does facts of an extremely complicated character. To them we bow and beg them to receive the assurances of our distinguished consideration. We always admire the modest man who confesses that he is not an expert in all things and refrains from entering fields whereof he knows not the paths.

But if the poor consuls have failed, what of the special agents from whom great things were expected? It appears now, sad to relate, that there is very little prospect of realization from them. Their work has been conscientious, it is said, and

they have passed a pleasant summer abroad, but their accomplishment will not meet the need of the situation, which is an adjustment of our tariff to the difference between domestic and foreign cost. There are some who have been skeptical about this all along, but anyway, what does it matter? If Congress has no data as to foreign costs, there will be no need to pretend that the new tariff rates have been computed to conform to them.

### The Steel Corporation Statement

The report of the United States Steel Corporation for the September quarter shows a moderate improvement in business as compared with the June quarter, and a considerable one over the first quarter of the current year. This applies to the net earnings after deducting operating expenses; as the gross receipts are not given, it is not possible to compare the total amount of business done. From the net earnings, however, it is evident that the estimates made heretofore that the company's plants have been operating during the quarter at 60 to 65 per cent. of last year's capacity are not far out of the way. The quantity of unfilled orders on the books on Sept. 30 was 106,000 tons greater than on June 30; on the other hand it was less than at the beginning of the year. The figures for Jan. 1, however, undoubtedly included many yearly contracts on which deliveries were indefinitely suspended.

The earnings for the quarter were sufficient to pay all charges and the usual dividends, and to leave a surplus of \$5,152,000, or nearly \$5,000,000 more than in the previous quarter. There were, however, no special appropriations for new construction and improvements this year; in the September quarter of 1907 the sum of \$16,000,000 was laid aside for those purposes.

One thing is evident from the statement. The Steel Corporation has passed the low point of depression, without curtailing its dividends, though it has been necessary to suspend large appropriations for new work.

The general conclusion from the report is that there has been a gradual but slow improvement in business from the low point reached at the opening of the year. Perhaps this advance might have been greater if the Corporation had made more concessions, and had not allowed independent concerns to secure the larger share of current business.

### The Report of the Coal Commission

The commission of foreign colliery experts who came to this country at the invitation of the Government to assist the Geological Survey in studying and ameliorating the dangers in our methods of coal mining has made its report, which, under orders of the President, has been published immediately. This extraordinary promptness is commendable, both as a mark of attention to the distinguished engineers—M. Watteyne, Herr Meissner and Captain Desborough—who constituted the commission, and for putting directly the results of their investigation before the coal-mining industry. We make haste to say that the report is a good one, and the members of the commission are to be congratulated upon their facility in obtaining an accurate understanding of American mining conditions and their terseness in formulating a series of thoroughly sound and admirable recommendations.

The precautions that are advised are well considered and are above criticism. Indeed, the majority of the measures suggested have been advocated in the advanced mining practice in this country for many years and have been urged repeatedly in the JOURNAL, both editorially and by contributors. It is to be hoped that the positive expression of views of these eminent experts from Belgium, Germany and Great Britain, which have the indorsement of the United States Government, will be effective in introducing much needed improvements of methods in many mining districts where the advice of engineers has heretofore been ignored. Yet, while we agree with Secretary Garfield that the report will be of the highest importance in aiding Congress and the various State Governments in providing proper legislation, we find it difficult to foresee what Congress can do outside of Alaska, Arizona and New Mexico; and the legislatures of the States have always shown themselves regrettably obstinate in enacting adequate legislation of this kind.

Insofar as our unsolved problems of coal mining are concerned the report of the commission leaves us where we were before. As to minimizing the danger of dust explosions, we are all aware that water should be used, but how best to use

it is a question that still confronts us. Perhaps the idea of Mr. Haas to saturate the intake air by exhaust steam is the best suggestion that has yet been made; perhaps not; in this as in many other problems colliery engineers are still at sea. Similarly as to explosives, we do not yet know what is the best to use under our conditions, but neither the manufacturers nor the consumers are idle in this matter. The tests now being conducted by them will undoubtedly result in the production of a safer explosive.

With respect to many of the suggestions made by the commission, especially those pertaining to timbering, the employment of the flushing system of filling and other methods for increasing the extraction of coal, the great difficulty is that American operators at present are compelled to put their coal on board railway cars at their mines at a cost of only 50 to 60c. per ton, while in Europe the value of coal is many times as much. This feature of American mining practice pertains to the question to which we have frequently called attention, namely, the interest upon, and redemption of, capital account, which may make it more profitable to waste a large part of our resources than attempt to make a high utilization of them. The question that interests our colliery operators, just like other producers, is maximum profit, not merely the maximum percentage of extraction. The answer to this question is found always in the consensus of commercial experience, which generally is on the right road, although progress may be improved by engineering advice.

### Iron Ore and Pig

Some recent transactions in the pig-iron market, which have attracted much attention because they were practically the only large continuing contracts made for several months, are also notable as showing the important changes which have taken place in the methods of iron manufacture and marketing. It is not so many years since the iron mine, the blast furnace and the steel works were three distinct commercial units; the furnaceman buying his ore from the miner and in turn selling his pig iron to the steel maker. Now all the larger steel companies own not only their blast furnaces, but also their iron mines. The cost of iron ore delivered to the furnace and that of the

pig iron made are matters of account only, the final profit having to be reckoned only on the finished product of steel in its various forms.

It will readily be seen that this condition imposes a serious disadvantage on the surviving merchant furnaces which have to buy their ore; and in fact makes their absorption by larger companies only a question of time and opportunity. The merchant furnace in the Central West making foundry or basic pig, from Lake ore largely, must pay this season an average of about \$3.88 per ton for its ore at a Lake Erie port, plus the freight from that port to the furnace. It must compete with companies which get their ore at the actual cost of mining and transportation, an advantage of at least 75c. to \$1 per ton; and this is a serious matter in a time of small demand and consequent low prices.

The United States Steel Corporation, for instance, owns not only the mines from which its ore is taken and the railroads which deliver it at the upper Lake ports; it owns also the steamships which bring the ore to Lake Erie and the railroad which carries it from Ashtabula to Pittsburg. All of these agencies can be operated at actual cost, reducing to a minimum the cost of the ore as delivered at furnace. At the same time, owing to its extensive ownership of mines, it is in its power to determine the price which the merchant furnace must pay for its ore. It is only fair to say that so far this power has been exercised with discretion and some degree of liberality. Nevertheless it is a power which could be used to force a number of furnaces out of business.

In the transactions referred to above one furnace was able to underbid its competitors because its owners were also miners and shippers of Lake ore, and the contract price could be based upon actual cost, with a moderate profit on the whole transaction, of which the mining of the ore was an integral part. A year or more ago, when the Steel Corporation and some other companies found it desirable to buy pig iron outside, these transactions were, in most cases, based on the supply of ore by the buyers; so that the blast furnace really received only a fee or commission for turning the ore into pig. All these conditions make the future of the merchant furnace a doubtful one, and presage many changes in ownership.

### Rejection of Article 144

As was reported in a previous issue, article 144 of the proposed Mexican mining law was definitely rejected by the Mexican Government on Oct. 14. This article, which has been the subject of so much discussion, read as follows:

"Foreign corporate bodies are incapable of denouncing and acquiring henceforth by any process either mining properties, or liens thereon within the territory of the Mexican Republic."

This article having been rejected, foreign companies will be permitted in the future, as in the past, to acquire and operate properties subject to the same laws under which they have heretofore conducted business, which has led, as is well known, to the prosperity of the Mexican republic. Although the opponents of this article learned to appreciate, after the explanation and full discussion which it received, that after all it was not so bad as appeared at first sight; nevertheless, the decision of the Government has been hailed with rejoicing. We said in the early days of this controversy that the whole matter could be safely left to the wise decision of President Diaz and his advisers, which opinion has been borne out by the outcome.

A NOTEWORTHY EVENT of last week was the reduction in the price of aluminum to 26c. per lb., which causes this metal now to be available at less than the price for tin, weight for weight, while bulk for bulk aluminum is, of course, much cheaper. This marks a further step in the progress of aluminum toward becoming one of the common commercial metals; although the recent reduction has doubtless been inspired by slackness in demand, the downward steps in this metal are unlikely to be retraced, in view of the approaching expiry of the patent monopoly, and we may yet see aluminum sell at a price approximating the price for copper, weight for weight. In fact that condition already exists in Europe, where aluminum is now available at 14c. per pound.

MUCH IS SAID about cultivating foreign trade in times of depression at home, in order to keep iron and steel works busy. This does not take account of the fact that depression in trade is apt to extend all over the commercial world.



# Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and  
Debatable Points Suggested by Articles in the Journal

## CORRESPONDENCE AND DISCUSSION

### Misleading Estimates

In an editorial in the JOURNAL of Oct. 10, an inquiry is made as to the legality of expenditure by the Geological Survey, "upon the investigation of engineering problems like the development of water power, when the mining industry is loudly demanding its attention to important problems of economic geology."

Permit me to bring to your attention the fact that for 20 years the appropriations for the Geological Survey have contained specific items, and that the director of the survey would be legally culpable should he authorize expenditures for any purposes other than those specified in the wording of the current appropriation act. The accounting officers of the treasury very properly see to it that all administrative officers direct governmental expenditures in accordance with law rather than in response to "loud demands." The Survey policy is to have its administration accord strictly with Congressional enactments, and however much more urgent the need may seem for work along other lines the appropriation for water resources investigations will be devoted to that purpose and to no other.

In the particular case cited in this editorial, the appropriation involved was even more specific than is usually the case, the item being one passed by Congress on March 4, 1907, in connection with the agricultural appropriation bill as follows: "Survey of and Report on Appalachian and White Mountain Watersheds—To enable the Secretary of Agriculture to examine, survey and ascertain the natural conditions of the watersheds at and near the sources of the various rivers having their sources in the Southern Appalachian Mountains and the White Mountains, and to report to Congress the area and natural conditions of said watersheds, the price at which the same can be purchased by the Government and the advisability of the Government's purchasing and setting apart the same as national forest reserves for the purpose of conserving and regulating the water supply and flow of said streams in the interest of agriculture, water-power and navigation. \* \* \*"

Because of its identification with stream-flow investigations and its facilities for stream gaging the Geological Survey was requested by the Secretary of Agriculture to undertake this study of the water resources of the Southern Appalachian mountains. The expenses of the special field investigations upon which was

based the report entitled, "The Relation of the Southern Appalachian Mountains to Inland Water Navigation," and which was published by the Department of Agriculture, were met by an allotment from this appropriation.

I trust that this explanation is sufficient to indicate wherein the editorial on "Misleading Estimates" is itself misleading, and that the mining industry needs no special assurance that not a dollar has been diverted from any Survey appropriation that could legally be devoted to the study of ore deposits, or other problems of economic geology.

GEORGE OTIS SMITH,  
Director.

Washington, D. C., Oct. 20, 1908.

My attention has been called to the editorial entitled "Misleading Estimates," in the JOURNAL of Oct. 10. While I would like very much to take up with you a discussion of the estimates, I have not the time, and it is probable that you have not to spare in your JOURNAL the space which would be required to treat the subject in a worthy manner. My present purpose is to answer your inquiry as to the guise of legality under which the Geological Survey spends its money in the investigation of water resources.

In the bill making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1909, you will find under the caption "United States Geological Survey," the following:

"For gaging the streams and determining the water supply of the United States and for the investigation of underground currents and artesian wells and the preparation of reports upon the best methods of utilizing the water resources, \$100,000."

I assume that you will be very glad to have your attention called to the specific authority granted by Congress for this work.

M. C. LEIGHTON,  
Chief Hydrographer.

Washington, Oct. 10, 1908.

[Our inquiry implied an ignorance that did not exist. The point is that the organic law of the Geological Survey did not contemplate that it was to engage in extraneous investigations. Probably at the instigation of someone in the Survey, Congress lately authorized the Survey to engage in this investigation of water supply, but previously for many years the Survey frittered away time, attention and money upon water resources without any

authority other than that water is a mineral.

It is these foreign investigations, many of them of no particular value, many of them unauthoritative in character and many of them concerning subjects that the people can and ought to do for themselves, that play mischief with the real work of the Geological Survey. In the past the function of the director has been chiefly to win appropriations from Congress, while enthusiasts interested in magnifying their own work have teased and obtained appropriations for work that is not at all geological. What the Geological Survey needs if it is to live up to the high mark of its past history is the following:

(1) A recognition by Congress that will insure to it an adequate annual appropriation, without the exercise of any effort on the part of the director or anyone else. (2) The unhampered attention of the director to the technical administration of the organization. And (3) the lopping off of all the excrescences like the water-resources branch, the technologic branch, etc., and confinement of the work of the Geological Survey to problems directly connected with the geology of the United States, and especially the economic geology.—EDITOR.]

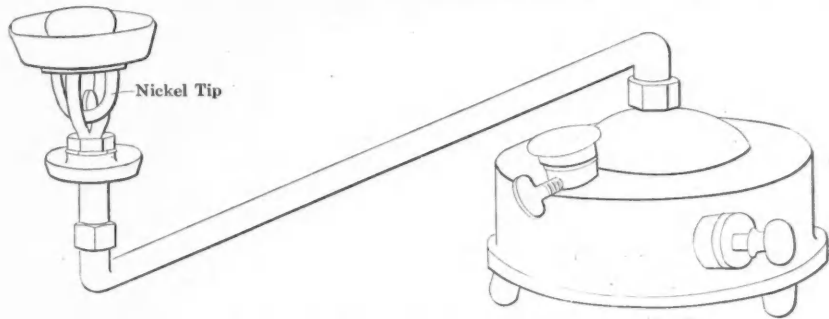
### Duties of the Mining Engineer

When has an examining engineer properly discharged his obligations to his client, and what constitutes a proper examination of ore deposits? I have in mind an eminent engineer, who having been engaged to report on certain mines, completed his examination in two days and a night and reported adversely to his principals. He made his examination without consulting anyone in the locality, and arrived at a conclusion which is diametrically opposed to that of other engineers who had seen the property and had formed their opinions only after weighing the testimony of a local engineer and conducting their examinations with the aid of the information given.

Some years ago I was called upon to make an examination of certain copper deposits. Time was a matter of great consideration just then, and the hurried superficial examination which I made led me to an adverse decision. Afterward, circumstances brought me into intimate contact with these same deposits for a considerable length of time. I became more closely acquainted with the deposits, my previous views began to change and

finally I came to have a high opinion of their value. The reason for this change was the fact that a thorough investigation had brought out a great many features that did not present themselves at first sight. My first impression was entirely wrong. I am now disposed to look with suspicion on any report made without an exhaustive and detailed study. This sort of study requires time; my client had not been properly served in my first report, notwithstanding the fact that the examination was made in a conscientious way. I hurried the matter at his own request.

The question naturally arises: Is an engineer doing either himself or his client justice by accepting a commission, the time given being inadequate for a thorough study of the property? It is to be confessed that nine out of ten reports are made after a hurried examination,



LABORATORY BURNER WITH FUEL TANK

many of them in one day or less. Such reports are totally devoid of value. John Hays Hammond, in his address before the A. I. M. E. at Chattanooga, remarked that the expert ought to consult the local engineer who, through years of contact, is familiar with conditions and historical facts which may be of inestimable value to the expert in his efforts to reach proper deductions. Experts should learn that they are not disgracing themselves by counseling with local engineers or, in fact, with anyone in the locality who may, by years of intimate contact, have gained valuable knowledge of the properties under examination.

JOHN T. REID.

Lovelock, Nev., Oct. 19, 1908.

### Laboratory Burner for Volatile Fuel

By R. STÖREN\*

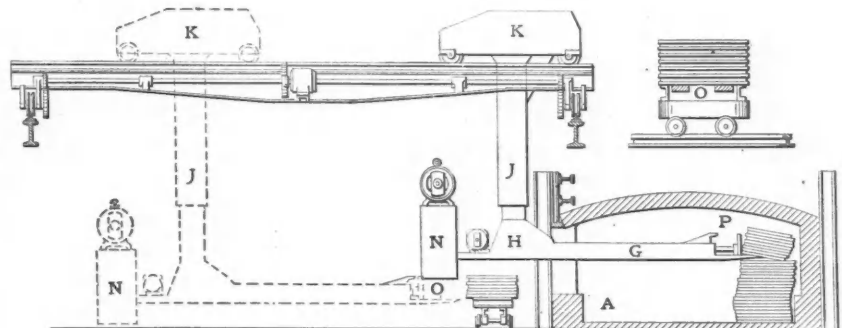
A new combination burner has been developed in the laboratory of the Nautanen Kopparfält. The burner, which is shown in the accompanying sketch, produces a flame near the surface of the table and has a tank for benzine sufficiently removed to prevent heating of the explosive liquid. More or less trouble with other burners led to the trial of the Swedish

\*Mining engineer, Hønefas, Norway.

silent-burning "Fotogen Primus" with the reservoir arrangement shown in the sketch. The separation of the burner from the fuel reservoir was effected by means of a copper pipe hard-soldered or screwed to the burner. The brass burner is rather quickly affected by the heat especially when used constantly under an iron plate. Nickel parts should be more durable.

### Machine for Charging Copper Melting Furnaces

In the accompanying illustration is shown partly in section and partly in side elevation a machine recently patented by H. A. Prosser, of Salt Lake City, and J. B. Ladd, of Ardmore, Penn., for feeding



MACHINE FOR CHARGING COPPER MELTING FURNACE

copper plates or pigs into a reverberatory furnace. It may also be employed for a variety of other uses.

In the illustration A is a reverberatory furnace with wide doorways between narrow posts. A track along the front of the furnace carries cars bearing the material to be charged preferably in loads of convenient size to be handled by the charging apparatus. The charging machine is provided with a long horizontal arm G to introduce the material well into the back of the furnace. This arm is suspended from the trolley K by means of a post H telescoping into the leg J, so arranged that the arm may be drawn back and lowered beneath the load and then raised, moved backward or forward, and thrust into the furnace.

The load is picked up upon a flat fork

O which is inserted below the pile of material blocked up on the car for this purpose. The arm is then lifted, thrust into the furnace and moved to the desired place, when the pusher P pushes the load off the flat fork, the arm being withdrawn at the same time. The machine is operated from the car N by means of electric switches, or other controlling mechanism.

The design of the lifting fork and the pusher is such that the operator can pile the successive charges accurately, filling the furnace to the roof with a minimum of lost space between the sheets.

### The North Broken Hill Mining Company

SPECIAL CORRESPONDENCE

The North Broken Hill Mining Company is one of the group of mines at Broken Hill, New South Wales. The report for the six months ended June 30, 1908, is regarded by the directors as satisfactory. At the deepest level worked, 950 ft., the ore is above the average grade of the ore milled during the last six months. The mill treated 65,633 tons of crude ore averaging 15.92 per cent. lead, 13.69 per cent. zinc and 6.49 oz. silver per ton. The yield of concentrates was 11,062 tons, the recovery of lead being 75.07 per cent., of zinc, 77.8 per cent. and of silver 53.63

per cent. Working costs, including mining, milling and development, were \$3.98 per ton of ore treated, equivalent to \$23.60 per ton of concentrates. The ore reserves are estimated at 1,000,000 tons.

The zinkiferous tailings are sold to the De-Bavay Treatment Company. These tailings contain 4.16 per cent. lead, 18.91 per cent. zinc and 3.67 oz. silver per ton.

Two dividends of 1s. each amounting together to £14,000 were paid during the half year. On working account there was a profit of £32,407. Out of this the dividends have been paid, while management and general expenses absorbed £1884, royalty £209; contingency account £3000, mine and mill plant and new shaft £12,619; the balance being carried forward to next account. The capital of the company is £140,000 in £1 shares.

## Philadelphia & Reading Coal and Iron Company

This company owns a large coal estate in the anthracite region, on which it operates numerous collieries. It is a subsidiary of the Reading company, which also owns the Philadelphia & Reading Railroad Company. The report is for the year ended June 30, 1908. The capital account shows \$8,000,000 stock; \$1,230,000 bonds; and \$75,241,270 due the Reading Company for advances made from time to time.

The anthracite coal statement for the year is as follows, in long tons:

	1906-07.	1907-08.	Changes.
Coal mined	10,034,713	10,218,392	I. 183,679
Coal bought	1,107,848	1,083,682	D. 24,166
Total	11,142,561	11,302,074	I. 159,513
Coal sold	11,492,512	10,992,976	D. 499,536
Inc. or dec. in stock	D. 349,951	I. 309,098	

The total production of anthracite by the company and its tenants from lands owned, leased and controlled by the company was 11,655,101 tons in 1906-7, and 11,914,154 tons in 1907-8; an increase of 259,053 tons, or 2.2 per cent. The cost of coal mined and purchased during the year was 1.5c. per ton less than for the previous year, and the price realized on all sizes was 2.2c. per ton higher, making a total increase in the net amount realized of 3.7c. per ton.

The income account for the year is as follows, averages being calculated on the tons of coal sold:

	Amount.	Per Ton.
Gross earnings	\$38,014,421	\$3.46
Coal added to stock	1,200,927	0.11
Total earnings	\$39,215,348	\$3.57
Mining and purchase of coal	\$22,996,197	\$2.09
Transportation of coal	10,652,083	0.97
Selling and general expenses	1,974,697	0.18
Total expenses	\$35,622,977	\$3.24
Net earnings	\$3,592,371	\$0.33
Depletion of coal lands fund	\$514,350	\$0.05
Colliery improvements	1,286,011	0.12
Interest on Reading Co. loans	1,584,485	0.14
Total charges	\$3,384,846	\$0.31
Surplus for the year	\$207,525	\$0.02

Gross earnings include \$36,669,481 for anthracite coal sold; \$859,012 bituminous coal sold; \$485,928 coal and other rents. Mining coal includes \$19,026,334 mining and repairs at collieries; \$2,497,487 anthracite bought; \$804,654 bituminous coal bought; \$667,722 royalty on leased collieries. The apparent profit on bituminous coal handled was \$55,358. Coal added to stock is credited at \$3.88 per ton.

Depletion of coal lands fund at the close of the year—including interest and the contribution for 1907-8—amounted to \$2,083,187. This sum is accounted for as follows: Invested in coal lands and permanent improvements, \$580,254; invested in securities, \$1,083,094; cash on hand, \$419,839. The contribution to this fund is 5c. per ton mined.

The total expenses last year were made up as follows: Cost of coal at mines, 64.6 per cent.; transportation, 29.9; selling and general 5.5 per cent. The total working expenses were 90.8 per cent. of gross earnings.

As compared with the previous year the gross receipts showed a decrease of \$733,149; while the expenses decreased \$970,964; leaving a net gain of \$237,815. The small decrease—4.3 per cent.—in sales of anthracite illustrates the stability of that product in a year of general business depression.

The statement of the Philadelphia & Reading Railroad gives the following figures for coal traffic:

	1906-7.	1907-8.	Changes.
Anthracite	13,223,780	13,537,464	I. 313,684
Bituminous	11,190,250	10,816,439	D. 373,811
Total tons moved	24,414,030	24,353,903	D. 60,127
Ton-miles	2,709,745,000	2,776,062,000	I. 66,317,000
Av. haul, miles	111	114	I. 3
Earnings from coal	\$18,730,190	\$18,577,272	D. \$152,918
Earn. per ton-mile	0.691c.	0.669c.	D. 0.022c.

The average haul is increased and the rate per ton-mile decreased by the large quantity of bituminous coal carried. The average rate per ton mile on all freight—including merchandise—was 0.946c. in 1907, and 0.954c. in 1908. The Coal and Iron Company furnished 84.2 per cent. of the anthracite carried last year.

## Electric Power for Transvaal Mines

### SPECIAL CORRESPONDENCE

The Victoria Falls Power Company, Ltd., a company formed in October, 1906, with somewhat of a misleading name, has issued its first report, covering the period from the incorporation of the company to Dec. 31, 1907. The name is misleading because the electric power is produced from steam plants situated on the Rand, many hundred miles away from the Zambesi falls. It is true that the company has acquired the right to develop 250,000 h.p. from the falls and to transmit it to the Rand, but this undertaking, about the commercial success of which there has been unfavorable criticism, seems unlikely to take practical shape for some time to come, if it ever does. At all events the report does not say much about this part of the scheme, confining itself to a statement that the directors and engineers paid a visit to the falls in 1907 and made an inspection of the sites for the future water-power stations and canal. The company purchased the 3550-h.p. electric station of the Rand Central Electric Works, situated at Brakpan at the eastern end of the Rand, and has added a new 8000-h.p. station. The company also acquired the 5000-h.p. plant of the General Electric Power Company at Germiston. A new power station of 16,000 h.p. is being

erected at the Simmer Parr, which is expected to be completed early next year. The new Brakpan station is now running. The erection of a new power station at Vereeniging on the Vaal river is also contemplated. The company has entered into a number of contracts to supply electric power to mines and municipalities. No profit and loss account is given, as the work of the company has so far been chiefly construction; but a revenue and expenditure account is included in the balance sheet, showing a balance of £49,482 of revenue over expenditure. Deducting interest on debentures and London general expenditure, a surplus of £36,685 is shown which is carried forward to the 1908 accounts. The issued capital is £1,808,000, divided into 1,000,000 ordinary shares and 808,000 6-per cent. preference shares. There is also a 5-per cent. debenture issue of £800,000. To pay interest on the preference shares and the debentures an amount of £88,800 is required, and if 5 per cent. on the ordinary shares is added, the company's earnings must show a net surplus of £138,800.

As the policy of purchasing power from a power company is at present popular with some of the Witwatersrand mines, relieving them of the necessity of providing their own plant, the company may be able to carry on a profitable business in spite of the heavy capitalization.

At present it has the supply of electrical power to itself, but there are rumors that a rival power company may shortly be started in the Transvaal.

## Sault Ste. Marie Canal Traffic

The freight traffic through the Sault Ste. Marie canals this season shows a decrease of 36.5 per cent., chiefly owing to the light ore and coal shipments. The total freight passing the canals for the season up to Oct. 1 was, in short tons:

	1907.	1908.	Changes.
East-bound	32,556,664	18,884,150	D. 13,672,514
West-bound	9,512,430	7,841,112	D. 1,661,318
Total	42,069,094	26,725,262	D. 15,343,832

The total number of vessel passages this year was 10,567, showing an average cargo of 2520 tons. The mineral freights included in the total were as follows, in short tons, except salt, which is in barrels:

	1907.	1908.	Changes.
Coal	8,588,910	7,113,709	D. 1,475,201
Iron ore	28,883,106	16,127,105	D. 12,756,001
Pig and manuf. iron	230,551	191,885	D. 38,666
Copper	52,689	64,841	I. 12,152
Building stone	748	1,019	I. 271
Salt, bbl.	387,367	406,504	I. 69,137

Iron ore was 60.3 per cent. of the total tonnage this year, and coal 26.6; against 68.9 and 20.4 per cent., respectively, last season.

During 1907 the United States produced 97,776 long tons of bauxite, as compared with 78,331 tons in 1906.



## Personal

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

Ayer Stradley is now manager of the Black Beauty mine at Wall street, Colorado.

Henry F. Lefèvre has been in the Cœur d'Alenes, Idaho, examining the Golden Chest mine.

Robert T. Hill left on Oct. 26 for Alumite, Nev., where he will be for several weeks.

J. F. Lane, of Goldfield, Nev., has bonded a mine at Nevada City, Cal., and will reopen it.

Thomas L. Wood, of Boulder, Colo., is now manager of the Camp Albion mine at Arapahoe Peak.

L. B. Queensburgh Tulloch, of Kingston, Jamaica, mining geologist, is visiting the United States.

George J. Bancroft has removed his office as consulting engineer to 222 McPhee building, Denver, Colorado.

Floyd Harman, formerly of the Teniskaming, has been appointed superintendent of the Cochrane mine at Cobalt, Ontario.

John D. Judson has opened an office as consulting mining and metallurgical engineer in the Mills building, 35 Wall street, New York.

W. S. Weymouth who has been operating mining properties in California has become manager of the Nemeha mine near Central City, Colorado.

W. H. Paul manager of the Dolores Mining Company, Dolores, Mexico, has been making a visit to Gilpin county and other parts of Colorado.

Benedict Crowell, of the firm of Crowell & Murray, Cleveland, Ohio, is at present in Arkansas making an examination of manganese-ore properties.

W. B. Le Veque, manager of the Richmond Mining Association at Salina, Boulder county, Colo., has been making a business visit to Marietta, Ohio.

Charles A. Mau, of Los Angeles, Cal., has been appointed manager of the United Gold Mining and Milling Company at Chinese, Tuolumne county, California.

Herrmann A. Keller, of New York, will sail for Europe early next week, partly on business and partly on pleasure. He expects to return about the end of the year.

J. C. Deloney, recently in charge of the Tennessee Coal, Iron and Railroad Company, has been appointed superintendent of mines for the Alabama Steel and Fuel Company.

Dr. A. P. Low, deputy minister of mines for Canada, who has been on sick leave for about a year, has recovered his

health and has reported at Ottawa ready to resume his official duties.

William Bishop, a mining expert from Australia, has been making an examination of the Next President mine at Central City, Colo., in the interest of English investors and has left for London.

George K. Kimball, manager of the Old Town Consolidated Mines Company, of Gilpin county, Colo., is making a business visit to Pittsburg to consult with stockholders regarding the erection of a mill.

President William G. Sharp and Managing Director A. F. Holden have returned to Boston from making an inspection of the Utah properties of the United States Smelting, Refining and Mining Company.

George Vivian, formerly of Georgetown, Colo., who has been with the Pittsburg-Montana Copper at Butte, Mon., has resigned and accepted a position with the Trinidad Smelting Company, at Silver City, New Mexico.

Milton H. Farr has resigned as superintendent of the Bingham Car and Manufacturing Company, and has accepted the position of superintendent of coal mines for the Birmingham Coal and Iron Company, with office at Birmingham, Alabama.

W. Fleet Robertson, provincial mineralogist for British Columbia, who late in September returned to Victoria from a three months' trip to the Findlay river district, where he investigated reports of new placer gold discoveries, is now in the Crow's Nest Pass coal district.

R. W. Brock, acting director of the Geological Survey, of Canada, is visiting the Slocan district of British Columbia, accompanied by W. H. Boyd and O. E. LeRoy, members of the Survey staff, who are about to commence preliminary work on a geological survey of the Slocan.

George Leyson, formerly of the Silver Queen, has been appointed manager of the Silver Leaf mine at Cobalt, Ont., with Stuart M. Thorne as assistant. The arrangement by which the mine was worked by H. G. Symmes for the company has been terminated, and the directors have taken over the management.

## Obituary

John E. Haworth, an English mining engineer in charge of the Mina Poderosa, Huelva, Spain, was stabbed by a miner who was demanding work on Sept. 24, and died immediately.

A. Arthur Abbott died recently at Bellevista, Penn., after a short illness. He graduated from the Michigan College of Mines in 1893, and had been employed at mines in South Dakota, Montana and California. Some years ago he went to Peru for the Cerro de Pasco Mining Company, but later left that company to engage in private work. At the time of his death

he was consulting engineer for the Peruvian Mining, Smelting and Refining Company.

## Societies and Technical Schools

*West Virginia Coal Mining Institute*—The next meeting will be held in Charleston, W. Va., Dec. 1 and 2. Several interesting papers will be presented, and some topics of interest to the coal-mining industry of the State will come up for discussion. John S. Cummings, Tunnelton, W. Va., is secretary.

*Association of Iron and Steel Electrical Engineers*—This association held its second annual meeting at Chicago, Oct. 14, 15 and 16. The following officers were elected for the ensuing year: President, J. C. Reed, Pennsylvania Steel Company; first vice-president, G. M. Sturgess, Lackawanna Steel Company; second vice-president, S. R. Palmer, Jones & Laughlin Steel Company; treasurer, E. W. Yearsley, Midvale Steel Company; secretary, G. H. Winslow, National Tube Company, Pittsburg. A number of papers were presented and plants visited and in conformity with the specific purpose of the society, all were discussed fully.

*Western University of Pennsylvania*—A recent bulletin outlines a comprehensive program for its School of Mines as follows: "The School of Mines, to cover fully its field, must give instruction in the forms of minerals, their properties and characteristics, including crystallography, the use of the goniometer and polariscope, or optical, microscopical, descriptive and determinative mineralogy. It must give instruction in the study of rocks, as covered by the science of lithology and petrology, or petrography. In the study of the earth it is necessary to cover the general principles of chemical, physical, stratigraphical and field geology, particularly in their applications to mining and engineering. It must further include the study of the ancient animals and plants, or paleontology and paleobotany, with their use, in determining the age and relations of geological formations. On the side of economics or mining geology there are to be studied all the metalliferous and non-metalliferous deposits of use to man. This work takes up their mode of occurrence and classifications; the methods of searching or prospecting for them; their uses or applications. \* \* \* The work of the school includes metallurgy in all its branches, comprising wet and fire assaying; hydro-metallurgy and electro-metallurgy; the preparation and use of fuels and refractory materials; calorimetry, pyrometry, and furnaces, their construction, equipment, and use, with experimental laboratory work. Owing to its location, particular attention must be given to iron and steel metallurgy and to the manufacture of coke. Lastly, mining in all its numerous ramifications must be covered."

## New Publications

THE MINERAL INDUSTRY, Vol. XVI.  
 Edited by W. R. Ingalls. Pp. 1127,  
 illustrated. 6¼x9½ in.; cloth, \$10 or  
 42s. New York and London, 1908:  
 Hill Publishing Company.

"The Mineral Industry" has so fully established its place as an essential part of the working library of everyone who is interested in the production, distribution, or manufacture of the metals and commercial minerals, together with many chemical products derived from them, that any extended reference to its usefulness is hardly necessary. It is enough to say that the appearance of this yearly volume is an event to those who read it, or rather use it; for the chief value of such a book is not and cannot be found in the immediate reading which it furnishes, but rather in its constant presence as a book of reference, which may be turned to at any time. Only those who so use it, and learn that they are sure to find the essential information that they need, appreciate its full value. I do not say—nor do I think the editor will claim—that it is an encyclopedia of all possible knowledge; but it is a compendium of current information of such character that one seldom appeals to its pages without finding what he needs in some form.

Vol. XVI—for 1907—is the largest of the series, comprising 1127 pages. Its make-up follows the style that has been standardized in previous volumes, i.e., the minerals and metals are treated in alphabetical order, everything pertaining to each subject being classified under the main head. This makes it easy for the reader to turn directly to the subject under his investigation without reference to the usual index at the end of the volume. The latter is supplied with commendable care, but in fact the whole volume is in itself an index.

The list of subjects treated in Vol. XVI is longer than in any previous volume, the editor carefully keeping step with the advances in the art. Thus it will be noticed that the new volume reports for the first time the production of metallic bismuth, cadmium and calcium in the United States, while the production of such new substances as the ore of tantalum and the manufacture of calcium cyanamid and calcium nitrate are treated.

The list of contributors to Vol. XVI is also noteworthy for its length and the high standing of all. The reviews of industrial progress are uniformly prepared by recognized experts in each line, while the records of current events are supplied by thoroughly informed reporters. Thus, the progress in the mining industry of each mineral is to a large extent described by the State geologists, or members of the State geological surveys, nearly all of whom are contributors to Vol. XVI, including Doctor Bain, of Illinois; Pro-

fessor Barbour, of Nebraska; Mr. Beeler, of Wyoming; Professor Blake, of Arizona; Professor Blatchley, of Indiana; Doctor Buckley, of Missouri; Doctor Clark, of Maryland; Professor Gould, of Oklahoma; Doctor Grimsley, of West Virginia; Doctor Haworth, of Kansas; Doctor Hotchkiss, of Wisconsin; Doctor Kummel, of New Jersey; Doctor Lane, of Michigan; Mr. Lees, of Iowa; Professor Leonard, of North Dakota; Mr. Newland, of New York; Professor Perkins, of Vermont; Doctor Pratt, of North Carolina; Doctor Sellards, of Florida; Doctor Smith, of Alabama; and Mr. Veatch, of Georgia. These contributors give an official character to the publication, which constitutes a valuable and appreciated medium for collating and bringing to general attention the statistical researches and commercial investigations in the several States. This is work that is most properly done by the State geological surveys, and "The Mineral Industry" affords them a means for the coördinated presentation of reports that otherwise might remain buried in local libraries.

Similarly "The Mineral Industry" brings together the mineral and commercial statistics of all the countries of the world, assembling them in a concise form that enables easy comparison. In this work the editor enjoys the active coöperation of the statistical departments of the foreign governments, several of which communicate their figures in manuscript in advance of their own publication, thus contributing materially to make the tables in "The Mineral Industry" up-to-date, which is the keynote of its preparation. As in previous years, a large part of the statistics given in "The Mineral Industry" are collected by itself by direct reports from the consumers, especially the domestic, although this work also extends to foreign countries. A consideration of these many ramifications of attention gives an impressive idea of the immensity of the work and multiplicity of detail that must be involved in preparing a volume of "The Mineral Industry."

The reviews of progress in metallurgy and technology are treated by the regular contributors, who have become identified with "The Mineral Industry." Thus Professor Austin writes on "The Metallurgy of Copper," Professor Hofman on lead, Professor Fulton and Alfred James on the cyanide process and gold ore treatment in general, Prof. J. W. Richards on aluminum, Prof. R. H. Richards and Prof. Charles E. Locke on gold milling, ore dressing and coal washing; Mr. Hobart and Professor Stoughton on iron and steel, Mr. Ingalls on zinc, Professor Kemp on ore deposits, Mr. Colcord on sampling and assaying, Mr. Parsons on coal, Mr. Lesley on cement and Mr. Atwater on coke. These reviews differ somewhat in character, it being evidently the policy of the editor to preserve the in-

dividuality of the contributor within reasonable limits. Thus certain of these contributors confine themselves to a digest, always intelligent and discriminating, of the technical literature of the year; others make the literature the basis of their review, but add their own comments and criticisms; while others write what is more in the nature of a professional report, summarizing the progress of the year from their own experience and observation, with, of course, references to the important literature when necessary.

As usual, Vol. XVI contains many noteworthy monographs. Undoubtedly the most important of these is the paper by Robert Sticht, on "Mining and Smelting at Mount Lyell," in which he describes the geology of the ore deposit, the history of the mining enterprise, and the methods of mining and smelting, illustrated by excellent engravings, and illuminated by wonderful sets of figures of cost from the very beginning of operations right down to date. This contribution will surely be one of the classics of mining and metallurgical literature. Other noteworthy contributions are those of Dr. Hohagen, director of the Bolivian mint, who describes tin mining and smelting in Bolivia; Dr. George F. Kunz, who writes about precious stones in his usual engaging way, and Dr. A. C. Veatch who contributes a valuable monograph on the mining laws of Western Australia. But it is impossible within the limits of this review to refer to all of the noteworthy contributions long and short. Many of the short contributions are particularly valuable inasmuch as they supply precisely the information that is needed.

There are two classes of information that are constantly needed. The first is the statistical. Everyone interested needs to know something about the production, consumption, uses of and market for the metals and mineral products of commercial value in the mining or manufacture of which he is concerned. It is at the foundation of his business that he should be able to estimate the supplies, the probable demand and the course of prices of his product; and that he should be able to gage the extent of these, and the competition with which he is likely to meet. This information he can find in this volume, with the addition, in many cases, of indications of probable new supplies and other matters affecting the future of the product or products in which he is interested. The publication of general statistical tables by governments is essential, but the average man—even if these are readily accessible to him—has not the time or the disposition to analyze and compare the figures and to work out their meaning. To have this done for him is by itself a great service, and this "The Mineral Industry" does certainly render. On the second side, the technical one, what the busy engineer wants is a summary of progress in the arts of mining and metallurgy,

as condensed as possible, but with such references as will enable him to follow up any special subject in greater detail.

It is impossible to go over a book like this critically. Its extent and the diversity of its contents prevent this, nor is it at all necessary. The test of a book of reference is found in its daily use, and I am confident that no one who has used "The Mineral Industry" can spare it. Briefly, Vol. XVI is fully up to the highest standard of its predecessors, and it has some improvements of its own.

J. B.

## Notes from Tonopah, Nevada

### SPECIAL CORRESPONDENCE

The Tonopah mines are producing \$120,000 weekly from 6000 tons of ore. Dividends, however, are rare, only two having been declared in 1908; both of these were by the Tonopah Mining Company, and amount in all to \$500,000. If the above estimate of \$6,000,000 annually be correct, the dividends are only 8 per cent. of the gross product—a discouragingly low proportion.

Henry Krumb's report on the Tonopah Extension mine, lately made public, does not give much encouragement to those holders who paid \$6 to \$8 per share for their holdings. His conclusion is that the mine has \$266,550 profit in sight—provided that the ore can be worked for \$4 per ton. At present it costs \$10.40 for the lowest grade ore, and probably \$15 per ton for the average grade of ore shipped by this mine. To build a 20-stamp mill will cost \$200,000. If this cost be reckoned against the ore now in sight in the mine, 35,000 tons, and on the dump, 25,000 tons (with the profit as stated above of \$266,500), there will be practically nothing for the shareholders. The only salvation for this mine—and for a number of other Tonopah mines—lies in consolidation with its neighbors.

During the last few months good ore has been found in the Belmont on the 1000-ft. level, and has been followed to the 1100 level. It is asserted that this ore is below the rhyolite-dacite intrusion, which is said to cut off all the pay ore in the camp. As a matter of fact, the rhyolite-dacite is not always barren, for good orebodies have been found inclosed in it in the West End, MacNamara, and Tonopah Extension mines. In the West End, for instance, there is fully 15 ft. of \$70 ore with rhyolite-dacite on both sides of it. However, in the Tonopah, Montana and Midway mines the good ore is cut off by the rhyolite-dacite and no pay ore has been found much below the 700 level.

The Tonopah Mining Company is sinking the Mizpah shaft to the 1500-ft. level. The shaft, which is 1250 ft. deep, is still in rhyolite-dacite. This company

is also prospecting from the Red Plume shaft with a Calyx drill, and intends sinking to the 1700-ft. level. For some weeks the work has made no progress, as caving ground has interfered, and filling up the hole with cement and then redrilling has not yet proved successful. Prospecting in depth has also been started at the Montana mine from the 765-ft. level at a point 1000 ft. north of the shaft. Here the company is sinking a three-compartment winze. The formation is earlier-andesite, the "lode-porphry" of the camp, but as yet it is barren. This prospecting in depth is most important for Tonopah and unless it finds ore the future of the camp looks dark. A ray of light, however, comes from the west; the finding of good ore in the extreme western end of the MacNamara mine on the 300-ft. level making it probable that the unprospected ground to the west of this will be productive. A large area here is controlled by the West End and will be prospected during the coming year. Unfortunately some of the more favorably situated claims—owned by the Red Rock, and McKane companies—are tied up by litigation and held by revolvers for one set of litigants.

Air-hammer drills are now being largely used in Tonopah, especially in raises; the advance in some of these raises is astonishingly rapid. The record so far seems to be held by the Waugh drill, which made 113 ft. in one week in a raise in andesite. This was for two eight-hour shifts daily.

The 40-stamp mill of the Montana company has proved a success. It handles some 4200 tons of ore monthly at a cost of \$3.75 and works the ore to 87.5 per cent. This mill will be of great benefit to Tonopah. It has already worked ore for the North Star mine and is now working 50 tons daily for the MacNamara. There is an excellent article describing this mill—by its manager, G. H. Rotherham—in the *Mining and Scientific Press*, of Sept. 5, 1908.

The labor situation is quiet; there are no rumors of strikes, and idle miners are too plentiful. When compared with conditions of a year ago, Tonopah is prosperous. Local real-estate agents report that all the better-class houses are occupied. The large Mizpah hotel, work on which was stopped in November, 1907, will be opened in a few days. The local banks are in good shape. The only bank of Tonopah that has not pulled through, the State Bank, made a bad failure and, it is now thought, will not pay over 30 per cent. to its depositors. Its president, T. B. Rickey, has already spent a night in jail and is now out on *habeas corpus*, fighting off his trial for embezzlement.

One noticeable feature this fall is the entire absence of prospectors. In October, 1906, and to a less extent in 1907, the town was full of teams in charge of hardy, hopeful men starting out in their

search for mines; but this year the few prospectors that come into camp are anxious to sell their outfits. This is an evidence of the tightness of money, for there are still plenty of chances for good discoveries in Nevada.

## Power Company Litigation in California

### SPECIAL CORRESPONDENCE

The Superior Court of Shasta county, California, has decided in favor of a number of farmers on Cow creek in that county, in the second suit against the Northern Light and Power Company, which sought to condemn their riparian water rights for "public use." The court holds, virtually, that riparian rights cannot be condemned for such a public service corporation as a power company which sells power to whosoever may buy. This is the first time such an issue has been made in a California court.

H. V. Gates is seeking a patent on a stone placer claim called the Excelsior, which the Northern California Power Company, of Redding, Shasta county, is contesting. The company attacks the validity of the location on the ground that while the placer claim was ostensibly filed upon for the building stone it contained, the real purpose was to locate a dam site, a reservoir site, and a tunnel site. The claim is on a proposed location of a tunnel site which the power company desires, the tunnel being intended to divert water in Pit river under the north flank of Hatchet Creek mountain, across what is called the big bend of the Pit. The tunnel is to be large enough to develop 250,000 h.p. of electrical energy at the downstream outlet. The location of the Excelsior claim upset the power company's plans altogether, and the case is now being heard at Redding to determine the real character of the stone deposit location. Government geologists have already been examining the ground and their testimony will be taken. The mine is in the Shasta National Forest reserve.

## Indian Gold Production

Gold production from the Kolar field in Mysore, India, in September, was 43,422 oz., a decrease of 344 oz. from August. For the nine months ended Sept. 30 the total was 394,192 oz. bullion in 1907, and 392,256 oz. in 1908; a decrease of 1936 oz. The bullion reported this year was equal to \$7,297,130, or 353,030 oz. fine gold.

To stop leaks in cyanide tanks W. H. Gaze suggests several hot applications of a saturated solution of asphaltum in turpentine.



# Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

## UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

### BAUXITE

**SULPHATE OF ALUMINA**—Improvements in the Treatment of the Residue or Sludge Resulting from the Production of Sulphate of Alumina. H. D. Pochin & Company, Ltd., and John H. Richardson, Salford, Manchester, Eng. (Brit. No. 25,227 of 1907.)

**TREATMENT PROCESS**—Improvements in, and Connected with the Treatment of Bauxite or Aluminous Material. H. D. Pochin & Company, Ltd., and John H. Richardson, Salford, Manchester, Eng. (Brit. No. 25,228 of 1907.)

### COAL AND COKE

**BRIQUETS**—Improvements in the Manufacture of Briquets for Metallurgical or Other Purposes. William F. Collins, Mong-tse, Yunnan, China. (Brit. No. 17,546 of 1907.)

**BRIQUETS**—Improvements in the Manufacture of Fuel Briquets. William F. Collins, Mong-tse, Yunnan, China. (Brit. No. 17,545 of 1907.)

**COAL-CUTTING MACHINES**—Improvements in Coal-cutting Machines. Slegmund Schaubberger, Tiefbau, Austria. (Brit. No. 20,116 of 1907.)

**COAL-CUTTING MACHINES**—Improvements in Mechanism for Driving Coal-cutting Machines. Anderson, Boyes & Company, Ltd., Motherwell, Lanarkshire, Eng. (Brit. No. 25,256 of 1907.)

**COAL-MINING MACHINE**. Leslie W. Veitch, Des Moines, Iowa. (U. S. No. 900,003; Sept. 29, 1908.)

**COAL WASHING**—Improvements Relating to Apparatus for Washing Coal, Coke and Other Materials. Hardy Patent Pick Company, Ltd., Heeley, Sheffield, and George Smith, Abbeydale, Sheffield, Eng. (Brit. No. 24,097 of 1907.)

**COKE-DRAWING APPARATUS**. James Reed, Pittsburg, Penn. (U. S. No. 900,206; Oct. 6, 1908.)

**COKE-OVEN**—Horizontal Regenerative Coke-Oven, etc. Francis J. Collin, Dortmund, Germany. (U. S. No. 898,439; Sept. 15, 1908.)

**COKE-OVEN**. Thomas J. Mitchell, Conneville, Penn. (U. S. No. 899,886; Sept. 29, 1908.)

**COKE-OVENS**—Improved Construction of Regenerative Coking Ovens. Franz Richter, Sheffield, Eng. (Brit. No. 2550 of 1908.)

**COKE-OVENS**—Improvements in Coke-Ovens. Rene Fabry, Chesterfield, Derbyshire, Eng. (Brit. No. 21,593 of 1907.)

**COKE-OVENS**—Improvements in, or Relating to Coke Ovens. Arthur O. Jones, Whitley Bay, Northumberland, Eng. (Brit. No. 27,443 of 1907.)

**COKE-OVENS**—Improvements in, or Relating to Coke Ovens. Arthur O. Jones, Whitley Bay, Northumberland, Eng. (Brit. No. 25,262 of 1907.)

**CONVEYERS**—Improvements in, or Relating to Conveyers for Incandescent Material, such as Coke, etc., Berlin Anhaltische Maschinenbau-A-G, Berlin, N. W., Germany. (Brit. No. 10,601 of 1908.)

**CONVEYING APPARATUS**—Improvements in, and Relating to Apparatus for Conveying Coal from the Working Face of a Mine to the Tubs or Trams. Wilhelm Hinselmann, Hochheide, Rheinprovinz, Germany. (Brit. No. 17,932 of 1907.)

**GASES**—Improvements in Apparatus for Measuring Dangerous or Obnoxious Gases in Mines and the Like. Communicated from Hartmann & Braun, Aktien Gesellschaft, Frankfurt-on-Main, Germany, and Emmanuel Amédée della Santa, Brussels, Belgium. (Brit. No. 18,060 of 1907.)

**SLATE-PICKER**. William J. Devers, Scranton, Penn. (U. S. No. 900,087; October 6, 1908.)

### COPPER

**BESSEMERIZING MATTE**—Method of Bessemerizing Copper Matte. George H. Benjamin, New York, N. Y. (U. S. No. 900,345; October 6, 1908.)

**SMELTING**—Method of Smelting Copper Ores. George H. Benjamin, New York, N. Y. (U. S. No. 900,346; Oct. 6, 1908.)

### GOLD AND SILVER

**AMALGAMATOR**. Fred Stringham, Manitou, Colo. (U. S. No. 900,965; Oct. 13, 1908.)

**FILTER-PRESS**. Charles W. Merrill, Lead, S. D. (U. S. No. 900,185; October 6, 1908.)

**GOLD-SAVING APPARATUS**. Richard G. Steele, Rutherford, Cal., assignor of one-half to Thomas B. Edington, Rutherford, Cal. (U. S. No. 899,271; Sept. 22, 1908.)

**PRESSURE-FILTER**. Charles W. Merrill, Lead, S. D. (U. S. No. 900,184; Oct. 6, 1908.)

**RECOVERING SILVER FROM SOLUTION**. Thomas A. Ross, Selby, Cal. (U. S. No. 901,124; Oct. 13, 1908.)

**RECOVERY FROM SOLUTIONS**—Process of Precipitating and Recovering Materials From Solutions. Charles W. Merrill, Lead, S. D. (U. S. No. 900,186; October 6, 1908.)

**TUBE MILLS**—Improvements in Tube or Ball Mills. Alfred James, London, E. C. (Brit. No. 13,096 of 1908.)

### IRON AND STEEL

**BASIC BESSEMER PROCESS**—Improvements in, or Connected with the Manufacture of Iron or Steel by the Basic Bessemer Process. Josy Flohr, Dudelange, Luxembourg, France. (Brit. No. 9554 of 1908.)

**BLAST-FURNACE**. Julius H. Meissner, Pittsburg, Penn. (U. S. No. 900,291; October 6, 1908.)

**BLAST-FURNACE-CHARGING APPARATUS**. Albion P. Aiken, Braddock, Penn., assignor of one-third to John F. Lewis and one-third to Michael Killeen, Braddock, Penn. (U. S. No. 898,818; Sept. 15, 1908.)

**BLAST-FURNACE PRACTICE**—Improved Arrangement for Filling Blast-Furnaces and the Like. Paul Thomas, Diesseldorf, Germany. (Brit. No. 7022 of 1908.)

**BLAST-FURNACE PRACTICE**—Improvements in Connection with Means for Running off Slag from Blast Furnaces. Joseph Marsden and Edward Pearson, South Bank, Yorkshire, Eng. (Brit. No. 1211 of 1908.)

**CHARGING APPARATUS**—Improvements in Apparatus for Charging Open-Hearth Furnaces and the Like. Benjamin W. Head, London, S. W. (Brit. No. 19,814 of 1907.)

**DESULPHURIZING**—Method of Desulphurizing Ores. Karl A. Johansson, Sandviken, Sweden. (U. S. No. 899,219; Sept. 22, 1908.)

**FOUNDRY PLANT**—Improvements in Foundry Plant for the Vertical Molding and Casting of Pipes. Fred Herbert, Birtley, Durham, Eng. (Brit. No. 26,390 of 1907.)

**HEAT TREATMENT and Quenching of Alloyed Steels**. James Churchward, New York, N. Y. (U. S. No. 899,713; Sept. 29, 1908.)

**INGOT-MANIPULATOR**. David L. Mekeel, Sewickley, Penn. (U. S. No. 899,832; Sept. 29, 1908.)

**INGOTS**—Method of Producing Ingots Free From Blow-Holes. William F. M. McCarty, Pleasantville, N. Y., assignor of one-fourth to George O. Eaton, one-fourth to Thomas M. Acken, and one-thirtieth to Alexander J. Guttman, New York, N. Y. (U. S. No. 898,770; Sept. 15, 1908.)

**INGOTS**—Process of Making Ingots. Frank Cutter, Providence, R. I. (U. S. No. 899,827; Sept. 29, 1908.)

**MALLEABLE IRON AND STEEL**—Improved Process for the Manufacture of Malleable Iron and Steel and Other Alloys of Iron, and Improved Apparatus Relating Thereto. Communicated from the Rombacher Hüttenwerke, and Wilhelm Schemann, and Jegor Bronn, Rombach, Lorraine, Germany. (Brit. No. 25,400 of 1907.)

**MANUFACTURE**—Improvements in, and Means for Use in the Manufacture of Steel. Felten & Guillaume Lahmeyerwerke Actien

Gesellschaft, Frankfurt-on-Main, Germany. (Brit. No. 24,213 of 1907.)

**MANUFACTURE**—Improvements in, and Relating to Steel Suitable for the Manufacture of Armour Plates, Projectiles and Other Bodies. Compagnie des Forges et Acieries de la Marine et D'Homecourt, Saint Chamond, Loire, France. (Brit. No. 25,742 of 1907.)

**MANUFACTURE**—Improvements in the Manufacture of Iron or Steel by the Open-Hearth Process or in Electrical Furnaces. Josy Flohr, Dudelange, Grand Duchy of Luxembourg, Germany. (Brit. No. 19,348 of 1907.)

**MANUFACTURE**—Improvements in the Manufacture of Iron and Steel. John W. Moon and Wesley J. Moon, Old Hill, Staffordshire, Eng. (Brit. No. 12,607 of 1907.)

**MANUFACTURE**—Method of Manufacturing Steel. John W. Maxwell, Williamsport, Penn. (U. S. No. 900,564; October 6, 1908.)

**MANUFACTURE**—Process for the Production of Pig Iron for the Manufacture of Steel in the Converter. Alexander Zeuzes, Charlottenburg, Germany. (Brit. No. 23,627 of 1907.)

**MOLDING MACHINE**—An Improved Portable Molding Machine for Foundry Use. Communicated from Badische Maschinenfabrik und Eisengießerei vormals G. Sebald and Sebald & Neff, Durlach, Grand Duchy of Baden, Germany. (Brit. No. 8981 of 1908.)

**ORE TREATMENT**—Method of Treating Ore. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 899,405; Sept. 22, 1908.)

**ORE TREATMENT**—Process of Treating Ferruginous Ore for the Manufacture of Iron and Steel Therefrom. Montague Moore, Melbourne, and Thomas J. Heskett, Brunswick, Victoria, Australia. (U. S. No. 12,856; re-issue; Sept. 22, 1908.)

**SMELTING**—Method of Smelting Ores. Ralph Baggaley, Pittsburg, Penn. (U. S. No. 900,466; October 6, 1908.)

**TREATMENT OF IRON**—Improvements in the Treatment of Iron Which is to be Converted into Steel. Hermann Röschling and Johannes Schönaiva, Volklingen-on-Saar, Germany. (Brit. No. 27,556 of 1907.)

### MICA

**MICA POWDER**—New or Improved Process for the Production of Mica Powder. Arthur B. C. Rogers, Agra, United Provinces of Agra and Oudh, British India. (Brit. No. 12,570 of 1908.)

**SPLITTING MACHINE**—Machine for Splitting Mica. Bernhard Walchner, New York, N. Y. (U. S. No. 901,130; Oct. 13, 1908.)

### NICKEL

**SEPARATING METALS FROM MATTE**. Art of. Albion J. Wadhams, Riverton, N. J., and Robert C. Stanley, New Brighton, N. Y., assignors to International Nickel Company, Bayonne, N. J., a Corporation of New Jersey. (U. S. No. 900,452 and 900,453; October 6, 1908.)

**SEPARATING METALS FROM SPEISS**. Art of. Albion J. Wadhams, Riverton, N. J., and Robert C. Stanley, New Brighton, N. Y., assignors to International Nickel Company, Bayonne, N. J., a Corporation of New Jersey. (U. S. No. 900,454; October 6, 1908.)

### SULPHUR AND PYRITES

**TREATING PYRITE LIQUOR**—Improvements in Treating or Utilizing Liquor Obtained from Pyrites, Pyrites Cinder and the Like. John H. Thwaites, Peterborough, Eng. (Brit. No. 27,426 of 1907.)

### TIN

**EXTRACTION PROCESS**—Improvements in and Relating to the Extraction of Tin From Ores, Slag or Refuse. Hermann Mühlhans, Wiesbaden, Germany. (Brit. No. 25,460 of 1907.)

**TIN CHLORIDE**—Improved Manufacture of Tin Chloride or the Like. Dr. Heinrich Brandenburg, Kempen-a/Rhein, Germany. (Brit. No. 1461 of 1908.)

## ZINC

**ELECTRIC FURNACE** for the Continuous Extraction of Zinc from Its Ores. Eugène F. Cote and Paul R. Piérion, Lyons, Rhone, France. (Brit. No. 22,283 of 1907.)

**OXIDE OF ZINC**—Process of Treating Complex Ores Containing Zinc and Other Volatilizable Metals for the Production of Oxides. George M. Rice, Worcester, Mass. (U. S. No. 899,322; Sept. 22, 1908.)

**OXIDE OF ZINC**—Treating Oxide of Zinc. Frederic P. Dewey, Washington, D. C. (U. S. No. 900,088; October 6, 1908.)

## MINING—GENERAL

**DUST IN MINES**—Method of Removing Dust and Gases from Mines. Frank T. Byers, Mount Pleasant, Penn. (U. S. No. 899,509; Sept. 29, 1908.)

**EXCAVATION SYSTEM**—Improvements in the System of Excavating and in the Construction and Operation of the Scoops, Buckets or Scrapers Employed Therein for Conveying and Discharging the Material Excavated. John Abbott, Eastbourne, Eng. (Brit. No. 16,054 of 1907.)

**EXPLOSIVE** or Blasting Agent For Blasting Rock and the Like. Wilhelm Eberhle, Eftlingen, Grand Duchy of Baden, Germany. (Brit. No. 15,195 of 1908.)

**HOISTING**—Improved Method and Device for Regulating Power-Supply in Hoisting Plants. Jakob Iversen, Charlottenburg-n/Berlin, Germany. (Brit. No. 3231 of 1908.)

**MINE-DOOR**—Automatic Mine-Door. Benjamin O. Byers and Charles F. Thiede, Columbus, Ohio. (U. S. No. 900,262; October 6, 1908.)

**MINE-TRACKAGE**—System of Mine-Trackage. Freeman R. Willson, Jr., Worthington, Ohio, assignor to the Jeffrey Manufacturing Company, a Corporation of Ohio. (U. S. No. 900,903; Oct. 13, 1908.)

**UNDERGROUND WATERS**—Process for Stopping or Sealing Off Underground Flows of Water Into Mine-Workings, etc. Edmund B. Kirby, Flat River, Mo. (U. S. No. 900,683; October 6, 1908.)

**ORE-CHUTE**. John Ross, Landlock, Alaska. (U. S. No. 899,076; Sept. 22, 1908.)

**VENTILATION**—Means for Ventilating Mines and Removing Dust and Gases Therefrom. Frank T. Byers, Mount Pleasant, Penn. (U. S. No. 899,508; Sept. 29, 1908.)

## ORE DRESSING

**CLASSIFICATION**—Improvements in Machines for Grading or Classifying Pulverulent or Comminuted Materials. Arthur R. Robertson, Kingston, Glasgow, Scotland. (Brit. No. 19,736 of 1907.)

**CONCENTRATING-TABLE**. Albert M. Kemp, Merton W. Loomis and Joseph E. Fitzwater, Denver, Colo. (U. S. No. 900,285; October 6, 1908.)

**CONCENTRATOR**—An Improved Concentrator of the Endless Traveling Belt Type. Charles L. Buckingham, Denver City, Colo. (Brit. No. 6413 of 1908.)

**CONCENTRATOR**. Ray H. Manley, Stockton, Cal. (U. S. No. 899,312; Sept. 22, 1908.)

**CRUSHING-MILL**. Waldemar M. Mueller, Los Angeles, Cal. (U. S. No. 899,176; Sept. 22, 1908.)

**CRUSHING MILLS**—Improvements Relating to Crushing Mills. Arnelin Bernard, Carloforte, Sardinia. (Brit. No. 8980 of 1908.)

**ELECTRIC SEPARATOR**. Henry A. Wentworth, Lynn, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass., a Corporation of Maine. (U. S. No. 899,364; Sept. 22, 1908.)

**MAGNETIC ORE-SEPARATOR**. Charles E. Stebbins, Iola, Kan. (U. S. No. 899,348; Sept. 22, 1908.)

**ORE-CONCENTRATOR**. Albert H. Stebbins, Los Angeles, Cal. (U. S. No. 900,442; October 6, 1908.)

**ORE-FEEDER**. Samuel T. Graham, Los Angeles, Cal. (U. S. No. 899,527; Sept. 29, 1908.)

**ORE-SEPARATOR**. Joseph F. Pagett, Denver, Colo. (U. S. No. 900,581; October 6, 1908.)

**ROTARY SCREENS**—An Improvement in Rotary Screens Applicable to Stone and Ore Crushing Machines, and for Screening Gravel and Like Material. Joseph Broadbent and James E. Broadbent, Stalybridge, Lancashire, Eng. (Brit. No. 24,740 of 1907.)

**SEPARATION**—Apparatus for Recovering Mineral Values. James W. Boardman, Josephine, Mont., assignor of one-fourth to Lucy E. Phillips and one-fourth to Melissa French, Harlem, Mont. (U. S. No. 899,710; Sept. 29, 1908.)

**SEPARATION**—Improved Process for Separating Parts of the Constituents of Ores from the Remainder Thereof. Auguste F. Joseph de Bayay, Kew, Victoria, Aust. (Brit. No. 17,364 of 1907.)

**SEPARATION**—Process for Separating Metals From Their Ores. Jacob D. Wolf, London, England. (U. S. No. 899,478; Sept. 22, 1908.)

**SEPARATION**—Separation of Metals From Their Ores. Jacob D. Wolf, London, England. (U. S. No. 899,149; Sept. 22, 1908.)

**SEPARATOR**—Machine for Separating Solids from Liquids. Frank K. Atkins and Earl F. Atkins, Denver, Colo.; said Earl F. Atkins assignor to said Frank K. Atkins. (U. S. No. 901,056; Oct. 13, 1908.)

**SLIMES-SEPARATOR**. Horace G. Nichols, Ymir, British Columbia. (U. S. No. 899,428; Sept. 22, 1908.)

## METALLURGY—GENERAL

**BAG-HOUSE**. Holland E. Benedict, Salt Lake City, Utah, assignor to United States Smelting, Refining and Mining Company, Salt Lake City, Utah, a Corporation of Maine. (U. S. No. 898,426; Sept. 15, 1908.)

**BY-PRODUCT RECOVERY**—A Process for the Utilization of Products and By-Products of the Chemical Treatment of Ores, Especially Mixed Ores. George Evans, Stroud Green, London, N. (Brit. No. 17,125 of 1907.)

**CASTING**—Improvements in, and Connected with the Casting of Metal Ingots. Communicated from Friedrich W. Winner, Hanyang, Province of Hupeh, China. (Brit. No. 20,759 of 1907.)

**ELECTRIC-FURNACE PROCESS**. George O. Seward and Franz von Kugelgen, Holcombs Rock, Va., assignors, by mesne assignments, to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 898,691; Sept. 15, 1908.)

**FLUE-DUST**—Composition for Solidifying Flue-Dust. Samuel W. Ramsey and Guy W. Smith, Youngstown, Ohio, assignors to the Ramsey-Smith Company, Youngstown, Ohio, a Corporation of Ohio. (U. S. No. 900,587; October 6, 1908.)

**FLUE-DUST**—Method of Recovering Values From Flue-Dust and Fines. Ralph Baggaley, Pittsburg, Penn. (U. S. No. 900,467; October 6, 1908.)

**REFINING**—Process of Refining Metals. Karl O. Kretschmer, Elizabeth, N. J., assignor of two-thirds to Charles J. Canda and Ferdinand E. Canda, New York, N. Y. (U. S. No. 898,116; Sept. 8, 1908.)

**SINTERING PROCESS**—Improvements in, and Relating to Apparatus for Roasting and Sintering Ores. Arthur S. Dwight and Richard L. Lloyd, New York City. (Brit. No. 25,985 of 1907.)

**SINTERING PROCESS**—Improvements in, and Relating to Process of Roasting and Sintering Ores. Arthur S. Dwight and Richard L. Lloyd, New York City. (Brit. No. 17,343 of 1907.)

**SMOKE PREVENTION**—Improvements in Means for Preventing or Consuming Smoke and Economizing Fuel in the Furnaces of Steam Generators. Henry Blackney and Sydney Oram, Buxton, Eng. (Brit. No. 18,138 of 1907.)

## MINING MACHINERY AND APPARATUS

**DREDGING APPARATUS**—Pins for Dredges or Dredging Chains. Communicated from the Taylor Iron and Steel Company, Highbridge, N. J. (Brit. No. 6576 of 1908.)

**ELEVATING APPARATUS**—Improvements in, and Relating to Elevating Appliances for Use in Mines and the Like. Karl Teichmann, Salzdetfurth, Germany. (Brit. No. 25,547 of 1907.)

**EXPLODING APPARATUS**—Apparatus for Exploding Mine Charges. Charles I. Dodson, Pittsburg, Kan. (U. S. No. 898,847; Sept. 15, 1908.)

**EXPLODING APPARATUS**—Means for Exploding Blast Charges. Charles I. Dodson, Pittsburg, Kan. (U. S. No. 898,848; Sept. 15, 1908.)

**HAMMER-DRILL**. Albert H. Taylor, Easton, Penn., assignor to Ingersoll-Rand Company, New York, N. Y., a Corporation of New Jersey. (U. S. No. 898,702; Sept. 15, 1908.)

**HOISTING APPARATUS**—Controlling Device for Hoisting Apparatus. Carl Notbohm, and Heinrich Eigemann, Essen-on-the-Ruhr, Germany. (U. S. No. 899,794; Sept. 29, 1908.)

**HOISTING-ENGINE**. Sven T. Nelson, Chicago, Ill., assignor to Sullivan Machinery Company, Chicago, Ill., a Corporation. (U. S. No. 900,768 and 900,769; Oct. 13, 1908.)

**MINERS' LAMPS**—Improvements in Miners' Lamps. Boleslaus Rynkowski, Brauck near Gladbeck, Germany. (Brit. No. 20,979 of 1907.)

**MINING AND LOADING MACHINERY**—Improvements in Combined Mining and Loading Machinery. Edmund C. Morgan, Chicago, Ill. (Brit. No. 18,233 of 1907.)

**PNEUMATIC DRILL**. Martin Hardsocg, Ottumwa, Iowa. (U. S. No. 899,729; Sept. 29, 1908.)

**RESCUE APPARATUS**—Improvements in, or Relating to Respiration or Life-Saving Apparatus for the Use of Persons Entering Places Such as Coal Mines Containing Irrespirable Gases. William E. Garforth, Normanton, Yorkshire, Eng. (Brit. No. 23,111 of 1907.)

**ROCK-DRILL**. Clark J. Smith, Ottumwa, Iowa, assignor to the Hardsocg Wonder Drill Co., Ottumwa, Iowa. (U. S. No. 896,475; August 18, 1908.)

**ROCK-DRILLING APPARATUS**—Improvements in, or Relating to Fluid Pressure Operated Rock Drilling Apparatus and the Like. Henry S. Potter, Walton-on-the-Hill, Surrey, Eng., and Frederick D. Johnson, Westminster, London, S. W. (Brit. No. 23,218 of 1907.)

**ROCK-DRILLING MACHINE**. John B. Damas and Joseph Francis, Sonora, Cal. (U. S. No. 896,518; August 18, 1908.)

**ROCK-DRILLING MACHINES**—Improvements in Fluid-Actuated Rock-Drilling and Other Percussive Machines. Wilhelm Mauss, Brakpan, Transvaal. (Brit. No. 13,758 of 1908.)

**ROCK-DRILLS**—Improvements in Pneumatic Rock-Drills. Harry J. Smith, London. (Brit. No. 22,863 of 1907.)

**ROCK-DRILLS**—Improvements in Rock Drills. Henry J. C. Keymer, Gorleston-on-Sea, Great Yarmouth, Eng. (Brit. No. 10,251 of 1907.)

**ROCK-DRILLS**—Machine for Sharpening Rock-Drills. Bradford H. Locke, New York, N. Y. (U. S. No. 898,663; Sept. 15, 1908.)

**SAFETY APPARATUS**—Improvements in, and Relating to Safety Devices for Lifts, Mines and the Like. Malcolm J. McVittie, Newcastle-on-Tyne, Eng. (Brit. No. 17,660 of 1907.)

**SAFETY APPARATUS**—Improvements in Safety Apparatus for Mining Cages and the Like. Thomas W. Barker and Batie Barker, Newsham, Northumberland, Eng. (Brit. No. 6571 of 1908.)

**SAFETY HOISTING DEVICE**—An Automatic Stop Guide That Will Prevent the Descent of Cages or Hoists if the Sustaining Tow or Wire Rope Breaks. James Martin, Coatbridge, Scotland. (Brit. No. 19,754 of 1907.)

**SAFETY LAMPS**—An Improved Guard for the Locking Bolts of Miners' Safety Lamps. John C. Best, Morley, Yorkshire, Eng. (Brit. No. 23,086 of 1907.)

**TUNNELING-MACHINE**. Olin S. Proctor, Denver, Colo., assignor by mesne assignments, to the Terry, Tench & Proctor Tunneling Machine Company, a Corporation of New York. (U. S. No. 900,950 and 900,951; Oct. 31, 1908.)

## METALLURGICAL MACHINERY AND APPARATUS

**BRIQUET PRESS**—An Improved Press with Intermittently Rotating Mound-Table for Making Briquets, Artificial Stone Blocks and the Like. Wilhelm Surmann, Cologne, Germany. (Brit. No. 21,069 of 1907.)

**CASTING APPARATUS**—Improvements in Apparatus for Holding and Pouring Metals into Molds for Casting Operations. Edgar A. Custer, Philadelphia, Penn. (Brit. No. 16,747 of 1907.)

**CASTING APPARATUS**. William S. Weston, Chicago, Ill. (U. S. No. 900,807; Oct. 13, 1908.)

**CONVERTERS**—Improvements in Converters. Richard Cremer, Leeds, Eng. (Brit. No. 10,835 of 1908.)

**CHARGING FURNACES**—Improvements in Means for Bringing Charges into Position to be Taken up by Apparatus for Charging Furnaces. Benjamin W. Head, Westminster, London, S. W. (Brit. No. 10,046 of 1908.)

**CRUCIBLE FURNACES**—Improvements in, or Relating to Crucible Furnaces and the Like. Louis Rousseau, Seine et Oise, France. (Brit. No. 6028 of 1908.)

**DESULPHURIZING-FURNACE**. Robert Hübner, New York, N. Y. (U. S. No. 899,403; Sept. 22, 1908.)

**ELECTRIC FURNACE**. Erik Cornelius, Trölhättan, Sweden. (U. S. No. 900,486; October 6, 1908.)

**ELECTRIC FURNACE**. James H. Reid, Cornwall, Ontario, Canada, assignor of one-half to Stephen Lemuel Tingley, Ottawa, Canada. (U. S. No. 900,207; October 6, 1907.)

**ELECTRIC FURNACE**. Johannes Härdén, London, England. (U. S. No. 897,203; Aug. 25, 1908.)



# Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at  
San Francisco, Salt Lake City, Denver, Butte and Goldfield

## REVIEWS OF IMPORTANT EVENTS

### San Francisco

Oct. 20—The Greek laborers having been discharged and trouble with the miners' unions thus avoided, it is probable that the cleaning out and repairs to the Campbell ditch, in Yuba county, will be done by the Tarr Mining Company with American laborers, if they can be obtained. Until this ditch is completed no profitable work can be accomplished at the Blue Point mine at Smartsville, which is being reopened by the company. There are immense beds of unworked gravel in this mine, which was formerly a large hydraulic property; it is now to be worked on some different system but large quantities of water must be used. Yuba county now ranks fourth among the gold-producing counties of this State and numbers of old mines long idle are being reopened. Of course, the main seat of the gold-mining industry is the dredging ground near Marysville and this is being extended and more dredgers are being built. Indeed it is the opinion of many that this Marysville, or Yuba field, is the best in the State for dredging, and will have the longest life.

The Canada Hill Consolidated Mining Company, formerly owned by L. Charronat & Sons, on Canada Hill, Nevada county, was supposed to be worked out a couple of years ago but the superintendent, A. Charronat, succeeded in getting the company to go on until finally the ledge came in again. A modern equipment of hoisting and pumping machinery was then installed and deep mining commenced. The company has now got on far enough to build a 10-stamp mill. The mine was formerly among the dividend payers of Nevada city district.

The Four Metals Mining Company, of Inyo county, has completed its new smelter and is about to work up old slags which have accumulated from former operations of the mines at Cerro Gordo. The new smelter will primarily be used for the company's own ores, but some custom smelting will also be done for the benefit of the miners in that locality. A large power generating plant is being put up on Lone Pine creek from whence transmission lines will be run from Keeler to Cerro Gordo. The company is about to put up 27,000 ft. of 3/4-in. steel cable for its aerial gravity tramway. There is a fall of some 4000 ft. between Cerro Gordo and the smelter. The tramway system will deliver 20 tons of ore hourly to the smelter.

The new district of Kewance in San

Barnardino county has now several companies actively working and others ready to let contracts for shafts, tunnels, etc. For such a young camp to have as many as five properties nearly ready to turn out bullion, is something worth note. The object of the companies is now to gain depth and the sulphide zone, where it is expected that the gold ores found on the surface will become richer. Moreover, a water supply will be developed, which is necessary for milling the ores in any quantity. Ore worth \$25 to \$30 per ton is common, and some found is of quite high grade. The Chico, Sunnyside and Casa Grande properties are looking well, and the Morning Star is considered a good milling proposition. The Meadville company, owning the West End claim, is producing gold-silver-lead ore. Numbers of prospecting parties are outfitting at different points in this county, which is a very large one, and are scattering in many directions. Hart, another of the new districts, is doing well for a place so recently opened, and the discoveries there are opening up other small camps within a radius of 100 miles. In addition to gold, silver and lead mines, deposits of borax and soda are being looked for and opened.

Prospectors who have been in the Surprise valley region of Modoc county this summer, speak highly of the mining possibilities of that section. The only mining of any extent being done in the county is near Fort Bidwell, where a number of properties have been opened and a few are now producing in a small way. More milling facilities are needed. A quicksilver mine is being opened near Cedarville, but has not yet become productive. In the section around Surprise valley some gold prospects have been found and are being opened in a small way. There is plenty of water, but the country is undeveloped, as it is far from any railroad transportation.

### Wallace, Idaho

Oct. 20—Efforts to compromise the difficulties between the Federal Mining and Smelting Company and the Bunker Hill & Sullivan Mining and Concentrating Company have failed, and now there is to be litigation between the two, which promises to be a serious matter. Pope Yeatman, chief consulting engineer for the Guggenheim interests, was sent out from New York to endeavor to effect a compromise, but he failed to do so, and decided that the litigation should proceed.

Consequently the Federal company has brought suit against the Bunker Hill & Sullivan. The questions involved, which pertain to extralateral rights, are very complicated, and the present outlook is that there will be a costly and vexatious law suit, once more illuminating the hideousness of the law of the apex.

### Salt Lake City

Oct. 24—The controlling interest in the Carisa mine in the Tintic mining district has been obtained by E. C. Loose, of Provo, and associates. Mr. Loose is manager of the Sioux Consolidated, an adjoining property, in which some important developments have been made during the past six months; the supposition is that the orebodies opened in Sioux ground extend into Carisa ground. The strike of the vein also crosses the Iron Blossom property. Some extremely interesting developments are taking place in this portion of the Tintic district which may prove to be as richly mineralized as any of the older exploited portions of it.

Another deal of importance in which Tintic property is involved was the obtaining of a controlling interest in the Opex group by a Utah syndicate at the head of which is Jesse Knight, of Provo. This property is adjacent to the Centennial Eureka mine. A company has been formed to exploit the property and is to be known as the Opex Consolidated Mines Company, having a capital stock of 1,000,000 shares, par value \$1 each. Provo is to be the headquarters of the corporation. New machinery was installed at the mine last year. Frank P. Swindler, of Salt Lake, is manager.

Apparently some shareholders, friendly to Guggenheim, or American Smelting company, interests, are opposing the construction of a new copper smelter by the Utah Consolidated Mining Company. Consequently, further than exercising the options held on a large area of land in Tooele county, the Utah Consolidated management has taken no steps toward carrying out its plans to erect the proposed plant. The American Smelting company interests are doing what they can to prevent any more competition in Utah, and that is what it will mean to them if a smelter is built in Tooele county. It is contended by Utah Consolidated officials that a 5-year contract with the American Securities Company on the basis of the one now in existence would mean a large loss to shareholders and unless the terms were modified materially it would be against



good business judgment to continue shipments of ore to the Garfield smeltery for treatment. The Utah Consolidated is charged 40c. a ton for ore transported from Bingham to Garfield, for the Denver & Rio Grande Railroad rigidly enforces the terms of an old contract; other companies are charged at the rate of not to exceed 25c. a ton. By building a smeltery in Tooele county, the ore could be transported from mine to smeltery by means of an aerial tramway.

The regular monthly report shows the financial condition of the several Knight mining companies at the end of September to be as follows: Iron Blossom, cash, \$20,755, treasury stock, 100,000 shares; Crown Point, cash, \$13,199, treasury stock, 120,300 shares; Ibez Gold Mining Company, cash, \$5965, treasury stock, 53,300 shares; Colorado, cash, \$2358, no treasury stock; the company has ceased the payments of dividends temporarily owing to the shutting down of the Tintic smelter; Uintah Treasure Hill, accounts payable, \$5558—shareholders have been called on for an assessment of 1c. a share, or \$30,000; East Tintic Consolidated, cash, \$707, treasury stock, 163,000 shares; Mineral Flat, accounts payable, \$7935; this company is installing power equipment; Mountain Lake, cash, \$16,123, treasury stock, 123,425 shares; King David, cash, \$29,858, treasury stock, 400,000; Beck Tunnel Consolidated, accounts payable, \$19,341; Indian Queen, cash, \$9065, treasury stock, 91,300 shares; Black Jack Consolidated, accounts payable, \$2475.

The annual report of the Consolidated Mercur covering the operations of that company during the fiscal year ending June 30, 1908, shows net profits of only \$2436. Gold bullion sold during the year amounted to \$644,354, while receipts from other sources brought the total earnings up to \$659,941. The net operating expenses were \$657,505. There was mined and milled 87,492 tons of base and 138,737 tons of oxidized ores; the average extraction was \$2.85 a ton, while the average value of the tailings for the twelve months was 92c. per ton, making the total value of the ore treated \$3.77 per ton. The cost of mining was \$1.65 and the milling cost \$1.27 per ton. The exploitation of the Brickyard mine was quite successful and the reopening of the Magazine vein insures two or three years' supply of ore for the mill on the basis of 800 tons a day.

Shareholders of the Talisman and Cedar Mining companies, whose properties are in Beaver county, have concluded arrangements for consolidation. The Cedar-Talisman Consolidated Mining Company, has been organized, shareholders of the respective corporations having equal representation.

#### Butte

Oct. 22—The mines of the Boston & Montana company are now producing at their normal rate of 3500 tons daily,

which is sent to the company's smelter at Great Falls. The company's largest producer is the Mountain View, with the Pennsylvania and Leonard mines next in order. Between 15 and 20 per cent. of the ore shipped is first class.

On October 1, 540,000 shares of the old Davis-Daly Estates Copper Company, together with the 50c. per share assessment, were turned in to the new Davis-Daly company in exchange for shares of the latter company. Since then other shares have been turned in, leaving only 7½ per cent. of the stock forfeited by failure to pay the assessment. Under the terms of the agreement with the underwriters, this remaining 7½ per cent. of the stock will go to them as compensation for their services.

Paine, Webber & Co. have begun action against the British-Butte Mining Company, of this city, to recover \$2971 as damages for the refusal of the mining company to transfer upon its books certain shares of stock. It is alleged that in February of the present year the plaintiffs purchased in the open market 5000 shares of British-Butte stock. The mining company, claiming that the stock was subject to a pool agreement whereby no sales were to be made until January 1, 1909, refused to transfer the stock on its books. The brokerage company sues to recover commissions and profits which it lost by the alleged wrongful refusal of the mining company.

#### Denver

Oct. 24—In the Cripple Creek district, the deep drainage tunnel is in 3800 ft. from the portal, and a flow of 350 gal. of water per minute is reported as having been encountered.

According to some published reports, there is marked depression in mining in the Cripple Creek district. These are not substantiated by the production of the district which is now quite as large as it has been for two years past; nor by the number of miners at work, which is large. Of course, it has been demonstrated that the richest part of Cripple Creek was on the top. There has been no reduction of the value of the product, but less of it contained in the rock broken, and as the mines are now deep, there is the increased cost of pumping and hoisting. This has been counterbalanced to a certain extent by improved metallurgical methods and lower treatment charges. Now that these treatment charges have been increased, it is possible that some depression in the district will result.

That the mining and engineering interests of the State of Colorado are being injured by the misplaced zeal of the Reclamation and Forestry bureaus of the Government, is patent to everyone, and the worst feature of it is that though the officials have been shown their error, it has so far been impossible to get the redress needed. Polite verbal and written

assurances are plentiful, but "nothing doing" is the result. Withdrawal of immense tracts for forest reserves where there are no forests, barring out prospectors from the same by an impossible rule which requires him to prove his claim valuable before his stake holds good, and withdrawal of lands by the Reclamation Service where there is nothing to reclaim, are only a few of the absurdities.

There are instances where the building of a much needed railway was delayed, and its projectors subjected to heavy legal costs, because the Reclamation Service wished to make an immense reservoir through which the line would pass. And although the railway has been allowed to go through, the Reclamation Service will not release the valuable lands included in the withdrawal, some of which is high mountain range, containing valuable deposits of limestone and other minerals, which cannot be acquired or utilized.

The chief of the Forest Service, however, now seems amenable to reason, and has arranged a conference between himself and committees representing Colorado mining men and the American Mining Congress, with a view to correcting wrongs.

#### Toronto

Oct. 23—The Ontario Government has undertaken the building of a wagon road, 47 miles long, to render accessible the new mining region around Gowganda lake, which lies in unsurveyed territory west of Mickle township. The road leaves Earlton, a point on the Temiskaming & Northern Ontario railway, 25 miles north of Cobalt, passes through Elk City and Smythe on the Montreal river and continues westward through James and Mickle townships, and thence through a section interspersed with many small lakes where a large number of claims have been staked out, especially around Miller, Leroy and Everett lakes, terminating at the northern end of Gowganda lake. The last point is distant 25 miles from Elk City. Construction work, including a bridge over the Montreal river, will be pushed as rapidly as possible.

Four Cobalt properties were recently disposed of by the Temiskaming & Northern Ontario Railway Commission by tender. Sixteen acres of the Cobalt station grounds and lots 388 and 389 of the townsite were secured by A. Rosenthal and G. P. Dickson, of Ottawa, for \$30,000. Four acres of lot 44 and lot 338 in the town were brought by W. L. Hayden and Raymond Mancha, of Detroit, for \$5575. The property is leased for 999 years, subject to a royalty of 25 per cent. of the gross value of the output.

At a preliminary meeting held at Kenora, Ont., on Oct. 15, an organization, to be known as the Mine Owners and Prospectors' Association of Western Ontario, was formed. The details are to be completed at a later meeting in November.

# Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

## THE CURRENT HISTORY OF MINING

### Arizona

#### YAVAPAI COUNTY

*Consolidated Arizona Smelting Company*—The property of this company is to be sold at auction at Prescott on Nov. 10, for the benefit of its creditors. The company is now in the hands of a trustee in bankruptcy.

### California

#### AMADOR COUNTY

*Keystone*—At this mine, Amador City, the old owners have cleaned up the mill and other property, and most of the men have been laid off in the expectation that those who hold the bond will make the other payments and take the mine. The first payment of \$5000 was paid, but the second has not yet been met. The electric company has been notified that no more power will be required. The plans of the new management call for the expenditure of about \$200,000, so the sale may not "come through" after all. If work is not resumed, this will make three large Mother Lode mines to close within the year—the Oneida, Gwin and Keystone.

#### BUTTE COUNTY

*Steiffer*—The Butte county grand jury has returned an indictment against the president and secretary of this company of Magalia, which has been operating on the old Perschbacher gravel mine. It is alleged that stockholders have discovered that the company does not own the property at all, but that it is in the name of an attorney.

#### CALAVERAS COUNTY

*Wickham Group*—This group, consisting of the Reed & Wickham, Old Consolidated, and Bear Creek mines, is being developed by M. D. Wickham & Son, who have put in an overshot wheel for power in pumping and hoisting.

#### EL DORADO COUNTY

*Woodside-Eureka*—This company, after unwatering the Eureka shaft and doing the necessary sampling, has put up boilers, engines, pumps, etc., at the shaft. It is now about to begin the unwatering of the Woodside shaft, which has been filled with water for the past 40 years.

#### INYO COUNTY

*Niter Deposits*—At the lower end of Death valley, in the hills along the Willow creek branch of the Amargosa river, Los Angeles men have taken up and

patented 4000 acres of land supposed to contain niter deposits of value. A laboratory has been built on Willow creek, near the China ranch, where samples are being tested. The surface of a considerable area has been removed so as to get at the bedrock where it is expected that the deposits are richer than on the surface. John E. Fishburn, president of the National Bank of California, of Los Angeles, is largely interested in this enterprise. These deposits have long been known, but transportation facilities have been lacking.

#### KERN COUNTY

*Golden Group*—J. B. Ferris, at these mines in Caliente cañon, has erected a new mill with a capacity of 25 tons daily. The ore runs \$10 in gold and \$12 in silver.

#### LASSEN COUNTY

Some rich placer ground has been found just north of Susanville, and numbers of claims have been located on the north side of Indian Camp.

#### MODOC COUNTY

*Bald Mountain*—J. P. Rathburn has sold to W. C. Stanley and others 25 mining claims at this place for \$65,000, and the purchaser will commence work in spring.

#### NEVADA COUNTY

*Rose Hill*—Hemmingson & Green, who have a bond on this Grass Valley property, are clearing away the caved-in portion of the old tunnel. Sinking will commence from the end of this tunnel.

#### SHASTA COUNTY

*Mammoth*—The smeltery of this company is now running at full capacity. The production in 1908 is expected to be 30,000,000 pounds.

#### SAN BERNARDINO COUNTY

*Coolgardie Placer Company*—This company, operating on the desert near Barstow, is putting in engines to run its dry-washing machinery.

*Fremont*—In this property near Barstow, on the 260 level, ore of high grade has been struck. Enough has been developed to warrant the construction of a mill and one is to be built.

*Long Horn Consolidated*—This company at Garrett Cañon has put in place a five-stamp mill to prospect the ore from its wide ledge.

#### SAN DIEGO COUNTY

*Escondido Mine Development Company*—This company at Escondido, has taken a 10-year lease on the Oliver Oaks property, with the privilege of purchase. The ground is to be prospected at once.

#### SHASTA COUNTY

*Delta Consolidated*—This company is preparing plans for a narrow-gage railroad from Delta to Dog Creek, where the mines are located.

*Mountain Copper Company*—This company has started one of its McDougal roasters to remove the sulphur from the ores being shipped to its smelter near Martinez.

#### SISKIYOU COUNTY

*Granite*—This property near Yreka has been sold to Chas. Mitchell, representing New York men, and work will commence upon it at once.

*Scott Bar Hydraulic Company*—Work has been commenced on the ditch of this company near Fort Jones, which is to be cleaned out and put in repair. The old channels to be worked are high above the present river bed.

#### TEHAMA COUNTY

*Tom Head Copper Mine*—The company owning this mine has done over 12,000 ft. of development work, mainly in prospecting. The vein in No. 3 tunnel is 52 ft. wide and new levels will be run to cut it still deeper; a large force of men, with machine drills, is to be put on. It is the intention to block out enough ore to warrant smelter construction.

#### TRINITY COUNTY

*Brooks*—This mine on Eagle Creek, owned by P. Grace and P. L. Young, has over 1000 tons of ore ready to be milled and a stamp mill will shortly be installed.

*Salmon Summit*—Seven tunnels have been run on this mine on Eagle Creek.

#### TULARE COUNTY

*Jupiter Consolidated Jewel Company*—This company has leased, with the privilege of purchase, the Venus Hill and Baby Venus chrysolite mines. The company now owns 14 gem mines in Mariposa and Tulare counties. The main offices of the company are in Fresno.

#### TUOLUMNE COUNTY

*Sweeney*—This mine, after being in liti-

gation over 30 years, is now to be worked again by C. H. Segerstrom, and the shaft is being cleaned out and retimbered. New machinery is to be installed.

## Colorado

### BOULDER COUNTY

*United States Gold Corporation*—This company is going to erect a 200-ton cyanide mill at the property on Sugar Loaf mountain, and has placed the matter in charge of the Burnite-Leonard Engineering Company, of Denver, which has designed the plant and is now putting in the concrete foundations. The machinery will be contracted for this month.

### LAKE COUNTY—LEADVILLE

*Cleveland*—The main shaft on this property, South Evans gulch, will be sunk another 100 ft., making it 750 ft. deep; work will be commenced within a short time. The fissure vein at the 650-ft. level has been opened for 1500 ft. each way, north and south, and the width of the vein will average 8 ft. for the whole of the 3000 ft., carrying an average value of \$40 per ton; this is outside of the high-grade ore which runs high in gold and is sacked separately. The object in sinking the shaft deeper is to develop the fissure vein and to give the company sufficient stoping ground to keep it busy for another two years.

*Fanny Rawlings*—At this mine, Breece hill, the upraise started from the lower workings has opened a body of ore that is, so far as known, 30 ft. high and 10 ft. wide; 30 tons daily are being sent to the smelter.

*Greenback*—It is reported that the Clark interests in this property, Carbonate hill, have been sold to a party of Boston capitalists, and that work will be started within a month, the ore going to an independent smelter.

*Hilltop*—The owners of this property, Horseshoe district, are preparing for active work. The mine is in charge of J. C. F. Berger, who was manager of the Silent Friend, South Evans gulch. The Hilltop has produced a high-grade zinc ore, and from now on the shipments will be increased; all the ore goes to the smelters in Kansas.

*Jennie June*—This shaft, East Tennessee district, has been sunk 75 ft., making it 250 ft. deep; drifts have been run from the bottom of the shaft east and west on the vein, and in the west drift ore has been found that runs high in gold; as work proceeds the vein becomes larger and stronger. From the bottom level of the Jennie June it is the intention to develop the Golden Gate, an adjoining claim.

*Jolly Shaft*—From this shaft, East Fifth street, lessees are shipping in the neighborhood of 15 tons daily of a good grade

of iron and oxidized carbonate; the ore coming from the lower level.

*Progressive*—The last work done on this property, Fryer hill, showed a good streak of ore at the bottom of the shaft, but the lessees were compelled to abandon work on account of the heavy flow of water. Arrangements are now being made to install a heavier pumping plant and to sink the shaft 100 ft. farther.

*Black Prince*—In this mine, Breece hill, a good body of silicious ore has been opened in one of the lower levels, and 20 tons daily are being sent to the local smelter. The mine joins the Highland Chief, and one set of lessees is working both.

*Coon Valley*—The installing of electric power at this mine, Rock hill, is now completed, and a force of men is at work underground breaking ore and doing development work.

*Dinero Tunnel*—The work of piping the spring water from the 2000-ft. point in the tunnel is nearly completed, and the work of crosscutting at the breast to find the hanging wall has been started.

*Favorite*—In this mine, South Evans gulch, the body of ore recently opened at the 175-ft. level, is now 18 ft. high with width unknown; three shifts are steadily at work and shipments amount to 50 tons daily.

*Mosquito Range*—The Park Range Company is at present sinking a shaft on the Park Range and following a streak of ore. Work will be continued during the winter. The Majestic group is being worked by a tunnel, which is in 350 ft. with another 200 ft. to be driven, when crosscutting to the vein will be started; at this point the breast of the tunnel will be 700 ft. from the surface. The work is being done by Leadville men.

*Saguache Tunnel*—This enterprise, Sugar Loaf district, is to the south of the Dinero and the company controls a large acreage. Work of driving the adit has been started; it is to be 5000 ft. long.

*Gold Sovereign Mining and Tunnel Company*—The report just issued by this company shows that between Jan. 4 and Oct. 4, 1908, a total of 7805 tons of ore, with a gross value of \$79,337, have been mined by lessees, and the company has received royalties to the amount of \$7027. Unfortunately, on Oct. 15, the buildings and machinery of the mine were destroyed by fire, entailing a loss of \$25,000 it is said.

*Victor Gold Mining Company*—The Victor and Little Joe lode mining claims, owned by this company, situated on the northeastern slope of Bull cliff, have been leased for a two-year term to the Western investment company. The mine workings are to be thoroughly exploited and all ground not reserved for operation by the leasing company will be platted out for leasing purposes and later sub-leases will be granted. Work underground has already been commenced by the lessee. The

Western Investment Company is operating on a number of leasing blocks of the Stratton estate and also on the main workings of the Mary McKinney, on Raven hill.

### OURAY COUNTY

*Atlas-Klondike*—Drifts in three directions from the shaft are showing a good body of silver-lead ore. No stoping will be done until further development is completed, but some ore taken from the drifts is being shipped.

*American-Nettie*—Meyers & Co., working this mine, are shipping some good ore.

*Ouray Consolidated*—This company has made arrangements to continue the Blow-out adit. Machine drills are being installed.

### SAN JUAN COUNTY

*Gold Prince*—Work on this mine at Animas Forks is to be resumed under charge of Daniel McLean, who was recently appointed receiver.

*Hammond Tunnel*—Work on this adit in the Red Mountain district is being pushed, but there has been some trouble in securing the mines needed.

*Kittimac*—At this mine, near Animas Fork, the mill is nearly completed. It will have a capacity of 100 tons daily. Joseph J. Clark is general manager.

*San Antonio*—The Kochler adit is now in 200 ft. Regular shipments are being made; in September they amounted to 1075 tons.

### TELLER COUNTY—CRIPPLE CREEK

*Accident*—Morrell & Co., lessees in this mine on Gold hill, are reported to have cut a 4-ft. vein of good ore, 285 ft. from the surface.

*Henry Adney*—Ore of good smelting grade is being taken from the vein recently opened in this mine on Beacon hill.

*Pharmacist*—At the annual meeting, Oct. 21, the stockholders elected the following board of directors: Walter F. Rock, E. R. Whitmarsh, J. E. Jones, H. L. Shepard and A. Halter. James F. Burns, of Colorado Springs the owner of 87,001 shares, was represented at the meeting by John Nicholls. The policy of the president in leasing property was approved by unanimous vote of the stockholders at the meeting of the directors following the stockholders' meeting the following officers were elected: President and general manager, W. F. Rock; vice-president and treasurer, H. L. Shepherd; secretary, E. R. Whitmarsh.

*Tcutonic*—In this mine on Ironclad hill a promising vein has been cut in the shaft which is being sunk by Smith & Co., lessees.

## Idaho

*Rex*—The affairs of this company, which have been tied up in litigation for some time past, chiefly on account of labor



and other liens, show promise of being straightened out and shipments from the mine have commenced once more.

*Snowstorm*—This company on Tuesday last disbursed its first dividend for the year, at the rate of 3c. per share, a total of \$45,000.

*Tarbox*—J. L. Ford & Co., of Spokane, acting on behalf of a number of New York capitalists have taken an option on the control of this company. This option is for 90 days and covers 55 per cent. of the stock.

*Standard*—The famous tailings suits begun by Josiah and J. S. Hill against this company have at last been settled out of court after a great deal of litigation. The suits were commenced years ago to recover damages for farm lands alleged to have been destroyed by the dumping of tailings into the Cœur d'Alene river.

*Callahan*—Shipments of ore are about to commence again to the Salida, Colo., smelter. Arrangements have been made for all winter work.

*Liberty Group*—A good strike of about 1 ft. of rich copper ore has been made on this group of claims in the Lookout district.

*Star*—The ore shoot in this property on which a sensational strike was made some time ago has now been proved to a distance of over 500 ft. The orebody is about 4 ft. wide.

*Panhandle Smelter*—The blowing in of the furnaces comes as a boost to shipping mines all over the district. It is understood that contracts for all the ore the smelter can treat have been secured from the Cœur d'Alene district and from Montana.

*Imperial*—The big Pelton water wheel for this property, together with most of the other machinery, has been delivered and work has commenced on the installation.

*Evolution Mining Company*—Shipments of ore have commenced. Last week 10,000 lb. of ore was sent to the Pendoray smelter and if the returns on this are satisfactory further shipments will be made.

*Hccla*—This company has declared its regular monthly dividend of 2c. per share, total \$20,000. This is the 64th dividend and makes a grand total of \$1,660,000 of which \$140,000 has been paid this year.

*Surprise*—Two feet of shipping ore and 4 ft. of milling ore have been opened up on this property. The strike was made in the west drift. The mine is located in the Wardner district.

*Thompson Falls Power Line*—A power line from Thompson, Mont., to the Murray mines has been successfully financed by Senator Ed. Donlan, of Missoula, and work on the construction will be commenced in a short time. The project will cost between \$2,500,000 and \$3,000,000. The line from Thompson to Murray will

be approximately 31 miles long. From the Summit district a branch of the line will be built to the Burke and Wallace mines. It is estimated that at the lowest season of the year not less than 29,000 h.p. can be developed.

*Bear Top*—This company is awaiting the completion of the Idaho Northern railroad into the North Side district to commence shipments at the rate of 350 tons a month. The ore averages about \$85 to the ton. Everything is in readiness at the mine and the big 100-ton concentrator, operated by water power, is ready to start at a moment's notice.

*Granite & Allie*—The recent strike of 34 ft. of concentrating ore in this mine has practically decided the management to erect a 100-ton concentrator within the next year.

*Paragon*—Work has been resumed on this property and the mine will join the regular shippers as soon as the railroad is completed. The mine has a full line of machinery.

*Monarch*—A force of men has been set to work in this mine to pump out the upper workings which have been closed since June, 1907. When this has been done the men will commence on the driving of a 760-ft. upraise from the lower tunnel and the mine will be in a position to ship. The Idaho Northern railroad passes within 500 ft. of the mill, which has a capacity of about 50 tons a day. The property was recently leased to the Cœur d'Alene North Fork Mining and Smelting Company.

*Amazon-Dixie Mining Company*—Herman J. Rossi, of Wallace, has purchased from Mark Everett a one-sixth interest in this mine for a consideration of \$20,000.

*Corrigan Mine*—Work is about to be resumed by the Federal Mining and Smelting Company, and as soon as a new 20-drill compressor can be installed a force of between 60 and 70 men will be put to work.

*Butte & Cœur d'Alene*—Shipments of ore will commence as soon as the wagon road at present under construction has been completed.

*Birthday Group*—Six feet of good concentrating ore has been found in this group of claims, situated in the Grand Forks district. The strike was made in the face of the No. 2 tunnel, and the owners have started the driving of a long tunnel to get under the showing just opened.

*Federal*—Still another suit has been started by the Federal Mining and Smelting Company against the Bunker Hill & Sullivan Company. This suit is for the purpose of quieting title to the Nellie lode claim, part of which is claimed by the defendant company to belong to the Cheyenne lode claim. This makes the third suit started by the Federal company almost within as many days.

## Indiana

### GREENE COUNTY

That the town of Elliston is underlain with coal is a discovery made recently by the Evansville & Indianapolis Railroad Company, while sinking a deep well at its stockpens in Elliston. At a depth of 129 ft., the drill passed through a vein of coal 5 ft. 9 in. thick and below that vein another was tapped that measures 4 ft. 3 in. In other portions of Greene county coal mining is carried on extensively, but this is the first discovery made in this locality. Steps have been taken to organize a company to sink a shaft.

## Michigan

### COPPER

*Seneca*—A new hoisting engine, capable of operating from a depth of 1500 ft., has been delivered at the property and will soon be put in regular commission; with this engine doing duty greater progress will be made in sinking the shaft which is down about 112 feet.

*Ojibway*—No. 1 shaft is down to a depth of 500 ft., and at that point preparations are being made to begin crosscutting to the lode; this will be the first level of the shaft.

*Cliff*—Exploratory work continues at this property under the management of the Tamarack company. A crosscut has been driven from the 260-ft. level to the old Avery shaft, a distance of about 1500 ft., and this shaft is to be reopened and the tributary ground opened up. The crosscut is driven on a fissure vein, which lies at right angles to the bedded lodes and is yielding about 80 tons of stamp rock weekly. Several lodes have been cut, but no drifting has yet been started.

*Michigan*—The lower levels in "B" and "C" shafts of this company are encountering a better grade of copper rock; the vein has widened out and is heavily charged with shot copper. This company is also carrying on extensive explorations in view of opening up the Lake and other lodes that traverse its lands.

*Superior*—Drifting continues at the various levels of this property, and the same favorable ground is being blocked out. The work of enlarging the shaft is nearing completion. The shaft house has been inclosed and a breaker installed. The new compressor is being assembled, and everything is gradually reaching the point when rock shipments will be made to the Atlantic mill and a thorough mill test made. No. 2 shaft is sinking below the 260-ft. level.

*Atlantic*—This company is opening up encouraging ground; the south drift at the 13th level continues in the same rich ground, and copper was recently found at the 15th level. This gives about 300 ft. of proved stoping ground. Drifting north at the 12th level has again been started

and some copper is being exposed. The shaft is sinking about half-way between the 18th and 19th levels, and the ground continues to be disturbed. Everything is in readiness at the stamp mill to handle this rock.

*Osceola*—The permanent equipment for No. 4 shaft of the North Kearsarge branch of this company is being rapidly put in shape; nearly all the machinery is on the ground and is being assembled. The shaft is now down to the 10th level, and from this point a crosscut will be driven to the lode. The shaft is going down in the footwall about 75 ft. behind the lode. Crosscuts have been driven to the lode at the sixth and eighth levels and a high grade of mineralization has been exposed. The ground tributary to this shaft has been proved both by diamond drilling and drifts extended from No. 3 shaft.

### Missouri

#### ZINC-LEAD DISTRICT

*American Zinc, Lead and Smelting Company*—Chas. Hart, of Joplin, and associates are developing the south 20 acres of the Hockaday 80 on Center creek, north of Webb City. The lease is from the American company. The Royal mill will be moved from Carterville to the lease.

*Cardinal*—This old mine has been leased by Snyder & Watkins, of Joplin. The water drained and ore is being produced. This mine is located on Turkey creek, northeast of Joplin and south of the old Dividend. There are now seven companies at work in this locality.

*Grace Holmes*—This company has bought the Carnegie-Galena mine on the Dinkelbühler lease, southeast of Joplin. Jas. Stoop is president of the company, and R. D. Sims, of Joplin, secretary and treasurer.

*Haines Land*—A rich drill strike has been made on this land south of Spring City at 45 and 110 ft. Adam Scott, of Joplin, owns the first lease.

*Maple Leaf*—This company has incorporated with a capital stock of \$50,000. Frank Forlow, of Webb City, and associates, of Montreal, New York and Chicago, are the stockholders.

*Twin Cherry*—This company, at Granby, has made a rich lead strike in six drill holes in its lease on the Massey land.

*United Zinc Company*—The 500-ton mill and mine, formerly owned by this company, north of Duenweg, will soon be producing again. Pumps are at work. Clarence Playter, of Joplin, is manager.

*South Town*—This company, of Webb City, has been incorporated with a capital stock of \$4000. H. G. Gaston, F. R. Cornett, H. W. Pyatt, all of Webb City, and W. M. Robinson, of Jefferson City, are the stockholders.

*Sunrise*—This company is erecting a 100-ton mill on the lease on the Allen land at Spring City. C. V. Millar, of Joplin, is manager.

*Tidionic*—This company, at Zincite, has installed the cheapest small power plant in the district. A 40-h.p. gas engine drives a line shaft, from which belts run a 5-in. single-stage centrifugal pump, and the hoister. J. Wise Brown, Zincite, is manager of the 40-acre lease.

### Montana

#### BUTTE DISTRICT

*Parrot*—At the Parrot mine the shaft has been sunk to the 2000-ft. level within the past year. Crosscuts are now being run on the 1900 and 2000, and it is expected that the veins on both levels will soon be cut. At the Little Mina, sinking below the 1000 mark has begun. The hoisting engine now on the Anaconda company's Bell mine will be taken to the Little Mina. On the 1000-ft. level considerable development work has been done on what is known as the "blue vein."

*North Butte Extension*—The creditors who instituted involuntary bankruptcy proceedings against the company filed a motion to dismiss the proceedings last week, stating that their accounts had been paid. The company has defaulted in its payment under its option on the Michigander and Third Sphinx claims. W. T. Van Brunt, president of the company, has resigned.

*Red Metal*—The shaft at the Tramway mine is now down 1660 ft. The ore from the company's Tramway, Minnie Healey and Rarus mines is all hoisted through the Rarus shaft. About 2,000,000 lb. of copper is being produced monthly by the properties.

*Butte & Boston*—This company's shipments to the Washoe smelter at Anaconda have lately been averaging 26,000 tons per month. Of this output the Berkeley mine contributes 8000 tons. At the West Grey Rock the ore contains chiefly gold and silver, with a small amount of copper.

#### JEFFERSON COUNTY

*Boston & Corbin*—Manager Emerson states that the vein on the 600-ft. level of the company's property at Corbin has been cut. It is supposed that it is the same vein found on the 500-ft. level.

### Nevada

#### ESMERALDA COUNTY—GOLDFIELD

The production for the week ending Oct. 17 amounted to 1896 tons valued at \$149,630. The Combination mill treated 630 tons of ore; the Kinkead mill treated 45 tons. The Western Ore Purchasing Company handled from Florence Consolidated, 128 tons; Engineers' Lease, 208; Florence Wheeler, 55 tons; Butte Boys' lease, 4 tons. The Nevada-Goldfield Reduction Company handled: From the

Consolidated Red Top, 127 tons; Combination Fraction, 120; Begole Syndicate, 300; Baby Florence, 100; Great Bend, 22; Diamondfield Horseshoe, 15; Little Florence, 89; Florence Annex, 28 tons.

*Diamondfield Daisy*—It is stated that 40 tons of ore are being shipped per day from this property, but none of the companies shipping from the district will state whether or not they have received ore from the Daisy. The ore is said to come from the 300-ft. level.

*Little Florence*—The litigation with the Florence Goldfield has been settled out of court. It is said that \$100,000 and other concessions have been made to the Little Florence company. The shaft is 450 ft. deep, and a drift is being driven north to catch the Combination Fraction vein.

*Hazel Goldfield*—The shaft on this lease on the Laguna claim of the Goldfield Consolidated company is 700 ft. deep, being the deepest shaft on any lease in the district. The shaft is being sunk to a depth of 750 feet.

*Combination Fraction*—Shipments have been resumed, as the compressor blast has been fixed and the shaft repaired.

*Zinn Florence*—Air drills are now used, power being obtained from the Florence Consolidated company. The crosscut being driven toward the Florence Consolidated oreshoot is 80 ft. long; 100 ft. remains yet to be driven. An automatic dumping arrangement and a bin are being installed at the mouth of the shaft.

*Engineers Lease*—The high-grade ore in the shoot on this lease, which has paid \$360,000 in dividends, has been almost exhausted. The production in the future will be limited to sweepings and second-grade ore, as there is not sufficient time to develop another orebody. Another dividend will be paid.

### Oklahoma

#### QUAPAW-BAXTER DISTRICT

*Big Jack*—This company, of Baxter Springs, Kan., has bought 12 acres, including the Big Jack mine, from Norton & Haskett for \$10,000.

*Spring River Power Company*—This company is figuring on another power dam at Wyandotte, Oklahoma.

### Pennsylvania

#### BITUMINOUS COAL

*Morris*—At this coal mine, near Punxsutawney, a fire recently started, which threatened serious consequences, as the workings connect with those of the Berwind-White Coal Company's colliery adjoining. The fire started in a heap of refuse near the mouth of the slope, and hard work was required to bring it under control.

*Pittsburg-Buffalo Coal Company*—A fire started in this company's Hazel mine Oct.

24. There were about 500 men working in the mine at the time, but ample warning was given and all got out before there was any real danger. It is stated that the operations in the mine will not be discontinued. The origin of the fire is not known. Two theories are advanced—a blown-out shot and electric wires. The fire was discovered in entry 25, which is more than a mile from the entrance and at a point underneath the North Strabane hills. There was no explosion. As soon as the fire was discovered the mine officials began pumping water into the burning entry. There is an abundant supply of water and plenty of fire-fighting apparatus in the mine. Orders were at once given to brick up the burning entry, and this was completed by night.

### South Dakota

#### LAWRENCE COUNTY

*Lucky Strike*—Superintendent Frank Allen has sunk the shaft 220 ft., and will continue it to the 300-ft. level. The company is controlled by Minnesota and Wisconsin men.

*Mogul*—Under the management of W. L. McLaughlin, of Deadwood, the October output will be more than 400 tons per day.

*Two Bit District*—J. D. Hardin and P. H. Smith, two of the principal owners of ground, have settled their difficulties, and both will shortly resume work in this old section.

#### PENNINGTON COUNTY

*Ama Queen*—Sherman Brothers, of Pactola, will commence pumping out the shaft before the end of the month and resume regular treatment of some of the ore from a 4-ft. lode of free-milling ore at the 70-ft. level.

*King Solomon*—Investigation of this claim has been completed by an Eastern expert, said to be in the interest of the old Pittsburg Mining Company, the former owner, and it is believed that operations may be resumed on the ground, which is near Redfern.

*Kimball*—This ground, adjoining the King Solomon, a free-gold property, was also investigated, and shows three small veins that will bear developing.

*Omega*—President Clark, of New York, has decided to erect a large mill on this property on Rapid creek; also a power plant. The ore runs about \$3 per ton.

*Sunbeam*—Dr. J. Y. Scott, of Washington, Penn., has just purchased this mine at sheriff's sale, but has not announced his plans.

### Tennessee

#### POLK COUNTY

*Tennessee Copper Company*—The acid plant is producing 150 tons per day, which

will be increased to 250 tons. The capacity of the plant is 120,000 tons per annum. The plant is said to have cost \$1,000,000. It is reported that various technical difficulties have now been overcome.

### Texas

Pipe-line and refinery returns for September show a production of 896,750 bbl. petroleum, a decrease of 26,050 bbl. from August. Rail shipments in September were 524,904 bbl.; water shipments, 227,678; total, 752,582 bbl. Refinery consumption is estimated at 150,000 bbl., so that stocks decreased a little. The number of new wells completed in September was 46, of which 34 were producers and 12 dry. On Oct. 1 there were 80 new wells under drill.

### Utah

#### JUAB COUNTY

*Tintic Ore Shipments*—Last week shipments amounted to 99 carloads. The Bullion Beck shipped three carloads; Centennial Eureka, 41; Colorado, 25; Eagle & Blue Bell, 1; May Day, 2; Uncle Sam, 2; Yankee Consolidated, 3; Sioux Consolidated, 8; Beck Tunnel, 2; Eureka Hill, 4; Mammoth, 2; Grand Central, 2; Carisa, 1; Gemini, 3.

*Tintic Smelter*—It is expected that at least one lead furnace will be in commission within two weeks. The plant was closed recently, the reason assigned being inadequate electric-power facilities. Two additional transmission lines are being built.

*King William*—Development of this property has begun through the Eagle & Blue Bell mine from the 1000-ft. level of the shaft.

#### TOOELE COUNTY

*Consolidated Mercur*—The developments on the Magazine vein in the Brickyard mine are very promising. A cross-cut has exposed ore averaging for a length of 80 ft. \$6 gold per ton.

*Great Divide Mining Company*—A compressor plant is being installed; air drills will be used to develop its group of 40 claims located opposite Bingham and on the west side of the Oquirrh range.

*United States*—This company, through its subsidiary, the Centennial-Eureka, is reported to have bought a controlling interest in the Bullion, Beck & Champion Mining Company, of the Tintic district.

#### SALT LAKE COUNTY

*Utah Apex*—This company, in Bingham, has begun a raise to the 700-ft. level from the Parvenue adit; this adit is to be made the main entrance to the mine. Other improvements are being made which the management declares will decrease the mining costs 60c. per ton.

*Boston Consolidated*—The mill is up to a capacity of 1600 tons daily, and the

entire operation is financed from an advance of 85 per cent. of the value of concentrates stored for treatment at the Goldfield smeltery after Jan. 1. The saving is about 71 per cent. Costs in September, 28,365 tons being milled, were 47.2c. per ton; the cost is expected to be below 40c. per ton when the mill reaches full capacity. Production for October promises to exceed 1,000,000 lb. copper.

#### SUMMIT COUNTY

*Park City Shipments*—Last week shipments amounted to 1493 tons; the Daly-Judge shipped 374 tons; Silver King, 544; Daly-West, 575 tons.

### West Virginia

#### HARRISON COUNTY

*Harrison County Coal Company*—This company has bought the mine and plant of the Gunton Coal Company on the Short Line road between Clarksburg and Fairmont. The new owners will make improvements in the plant and will introduce coal-cutting machinery. The officers are George C. Johnston president; P. M. Chidester, vice-president; E. B. Reese, Pittsburg, Penn., secretary; R. S. Monroe, Fairmont, W. Va., treasurer.

### Wisconsin

#### ZINC-LEAD DISTRICT

*Board of Trade*—This mine, a new producer, is turning out green concentrates testing above 55 per cent. zinc and is said to be earning a profit of \$1000 per week.

*Cuba City*—The Dall is building 1000 ft. of tramway, connecting its new shaft with the mill; a new 150-h.p. Allis-Corliss engine is being installed.

*Gogebic*—A shaft will be sunk on this property by W. J. Power, of Hibbing, Minn., who recently purchased one-half interest in the lease; the property lies between the Kohinoor Blende and Klar-Piquette, and was proved by drill two years ago.

*Pittsburg*—The 75-ton mill on this property turned out its first car of concentrates recently. Besides a run of hard-sheet ore, a huge clay opening 30 ft. high and 25 ft. wide, carrying about 12 per cent. of jack, has been proved over 100 ft.; a crevice, carrying this clay and jack continues down into the St. Peter sandstone.

*Platteville*—The Kohinoor Blende has been unwatered; development work will be continued and a 75-ton mill erected. The Klar-Piquette has resumed operations after a year's shutdown. The 35-ton mill erected in 27 days on the Cruson has turned out its first car of concentrates, testing 50 per cent. metallic zinc. The Wisconsin Zinc Company has doubled the roasting capacity at the Empire by adding the roasting equipment of the Royal. This company has declared a dividend of 3 per cent. on its capitalization of \$75,000.



payable Oct. 15. The Grant county mine is being unwatered; the new shaft will be sunk to the clay-bed and connected up with the main drift before milling will be begun.

*Toadville*—This mine, on the Hartshorn land in the St. Rose district, is being opened up by shaft.

*Annie Laurie*—This company is encountering good lead and carbonate in a new shaft just north of the Corr, on the mine known formerly as the Lake Superior-Benton.

*Benton*—The Bureau Mining Company has replaced the mill equipment destroyed by fire on the Rooney-Swift property, and will reopen this mine.

*Coon Branch*—The miners at work here broke into a large opening Oct. 19, and are taking out chunks of lead and jack weighing 5000 lb. in some cases.

*Drumm*—The Benton Mining and Developing Company, operating this lease, has just completed a sinking plant, including a 10-in. Cook steam pump, and shaft sinking has been resumed.

*Hoosier*—This company has just installed a power plant, including a Columbus centrifugal pump, to complete its shaft on the Graham land, two miles south of the Vinegar Hill; a vein of ore varying from 6 to 17 ft. in thickness was proved by drill.

### Canada

*Canada Iron Corporation*—This company has been formed by the amalgamation of the Canada Iron and Foundry Company, the Canada Iron Furnace Company, John McDougall & Company, the Annapolis Iron Company and the Londonderry Iron Company. The last two are in Nova Scotia, the others in Quebec. The properties include iron ore and coal mines, coke and charcoal blast furnaces and foundries. The new corporation is capitalized at \$5,000,000 common and \$3,000,000 preferred stock and there are \$2,500,000 in 6 per cent. first mortgage bonds. The directors are T. J. Drummond, president; G. E. Drummond, Edgar McDougall, C. C. Chipman, A. Cockshutt and George Gudwell.

#### ONTARIO—COBALT DISTRICT

*Ore Shipments*—Shipments of ore for the week ending Oct. 17 were as follows: Kerr Lake, 61,170 lb.; La Rose, 120,000; McKinley-Darragh, 178,000; Nipissing, 185,200; Right of Way, 123,100; Temiskaming & Hudson Bay, 180,000. Total, 847,470 pounds.

*Chambers-Ferland*—The La Rose vein has been struck at a depth of 85 ft. by cross-cutting, at a distance of about 150 ft. from the Right of Way main shaft. The vein is about 4 in. wide and is similar to those found on the La Rose property.

*Cobalt-Central*—A 2-ft. vein showing smaltite, native and ruby silver was cut recently by diamond-drilling at a depth of

185 ft. It parallels the main drift and can be reached by a 20-ft. crosscut.

*Coniagas*—A cobalt vein was recently encountered in a trench that was being dug to lay water pipes. It will be worked from an adjoining shaft.

*La Rose*—According to an official report the production of ore in September was 499 tons containing 256,625 oz. silver valued at \$115,845. The estimated expenses were \$14,000 leaving net profit for the month \$101,845. The net profit for June, July, August and September is stated to be \$420,644 derived from 1,034,742 oz. silver.

#### ONTARIO—MONTREAL RIVER DISTRICT

*Otisse*—A force of men in charge of Frank C. Loring is developing this property. The big vein, 2 ft. in width has been traced across the location. It carries silver estimated at from 1500 to 2000 oz. per ton; the wall rock shows silver to a depth of 6 or 8 in. Another find was made on the property recently and a quantity of native silver was extracted near the surface.

### Mexico

#### CHIHUAHUA

*Parral Production*—The production of the Parral camp for the week ending Oct. 15 amounted to 9195 tons, as compared with 9415 tons for the preceding week. The product shipped to smelters for these periods was, respectively, 3745 and 3950 tons, while the ore treated at local milling plants was, respectively, 5450 and 5465 tons. The October output will be approximately 40,000 tons.

*Uruachic Mining Company*—This lately organized company, in which Chihuahua men are mainly interested, is prosecuting development work on a promising lead-silver location in the Uruachic section. D. J. Carson is in charge of operations.

*Parral Consolidated*—This company has nearly completed the erection of crushing and sampling plants at its Prieta mine in Parral camp. With these improvements and its electrically operated pumping and transportation systems, the company's properties are equipped second to none in the district. The manager in charge is D. H. Bradley, Jr.

*Alvarado Consolidated*—A reorganization of this company, holding a lease on Pedro Alvarado's Palmilla mine in the Parral camp, was lately perfected, and extensive developments are under way. The direction of the company affairs is now in the hands of J. A. Creel and Thomas S. Shepperd of Chihuahua, and James I. Long of Parral. F. C. Morehouse remains as superintendent. It is the plan to drive a new working tunnel. The erection of a large reduction plant is also among the announced plans.

#### JALISCO

*Amparo*—The company has placed an

order for 500,000 young eucalyptus trees to be set out on the Embocada ranch in the Etzatlan district. The trees are to furnish a future timber supply for the mines. The Virginia & Mexico company in the Hostotipaquillo district is also setting out eucalyptus trees.

*Eldorado*—This company which began operations in 1905 has issued a statement to its stockholders giving the condition of its mines in Jalisco and Tepic. It recommends the installation of a cyanide plant for the ores of several of its mines.

*Cherokee-Mexican Mining Company, Ltd.*—This new concern is developing the Juarez acreage adjacent to the Providencia and Resolana properties in the Parral section. Sinking is in progress. P. N. Skousman is in charge.

*Chihuahua Copper*—The monthly shipments, mainly concentrates, total about 450 tons. With the proposed enlargement of the milling plant the output will be doubled. R. W. McCausland is the manager in charge. This property is reached from Falomir on the Orient railroad.

*Sampling Works*—The Chihuahua state government has granted a concession to Harvey B. Lawrence for the erection and operation of sampling works and ore-testing plant at Chihuahua. Sufficient funds are said to be available for the purchase of custom ores in quantities.

*Las Vigas*—It is reported that George E. Voorhees and associates are shortly to resume productive operations at these copper mines near Coyame in the eastern part of the state. The properties have been closed down about a year.

*Southern Mining Company*—This company, operating in the Ocampo district, has resumed mining operations under the personal direction of President Warren Bennett, of Birmingham, Ala. The mill is also being prepared for early starting.

### Africa

#### TRANSVAAL

The labor report of the Witwatersrand for September shows that the number of Kafirs employed in the mines on Sept. 30 was 138,180, an increase of 2632 during the month. The number of Chinese was 14,655, a decrease of 2351. During the year ended Sept. 30 there was a decrease from 46,260 to 14,655 in the number of Chinese at work. At the present rate the Chinese will be entirely out of the mines in six months.

### Oceanica

#### SOCIETY ISLANDS.

An English company is reported about to begin mining on a large phosphate deposit on the island of Makatoa. Other deposits are said to have been discovered on Ocean and Pleasant islands, outlying atolls of the Gilbert group. It is said that a French company has been organized also to work some of these deposits.

# Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

## QUOTATIONS FROM IMPORTANT CENTERS

### Coal Trade Review

*New York, Oct. 28*—The coal market in the West continues to show a slight improvement, and better reports are received from Indiana and Illinois mines than for some time past. In the Pittsburg district, however, trade continues dull, partly owing to light Lake shipments, and partly to the long stoppage of the River trade. Local demand is improving a little.

In the East the bituminous trade is also showing some improvement, and the markets are reported more active, with only a few exceptions. Consumers are putting in winter stocks on a larger scale than had been expected.

The anthracite trade, however, is dull. This is largely due to continued mild weather. In fact, a "weather market" may be anticipated for some time to come.

The Coastwise trade is improving, and is more active than it has been for several months. Vessels are in good demand, and rates are consequently higher.

#### COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct. 17, in short tons:

	1907.	1908.	Changes
Anthracite.....	4,582,056	4,043,829	D. 538,227
Bituminous.....	31,264,996	26,334,082	D. 4,930,914
Coke.....	11,243,846	5,456,069	D. 5,787,777
<b>Total.....</b>	<b>47,090,898</b>	<b>35,833,970</b>	<b>D. 11,256,928</b>

Total increase this year to date was 23.9 per cent.

Coal tonnage through the Sault Ste. Marie canals for the season to Oct. 1, short tons:

	1907.	1908.	Changes.
Anthracite.....	1,035,790	971,088	D. 64,702
Bituminous.....	7,553,120	6,142,621	D. 1,410,499
<b>Total.....</b>	<b>8,588,910</b>	<b>7,113,709</b>	<b>D. 1,475,201</b>

Total decrease this year was 17.2 per cent. The total this year, however, exceeded that of 1906 by 968,922 tons.

The Pittsburg Coal Company reports for nine months ended Sept. 30, short tons:

	1907.	1908.	Changes.
Pittsburg district	13,302,634	9,726,387	D. 3,576,247
Ohio district.....	1,018,481	773,568	D. 244,913
<b>Total coal.....</b>	<b>14,321,115</b>	<b>10,499,975</b>	<b>D. 3,821,140</b>
Coke.....	5,370	382,205	D. 376,835

Decrease in coal tonnage this year, 26.7 per cent.; in coke, 98.6 per cent.

Coal shipments from Seattle and Tacoma, Wash., eight months ended Aug. 31, were 481,210 tons in 1907, and 386,519 in 1908; decrease, 94,691 tons.

Coal receipts at St. Louis, eight months

ended Aug. 31, were 4,883,953 short tons in 1907, and 4,196,983 in 1908; decrease, 686,970 tons.

Coastwise shipments of coal from chief Atlantic ports, eight months ended Aug. 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	9,877,041	6,557,376	16,434,417	62.4
Philadelphia	1,403,219	3,041,920	4,445,139	16.9
Baltimore....	161,692	2,434,920	2,596,612	9.8
Newp't News	.....	1,757,820	1,757,820	6.7
Norfolk.....	.....	1,095,337	1,095,337	4.2
<b>Total.....</b>	<b>11,441,952</b>	<b>14,881,373</b>	<b>26,323,325</b>	<b>100.0</b>
<b>Total, 1907.</b>	<b>12,727,221</b>	<b>15,981,172</b>	<b>28,708,393</b>	<b>.....</b>

\* Total decrease this year, 2,385,068 tons, or 8.3 per cent.

### New York

#### ANTHRACITE

*Oct. 28*—Prepared sizes are active and in good demand, but small steam sizes are inclined to be dull. Schedule prices are \$4.75 for broken, and \$5 for egg, stove and chestnut. Small steam prices are: Pea, \$3.25@3.50; buckwheat No. 1, \$2.35@2.50; buckwheat No. 2 or rice, \$1.60@2; barley, \$1.35@1.50. All prices are f.o.b. New York harbor points.

#### BITUMINOUS

Local business is almost at a standstill. New York harbor seems to be more inactive than any other consuming territory. The reports from shoal-water ports indicate that consumers have quietly and steadily taken fairly good supplies of coal, and now seem to be well stocked for the winter. Along the Sound the demand is good and the all-rail trade shows a more healthy condition. It would, therefore, seem that New York harbor was the only point suffering from extreme dullness. Good grades of coal fetch \$2.45@2.65 with a little demurrage coal reported at \$2.25. Transportation is good.

In the Coastwise vessel trade freight rates are firm and unchanged. In New York harbor small vessels are reported scarce. The rates for large vessels from Philadelphia are: Boston, Salem and Portland, 55c.; Lynn, 65c.; Newburyport, 70c.; Portsmouth, 60c.; Saco, 90@95c.; Bath, 75c.; Gardiner, 80c.; Bangor, 70@75c.; Providence, New Bedford and the Sound, 50c. per ton.

### Birmingham

*Oct. 26*—All demands for coal and coke in this State are being met promptly, but the normal condition as to production has not been reached as yet. The demand, however, is picking up rapidly and more

men are being placed at work in the mines.

A new coal company has been organized to develop coal lands in Tuskalooosa county, near the Warrior river. Negotiations are also under way for development in the northern part of Jefferson county and in St. Clair county.

Coke is being accumulated; it is believed that the time is not far distant when the pig-iron make will increase so that the daily production of coke will not be sufficient, hence the stocking of the product.

### Chicago

*Oct. 27*—The wholesale coal market is in general by no means strong. Warm weather and the continuance of depressed conditions in the industrial field have made the week dull. Western and eastern coals have suffered considerably from demurrage. Conditions at the Illinois and Indiana mines are such that the average operator is by no means yet in touch with the Chicago market; his shipments consequently vary with his product. Demurrage sales cannot compare with the open-market conditions that have prevailed. The demurrage evil is by no means felt generally as yet, but dealers are anxious. Chicago seems to the local dealer to be a dumping ground to which consignments are ordinarily made after other fields have been judged unprofitable.

Illinois and Indiana coals remain comparatively strong as to lump, and weak as to fine sizes. Lump and egg sell for \$1.80@2.65; run-of-mine for \$1.65@2.15, and screenings for \$1.10@1.55. Hocking Valley coal is somewhat subject to demurrage and brings 15@25c. less than the \$3.15 standard. Pittsburg No. 8 is steady at \$2.75@2.85 for 3/4-in., and Youghiogheny moves on contracts at \$3 for steam and \$3.15 for 3/4-in. gas. Smokeless brings \$4.20@4.30 for lump and \$2.90@3.45 for run-of-mine, with the market overloaded. Anthracite continues a steady though quiet seller.

### Indianapolis

*Oct. 27*—The owners of the Hudson mine near Terre Haute, have been awarded \$3000 by the Operators Association to cover the aggregate amount lost by the owners on account of the strike compelling a closing down July 23. The origin of this trouble was trivial; but the strike led to a dispute between the State and National officers of the miner's union, which is now in the courts.

**Pittsburg**

Oct. 27—Production in the Pittsburg district has fallen off considerably during the past week and today it is estimated the mines are not running to more than 40 per cent. of capacity. Large independent interests continue to quote prices on the basis of \$1.15 a ton for mine-run coal at mine, but many of the small concerns and probably a large one are still shading this rate.

*Connellsville Coke*—A further reduction in production is noted today and conditions are dull, although prices are unchanged for contract coke. Furnace is quoted at \$1.65@1.85 and foundry at \$2.10@2.25 at ovens. For prompt delivery these rates may be shaded. The *Courier* gives the production in both fields at 198,315 tons. The shipments were 7692 cars as follows: To Pittsburg, 3138; to points west of Pittsburg, 4114; to points east of Connellsville, 440 cars.

**Foreign Coal Trade**

*Spanish Coal Trade*—Coal imports into Spain, eight months ended Aug. 31, were 1,281,984 metric tons, a decrease of 19,657 tons; coke imports, 186,756 tons, an increase of 20,609 tons.

*Transvaal Coal Mines*—Coal mined in the Transvaal, seven months ended July 31, was 1,685,144 tons in 1907, and 1,709,671 in 1908; increase, 24,527 tons.

*Welsh Coal Market*—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 17: Best Welsh steam, \$3.60; seconds, \$3.48; thirds, \$3.30; dry coals, \$3.60; best Monmouthshire, \$3.18; seconds, \$3; best small steam, \$1.80; seconds, \$1.56. All per long ton, f.o.b. shipping port.

**Iron Trade Review**

*New York, Oct. 28*—The general tone of the market is still a waiting one. The activity in pig iron which began to develop early in the week quickly subsided after a few orders for foundry and basic pig had been placed. Southern furnaces just now are best supplied with orders and are accordingly firmer on prices.

In finished material the only special activity is in wire, the mills being reported full of work. In other branches from 60 to 70 per cent. of capacity is the report. Some bridge orders have been placed, which will call for a good deal of material. A few new orders for cars are also reported. No large orders for rails have been given out. In structural steel, outside of bridge work, contracts are still held back.

There are reports that a general reduction in finished-steel prices may be made before long. In some lines this will confirm the cuts already made. Nothing definite can be ascertained as to the truth in these reports.

*United States Steel Corporation*—The statement for the quarter ended Sept. 30 gives the following figures:

Net Earnings:	1907.	1908.
July.....	\$13,804,167	\$ 8,599,630
August.....	15,279,173	9,152,311
September.....	14,720,945	9,354,333
<b>Total.....</b>	<b>\$43,804,285</b>	<b>\$27,106,274</b>
Depreciation, reserve, etc..	\$ 7,109,180	\$ 5,795,857
Interest, etc.....	6,936,962	7,311,962
Special appropriations.....	16,000,000	.....
Dividends.....	8,846,432	8,846,432
<b>Total payments.....</b>	<b>\$38,892,574</b>	<b>\$21,954,251</b>
Surplus.....	\$ 4,911,711	\$ 5,152,023

The net earnings show a decrease of \$16,698,011 as compared with the corresponding quarter of 1907; they were however, greater by \$6,840,418 than those for the June quarter, and \$8,877,269 than those for the March quarter of 1908. The dividends declared were the same as in the previous quarter—1¾ per cent. on the preferred and ½ per cent. on the common stock.

The unfilled orders on the books on Sept. 30 reached a total of 3,421,977 tons of material; an increase of 108,001 tons over June 30, but a decrease of 343,366 tons from March 31; and a decrease of 3,003,031 tons as compared with Sept. 30 last year.

**Baltimore**

Oct. 27—Included in the imports for the week were 50 tons spiegeleisen and 505 tons ferromanganese; 5500 tons iron ore from Cuba, 2250 tons iron pyrites and 5608 tons cupreous pyrites from Spain. The exports included 930,117 lb. tin scrap to Rotterdam; 562,500 lb. steel billets to Liverpool.

**Birmingham**

Oct. 26—There seems to be a consensus of opinion in this section of the country that within another fortnight a change for the better will be apparent on all sides in the pig-iron market. There is some iron being sold now but it is yet in small lots and for immediate delivery. A few large interests have been sounding the market.

Quotations hold firm despite the inclination on the part of consumers to put off buying to the last moment. No. 2 foundry is still quoted at \$12.50@13 per ton. Some inquiry is being received for iron to be delivered into next year but no concessions are being offered to secure that business.

There is a healthy home consumption in the Southern territory again, cast-iron pipe foundries, machine shops and foundries and other interests doing better.

**Chicago**

Oct. 25—Iron and steel conditions continue dull, but the feeling is optimistic. Sales of pig iron are in general small. Melters are buying only as much iron as is necessary for their immediate wants, though inquiries for 1909 deliveries continue large and increase in numbers. If

one might safely infer anything from the situation it is that the average melter of pig iron looks for good business for the future, but his caution against the unforeseen has been developed largely in the last year.

Sales of pig iron, in general, do not run beyond the requirements of one to three months, and on such business \$12.50@13 Birmingham (\$16.85@17.35 Chicago), continue the ruling quotations for Southern; the exceptional contract obtains special prices, 25c.@50c. either way representing the extremes. Northern iron at \$16.50@17 continues to be the favorite. Lake Superior charcoal iron is firm at \$19.50.

Iron and steel products are in general stationary, except there is a strong development of structural iron sales. Coke is quiet, but firm at \$4.90 for first-class Connellsville, with Southern cokes 25c.@50c. lower.

**Philadelphia**

Oct. 28—Scarcely any change can be observed in the pig-iron situation as to sales or prices. There are more inquiries, and many of them are from large consumers. The sales for the past week have been of special brands in small lots, but the correspondence which led to these sales was accompanied with inquiries relating to next year's iron. Very few furnaces are now hungry for business. Most makers feel that things are coming their way even though prices may not advance. Malleable iron is under better inquiry than for months. Basic pig is stronger. Forge is coming in for more attention; it is quoted delivered close to \$16, and \$16.50@17 is asked for No. 2X foundry.

*Steel Billets*—No large sales have been made, but negotiations are under way.

*Bars*—Two or three mills took orders this week for prompt delivery at outside figures.

*Sheets*—Some good-sized orders for winter delivery have been sent to the mills.

*Scrap*—More mill scrap has been contracted for this week than for any week in months. Dealers are holding out for strong prices.

**Pittsburg**

Oct. 27—The lull before the election is more pronounced than in former years, as there is no business of any consequence being booked in any of the iron and steel lines. While the general run of small orders are being placed and there are still some specifications on old contracts unfilled, the mill operations continue practically the same as a week ago. The Republic Iron and Steel Company is operating its big bessemer-steel plant at Youngstown for the third consecutive week and expects to close up all orders by Saturday night. In the Pittsburg district there is



no change in operations of the Carnegie company, the principal works running a trifle over 50 per cent., which 30 of its 55 blast furnaces are running. The National Tube Company is still operating at about 68 per cent. of capacity. Shading of many finished-steel products continues although "official" prices are strictly maintained by the Steel Corporation and large independent concerns.

**Pig Iron**—There is nothing doing in pig iron this week, the market being absolutely dead. The Jones & Laughlin Steel Company will blow in its idle Soho furnace tomorrow, when all of its blast furnaces will be running. This company seems to be using most of its product, but has large stocks on hand in readiness for a rush if a good buying movement develops. The contract placed last week by the Pittsburg Steel Company did not strengthen the market and is not as big as it looks. While it calls for a total of 360,000 tons of basic pig iron covering a period of five years, it provides for the shipment of 6000 tons only a month. This is the product of one furnace for about two weeks in each month. The price as reported is not regarded as desirable for a merchant furnace. Another feature in the contract developed this week is that it may be terminated at the end of 2½ years. Pig-iron quotations are as follows, f.o.b. Valley furnaces: Standard bessemer, \$14.75; malleable bessemer, \$14.25; basic \$14; No. 2 foundry, \$14.25 to \$14.50; gray forge, \$13.50.

**Steel**—There is nothing doing in billets or sheet-bars. Bessemer and open-hearth billets are \$25, Pittsburg, and sheet-bars \$27.50. Merchant-steel bars are 1.40c. and plates 1.60c.

**Sheets**—Cutting in sheet prices continues, but is not bringing out new business. Regular prices remain 2.50c. for black sheets and 3.55c. for galvanized No. 28 gage.

**Ferro-Manganese**—Little demand; prices remain \$45, Pittsburg.

**Foreign Iron Trade**

**British Iron Trade**—Values of exports from Great Britain, as given by Board of Trade returns, nine months ended Sept. 30, were: Iron and steel, £28,246,022; machinery, £23,204,786; new ships, £8,274,358; total, £59,725,166, a decrease of £7,241,402, or 10.8 per cent., from 1907. Imports for the nine months were: Iron and steel, £5,550,393; machinery, £3,645,594; total, £9,195,987, an increase of £79,166, or 0.8 per cent. The quantities of iron and steel were, in long tons:

	1907.	1908.	Changes
Exports.....	4,002,919	3,100,820	D. 893,099
Imports.....	643,197	791,649	I. 148,452

Imports of iron ore into Great Britain, nine months ended Sept. 30 were 5,967,809 tons in 1907, and 4,428,896 in 1908; a decrease of 1,538,913 tons, or 25.8 per cent. The imports in 1908 included 3,259,540 tons from Spain.

**Metal Market**

**Gold and Silver Exports and Imports**

NEW YORK, Oct. 28.  
At all U. S. Ports in September and year.

Metal.	Exports.	Imports.	Excess.
<b>Gold:</b>			
Sept. 1908..	\$ 3,974,391	\$ 4,695,894	Imp. \$ 721,503
" 1907..	1,503,836	2,759,019	" 1,255,183
Year 1908..	68,937,380	38,356,816	Exp. 30,580,564
" 1907..	49,879,813	30,862,220	" 19,017,593
<b>Silver:</b>			
Sept. 1908..	4,198,286	3,303,362	Exp. 894,924
" 1907..	6,048,467	3,822,766	" 2,225,691
Year 1908..	38,781,380	30,725,475	" 8,055,905
" 1907..	47,970,793	34,488,224	" 13,482,569

Exports of specie from New York week ended Oct. 24: Gold, none; silver, \$949,817, to London and Paris. Imports: Gold, \$492,354, chiefly from Australia; silver, \$71,700, from the West Indies and Central America.

Notwithstanding reports of probable gold shipments, the only exports for the week were \$500,000 to Canada. On the other hand, a shipment of \$412,000 was received from Australia.

Gold holdings of the leading European banks Oct. 24 reached a total of \$2,253,496,760; New York banks, \$306,290,200; making \$2,559,496,960 in all.

Notwithstanding its heavy gold reserve, amounting to \$656,000,000, the Bank of France is still accumulating gold, having paid 77s. 11¾d.—a premium of ¼d.—this week for \$5,000,000 gold in the London open market.

**Silver**

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver.		Oct.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
22	4.8655	51½	23½	26	4.8655	51½	23½
23	4.8660	51½	23½	27	4.8655	51½	23½
24	4.8655	51½	23½	28	4.8650	51½	23½

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The London silver market is still under pressure of sales of bullion for future delivery on Indian bear account; and so long as no very active demand for spot silver arises there does not seem much chance for a rise in price of any importance.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 15:

	1907.	1908.	Changes.
India.....	£9,741,954	£7,349,863	D. £2,392,091
China.....	68,400	516,400	I. 448,000
Straits.....	625,950	112,385	D. 513,565
<b>Total.....</b>	<b>£10,436,304</b>	<b>£7,978,648</b>	<b>D. £2,457,656</b>

Receipts for the week, £133,000 from New York, £5000 from Mexico, and £108,000 from China; £246,000 in all. Exports, £20,000 to India.

**Copper, Tin, Lead and Zinc**

Oct.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			Cts. per lb.	Cts. per lb.
22	13½ @14	13¼ @13½	60½	29½	4.22 @4.27	4.77 @4.82	4.62 @4.67
23	13½ @14	13¼ @13½	60½	29½	4.22 @4.27	4.77 @4.82	4.62 @4.67
24	13½ @14	13¼ @13½	.....	29½	4.25 @4.30	4.77 @4.82	4.62 @4.67
26	13½ @14	13¼ @13½	61½	29½	4.25 @4.30	4.80 @4.85	4.65 @4.70
26	13½ @14	13¼ @13½	61½	29½	4.27 @4.32	4.80 @4.85	4.65 @4.70
27	13½ @14	13¼ @13½	61½	29½	4.27 @4.32	4.80 @4.85	4.65 @4.70

London quotations are per long ton (2240 lb.) standard copper. 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 price of cathodes is 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.

**Copper**—On Oct. 22 the sudden advance of £1 in the London market inspired buyers, both foreign and domestic, to come into this market and sales of electrolytic copper were made at an advance of ¼c. per lb. and more, while the Calumet & Hecla made sales of its particular brand of Lake copper at 14c. The United Metals Selling Company successively raised its asking price to 13½ and 13¾c., delivered, 30 days, or respectively about 13½ and 13¾c., cash, New York. The aggregate sales of all the agencies during the week, Oct. 22-28, were approximately 50,000,000 lb., including large transactions both in electrolytic and Lake copper, and both for domestic and foreign account. The majority of the business was done for export, but although the sales to domestic manufacturers were somewhat less than the normal ratio, nevertheless they figured prominently in the market. Consumption is gradually increasing, both in this country and abroad, and inasmuch as manufacturers are not well covered, the market looks strong.

The bulk of the business this week was done for delivery in November and December, but sales were made for as far ahead as February, and several of the important producers are now sold out for November-December delivery.

An interesting feature of the week was the wide range in prices for Lake copper. While the Calumet & Hecla was obtaining 14c. for its particular brand, other standard grades of Lake copper were selling at 13¾c., and business in Lake, other than Calumet & Hecla, was done right along at 13¾c. At the close the market is strong at 13¾@14c. for Lake and 13½@13¾c. for electrolytic in cakes, ingots and wirebars. Business in casting copper has been done at an average of 13½@13¾c., closing higher.

Copper sheets, cold-rolled, 19c.; hot-rolled, 18c. Wire, 15c. base, carload lots at mill.

The London market for standard copper has also been strong and active, and the daily turnover has been larger than for some time past. Prices have steadily advanced, and at the close spot is quoted at £61 2s. 6d.

Refined and manufactured sorts we quote: English tough, £65; best selected, £64@65; strong sheets, £76@77.

Copper exports for the week from New York and Philadelphia, 2783 long tons. Our special correspondent gives the exports from Baltimore at 1022 tons.

**Tin**—The London market throughout the week has remained steady and closes firm at £133 15s. for spot, £135 5s. for three months.

An active business was transacted in the domestic market, and the close is quoted at about 29½ cents.

**Lead**—Immediately after the close of last week the market took an upward turn, consumers showing more interest in the metal at the lower prices. On the advance some good business has been done, but the transactions have been restricted by the failure of consumers to meet the views of producers who are now looking for a further rise in prices. At the close the market is 4.27½@4.32½c., New York, and 4.12½@4.17½c., St. Louis.

The London market remains unchanged at £13 6s. 3d. for Spanish lead, £13 8s. 9d. for English lead.

The plants of the American Smelting and Refining Company are said to be operating now at 90 per cent. of their capacity.

**Spelter**—The demand for this metal has improved slightly, and the market is firmer at 4.65@4.70c. St. Louis, 4.80@4.85c. New York.

The London market is strong, good ordinaries being quoted at £20, specials at £20 5s. per ton.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

**Other Metals**

**Antimony**—Market is quiet both in New York and abroad, with little buying. Quotations, 8.15@8.50c. for Cookson's; 7½@8½c. for Hallett's; 7½@7¾c. for ordinary brands.

**Aluminum**—A further reduction is reported. Base price, No. 1 ingots, is now 25½c. per lb. for ton lots; 26½c. for less than one ton.

The former convention among the European producers having expired on Oct. 1, aluminum is now available in Europe at 14c. per lb., at which price the metal can be imported into this market to undersell the American product. High grade French aluminum has been offered

here this week at 23c. per lb. We quote 23@25½c. for ingot.

**Platinum**—Demand is increasing, especially from the jewelry trade. Quotations are higher at \$20@21 per oz. for refined metal; the higher price being named by regular dealers.

**Quicksilver**—Business in New York is good, and prices have been advanced to \$47 per flask for large orders. San Francisco, \$44@45 for domestic sales, \$42@43 for export. London, £8 10s. per flask; 1s. less from second hands.

**Cadmium**—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

**Magnesium**—This metal is offered in New York at \$1.25 per lb. in 100-lb. lots. The price is \$1.40 per lb. for 5-lb. lots.

**Nickel**—Large lots, 40c., New York.

**Zinc and Lead Ore Markets**

**Platteville, Wis., Oct. 24**—This week \$37 per ton was the highest price paid for zinc ore on a basis of \$35@36 per ton of 60-per cent. zinc. For 80-per cent. lead ore \$50@52 was paid.

Shipments, week ended Oct. 24:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton.....	608,980	142,240	.....
Platteville.....	512,870	62,600	220,000
Hazel Green.....	337,500	74,700	.....
Days Siding.....	176,000	.....	.....
Linden.....	171,840	.....	.....
Highland.....	134,000	.....	.....
Livingston.....	80,000	.....	.....
Mineral Point.....	21,800	.....	.....
Total.....	2,042,990	279,540	220,000
Year to Oct. 24.....	82,294,729	8,851,105	2,614,604

There were shipped last week, not then reported, from Highland, 115,200 lb.; from Linden, 164,700 lb.; from Harker, 60,470 lb.; and from Mineral Point, 168,000 lb. zinc ore.

In addition to the above there was shipped to the Electrostatic Separator, at Platteville, from Benton, 259,980 lb.; to the Joplin Separator Works, at Galena, 69,200 lb.; to the Enterprise roaster, at Platteville, 54,470 lb. zinc concentrates.

**Joplin, Mo., Oct. 24**—It is reported that one small lot of ore assaying 64.5 per cent. zinc sold at \$40 per ton, but the high price for any quantity was \$39, the assay general base being \$35@36 per ton of 60-per cent. zinc, with some slime ore selling as low as \$34 base. Silicate ore sold as high as \$25.50 on an assay base of \$18 per ton of 40-per cent. zinc. The average price, all grades, was \$32.60. As high as \$54 per ton was paid for a few bins of lead, and a considerable quantity sold at \$53@53.50, with medium grades at \$52@52.50 per ton. The average price, all grades, was \$52.52 per ton.

All effort of the purchasing agents to lower the price of zinc ore was met by concerted action on the part of Webb City producers declining to sell. This week a \$36 base was also declined by one strong company.

**SHIPMENTS, WEEK ENDED OCT. 24**

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,056,850	513,460	\$65,570
Joplin.....	2,047,720	259,580	42,276
Galena.....	544,830	86,430	11,552
Spurgeon.....	412,700	114,930	8,811
Oronogo.....	421,570	.....	7,250
Duenweg.....	284,350	93,410	7,107
Alba-Neck.....	355,020	.....	6,035
Aurora.....	855,130	.....	5,309
Miami.....	230,720	101,120	4,946
Granby.....	330,000	20,000	4,600
Prosperity.....	246,300	10,700	4,470
Sarcoxis.....	191,620	.....	2,775
Carthage.....	127,140	.....	2,288
Carl Junction.....	65,090	.....	1,170
Cave Springs.....	63,440	.....	1,078
Zincite.....	62,350	.....	1,059
Ash Grove.....	.....	37,420	973
Quapaw.....	64,480	.....	967
Totals.....	8,899,310	1,237,450	\$178,236

43 weeks.....411,041,640 63,064,180 \$8,665,646  
Zinc value, the week, \$145,736; 43 weeks, \$6,928,462  
Lead value, the week, \$3,500; 43 weeks, 1,737,184

**MONTHLY AVERAGE PRICES**

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	\$46.90	\$37.60	\$45.84	\$35.56	\$83.58	\$46.88
February.....	48.30	36.63	47.11	34.92	84.58	49.72
March.....	49.75	36.19	48.66	34.19	82.75	49.90
April.....	49.25	35.40	48.24	34.08	79.76	52.47
May.....	46.90	34.19	45.98	33.39	79.56	56.05
June.....	47.00	33.06	44.82	32.07	73.66	60.48
July.....	46.80	34.55	45.79	31.67	58.18	59.90
August.....	44.56	36.53	43.22	33.42	59.54	60.34
September.....	41.00	37.63	40.11	34.44	53.52	54.59
October.....	41.75	.....	39.83	.....	51.40	.....
November.....	38.60	.....	35.19	.....	43.40	.....
December.....	31.50	.....	30.87	.....	37.71	.....
Year.....	\$44.36	.....	\$43.68	.....	\$68.90	.....

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.

**Chemicals**

**New York, Oct. 28**—The general market is steady but business is not large. Imports are not heavy and with curtailed production supplies are not much in excess of demand.

**Copper Sulphate**—Demand moderate and market quiet. It is reported that outside makes are offered at \$4.50 per 100 lb.; but standard goods are quoted \$4.65 per 100 lb. for carload lots; \$4.90 for smaller quantities.

**Nitrate of Soda**—The market is strong. During the recent depression large sales were made at 2.12½c. and under for 1910 delivery. Quotations are 2.12½c. for spot; 2.15c. for the balance of 1908 and for 1909. The 96-per cent. grade sells 5c. per 100 lb. higher.

**Mining Stocks**

**New York, Oct. 28**—The stock markets have been rather inclined to advance this week, though they have not been especially active, and dealings have been generally of the professional kind. The public is not doing much trading, and the general impression is that the market is being held until after election, when a more active movement may be developed.



On the Curb the course of prices followed the Exchange for the most part. The copper stocks showed strength, but no very large buying demand. The Cobalt stocks were unsteady, with a fair amount of trading. Other shares were inclined to be quiet, but rather firm.

Boston

Oct. 27—The stock market has shown general strength through the week and a fair amount of activity. Nevertheless there has been a waiting element in it with some degree of uncertainty. The banks have been inclined to be cautious as to loans, and are not helping speculation.

Amalgamated Copper touched \$80.75 today, closing near that point. North Butte sold a good number of shares above \$81. Copper Range rose \$1.75 to \$78.50, losing the 50c. later. Superior & Pittsburg was active, and sold up to \$17.50, a gain of 50 cents.

Calumet & Hecla sold today at \$660; Calumet & Arizona at \$121; Centennial at \$35; while Atlantic jumped \$1.25, closing at \$19.25. The other copper stocks were firm all around.

An attempt is to be made to put life into the old National Mining Company, which has been closed down since 1893. A special meeting has been called for Nov. 24 to provide for raising money.

The Curb generally followed the lead of the Exchange, with no special feature.

The often-adjourned Osceola annual meeting has gone over to Dec. 15 next.

STOCK QUOTATIONS

Table with columns for NEW YORK and BOSTON, listing various stocks and their prices as of Oct. 27 and Oct. 28.

\*Ex. Div. †Ex. Rights.

‡Last quotation.

N. Y. INDUSTRIAL

Table listing industrial stocks in New York, including Am. Agri. Chem., Am. Smelt. & Ref., etc., with their respective prices.

ST. LOUIS Oct. 24

Table listing stock prices in St. Louis, including Adams, Am. Nettie, Center Crk, etc.

LONDON Oct. 28

Table listing stock prices in London, including Dolores, Stratton's Ind., Camp Bird, etc.

BOSTON CURB

Table listing curb stock prices in Boston, including Ahmeek, Black Mt., East Butte, etc.

NEVADA STOCKS. Oct. 28.

Furnished by Weir Bros. & Co., New York.

Table listing Nevada stocks, including COMSTOCK STOCKS, BULLFROG STOCKS, MISCELLANEOUS, and COLO. SPRINGS.

Monthly Average Prices of Metals SILVER

Table showing monthly average prices of silver in New York and London from 1907 to 1908.

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

Table showing monthly average prices of copper in New York and London from 1907 to 1908.

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 showing monthly average prices of tin in New York from 1907 to 1908.

Prices are in cents per pound.

LEAD

Table showing monthly average prices of lead in New York and London from 1907 to 1908.

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

SPELTER

Table showing monthly average prices of spelter in New York, St. Louis, and London from 1907 to 1908.

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

Assessments

Table listing company assessments, including American Fork, Birchville, Brookland, etc., with columns for Company, Delinq., Sale, and Amt.