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## Concentration Upside Down

A New Process of Ore Separation Based upon a Previously Unemployed Principle of Physics. Heavy Minerals Float, Light Ones Sink

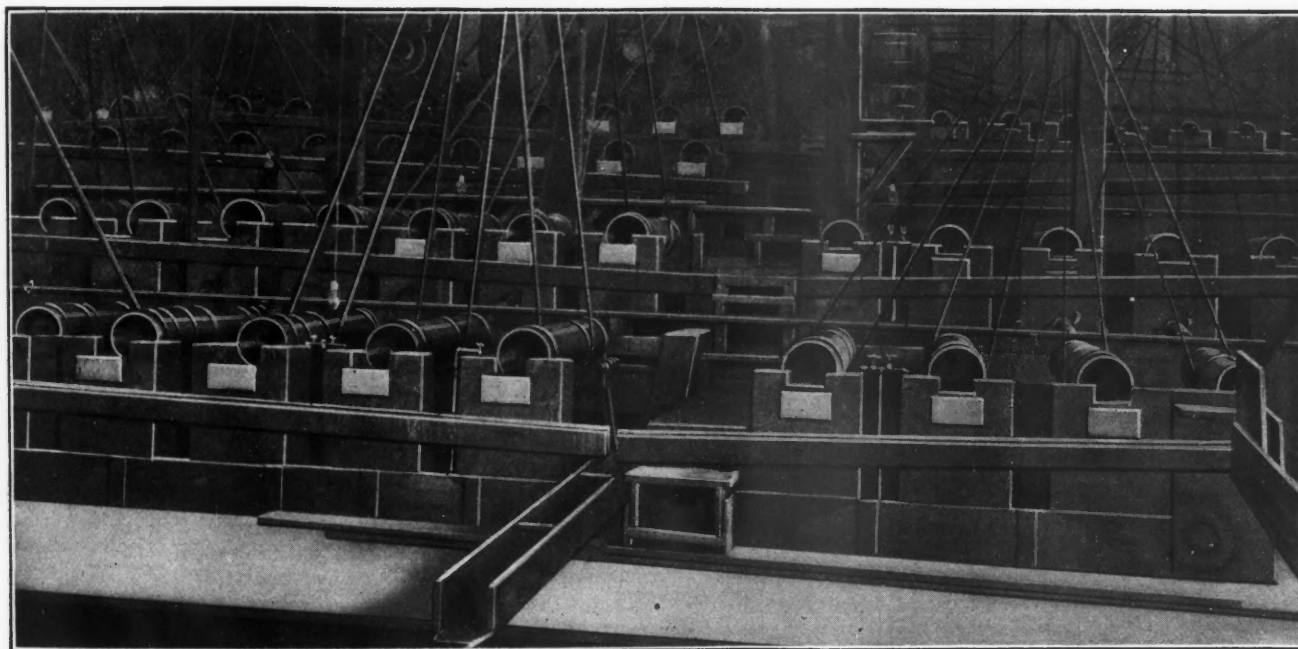
BY WALTER RENTON INGALLS

I leave it to the reader to decide, after perusal of this article, whether the title be appropriate. I venture to say that it will be guessed immediately to refer to a flotation process—a class of which we have heard a good deal during the last three or four years, that remarkable class of processes in which the concentrate is removed from the top and the tailing from the bottom, reversing the results of simple jigging and apparently negating the law of gravity. It is well known how important a factor the flotation pro-

cesses have become in the treatment of the mixed sulphide ore of Broken Hill, and how the early success of Potter and Delprat led many experimenters to direct their attention to this new field in ore dressing. It is unnecessary in this article to review the various processes that have been tried and the hypotheses (there is not yet a good theory) as to their principles. It is sufficient to remark that Potter and Delprat employ an acid bath which acts on the ore and causes certain minerals to float; Elmore treats the ore with oil, which adheres selectively to certain minerals and enables them to float with the aid of a vacuum; De Bavay

gasifies the ore and thereby induces certain minerals to float on a thin sheet of water. A. P. S. Macquisten, whose process<sup>1</sup> I shall describe in this article, employs no chemical or physical agents, subjects the ore to no preliminary treatment (save ordinary fine-crushing), but simply causes sulphide minerals to float on the surface water, in the simplest kind of an apparatus, while quartz and other gangue minerals sink to the bottom. At first sight this appears like scientific witchcraft.

Sulphide minerals are positively affected by the surface tension of the water, i.e., they do not penetrate the surface and sink through the water, but are retained on the surface, while rock constituents are affected by it negatively, i.e., they break through the surface and sink through the water." This outlines what happens although the expression is not perhaps made with scientific precision. It will be useful in this connection to have clearly in mind what "surface tension" is.



ARRANGEMENT OF TUBES, GOLCONDA, NEV.

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### SURFACE TENSION—THEORY OF THE PROCESS

It will be well at the outset to give the theory of this remarkable process in the words of the company<sup>2</sup> that is promoting it. It says in a circular: "The principle which this machine (the American Direct Concentrator) exploits is based on the different affinities exhibited by the various constituents of sulphide ores to the surface tension of water . . . ."

<sup>1</sup>U. S. patents, 865,194, Sept. 3, 1907; 865,194, Sept. 3, 1907; 865,260, Sept. 3, 1907.

<sup>2</sup>The American Direct Concentrating Company, 27 Pine Street, New York.

A body of water, or of any liquid, has greater cohesion in its free surface, i.e. the surface exposed to air, than anywhere in its interior, because whereas the particles in the interior are mutually attracted by adjacent particles in all directions, those which are at the surface have no attractions from the outside—from above, let us say—to counteract the pull from those in the interior. The effect of this is to reduce the mobility of the particles on the surface, while those in the interior are quite mobile. The surface, as it were, is stretched by an elastic skin, the effect being the same as if the surface layer exerted a pressure on the interior.

The production of this surface tension represents energy, i.e., molecular energy which may be measured; it is indicated by the so-called coefficient of surface tension. It is illustrated by blowing a soap-bubble on the end of a tube and closing the other end of the tube. The bubble remains, the elastic force of the inclosed air counterbalancing the tension of the surface of the bubble, but when the tube is opened the surface tension of the bubble causes it to contract and disappear.

The molecular force of surface tension may up to a certain point outweigh the force of gravity. Thus a drop of mercury on a plane surface may retain a globular shape, its molecular attraction being greater than that of gravity, but the addition of another drop of mercury may cause gravity to outweigh molecular attraction and the globule will flatten. Consequently, the fact that particles of a heavy mineral may be caused to float on

theory outlined above be correct it follows that even after such exposure their surfaces have not become wetted.<sup>3</sup>

#### PRACTICAL PRINCIPLES

Assuming the above theory to be correct (certainly it is sufficiently logical to serve as a working hypothesis) it is obvious that the process is concerned with a delicate balance of small forces. The particles of ore in order to be floated must be small in size in order that their weight shall not cause them to break through the surface tension of the water. They must be brought very carefully upon the surface of the water so that the gangue, or easily wetted portion, may sink and the sulphides which are not well wetted may float off. The angle at which the mineral particles are presented to the surface of the water must be just right in order to insure the maximum flotation, just as the needle carefully slid upon the

ploration Company. The remodeling of those works to adapt them to the flotation process and the installation of the latter were done by Otto Stalman, who is manager of the Glasgow & Western company and also is consulting engineer for the American Direct Concentrating Company.

#### THE ADELAIDE REDUCTION WORKS

These works were erected a number of years ago to reduce the ore of mines that had been acquired by the company in the vicinity of Golconda, chiefly at Adelaide, about 14 miles south of Golconda. The works comprise a concentrating mill and a small smeltery. The latter has two Brückner roasting furnaces and three small reverberatory smelting furnaces, rated at capacity for smelting about 30 tons of ore per day per furnace. A railway was built, connecting the works and the mine at Adelaide. The works were operated for a brief period but were



ADELAIDE REDUCTION WORKS, GOLCONDA, NEV.

the surface of water does not imply that gravity is no longer a force; simply it is being outweighed by a stronger force under the given condition. Attention may be directed to the old experiment wherein a sewing-needle, gently placed on water, does not sink, its pressure causing a depression in the water and the elastic reaction of the surface layer keeping it up in spite of its weight. The depression in the surface is supposed to be caused by an oily layer on the needle which prevents it from becoming wetted. Similarly in Mr. Macquisten's process it is believed that the flotation of the sulphide minerals is due to some superficial property which prevents them from becoming wetted, while gangue minerals do not possess this property and readily sink. It is found practically that the ability to float the sulphides is confined to those of a "greasy" character. I shall show later in this article that such sulphides can be floated after prolonged and repeated immersions in water. Of course if the

surface will float whereas it will sink if carelessly dropped upon it. The thickness of the pulp and speed of its delivery to the apparatus for flotation are important considerations. It is the merit of Mr. Macquisten's invention to conform to these, and other principles which he has studied out, in a thoroughly practical way.

Mr. Macquisten made his original experiments and developed his process through the laboratory stage at Glasgow, Scotland. Later experiments were made on a larger scale at Chicago, Ill. The process has now passed beyond the laboratory stage, having been introduced on a large working scale at the Adelaide Reduction Works at Golconda, Nev., which are owned by the Glasgow & Western Ex-

<sup>3</sup>This theory and the part that surface tension may play in what we may call, for distinction, the gas-flotation processes (Potter, Delprat, De Bavay, etc.) was discussed in articles by J. Swinburne and G. Rudorf, the JOURNAL, Feb. 10, 1906, p. 276, and A. K. Huntington, *ibid.*, Feb. 17, 1906, p. 314. These papers may well be referred to for further discussion of the principles involved in Mr. Macquisten's process.

found unable to treat successfully the Adelaide ore, and consequently were closed, since when they have been run only when some new process was to be tried.

The Adelaide ore is chalcopyrite, with a smaller proportion of pyrrhotite and pyrite, and a little blende and galena. These minerals are rather finely disseminated in a hard, dense quartzose gangue which contains spinel and garnet. The presence of the heavy gangue minerals caused concentration by ordinary jigging and tabling to be ineffective. Wilfleys, vanners and other forms of tables all failed. Then a trial was made with the Blake-Morscher electrostatic separator, which is reported to have given fairly good results, but not good enough to induce its adoption. The company is now of the opinion that its baffling problem has been solved by the process recently installed.

It is unnecessary to describe the general construction and equipment of the

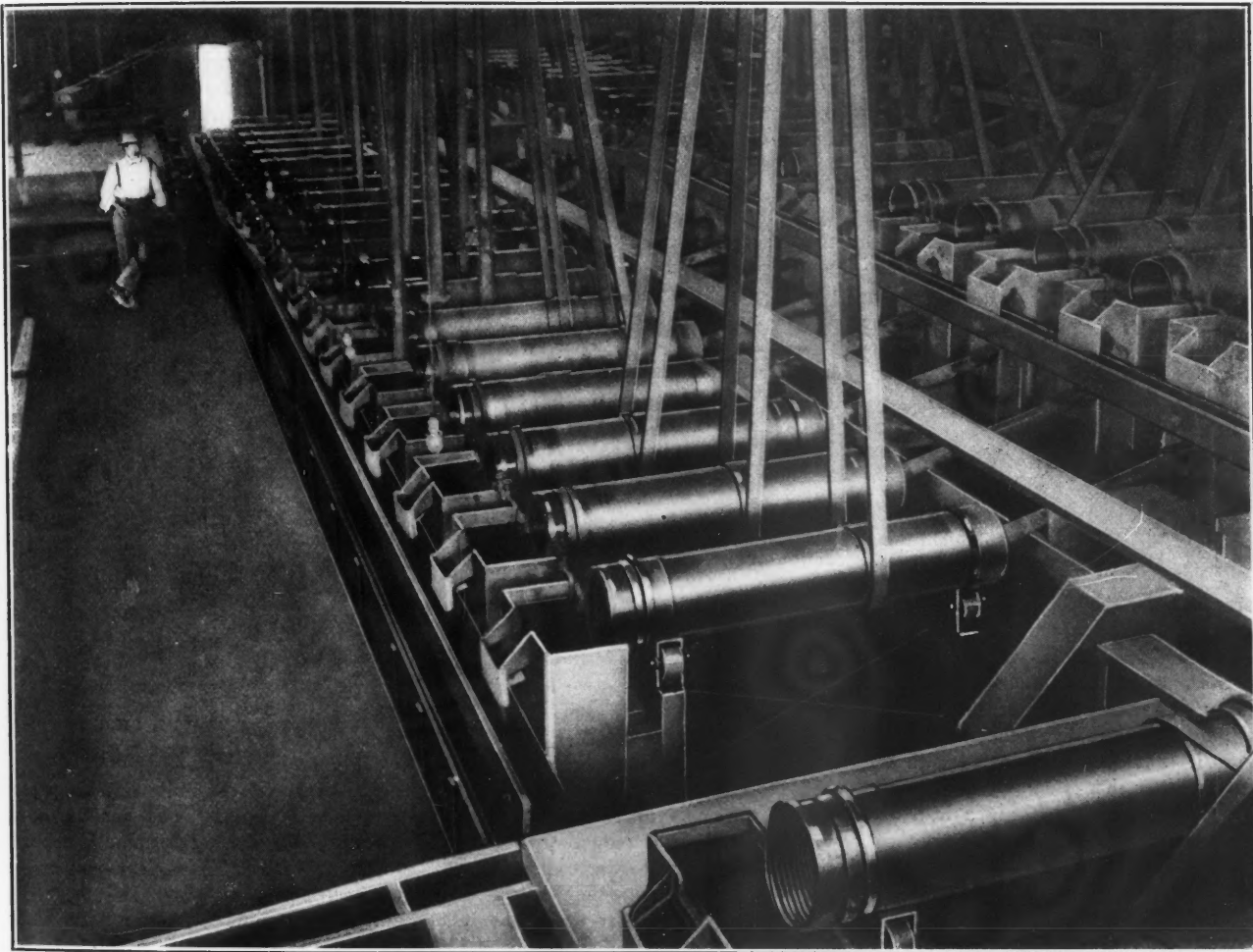


mill with any great detail, these being sufficiently shown in the accompanying photographs. The ore requires fine grinding, both to liberate the valuable mineral and to conform to the requirements of the separating process. Evenness in the crushing and reduction of the percentage of slime are as essential in connection with this process as they are in most processes of ore separation. Consequently the new process does not depart from the older ones in so far as the crushing of the ore is concerned, which may be done by any standard method, machinery, etc. The interesting

except for a hole in the center large enough to admit the pipe which feeds the pulp. Internally the tube is cast with a helical groove, the form and dimensions of which are shown in the accompanying sketches. The tubes in use at Golconda at the time of my visit had an interior helix of  $\frac{3}{4}$  in. pitch, but it was intended to substitute for them tubes of  $1\frac{1}{2}$  in. pitch, which is a later and improved form that has been found to give better results. The discharge end of the tube connects with a vessel, called the "separating-box," the joint between the latter and the tube being water-tight while the

ings flow out through a spigot at the bottom of the separating-box, passing thence to a second tube for further treatment, or to the waste dump as the case may be.

In operation the tube is rotated at 30 r. p. m. in a direction corresponding to the helix of the interior. The pulp is thus screwed through the tube and in its advance is repeatedly given an opportunity to slide upon the surface of the water where it may be retained by surface tension. Considering the pulp lying in any single corrugation, as the tube revolves the pulp is carried up to the surface of the water, some of it to a little above the



INTERIOR OF MILL, GOLCONDA, NEV.

part of the new process begins with the separating tubes.

#### THE SEPARATING TUBES

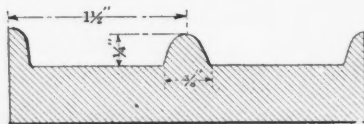
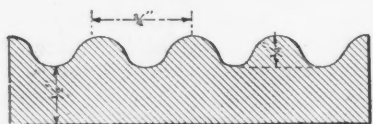
The appearance, construction and arrangement in the mill of the separating tubes are clearly shown in the accompanying engravings. The tubes are made of cast iron. They are 6 ft. in length, 1 ft. in diameter inside, and weigh about 450 lb. each. Externally they are cast with two tires which rest upon the supporting rollers. On the latter the tube rests horizontally. The discharge end of the tube is entirely open. The feed end is closed

tube is free to revolve. At the side of the separating-box directly opposite to the discharge end of the tube an opening is cut out for the overflow of the surface layer of water, carrying the floating mineral. This opening, or weir, regulates the depth of water in the tube. At Golconda the bottom of the weir is 3 in. above the bottom of the tube, inside; consequently there is 3 in. of water in the tube. The feed of pulp to the tube and the discharge of the tailings from the bottom of the separating-box are so regulated that the water passing over the weir is about  $\frac{1}{32}$  in. deep. The tail-

ings surface, and gently rolls over. The angle of emergence is such that some particles of sulphide mineral slide upon the surface of the water and once that is accomplished they appear to remain on the surface. The gangue minerals simply slide back into the water. This action is taking place in every corrugation, wherefore the minerals which are capable of being upheld by surface tension are given many chances to slide back upon the water at just the right angle. With four tubes in series some particles can be observed taking advantage of the chance to float at the very end of the fourth

tube. However, the maximum flotation occurs in the first tube and that which takes place in the fourth is comparatively insignificant and is confined chiefly to the larger and consequently more difficultly floatable particles of mineral. It is believed that with the improved tubes, two in series, each 6 ft. long, will be all that is commercially required and judging from the work at Golconda this opinion would appear to be correct.

In any given tube revolving clock-wise (looking toward the feed end) the flotation takes place chiefly at the left-hand side, where the pulp emerges from the water. The bulk of the pulp in any corrugation either slides back there into the water or floats off; however, a certain amount always adheres to the tube and is carried over to the water on the right-hand side where upon meeting the water a further flotation takes place, but naturally this is less than on the left-hand side. Consequently from the time the pulp enters the first tube there are floating sulphides streaming off from the sides of the tube, which by the time the discharge end is reached form a glistening film covering the entire surface of the water both in the tube and in the separating-box. This is quite different in ap-



LONGITUDINAL SECTIONS OF TUBES

pearance from the black frothy scum which rises to the surface in the acid flotation processes. In separating the chalcopyrite and pyrites at Golconda the surface of the water is covered with the sparkling bronze mineral, the water looking as if it had been sprinkled with the bronze powder that is employed for decorative purposes. In treating a lead ore, there comes off a film of steel-gray galena; in treating a zinc ore from Joplin, Mo., there was a film of mustard-yellow blende. It is, indeed, a weird sight to see these minerals of specific gravity four and upward go floating off so positively and so distinctively. The flotation is persistent. Once it has been effected the mineral remains on the water until the latter has overflowed into the launder which spouts it into the concentrate collecting tank, and even in the latter more or less mineral can be observed floating on the surface.

Such behavior of heavy minerals in regular mill work, not in mere laboratory jugglery, is so amazing that one cannot help thinking there is some necromancy about it. One feels like saying, "Well, you may do this thing once but you can't do it again." But we take a lot of ore and run it through a tube and collect the concentrate. Then we run the tailings

through again and obtain second tailings in which comparatively few particles of sulphide minerals are visible. Finally, we run the clean concentrate a second time and refloat the whole of it. Then we turn our attention to the hundred or more tubes of the mill which are regularly delivering their floating concentrate hour after hour, and we begin to feel respect for this mysterious surface tension.

#### THE PROCESS AT THE ADELAIDE WORKS

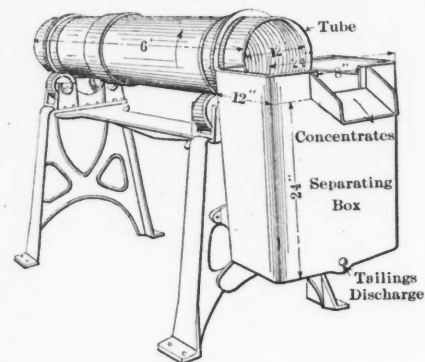
The ore coming from the mines is received in bins of 800 tons capacity. From the bins it is drawn upon a conveyor which delivers it to an elevator which in turn delivers it to a conveyor extending to the crushers and feeding the latter. There are two crushers, each 9x15 in., which reduce the ore to 1 1/2-in. size. From the crushers the ore goes to three sets of rolls, each 36x15 in., which reduce it to 1/4- to 3/8-in. size. From the rolls a 12-in. belt elevator takes the ore to a storage bin of 200 tons capacity. From the storage bins the ore is delivered by plunger feeders to four 5-ft. Huntington mills, which are provided with 10-mesh screens. The ore crushed by the Huntingtons to 10-mesh size passes

flow into a common launder which collects the concentrates from other series of tubes and delivers them into tanks, one on each side of the mill. It is to be observed that the largest proportion of the concentrates comes away from the first tubes. The second tubes deliver a smaller proportion, while the amount obtained from the third and fourth tubes is very small indeed and from the fourth tube in particular consists chiefly of large particles of mineral which because of their greater weight have escaped flotation in the previous tubes.

The water from the tailings dump and from the slime settling pond is returned to the mill by means of two rotary pumps. It is found that the efficiency of the water in the process improves with repeated use. This implies, perhaps, that its surface tension increases, but whether that be due to the cumulative effect of small quantities of soluble matter derived from the ore, or to some other reason, has not been explained.

#### TECHNICAL RESULTS AT GOLCONDA

The capacity of a single tube is five tons of ore per 24 hours; consequently



SKETCH OF APPARATUS, SHOWING DIMENSIONS

to four spitzkästen, which separate the slime, the latter going directly to the settling pond. The underflow from the spitzkästen is taken by two belt elevators to two Callow screens, each of which has 30-mesh wire cloth and a daily capacity for screening 65 tons. The over-size from the Callow screens goes to two Huntington mills provided with 40-mesh wire cloth and after reduction to that size the ore goes back to the Callow screens. The under-size from the Callows, i.e., material of 30-mesh size and under, goes to de-watering and distributing tanks, which thicken the pulp to the desired degree and then distribute it to 25 series of tubes, four tubes in each series, or 100 tubes in all.

The first tube of each series makes a floating concentrate and tailings which are drawn off from the bottom of the separating-boxes and thence pass to the second tube of the series. The latter makes again a floating concentrate and tailings which pass to the third tube which in turn makes a floating concentrate and tailings which go to the fourth tube. The fourth tube also makes a floating concentrate and tailings which go to a sand wheel which delivers them to the dump.

The concentrates from the four tubes

the capacity of the mill with its present arrangement is 125 tons per 24 hours. The ore of the Adelaide mine is reported to assay 2.7 to 3.2 per cent. copper, but at the time of my visit (July, 1907) the mill was running on dump stuff which was said to assay only 2.2 per cent. copper. Having been ground to 30-mesh size this was concentrated in the ratio of 11:1, yielding a concentrate assaying 22 per cent. copper and tailings assaying about 0.2 per cent. This indicates an extraction of a little more than 90 per cent., but refers only to the deslimed ore. The slime was being run into a settling pond and accumulated pending the determination of plans for its further treatment. This slime was believed to amount to 30 per cent. of the original ore and to be of about the same assay in copper as the latter. Consequently the actual extraction was about  $0.7 \times 0.9 = 63$  per cent., but it was considered that the percentage of slime could be reduced, and of course the percentage of extraction by



the tubes will increase directly in proportion as the percentage of slime is reduced.

The mill is run by three eight-hour shifts. Each comprises one engine-man, one fireman, one machinist, two men attending to the rolls and Huntingtons, one oiler, and one man attending to the tubes. There is also one man on a single shift who feeds the crusher, this keeping the bins full from which the Huntingtons draw during the three shifts.

No determination had been made of the amount of water used in the process. Also there had been no determination of the consumption of power. However, the latter was believed to be considerably less than in concentration in the ordinary

process wherein the concentrate is floated off on the surface of the water in the most literal sense of that expression, it will be contaminated by fine slime which does not settle quickly and floats at or just under the surface of the water. It would appear that this difficulty might be greatly ameliorated by a suitable modification of the form of the settling box, possibly increasing the length of the latter, reducing the velocity of water passing through it, or otherwise giving the fine slime an opportunity to settle a twentieth of an inch or so below the surface before reaching the weir.

However, at present the ore is deslimed before treatment. In experimental tests of small lots of ore the desliming consists in stirring the ore in a bucket

the slime of the same character and same degree of fineness that is formed in concentration in the ordinary manner; indeed that would appear to be quite certain. However, it is quite obvious that in this, as in other systems of concentration, the less the proportion of slime made in crushing, the better the process can be worked.

#### LIMITATIONS OF THE PROCESS

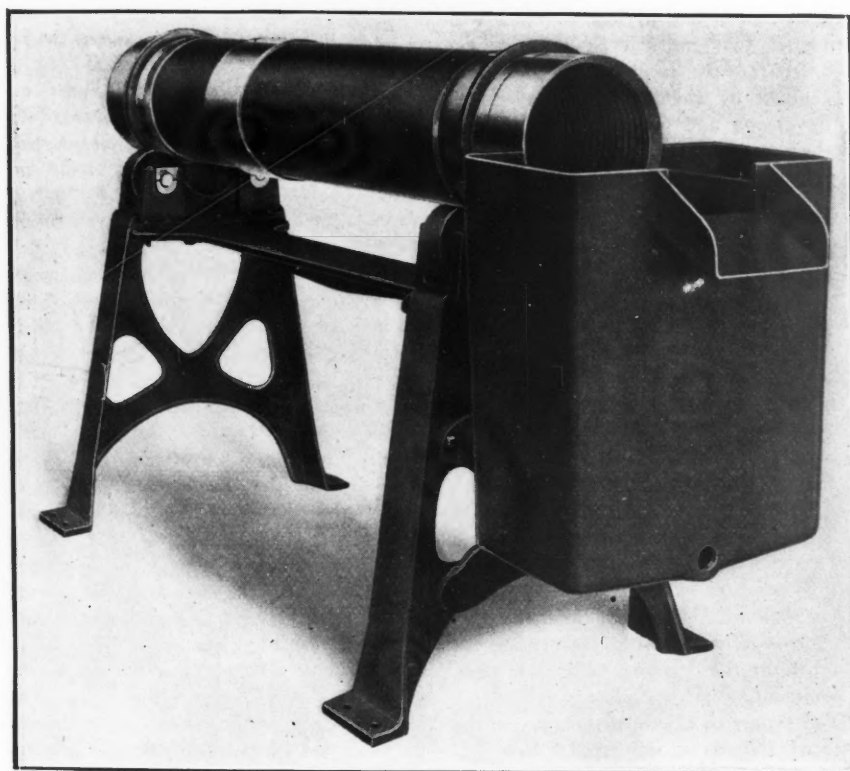
At Golconda the process is employed essentially for a two-mineral separation, i.e., pyrites from gangue. In experimental work on ore from the Atlantic Cable mine at Rico, Colo., a concentrate assaying 7.78 per cent. lead and 41.2 per cent. zinc has been obtained from crude ore containing 3.94 per cent. lead and 19.19 per cent. zinc. So far as developed at the present time, the process does not appear to be capable of effecting more than a two-mineral separation, i.e., as in the case of the acid flotation process it is capable of separating sulphides from gangue, but not sulphides from each other. Mixtures of comparatively pure blende, galena, chalcopyrite and pyrite, which had been floated separately, were found upon retreatment to float together with apparent indiscriminatio.

Mr. Macquisten thinks that it will be possible by proper adjustment of the tubes in a series to float chiefly one sulphide in one tube and another sulphide in another tube, and reports that he has done some promising experimental work in that direction, but it would appear to me that the difference in the flotability of the common sulphides is so slight that a practical separation of them in this way is hardly to be expected.

Prof. A. K. Huntington made some experiments upon the wetting of sulphide surfaces. The angle which a given liquid makes with a given solid is a constant, and is the measure of the degree to which the solid is wetted by the liquid. Of course this has an important bearing on flotation by surface tension. Professor Huntington's goniometrical measurements showed that the angle for galena was 48 deg., while for blende it ranged from 50 to 69 deg. Prof. Huntington concluded that for practical purposes, there was no material difference between the wetting of galena and blende. Incidentally he found that quartz was entirely wetted, which of course explains its different behavior toward surface tension from that of the sulphides.

#### EFFECT OF PITCH OF SCREW

It has been stated above that the tubes heretofore in use have been designed with an internal helix of  $\frac{3}{4}$  in. pitch, but that it is intended to substitute tubes of 1.5 in. pitch. The effect of this increase is obvious upon a little reflection. The all important consideration in floating the sulphides upon the surface of the water



VIEW OF SEPARATING TUBE

manner. The power plant comprises two boilers nominally rated as 80 h.p. each, and only one of these was in commission, and it was stated that since the present plant had been running only one boiler had been required, whereas two had been required when the mill was equipped with jigs and tables.

#### DRAWBACKS OF THE PROCESS

Like almost every process, this one has its drawback, and as in the case of almost all processes of ore dressing—tabling, magnetic separation, electrostatic separation and acid flotation—the drawback in this one is the treatment of the very fine material, which in the dry processes is dust and in the wet processes is slime. It is obvious that in this new pro-

cess of water, allowing it to settle a minute or two and pouring off the muddy water, which may remove 10 per cent. or so of the weight of the ore. It is somewhat doubtful, perhaps, what would be done in practice for the further treatment of that material. At Golconda the ore after having been crushed by Huntington mills is deslimed by means of spitzkästen, which take out about 30 per cent. of the ore, a surprisingly large proportion. It is considered, however, that 60 per cent. of the slime thus removed is treatable by the process with suitable modifications. Anyway, the slime problem is one that remains to be solved to make this process complete, although perhaps the slime which at present it does not treat can be handled in the same way as

is to present them to the water at precisely the right angle. Now, when a sheet of pulp lies in a series of concavities, the surface of the pulp must necessarily assume a wavy form corresponding to the concavities, or corrugations, and there will be considerable difference in the angle toward the water upon emergence from the water. By increasing the width of the corrugations, in other words the pitch of the helix, more uniformity in the surface of the ore is naturally acquired. This, of course, permits a more uniform adjustment of the ore with reference to the surface of the water and in a tube of given length increases the chances that individual particles of mineral will be floated. Moreover, the surface of ore exposed is increased in proportion as the ratio of the width of the crests of the screw to the width of the roots of the screw is decreased. Finally, the increase of the pitch gives the pulp a more rapid movement through the tube. The advantages of increase of pitch, therefore, up to a certain point are: (1) better angle; (2) more surface exposed; (3) more rapid movement. It is thought that it may be advisable under certain circumstances to go as high as 2 in. pitch.

#### ECONOMY OF THE PROCESS

The development of the process is not yet sufficient to enable conclusions to be formulated as to its cost of operation. The cost of crushing will obviously be the same as in other processes which require the ore to be reduced to 30-mesh size or smaller. As to the remainder of the treatment, there is no doubt that the requirements of power and labor are reduced as compared with jigging and tabling. The amount of labor needed in attendance is very small. One man can look after a large number of tubes. All that he has to do is to walk along the gangways between the tubes and observe that the pulp and water are flowing regularly through them. The wear and tear cannot be large, because the tubes have so few wearing parts. There are only the rollers upon which the tube rests and the packing at the joint with the separating-box exposed to wear by friction; after a certain period of life the tubes themselves will doubtless have to be replaced, but their cost is comparatively small.

Even with the arrangement of four tubes in series in steps, the floor space required is not very large. It is proposed, however, to reduce it, such as it is, by

\*This is not an exact expression from the mechanical standpoint, because the helix of the tube is not strictly a screw, but the meaning is conveyed with sufficient clearness. The form of the thread is precisely the same as if a 1/4-in. wire were wound into a helix, inserted into a tube and released to spring tightly therein, the interior being then enameled over the wire. In fact, tubes for experimental purposes have been made in just this way.

placing the two tubes of a series one above the other; as remarked above, it is expected that two tubes of improved design will do as much work and as good work as four tubes used at present.

#### FUTURE OF THE PROCESS

As in other processes of ore separation of special character, it is likely that this new process will be found to have its greatest usefulness in combination with other processes. For example, in the case of an ore consisting of galena, pyrites and gangue, it may be most advantageous to pass the crushed ore first over Wilfley tables, etc., to cut out the bulk of the galena, and then pass the tailings through the tubes to separate the pyrites from the gangue. Or it may be advisable in some cases to float a mixed concentrate of galena and pyrites, together with blende if that mineral be present, and then separate the sulphides of the mixed concentrate by washing on Wilfley tables, or by drying and passing over magnetic or electrostatic separators. Undoubtedly, modifications of such character must be made to suit the condition of each ore.

## Iron Ores in Indiana

### SPECIAL CORRESPONDENCE

Indiana is destined to become an iron-mining State, according to the forthcoming report of W. H. Blatchley, State geologist. Mr. Blatchley is very optimistic and discusses the iron-ore deposits and the iron industries of the State and predicts that Indiana is destined to take a leading position. The report tells what has been done in the past, and the various methods employed in prospecting for iron ore in the Indiana fields. It says, in commenting on the facts:

"The supply of raw materials within the State of Indiana is unlimited. New developments are being made along many lines and old interests are being revived, which were formerly held in check through lack of transportation and inexperienced management.

"To say that Indiana was at one time a chief iron-producing State might appear astounding or misleading, but if we go back to 1830-1870, we find a score of blast furnaces in operation and producing a fairly good tonnage of iron. Some of the furnaces used exclusively Indiana ores, others worked these ores mixed with foreign ores. Furnaces were located at Mishawaka and Logansport, Monroe county; in Green, Martin and Clay counties; at Harmony, Clinton, Terre Haute and other places. The last one to go out of blast was the Vigo furnace at Terre Haute."

Mr. Blatchley further says: "Although these furnaces have long since ceased operation and little remains to mark their location, indications now point to a re-

sumption on a large scale. During the last year interest has revived in the ore deposits of the State and the construction at Gary, Ind., of what will eventually be the largest system of blast furnaces and iron mills in the world, makes it an assured fact that Indiana is certainly to become one of the chief iron-producing States. The iron-ore deposits of Indiana are well worthy of consideration.

"The larger deposits, which can be more easily worked, would yield at least 15,000,000 tons of ore, and the smaller accessible deposits, which would be easily worked out by the owners if furnaces were within a reasonable distance, would bring the total up to at least 25,000,000 tons of ore. In many cases the smaller deposits contain the better grades of iron; this would compensate for the extra cost in mining.

"The methods of prospecting in the Indiana fields have been carried out in Greene and Martin counties; also extensively in the coalfields in southern Indiana and in the limestone and cement shale areas. By the use of drills and other implements and dynamite, vertical faces were cut on the outcrops extending from the surface down through the entire body of ore into the underlying formations. The length of these faces varied from 5 to 100 ft. In some cases, where formations were broken and irregular, some drift mining was done in order to determine more fully the dip and extent of the deposit. In some places in Martin county hundreds of tons of ore were removed from the face of the outcrop so that the formation desired might be obtained.

"Several thousand feet of drilling have been done with the diamond drill in the areas of Martin and Greene counties, and extensive use has been made of drills in the coalfields of adjacent counties. In Martin county a 2-in. core was removed at a cost of \$2.50 per foot. In Greene county the core was 15/16 in. in diameter and the cost per foot to the company would be somewhat less, the company owning its own drilling outfit."

Chinese coolies on the Rand are paid strictly on the basis of the results accomplished. The following wage scale is in effect at one of the largest mines: In ordinarily hard ground with wet holes, the minimum depth to be drilled per shift is 30 in.; if this depth is not attained, the coolie gets no pay, but if he reaches the depth he is paid 1c. per in. For drilling from 36 to 47 in. a bonus of 8c. is given. For a depth of from 48 to 50 in. there is a bonus of 10c., from 60 to 71 in. a bonus of 14c., and for 72 in. and over there is a reward of 18c. in addition to the standard rate of payment. Thus a coolie drilling a 6-ft. hole in a shaft—a performance which many Chinamen have accomplished—would receive 90c. for his day's labor.



# Electric Signal System for Mines

A New Method Has Been Successfully Installed in Some of the Copper Mines of the Lake Superior Copper Region

BY CARL L. C. FICHTEL\*

The old bell line, with its cumbersome lever and its wonderfully constructed gong, consisting of a falling weight striking a piece of metal or block, which has been the only means of communication between the underground workings and the hoisting plant, is being supplanted by a new device. The new system can be built to operate on any voltage from 50 to 500, and by either direct or alternating current, thus giving it a wide range, and avoids the necessity of installing any special electrical apparatus.

## UNDERGROUND INSTALLATION

Three wires are necessary for the operation of the system, and consist of two

which consists of a disk of phosphor-bronze, insulated from the handle or rod of the button, and is kept in normal position by a compression spring. This disk, together with the contacts, is incased in a cast-iron cup within the box, thus making an absolute water-tight and moisture-proof contact chamber, and eliminates the possibility of short-circuiting from that cause. The push button is further protected by having a metal cap placed over it on the face of the signal box to protect it from falling rock and water.

The signal box also contains a small lens with an incandescent lamp behind it and a small vibrating bell, which operates in multiple with the lamp.

glances at the rim of the drum for the markings which are made on the drum so that the engineer does not need to depend entirely on the indicator to locate the skip. In these semaphores are a green and red lens, each with an independent electric lamp.

The bell, or gong, is of the solenoid type and is built according to the voltage and kind of current generated at the mine in which the system is to be operated. The bell contains no contacts and operates wholly upon the solenoid principle, sucking the plunger with tremendous force against the gong immediately upon energizing the coils. Located also in the engine house is the switchboard upon which are mounted two special solenoid relays and the necessary switches for controlling the system.

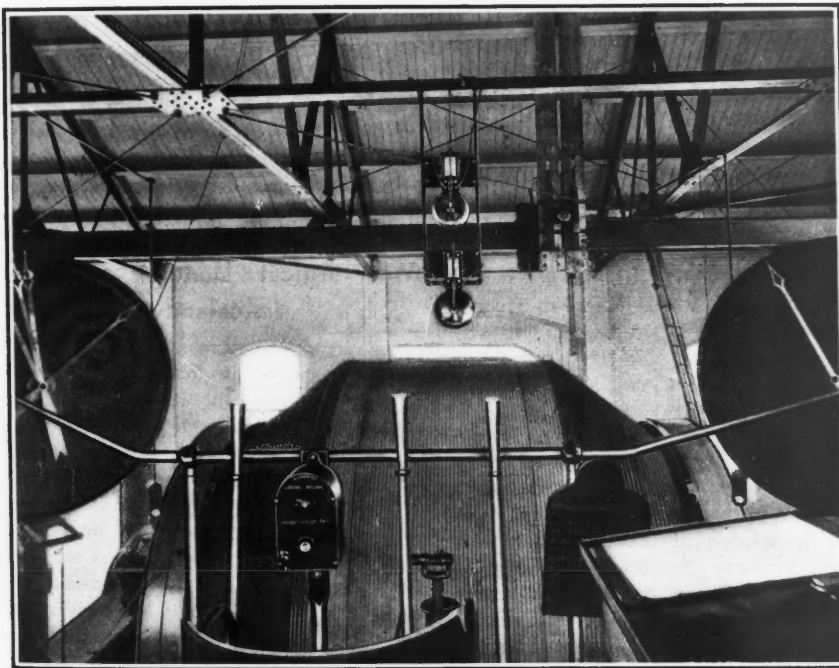
## METHOD OF OPERATION

When the system is in working order only the green lights in the semaphores are lighted, thus showing that the current is on and that the lines are in order. Pushing the push button at any of the various stations operates the relays at the engine house, which in turn sets the semaphores, extinguishes the green light and lights the red, lifts the plunger in the bell, and lights the lamp and rings the small bell contained in each signal box; this gives the operator underground positive assurance that his signal has reached the engine house and shows at all other stations that the system is in use. As all signal boxes are bridged across the lines they work simultaneously with the signal box at the engine house.

The alterations of the red and green lights in the semaphores is an ideal visible signal, and together with the striking of the gong, accentuates upon the engineer's mind the call or number of bells. It is possible for the engineer to repeat the call in case of doubt, or to call any level desired.

## CONTROL OF THE SKIP

In order to facilitate the handling of the skip at the dump or brace a separate circuit is installed connecting the above-mentioned stations with the engine house. When the skip approaches the brace the lander is notified by the vibrating bell; he then sends in what is known locally as a "half bell." This is made by closing a gravity switch, whereupon the red, or signal light, in the semaphores appears, and the plunger of the bell remains suspended while the switch is closed; this



COMPLETE EQUIPMENT IN THE ENGINE HOUSE

power lines and one signal line; these wires are incased in a  $\frac{3}{4}$ -in. iron pipe, which is first covered with a specially prepared compound which protects it from rust and abrasion. The compound has high insulating qualities, and this eliminates the possibilities of grounds on the system through any weakness in the wire insulation. Junction boxes are placed at each level and half way between each level, for convenience in locating trouble.

At the level, or signal station, is placed a signal box and semaphore; this box contains a specially constructed push button,

\*Electrical department, Calumet & Hecla mines, Calumet, Michigan.

## SURFACE EQUIPMENT

A signal box is placed at the brace or collar of the shaft and at the landers' station, or dump; at this point there is also a vibrating bell which is operated by a track-switch placed just below the brace and in such a position that a skip coming to surface strikes this switch and closes the circuit, thereby notifying the men at the breakers of the approaching skip. At the engine- or drum-house are a signal box and two semaphores and bells. The semaphores are so constructed as to be placed close to the edge, or rim of the hoisting drum and in a position to be readily seen by the engineer as he

notifies the engineer that the skip is passing a certain point and is a signal for him to get his engine under control and running slowly and to continue so until the semaphores return to normal and the plunger drops, which indicates that the skip has dumped, or is in place; this can also be accomplished from any of the underground stations and is a very good feature, as it enables the engineer to place the skip at any desired position.

This system of signaling has been in use at the Ahmeek mine for some time and has given excellent satisfaction. This mine is one of the best equipped small mines on the Lake, and has the distinction of being the first mine to use concrete stringers in skip-road construction.

At the Mohawk mine, the next-door neighbor, this system is being installed with the additional feature of a combined telephone system. In each signal box is



STATION SIGNAL BOX

placed a specially designed telephone jack in which can be inserted a plug attached to a telephone; this telephone is a unique device, consisting of a transmitter and receiver in a very compact form and can easily be carried in the pocket. The underground foreman, or whoever may have an instrument, can get the engine house, or any station and also, through an intercommunicating system, get connections with several of the surface buildings.

According to the *Practical Engineer*, the total consumption of coal in the world is considerably over 50,000 tons per hour. Of this enormous quantity about 12,500 tons is required to heat the boilers of stationary, marine and railroad engines. The production of pig iron consumes over 5000 tons per hour. The average hourly consumption of coal in households is estimated at about 10,000 tons.

## Ancient Mining in Transylvania

BY GUSTAV SLUJKA\*

Gold mining in Transylvania started soon after Christ's birth. When the Romans under Trajan in A. D. 98 conquered this country, called at that time Dacia Alpensis, the emperor at once ordered settlers there from all parts of the Roman Empire, as it was the sound policy of the Romans to bring inhabitants to a newly conquered colony. As one of their historians writes: "*Ubiunque vicit Romani habitat.*" Gold mining in Cris (Körös) valley was already flourishing in Trajan's time. The mines were operated in the same way—Pliny describes it—as is done at present in the old workings of Cebekaraes and Ruda mines. The mine settlement at Cris-Köröspatak, called Alburnus Major by the Romans, was a prosperous town with a mint wherein gold, silver and copper money had been coined. In the Ompoty valley some archaeologists say Auraria Parva was located; others say it was the site of Ampetum. Here the present Zalatna was built and the traces of the Roman town are still visible near the smelting works. Conquered races, the enslaved Dacians and Jews were employed as mine workers. When Julius Severus suppressed the dreadful crusade of Bar Cochba, in Palestine, thousands of Jews were sentenced as slaves to mine-work in Transylvania. Proofs of this are still to be found in the word Jehova in Hebrew characters engraved on the wall in several old workings. The slaves were kept in the mines, and never allowed to reach the surface.

The ruling force of Transylvania was the "Legio VII gemina" which had been transferred from Spain. The roads and turnpikes were proofs of the high technical knowledge of the Romans. Very interesting mine statutes were found in Atjustrel in 1876 engraved on a bronze plate and deciphered by Professor Floch. According to them the highest functionary of the Transylvania gold mines was the "Procuratio Caesaris." He had authority to give permission for mine working, and managed the mines. Taxes and lease payments were fixed by him and all industries connected with mining were considered government monopolies. Workers who stamped the ore and smelted the gold paid taxes according to their income. School teachers were an exception; they enjoyed an entire immunity from the "Procuratio Caesaris."

After the collapse of the great Roman Empire, the gold-mining industry decreased, or rather entirely ceased; savage wandering tribes crossing through the country destroyed all the flourishing Roman settlements and mines. This event is

\*Zalatna, Transylvania, Hungary.

plainly seen by comparing the artistic Roman coins with those made in the Middle Ages.

After this epoch the kings of Hungary, especially King Matthew Corvin, (1444-1485), imported miners from the Harz to Cris valley settlements. The resulting prosperity of the mines was remarkable and was talked of even after 200 years. During the wars of Francis Rakoczy II (1701-1711) the foreign officers of the Austrian army became shareholders of the gold mines of Transylvania, as is mentioned in the Oberbergamt's archives in Zalatna. Maria Theresa (1740-1780), the great ruler of Austria-Hungary, supported the mining industry in general and in 1770 established the first school of mines in Schemnitz, Hungary. Her son, Joseph II (1780-1790), was a friend of mining. He ordered a tunnel under the Schemnitz mines, but the hopes attached to this enterprise were not fulfilled. During his reign the telluride-gold mines of Nagy Ag were discovered by an artillery captain. The revolts of Hova-Closca, and later those of 1848-49 hurt the mining industry. At present only the Twelve Apostles company of Ruda in Cris valley, owned by a German syndicate, and the government mines of Verespatak are prospering. Nagy Ag is not a paying concern. Offen-Canya, once renowned for its telluride minerals and ores, is abandoned; the other gold mines are lifeless.

## Metallurgical Bonuses in New Zealand

Announcement is made in the *New Zealand Gazette* (July 25, 1907) that a bonus will be allowed on marketable copper produced from ores which have been mined and smelted in New Zealand. A bonus of £1100 will be paid if 1000 tons have been produced on or before June 30, 1909; if a second 1000 tons be produced between July 1, 1909, and June 30, 1910, a bonus of £500 will be given; if a third 1000 tons be produced between July 1, 1910, and June 30, 1911, another bonus of £500 will be paid. The bonus will be paid only upon presentation of a certificate from an officer appointed by the Minister of Mines, showing that the whole of the stipulated production has been made to his satisfaction. In case more than one company is instrumental in producing the required amount of copper, the bonus will be divided in proportion to the quantity produced by each applicant.

A bonus of 4d. per lb. will be paid on the production of the first 100,000 lb. of quicksilver retorted in New Zealand from ores produced in the country. At least a third of the above quantity must be produced on or before March 31, 1910, and the remaining two-thirds, on or before March 31, 1911.



### Short Electrolytic Copper Determination

BY PERSIFOR G. SPILSBURY\*

Having noted the Guess electrolytic method for copper as described in Low's recent edition of "Technical Methods of Ore Analysis,"† and feeling that experi-

Senger and myself. The tests were made in the smelter laboratory of the Cananea Consolidated Copper Company.

#### APPARATUS

The laboratory is equipped with 320 electrolytic units of the Guess-Haultain design. The terminals are of 5/16-in. cast aluminum with a cathode and two anodes in one piece, as shown in the accompanying diagram. The 3-in. poles project 2

Long service has proved that cathodes of 0.0025-in. foil weighing about three grams, containing just enough iridium to make them springy, are far more serviceable than any other. Hollow aluminum plugs may be dropped between any two terminals to short circuit the assay.

The switchboard in the smelter laboratory controls 200 assays in banks of 60, 70 and 70, as shown in the diagram. The current is taken from 250-volt direct current mains, and led through two 80-ohm rheostats in series, for each cabinet. The rheostats are of such resistance that the current may be cut down to 1.50 amp. with one assay on each cabinet and with sufficient steps to keep the current at 1.50 amp. while the cabinet is being filled. A 350-ohm coil resistance may be thrown in on No. 1 cabinet to reduce the current to 0.4 amp. for 16-hour assays.

#### PROCEDURE FOR ORES

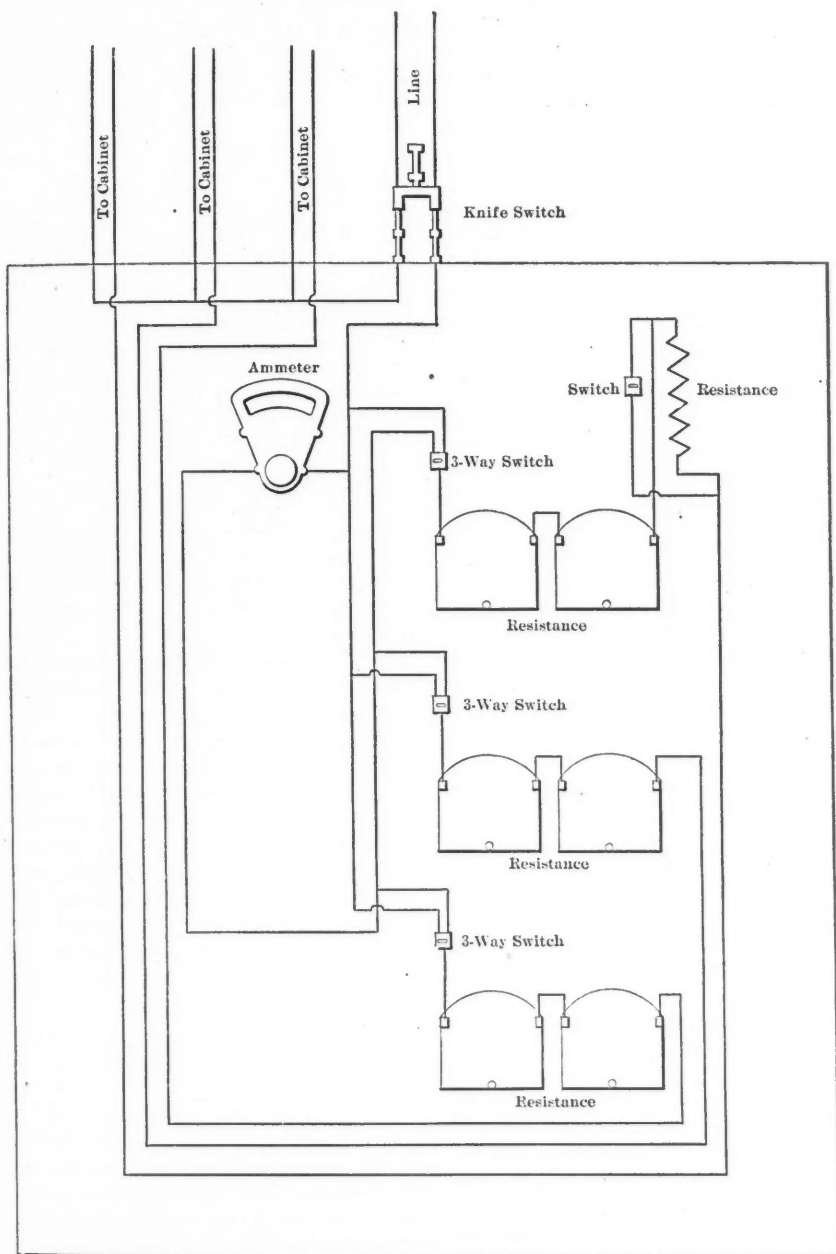
Weigh 0.5 gram ore (1 gram for low-grade ores) into a 100 c.c. tall beaker, with vertical sides; add 5 c.c. nitric acid and 1 to 1.50 c.c. sulphuric acid; boil gently to fumes; bake dry to remove any sulphur cakes; cool; add 5 c.c. nitric acid and 20 c.c. water, and boil gently five minutes. Add 1 c.c. nitro compound, fill with cool water, allow to settle, and electrolyze with 1.50 amp. for three hours.

For simple ores and concentrator products, weigh 0.5 to 2 grams, as necessary, into the 100-c.c. beaker; add 7 to 8 c.c. nitric acid; boil gently with the beaker covered until free from nitrous fumes, leaving 5 to 6 c.c. free acid. Add 1 c.c. nitro compound, fill with cool water, allow to settle and electrolyze as above.

The nitro compound is prepared by digesting 25 grams No. 4 hard oil of the Standard Oil Company, in 250 c.c. nitric acid on a warm plate for 12 hours. Dilute with cold water to 500 c.c., mix thoroughly and filter. The action of the nitro compound is to retard the sudden deposition of copper when the current is first passed through the solution, and to allow a slow, constant deposition giving a hard, clean deposit. It prevents the deposition of the small amounts of antimony contained in our ores. If the compound is too concentrated, a scum may form about the top of the electrode when the copper depositing about it will leave a dark brown streak which cannot be removed and gives too high a result. On slags and low-grade tailings the nitro compound is of little advantage.

#### THE ELECTROLYSIS

On standing five minutes all 0.5 gram charges are sufficiently settled to begin electrolysis. Two-gram charges take longer and fine slimes may not settle entirely. The latter may be filtered or the copper redeposited from the first cathode on a clean cathode for absolute results, but for ordinary work the first deposit



SWITCHBOARD FOR ELECTROLYTIC CABINET

ence has advanced its usefulness beyond a doubt for complex as well as simple ores, I present a few notes and observations made during an 18-months' practical test of the Guess three-hour electrolytic method for copper as modified by R. W.

in. through a board and below each set is a slide to support the beaker. Each unit has two vertically corrugated anodes of 0.001-in. platinum foil 0.5 cm. wide by 12.5 cm. long, and one corrugated cathode with a blade 6.25 cm. long by 4 cm. wide, the handle of which is of the same piece, 0.7 cm. wide and 6.25 cm. long. These electrodes are fitted into slots cut in the terminals and held by contact pressure.

\*Assayer, Cananea Consolidated Copper Company, Cananea, Sonora, Mexico.  
 †The original article appeared in *Trans. A. I. M. E.*, Vol. 36, p. 605.

is sufficiently accurate, the increase being but a few hundredths of one per cent.

Before starting electrolysis the anodes must be set firmly in the slots and at equal distances from the cathodes; otherwise, the deposition will be uneven and violent evolution of gas at the cathode will occur, giving a dark deposit. On starting electrolysis, evolution of gas at the cathode is common and occurs less frequently during and at the end of the operation. This may be stopped by an instantaneous short circuit of the assay.

It has been proved that in the three hours with a 5 to 6 per cent. acid solution, the deposition of 0.025 gram copper is absolutely certain and that 0.050 gram can be deposited leaving but a faint trace of copper in solution. This gives the limit of a 10 per cent. Cu. on 0.5 gram ore. Beyond this point it is advisable to

covered, in boiling dilute caustic soda. With this treatment, the weight changes 0.0001 to 0.0002 gram in 10 days.

This method under the conditions described is entirely satisfactory and removes as much as possible the personal equation so vital to all methods. One man can handle 200 assays in a day and have sufficient time to do other work about the laboratory.

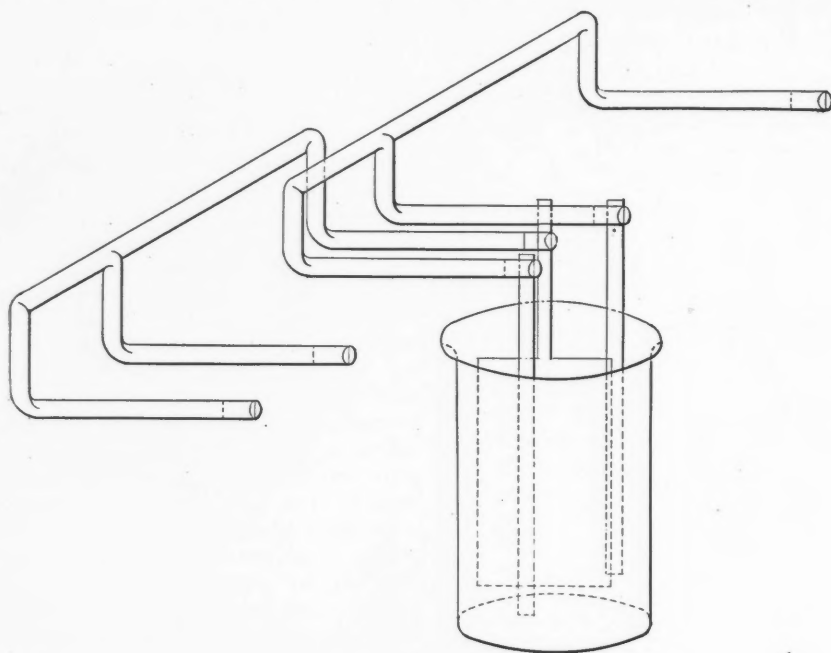
### The Divining Rod

In a recent press bulletin the U. S. Geological Survey takes up the old but ever interesting subject of the divining rod. It says:

Numerous devices are used throughout this country for detecting the presence of underground water—devices ranging in complexity from the forked

of which were communicated through the arms and wrists to the rod. No movement of the rod from causes outside the body could be detected, and it soon became obvious that the view held by other men of science is correct—that the operation of the "divining rod" is generally due to unconscious movements of the body or of the muscles of the hand. The experiments made show that these movements happen most frequently at places where the operator's experience has led him to believe that water may be found. The uselessness of the divining rod is indicated by the facts that the rod may be worked at will by the operator, that he fails to detect strong currents of water running in tunnels and other channels that afford no surface indications of water, and that his locations in limestone regions where water flows in well-defined channels are rarely more successful than those dependent on mere guesses. In fact its operators are successful only in regions in which ground water occurs in a definite sheet in porous material or in more or less clayey deposits, such as the pebbly clay or till in which, although a few failures occur, wells would get water anywhere.

Ground water occurs under certain definite conditions, and as in humid regions a stream may be predicted wherever a valley is known, so one familiar with rocks and ground-water conditions may predict places where ground water can be found. No appliance, either electrical or mechanical, has yet been successfully used for detecting water in places where plain common sense or mere guessing would not have shown its presence just as well. The only advantage of employing a "water-witch," as the operator of the divining rod is sometimes called, is that skilled services are obtained, most men so employed being keener and better observers of the occurrence and movements of ground water than the average person.



ARRANGEMENT OF ALUMINUM TERMINALS

allow the assay to remain one-half to one hour longer according to the copper contents, adding 1 c.c. nitric acid and 0.5 c.c. nitro compound if it is found that the deposit turns dark or the solution becomes too greatly heated. The discrepancy from the theoretical is due to the fact that the theoretical deposition is from a saturated solution and such conditions never occur in practice.

#### CARE OF ELECTRODES

At the end of electrolysis, the cathodes are removed either by lifting out of the beaker or by lowering the beaker, washed thoroughly, dipped in alcohol, dried and placed on velvet trays. The deposits are hard and firm, eliminating any danger of removal of copper by handling. The electrodes are cleaned by dipping in warm nitric acid, washing thoroughly and allowing to stand, handles

branch of witch hazel, peach, or other wood, to more or less elaborate mechanical or electrical contrivances. Many of the operators of these devices, especially those that use the home-cut forked branch, are perfectly honest in the belief that the working of the rod is influenced by agencies—usually regarded as electric currents following underground streams of water—that are entirely independent of their own bodies, and many uneducated people have implicit faith in their ability to locate underground water in this way.

In experiments with a rod of this type, one of the geologists of the Geological Survey found that at points it turned downward independently of his will, but more complete tests showed that the downturning resulted from slight and—until watched for—unconscious changes in the inclination of his body, the effects

### Mining in Turkey

According to a recent report by the British consul at Trebizond, more than 160 petitions have been presented to the authorities for prospecting licenses in the Vilayet of Trebizond, Turkey, during the last six months, most of the mines being situated between Kerassund and the Russian frontier. The whole of this country, to a distance of 10 or 12 hours inland from the shores of the Black sea, appears to be rich in minerals. The ores of manganese, copper, silver, lead and zinc, and iron are abundant and within such easy reach that villagers extract and smelt them. Copper exists in this district within comparatively easy access of the sea, and labor and material are cheap.



## Iron Ore in Crow Wing County, Minn.

BY DWIGHT E. WOODBRIDGE\*

After three or four years of exploration around Deerwood and in other parts of northern Crow Wing county, Minnesota, it becomes evident that ore of merchantable grade is to be found there. Until recently work in that district has not disclosed ore of high grade, and the excess of moisture and phosphorus and the lean character of the ore itself, have given the district a bad name.

For the past four months the firm of Rogers, Brown & Co., has been exploring on a tract in Section 29, T 47 R 28, on the south shore of Rabbit lake, and the result of drilling operations there has been remarkable. Hole No. 111, on lot 6, cut ore at 83 ft. from the surface. From there to 135 ft. the proportion of iron, as shown by the assays from samples of drill cuttings, averages about 63 per cent. and some 5-ft. sections yield from 65.62 to 66.04 per cent., the samples averaging about 0.110 per cent. phosphorus. From 135 to 220 ft. this hole will average a little better than 40 per cent. iron. A typical assay of the upper 52 ft. of the ore in this hole will be as follows: iron 63.22 per cent.; phosphorus, 0.134; manganese 0.18; silica 3.40; alumina 1 per cent. The hole stopped in ore of the lower grade; assays for the last 5 ft. were: iron, 38.85; silica, 36.94 per cent.

Hole No. 117, on the same tract, showed ore from 102 to 286 ft. a depth of 184 ft., averaging more than 60 per cent. iron and about 0.090 phosphorus. There was one assay in this hole below 50 per cent. iron. Hole No. 106 showed 210 ft. of ore averaging 58 per cent. iron and running in phosphorus about as No. 117. No. 120 showed a leaner ore, but for the depth of 70 ft., not including a seam of lean taconite between 180 and 215 ft., it showed an average of about 50 per cent., the silica being correspondingly higher and the phosphorus about the same as in other holes.

All these holes are vertical, and the general character of the formation is also nearly vertical, so that it may be that seams of rich ore have been penetrated by the drillholes. As, however, the holes are not in a line, but cross the property in two directions, this is scarcely probable, and it is reasonably safe to assume that a very considerable body of merchantable ore has been discovered. How much better this is than much of the ore found of late can be gaged from the fact that washing of 40 per cent. ore is now going on in the Grand Rapids district of the Mesabi range. These Rabbit lake ores do not seem to be washable, and if low grade must either be mixed or left.

\*Mining engineer, Duluth, Minnesota.

### PLAN FOR SHIPPING THE ORE

So satisfied are Rogers, Brown & Co. with the result of the explorations, that they are willing to guarantee a railway freight of upward of 250,000 tons per annum from this property, for an indefinite number of years, and are now endeavoring to make arrangements with either the Northern Pacific or the "Soo" roads to build to the property, assuring the roads that they can begin mining at this rate in 1908. The better ore found is, for the most part, hematite, of good structure and not especially wet. Eight drills are now working on this tract and more than 50 holes have been put down by the various parties who have explored there, beginning with the Orelands company, of Duluth, which first took up the matter of the development of this district, four years ago.

Rogers, Brown & Co. have two options, one for a lease at 25c. a ton royalty, with minimums of 25,000 tons the first year, 50,000 tons the second and 100,000 tons for subsequent years, the lease to be taken out in about 20 months from this time; or, second, for the purchase of the land outright for \$250,000, at any time within the same period. The main line of the Northern Pacific road now passes within about two and a half miles southeast of the property, and the main line of the "Soo" road, building from the west to Duluth, will cross in the vicinity. The Northern Pacific has made no rates for ore hauling but has intimated that it would ask 80c. a ton; as the distance is but 75 miles to Duluth the general opinion is that a lower rate will be made, possibly about 60c. Neither the Northern Pacific nor the "Soo" has ore-shipping docks at the head of the lake.

### OTHER DISCOVERIES

In Sections 30 and 31, adjacent to Section 29, and lying close to Rabbit lake, the Federal Mining Company and Messrs. Crosby and Harrison, all of Duluth, have much the same indications as those found in the lands of Rogers, Brown & Co., and so far as their work has gone have promise of finding good ore. In Section 1 of the township immediately south, or about a mile and a half from Rabbit lake, is the most remarkable find of deep ore that has ever been made in the Minnesota region, possibly in the United States. A. M. Chisholm and others have there drilled eight holes, one row north and south of five and another 1200 ft. east of three holes. These eight show ore as follows: No. 1, ore 83 to 153 ft.; No. 2, ore 82 to 735 ft.; No. 3, ore 90 to 120 ft.; No. 4, ore 83 to 324 ft.; No. 5, ore 93 to 898 ft.; No. 6, ore 85 to 710 ft.; No. 7, ore 110 to 350 ft.; No. 8, ore 90 to 198 ft. All but Nos. 1 and 2 were bottomed in ore, and No. 5, it will be noticed, shows 805 ft. of ore.

All of this great body of ore is rather low grade, averaging 40 to 45 per cent. and high in phosphorus. No consumer

has yet shown any interest in it. It is possible that further exploration may find some concentration of ore high enough to be merchantable or it may be that a 40 per cent. ore will be valuable in due time. This will depend largely on the character of the ore aside from its iron content and the cost of getting it to market, and on the possibility of concentration by cheap washing, such as the Oliver Iron Mining Company now employs at Canisteo. If washable this orebody is at once available.

The first discovery of ore in the district was made in the summer of 1904 by Cuyler Adams and associates along a line of magnetic attraction found by him in the vicinity of Deerwood.

### GEOLOGY AND FORMATIONS

The country is nearly flat, heavily covered with glacial drift, and has numerous glacial lakes. It was once wooded, but the timber has been taken off. There are practically no rock outcrops and the conspicuous topographic ranges notable in Lake Superior iron districts are absent. The rock succession, from the base upward, is as follows, according to C. K. Leith, whose report on the geology of the district is the only one so far written: Quartzites and schists; iron formation, consisting chiefly of iron carbonate where unaltered but where altered of amphibole-magnetic rock; ferruginous slates and iron ore, chiefly hematites; cloritic and carbonaceous slates, interbedded with the top of the iron formation; intrusive diorite and granite; cretaceous sediments; glacial drift from 80 to 350 ft.

The sedimentary series has been folded into a succession of repeated folds, and erosion has cut off the top of the anticlines, exposing the iron formation in a number of belts, generally parallel, but presumably connecting. The dips are very steep, making the remark that "it is impossible to tell anything of a vertical ore deposit by vertical holes," rather near the facts. These dips will run up to 80 deg. Work so far done shows the hanging walls to be cloritic slate and iron carbonate altered insufficiently, and the footwalls are quartz or magnetite schist.

Lines of magnetic attraction and drilling show a number of lenses of the ore formation, generally parallel. Several of these follow a general course parallel to and near the line of the Northern Pacific railroad. The Rabbit lake deposits are probably the same formation folded and brought to the surface. Other lines of magnetic attraction appear in the same general neighborhood. The district is, unlike the Mesabi and others on Lake Superior, one where glacial deposition has been more of a factor than glacial erosion. There is no doubt that vast quantities of ore have been removed from the Mesabi by the action of glaciers, which have deposited much of their drift over the Cuyuna region. The great depth of

ore concentration in the operations in Section I seems to indicate that the ores were developed before the formation of a topography at all similar to the present, and during a period of far greater possibilities for the circulation of underground ore concentrating waters than would now be considered likely. Such a change in topography must have been, of course, long before any glacial smoothing of the surface.

#### OPERATIONS IN NEIGHBORING DISTRICTS

About 75 miles west of Rabbit lake, in Otter Tail county, Minn., a large amount of land is being bought for Longyear & Bennett, as the result of magnetic surveys that have been made during the past year or two. They are buying lands outright, paying from \$25 to \$50 per acre, and will soon begin extensive explorations. The district favored by this firm begins near the village of New York Mills, on a branch of the Northern Pacific, and extends west in the arc of a circle having Perham as its center, and with a radius of about 12 miles, ending, so far, near the north line of the county in T 137 R 40. It is an undulating and rolling country of morainic till, without rock outcrops and dotted with lakes of glacial origin. The elevation is about 1400 ft. above sea level. Still another line of magnetic attraction has been worked out in the southern part of the White Earth Indian reservation, in Hubbard county, Minn., and lands will be sought for there when they can be secured.

It is impossible to tell how far this interest in lines of magnetic attraction may carry the iron prospector in northern Minnesota, nor how many more "new fields" they will lead him into. At many points between Rabbit lake and the westerly extension of the Mesabi range several such lines can be worked out, but it is hardly necessary to say that every line of attraction does not mean a new ore formation and a mining district. The study is becoming especially interesting and is absorbing the attention of a number of wide-awake men just now. It is worthy of note that this entire district is a region of morainic till and glacial drift deposition, and some of it along the borders of ancient "Lake Agassiz."

Although the mining code and the constitution of Nicaragua guarantee to the miner free importation of many articles, a correspondent of the *Min. Journ.* (Sept. 21, 1907) says that monopolies have such a strong grip on the country that virtually a very high duty is exacted on dynamite, powder, fuses, caps, caustic solution and cyanide. It is said that after protest, the duty may be taken off, but most miners prefer to pay rather than have their goods delayed for months in the customs house.

## Use of Dead Timber

The general belief that dead timber is unsuitable for use in any construction requiring strength, is said to be unfounded. This subject has recently been reported upon by Gifford Pinchot, chief of the U. S. Forest Service. Of the several classes of dead timber it appears that fire-killed timber is the only variety of any considerable importance. It is estimated that there are approximately 13,000,000 acres of this timber, having approximately 500,000,000 ft. board measure.

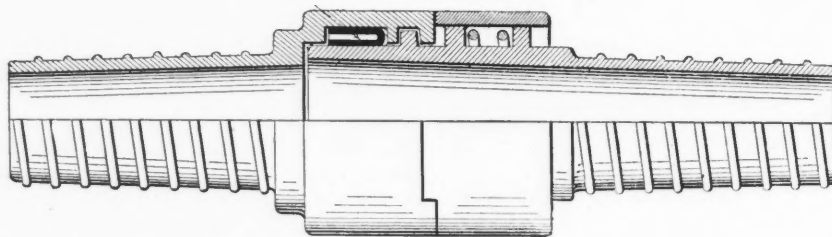
The principal defect of fire-killed timber is check, which appears soon after the death of the tree, but apparently does not greatly increase later. However, timber above 9000 ft. elevation is not affected for many years. Cases are known where such timber has been used after more than 50 years have passed since burning. Very large quantities of fire-killed timber of 20 or 30 years' age is entirely free from decay. It is necessary, however, to remove the bark from the tree soon after it is killed in order to prevent surface decay.

Tests to determine the actual strength

wood, so there is no watery sap to act as a mechanical barrier to the entrance of the preservative. It is for the reason just mentioned that artificial seasoning of green timber is so expensive and is so liable to reduce its strength; therefore sound dead timber is really more valuable for preservative purposes than green timber is. It also happens that most dead timber in the West has an open, porous structure and it can be treated by a simple and inexpensive process without the use of the complicated preserving apparatus required by other kinds of wood.

## A New Air-hose Coupling

A new form of air-hose coupling has recently appeared which is of interest because of two novel features. The first is that the air pressure within the pipe is used to make the coupling automatically and the greater the pressure the tighter is the joint. The second feature is that the joint is smooth externally, having no angles, corners or lugs, but is uniform in size with the rest of the pipe and hence the hose equipped with this device can be



AUTOMATIC AIR-HOSE COUPLING

of the fire-killed timber in comparison with green and seasoned timber show the following facts: Sound fire-killed timber is almost as strong as seasoned timber and much stronger than green timber before seasoning. Figures obtained by test upon fire-killed timber 12 years of age, and of green timber of the same species and from the same locality, show that the fire-killed timber is about nine-tenths as strong as the green timber which has been seasoned and about twice as strong as green timber freshly cut.

The principal defect of dead timber is check and this may largely be minimized by using the timber in round form for mine and coal props, telephone poles, fence posts and the like. This variety of timber is especially suitable in mines because it is perfectly seasoned and is light. It is estimated that the mines of Leadville, Colo., use each month some 350,000 ft., board measure, of dead timber. There are also many other large mining camps that use it in wholesale quantities and in these camps it is decidedly preferred to green timber. Another decided advantage which dead timber has is that it is in excellent condition for preservative treatment, as the moisture has evaporated from the

dragged over muck piles and other obstructions without catching.

The coupling consists of a U-shaped gasket placed inside the female half of the coupling in such a way that when under air pressure, the lips of the gasket press out, one against the male and the other against the female end and a tight joint is formed. The gaskets are made of a rubber compound especially adapted to withstand the action of oil. This coupling is made by the Cleveland Pneumatic Tool Company, Cleveland, Ohio, and is called the Bowes' coupling.

Consul F. M. Ryder, of San Juan del Norte, Nicaragua, reports that a joint stock corporation, composed of President Zelaya, Angel Caligaris, E. Palazzo & Co. and Julio Wiest, has been formed for taking over the Nicaraguan salt concession, which was granted to Julio Wiest in May, 1905. The company is styled *Compañia Salinera de Nicaragua (Limitada)*, and is capitalized at \$700,000. The government grant is for a term of 30 years, dating from Feb. 14, 1906, and gives the exclusive franchise to manufacture, sell and export table salt in that Republic.



# Care of the Plant in Sinking by Refrigeration

Causes of Interruptions in the Operation of the System and Methods for Preventing and Correcting Them

BY SYDNEY F. WALKER\*

The freezing plant may be said to consist of two distinct portions: the compression plant, or the absorption plant, as the case may be, including the compressor, condenser, evaporating coils, and the brine circulating plant, consisting of the brine tank, the brine pipes and the brine pump. The two portions of the plant meet, of course, in the brine tank.

## LOCAL INTERRUPTION

Taking first the brine circulating system, the ice wall in the shaft may be caused to fail in any one part, and the water then leak through, if the brine ceases to circulate through one of the pipes, for any time. One of the reasons for making the ice wall as thick as possible, is to allow for an accidental stoppage of the brine circulation in one or more of the tubes. If this occurs and there is a good thickness of ice wall, there should be time to repair the damage, and the plant can then be worked a little harder until the wall has been built up again. If the wall is thin, the attrition, etc., will very quickly make a hole in it, and the results may be serious. The arrangement of the concentric vertical pipes rather lends itself to an occasional stoppage of the circulation, owing to the possibility of the inner pipe coming in contact with the outer pipe at some portion of its length, and the difficulty of providing any arrangement in a long length of pipes for preventing this, in face of the expansions and contractions that are going on in the neighborhood. It will be remembered that while the ice wall is expanding, the pipes conveying the brine solution are contracting. If the inner pipe touches the outer at any portion of its length, the result will be that the cooling effect will be partially cut off from that portion of the pipe below.

## WARNING INDICATIONS

In my opinion, the best protection against accidents of this kind is to have constant warning, constant guides, of what is going on in the pipes themselves. This is to be obtained by fixing thermometers on the inner and outer pipes at the top of each inner and outer pipe. Valves also should be arranged, so that any set of pipes may be completely cut off from the rings while repairs are being made. The brine issuing from the outer pipe at the top will be at a higher temperature, about 3 to 4 deg. F. than the

brine entering the inner pipe, and if there is a thermometer fixed in each pipe, as explained, and readings constantly taken, early warning should be given that something is going wrong.

There is a rough and ready method of knowing whether each pair of pipes is doing its work, and that is by observing the frost upon each. As is well known, the atmosphere always contains a certain quantity of moisture, and its ability to carry moisture varies with the temperature, the quantity it can carry falling quickly at a certain portion of the temperature scale. The result of this is that whenever a metal surface, say, is cooled, as in the case of the brine circulating pipes, the atmosphere in its immediate neighborhood is also cooled, and deposits upon the cold surface a portion of the moisture it carried as vapor, the condensed vapor so deposited immediately freezing, and the result being, in the case of the very low temperatures employed in the freezing process, that a somewhat thick wall of ice is built around the rings, the connections to the pipes, the valves, etc.

At one of the collieries where the freezing process was carried out, they used to go every morning and knock the ice off each set of tubes, and observe if it quickly formed again. This is a very fair rough-and-ready guide, but thermometers are much better guides, and give much earlier indications. At certain times of the year the rough-and-ready guide might fail altogether.

## ARRANGEMENT OF THERMOMETERS

There is a difficulty here, however, in the matter of fixing the thermometers, and to overcome the difficulty several firms have worked out apparatus by means of which thermometers can be inserted in the tubes, and maintained *in situ*, notwithstanding the presence of the ice, and can be examined as frequently as may be desired. In one arrangement a socket is screwed into the pipe, so as to stand well above the ice surrounding the pipe, and the thermometer is screwed into the top of the socket, itself being insulated from the socket, so that it can be handled if necessary. The socket is fitted with a screwed cover, which should be kept in place when the thermometer is not present.

Thermometers at the egress from the brine tank and at the return, will also give indications in case there is a serious stoppage in the brine circulation, but it will

give no indication of a stoppage in an individual pair of tubes, because the difference in temperature between the outgoing and returning brine is too small to show an appreciable difference from one tube not doing its work.

## CONDITION OF THE BRINE

Stoppages occur in all brine circulating pipes occasionally, from the deposit of some of the salt employed. The brine should not be of more than a certain density, depending upon the temperature to which it is to be reduced. If the density is higher than this it has a tendency to deposit. The saturation limits of the salts usually employed for brine, drop slightly with the temperature. With chloride of calcium, the saturation limit at 32 deg. F. is 5 lb. per gal., while at 14 deg. it has fallen to 4.2 lb., and at 4 deg. it is only 3.6 lb.

With magnesium chloride, which was employed in the sinkings at the Durham collieries, the difference is not so great, and that will probably be one of the reasons why it was employed by the German engineers who carried out the contract. At 32 deg. its saturation limit is 5.6 lb. per gallon, at 14 deg. it is 5.4 lb., and at 4 deg. it is 5.3 lb.

In addition there is the possibility of oxide of iron being formed, and I understand that stoppages have occurred from this cause. The stoppage would occur mainly, of course, by filling up the space between the open end of the inner tube and the closed end of the outer tube. As the stoppage should be a gradual process, warning should be given by the thermometers, as explained. In addition, it would certainly be wise to have pressure gages, arranged to show a pretty wide difference on the scales, on the outflow and return pipes from the brine tanks. Any variation in the difference of pressure, showing a difference in the quantity of brine flowing, should be made the cause of investigation.

## FAULTS IN THE COMPRESSION SYSTEM

There are four serious faults that are met with in refrigeration compression plants. Three of them may be grouped together as being part and parcel of the same thing: shortage of the refrigerant. A certain quantity of refrigerant is required for a given plant; if more than the quantity is present, it leads to certain troubles, but the cases where there is a surplus of the refrigerant are rare. Cases have been known where managers of re-

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refrigerating plants have loaded the system up with double the quantity of the refrigerant it required, and it has led to queer results, but as a rule it is difficult to overload a plant in this way, under ordinary conditions.

On the other hand, it is very easy indeed for the plant to become short of refrigerant, and therefore manufacturers always advise that any danger of overloading with refrigerant shall be taken rather than risk the possibility of shortage. When shortage arises, even to a comparatively small extent, it enormously reduces the efficiency of the plant, and with it the work in transporting the heat from the ice wall is also considerably reduced.

The cooling action in the evaporator coils is due entirely to the conversion of the ammonia, or carbonic acid from the liquid to the gaseous conditions. When the system is short of the refrigerant, in place of liquid passing over to the evaporator coils in the proportion required, a certain quantity of gas passes over with the liquid, and as the gas has practically no refrigerating effect, as 0.4 to 555 in the case of ammonia, it is easily seen that the work done is enormously reduced by the presence of gas, where it is not wanted. In addition to the gas taking the place of the liquid, while not being able to do the work of the liquid, it partially prevents the liquid's performing the work it would do in the ordinary way, owing to the pressure it creates by its presence in the expansion coils.

#### PRELIMINARY TESTS

Shortage will arise from three causes: leakage from joints, the presence of air or occasionally of hydrogen gas in the system, and the presence of oil in the system. It is the rule, when the plant is first fitted up, to test it with an air pressure of about 200 lb. per sq.in. The plant is fixed in position, all connections made, and then a joint is broken at the suction valve, or some other convenient spot, air is pumped into the system, the joint closed, and the air compressed, the whole system being held under pressure for some hours, while the joints are carefully examined.

For carbonic acid, soap and water placed over the joints, or anywhere that a leakage is suspected, will give rise to bubbles, if any gas is escaping. For ammonia the same method may be employed, or a piece of sulphur may be burned, the ammonia if present, forming dense fumes.

After the test, the air is pumped out of the system, through a valve provided for it at the top of the condenser, and when the pressure has been reduced to a certain figure, the refrigerant is introduced on the low-pressure side, usually between the expansion coils and the compressor, and is gradually pumped into the system, the air being gradually forced out. With carbonic acid it is usual to go on pumping

the refrigerant in, and to waste a certain quantity of it by driving it through the escape valve mentioned, to insure that the whole of the air has been expelled.

With ammonia the air is pumped out through the valve, as before, and a simple test for ammonia is made and immediately it begins to appear, the valve is closed. If air enters the system, it reduces its efficiency by taking the place of a certain portion of the refrigerant, and by getting into pockets and places in the system where, being under compression, it interferes with the proper circulation.

#### PRECAUTIONS TO BE OBSERVED

On no account should a vacuum be pumped; nor should the system be allowed to remain under vacuum. In such a case, if any weak points exist, air will enter, and the troubles mentioned will arise. Hydrogen gas is sometimes present in the ammonia system owing to the decomposition of the ammonia itself, if the compressor is allowed to get hot, as explained below. Hydrogen gas acts very much as air does, inasmuch as neither can be liquified under the pressures employed. It should be understood that the process of condensation of gases is twofold.

Oil in the system is frequently a source of trouble, but it is merely a question of care in the construction of the apparatus, in adjusting it, and in looking after it to avoid the troubles. As with every kind of moving machinery, the compressor piston requires lubricating, and also the bearings. The bearings, are made long, and the lubricant is held in them under pressure. A small quantity of the lubricant almost invariably finds its way from the bearings into the compression cylinder, in addition to that employed for lubricating the piston. A separator is always connected to the delivery from the compressor, and it should remove the whole of the oil used for lubricating the piston, and that which comes from the bearings, which comes through the delivery valve with the compressed gas. The oil is removed from the separator from time to time, filtered and used again. If, however, the separator does not work properly, or if from any cause oil passes into the condenser coils, with the gas, it begins to cause trouble. It may deposit upon the inside of the condenser pipes, it may pass on and deposit on the inside of the pipes of the evaporating coils, and it may also combine with the ammonia, where that is used, to form a substance which deposits in various places, reducing the space for the gas, and lowering the efficiency of the plant, and the work it can do.

When this occurs, it is usual to clean the system out by blowing steam through the condenser and evaporator coils in succession, and afterward driving the steam and moisture out by air, as on first starting. In one form of compressor, the De La Vergne, oil is injected into the cyl-

inder at a certain portion of the stroke, to lubricate it, and to fill up the clearings, the oil being driven out at the end of the stroke, and being removed from the system by a special arrangement of pumps and filters. An arrangement similar to this was used in the Dawdon and Washington sinkings.

#### HEATING OF THE COMPRESSOR

A somewhat frequent source of trouble with compressors, leading to trouble with oil, arises if the compressor is allowed to get hot. When working normally the entire compressor should be quite cold. The suction valve and the suction pipe leading from the evaporator coils, should be covered with frost. Whenever the frost disappears from the suction pipe and the suction valve, it is a sure sign that things are not working properly. Sometimes even a large portion of the compressor itself is covered with frost.

The low temperature is due to the cooling action of the gas coming over from the expansion coils the expansion being carried on right up to the moment when compression begins. The low temperature at which the compressor is maintained, keeps the apparatus in proper working order. If, however, heating is allowed to occur, either from friction, or from defective working of the plant, two things may happen. The packing of the bearing will be damaged, leading to an escape of the refrigerant, and if the temperature is allowed to reach a sufficiently high degree, the oil itself is vaporized, and is carried over into the condenser with the hot gas, notwithstanding the action of the separator, the latter being practically useless for the vaporized oil.

It is necessary that the piston rod should be absolutely bright and free from anything that will cause friction, and that it should be maintained absolutely cold.

One source of heating is the defective working of the plant. When the plant is working normally, the delivery pipe from the compressor should be slightly warm. With carbonic acid it is a little warmer than with ammonia, but in both the heat should not be great, not sufficient to burn the hand. If the delivery pipe becomes hot, it may be due to the regulator valve not being sufficiently open, in which case a very small turn will put the matter right, or it may be due to a shortage of the refrigerant, owing to one of the causes described. If the heat continues, it will be communicated to the compressor, and the other troubles mentioned may arise.

#### TROUBLE CAUSED BY DEPOSITS

The other source of trouble which has been partly indicated above, is due to the deposit upon the condenser or evaporating coil pipes. The passage of heat from the gas to the cooling water of the condenser, and from the brine to the liquid refrigerant, will take place quickest and best when



both sides of the pipes are clean. Cooling water very often contains salts, which are deposited on the outside of the condenser pipe, the scale so forming, building up a resistance to the passage of heat through the metal. The remedy for this is, frequent examination of the pipes, and frequent clearing of any deposit that may arise, by means of brushes that are usually supplied for the purpose, by manufacturers.

When a deposit forms on the condenser pipes, and the cooling water does not perform its full work, the pressure on the condenser side rises. Hence, watching the gages will always give indications of coming trouble. The same remarks apply practically to the evaporator coils. If there is a deposit on the pipes, the refrigerant cannot do its work properly, the pressure at the suction side of the evaporator coils, rises. Watching the pressure and temperature gages at the condenser, and at the evaporator coils will always give warning of trouble. The gages should be maintained at the proper figures. If it either rises, or falls, without any sufficient cause, such as a higher temperature of the cooling water, the plant should be examined.

### The Tilbury Oilfield, Ontario \*

BY EUGENE COSTE†

Oil was first struck in the Tilbury field in December, 1905, in the township of Tilbury East, in Kent county, Ontario. The well was drilled by the Acme Oil Company, of Detroit, Mich., striking gas at 1360 and 1375 ft.; oil at 1385, at 1410 and at 1430 ft. Drilling was stopped at 1450 ft., after striking salt water. Other wells since drilled prove the good oil territory of the Tilbury field extends at least over an area of two miles east and west by five miles north and south and the limits of the field to the south and north are still unknown. Only three or four dry wells have as yet been encountered over that large area of 6400 acres, and a number of very good wells (century wells) have been struck. Large gas wells have also been struck in this field.

As to the small content of sulphuretted hydrogen, 0.20 per cent., there is no difference between the Tilbury field gas and the Ohio and Indiana gas taken at a number of places widely scattered over those two States. The oil of the Tilbury field also contains some sulphur which gives it a strong odor. It is a dark green in color, of 38 to 41 deg. Baume gravity, and belongs to the same class as the Lima, Ohio, the Indiana, and the Petrolia and Oil Springs, (Ontario) oils. It is bought from the producer at the present time

\*Abstract of paper read before the Canadian Mining Institute, 1907.

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only by the Imperial Oil Company of Sarnia, Ont. This company has established a pumping station and tankage in a central part of the field, from which it pumps the oil through a 4-in. and also through a 2-in. line to Merlin, Ont., on the Pere Marquette Road, 4½ miles distant. From there the oil is taken over that road in tank cars of the Imperial Oil Company to the large refinery at Sarnia.

Owing to the depth of the sand—about 1400 ft.—all the drilling done is by the American cable-tool system; the Canadian pole-tool system being too slow and not suitable for wells of that depth.

#### GEOLOGY OF THE FIELD

The Tilbury field lies under a flat, drift-covered section of the country, the elevation of which is about 600 ft. above the sea. The drift is about 150 ft. thick in the south end of the field and about 100 ft. in the north end, and is composed of boulder clay on the top and sands and gravels varying very much in thickness below. The first strata struck under this drift are the grey blue shales of the Hamilton or Middle Devonian formation—the so called upper soapstone or soap of the Petrolia driller; then comes the middle lime and the lower soap of the same formation followed by the Corniferous or big lime of the Lower Devonian, which is struck at depths ranging from 230 to 285 ft., and is about 150 ft. thick. Below this are the dolomitic limestones with flint and gypsum of the Onondaga, or Upper Silurian, a little more than 1000 ft. thick; then comes the Guelph and Niagara, Silurian dolomitic limestones in which, so far, the drilling of the wells has been stopped, but it is likely that, in future in some parts of that field or not far from it, the wells will be drilled deeper still and will obtain their gas and oil either from the Clinton limestone immediately underlying the Guelph and Niagara and about 150 ft. thick in that section of the country, or from the still deeper strata of the Trenton limestone lying about 900 ft. under the Clinton, from which it is separated by the Medina, Hudson river and Utica soft shales, which can be drilled through very quickly and cheaply.

The gas and the two upper oil pays in the southern part of the field are found in the lower brown dolomites and gypsum of the Onondaga, while the lower oil pay is struck in the upper beds of the Guelph and Niagara. In the north end of the field, north of the Michigan Central Railway, the lower beds of the Onondaga are barren of oil, which is there altogether found in the Guelph, but the gas is still found there in the lower beds of the Onondaga in the strata which form the first and second oil pays of the south end of the field. In the east middle part of the field on the other hand, the oil is struck in the Onondaga strata which constitute the gas pays in many of the

wells of the middle western part of the field.

A little gas is also often found in this field in the sand or gravel at the bottom of the drift, also in the upper part of the Corniferous in some of the wells, while in other wells some gas and a little oil were found in the upper beds of the Onondaga between 500 and 600 ft. However oil was struck in most of the wells at about 1250 to 1280 ft. in the Onondaga, all of which shows the adventitious nature of the gas and oil in the different porous strata or reservoirs of this field; which does not in this differ from many other oil and gas fields.

### Virginia Iron, Coal and Coke Company

This company owns extensive coal and iron-ore properties in southwestern Virginia, and operates coal mines, coke ovens and blast furnaces. Its report for the year ended June 30, 1907, shows \$10,000,000 capital stock, of which \$8,641,600 has been issued; and \$5,643 funded debt. The income account is as follows:

	Earnings.	Expenses.	Net Earn'rs
Blast furnaces & foundries.....	\$3,674,658	\$2,941,156	\$ 733,502
Coal mines.....	933,269	746,548	186,721
Coke ovens.....	650,058	590,332	59,726
Other operations	392,421	387,454	4,967
Total.....	\$5,650,406	\$4,665,490	\$ 984,916
Miscellaneous receipts.....			82,453
Total income.....			\$1,067,369
Interest, taxes, etc.....			407,362
Surplus for the year.....			\$ 660,007

The operating expenses during the year were charged with \$301,787 for depreciation accounts, comprising five different funds.

The labor situation was worse, if anything, than the year before, and not only was the company obliged to pay advanced wages in its own mines and at its furnaces, but the character of the labor itself was of the most shiftless sort. If it were not for the steam shovels bought in the last two or three years it would have been impossible to have obtained enough ore from the mines to keep the furnaces going. This labor situation has added to the cost of production of iron materially, but owing to the rapid advance in prices this was more than counterbalanced by the figures received for iron sold.

The company made in the year ending June 30, 1907, a total of 202,453 tons of iron, and this amount was produced wholly by iron ores derived from local sources, a very large proportion of which was mined from the mines of the company. The coal business has continued to be gratifying, and the prices received showed a steady increase. Most of the coke produced by the company is consumed in its own furnaces. The coal mined during the year was 1,166,445 tons; coke produced, 394,791 tons.

## The Alaska Treadwell Gold Mining Company

This company owns extensive properties on Douglas Island, Alaska. The report for the year ended May 31, 1907, shows no change in the capital stock, which is \$5,000,000 in 200,000 shares of \$25 each. The profit and loss account for the year was as follows:

Balance from previous year.....	\$ 525,022
Net earnings for the year.....	625,585
Sundry accounts.....	2,727
<b>Total.....</b>	<b>\$1,153,334</b>
Depreciation on plant.....	\$ 150,000
Accounts written off.....	1,779
Dividends paid, 14 per cent.....	700,000
<b>Total charges.....</b>	<b>\$ 851,779</b>
<b>Surplus, May 31, 1907.....</b>	<b>\$ 301,555</b>

The mine statement shows 197 ft. shaft sinking and 9200 ft. other development work. The total rock broken was 800,455 tons, of which 8988 tons were rejected as waste, 791,467 tons being ore. The ore sent to mill was 702,953 tons. The average number of drills at work was 36.79; the average work per drill per 10-hour shift was 5.06 holes, or 36.16 ft. There was an average of one ton of rock broken to 1.07 ft. drilled.

The company has two mills, one of 240 stamps, in which 351,438 tons of ore were crushed, 6600 tons of sulphurets being saved by concentration. In the other, of 300 stamps, 351,515 tons of ore were crushed and 6382 tons of sulphurets saved. The loss of quicksilver in amalgamation was 35.2 per cent. in the 240-stamp mill, and 32.5 in the 300-stamp mill. The mills were closed 21 days, on account of scarcity of fuel. Some time was also lost on account of a strike of the miners.

The average number of men employed for the year was 493.3, and the average wages paid each, including the cost of board and lodging for those who board at the company's boarding house, was \$3.23 per day. A flat rate of \$27 a month is made to all employees who board at the company's boarding houses. Labor was scarce throughout the year.

The statement of mine earnings and expenses is as follows, the averages being based on 702,953 tons milled:

	Amount.	Per Ton.
Free gold from mill.....	\$ 776,266	\$1.1043
Gold from 12,644 tns. sulph'rets.....	735,406	1.0462
Miscellaneous profits.....	65,136	0.0926
Interest.....	15,974	0.0227
<b>Total receipts.....</b>	<b>\$1,592,782</b>	<b>\$2.2658</b>
Mining and development.....	\$ 700,874	\$0.9970
Milling ore.....	121,564	0.1729
Treating sulphurets.....	82,304	0.1171
General expenses and taxes.....	28,716	0.0409
Bullion charges.....	6,507	0.0093
Construction and repairs.....	27,232	0.0387
<b>Total costs.....</b>	<b>\$ 967,197</b>	<b>\$1.3749</b>
<b>Net profit for the year.....</b>	<b>\$ 625,585</b>	<b>\$0.8809</b>

The average assay value, shown by 3342 samples taken, was \$2.42 per ton. The average saving per ton, as shown above, was \$2.15.

The winter was unusually severe. The company is erecting tanks and making

arrangements to use fuel oil entirely, in place of coal.

During the year there were 89,172 tons of ore sent to the mills from the open pits, or 12.7 per cent. of the total tonnage milled. The pits have now reached a point in depth beyond which it will not be economical to work them, but there still remains a large tonnage in the pillars that can be mined and sent to the mills. The estimate of ore in sight at the close of the year is as follows: Above 440 ft. level, 968,646; above 600 ft., 230,274; above 750 ft., 458,704; above 900 ft., 155,613; above 1050 ft., 1,122,212; above 1250 ft., 1,273,583; total in levels, 4,209,032; broken ore in stopes, 773,851; grand total, 4,982,883 tons. The ore above the 1450-ft. level is not sufficiently developed to estimate. The above estimate includes ore that must remain in the mine in the shape of pillars.

## The Borax Deposit of Salinas, near Arequipa, Peru

The following notes on the occurrence and working of the borax deposit of Lake Salinas in Peru are abstracted from the *Min. Journ.* (Aug. 24, 1907). Lake Salinas lies about 12 leagues east of Arequipa City. Its altitude is about 14,200 ft., and it occupies the bottom of a large basin bounded by a circular chain of high mountains in a markedly volcanic region. Examination of the mountains reveals clearly their volcanic origin, and the superposition of lava sheets of great thickness. The predominating rock is biotite-hornblende-andesite, with large crystals of vitreous plagioclase.

The quantity of water discharged into this basin has of late diminished considerably, so that today what is called the lake remains dry for the greater part of the year. The borate forms a non-continuous bed in the lake, varying in thickness and depth. The following is a vertical section of the deposit: A superficial crust of chloride and sulphate of soda, fine sand 10 to 14 cm. thick, gravel 6 cm. thick, sand with layers of borate 20 to 50 cm. thick, shallow fine sand, borate of variable thickness, usually 40 cm. but sometimes reaching a maximum of 1 m. The borax deposit is a calcium-sodium-borate, or ulexite; on extraction the percentage of boracic acid is 30, afterward being raised by artificial dessication to 52. Two kinds of borate are recognized—the *sedoso* (silky), which is fibrous ulexite with a brilliant silky luster, and the *corriente* or ordinary borate which generally contains water and other impurities. The borate bed is impermeable, so that the water which reaches the lake by subterranean means cannot reach the surface at the spot where borate exists and hence parts of the lake which contain no borate are easily recognized by the presence of pools of water that do not dry up.

The extraction of the borate is effected

by shallow pits 1 m. wide by 2 or 3 m. in length. When the whole of the borate has been taken out, the water rises and fills the pits and then another one is sunk, leaving a narrow partition wall between the two in order to prevent flooding the second pit. The pits are dug in series, and roads are left between them, in order to facilitate transport. Decauville transmission lines are used to collect the borate from point of actual exploitation to a central station where it is dried and afterward sacked. Twelve furnaces are used for dessication, each one of which has a daily capacity of 85 quintals and a fuel consumption of 68 quintals of *yaretas*.

The *yaretas* is a vegetable peculiar to the elevated regions of the country and grows on the rocks in rounded form. Its calorific value is derived from its large quantity of rosin. The *yaretas* should not be used more than 20 days after cutting, as it begins to dry and rot at that time. This vegetable is abundant in the mountains and costs 22c. per quintal delivered at the furnaces. Transportation to Arequipa is accomplished by llamas, mules, or donkeys, and costs 70c. per quintal. The average shipments to Arequipa are about 3000 quintals per month.

## A New Annealing Process

A new principle of annealing, described in the *Mechanical Engineer* (Sept. 14, 1907), has been put into operation by the Sheffield Annealing Works Company. The principle is that the steel to be annealed is heated in a chemically reducing instead of an oxidizing atmosphere. The advantage resulting from this change in conditions is that oxidizing or scaling the surface of the bars to be annealed is entirely avoided. By the old process of annealing the scaling of thin bars amounted in some cases to as much as 2 per cent. of the material. Also when the steel comes to be machined, the scale is the source of considerable trouble as it has to be either turned off, ground off or removed by pickling.

A small producer-gas plant is an essential part of the new annealing installation, and the producer gas is led directly into the furnace and is there mixed with the quantity of air necessary to support combustion. This process is said to give a uniform softness to the steel, and is carried out with a consumption of only 4 cwt. of coal per ton of steel annealed, whereas the ordinary annealing furnaces require nearly a ton of coal to every ton of steel. The complete process is accomplished in 48 hours, whereas in most other annealing furnaces thermal treatment occupies four to six days.

At Rio Tinto it takes six to seven years to exhaust one of the large ore heaps of its copper and the ore then contains only 0.25 to 0.35 per cent. copper.



# The International Petroleum Congress

Account of a Notable Gathering of Petroleum Experts and Chemists.  
Progress Made in the Industry Especially in Oilfields of Rumania

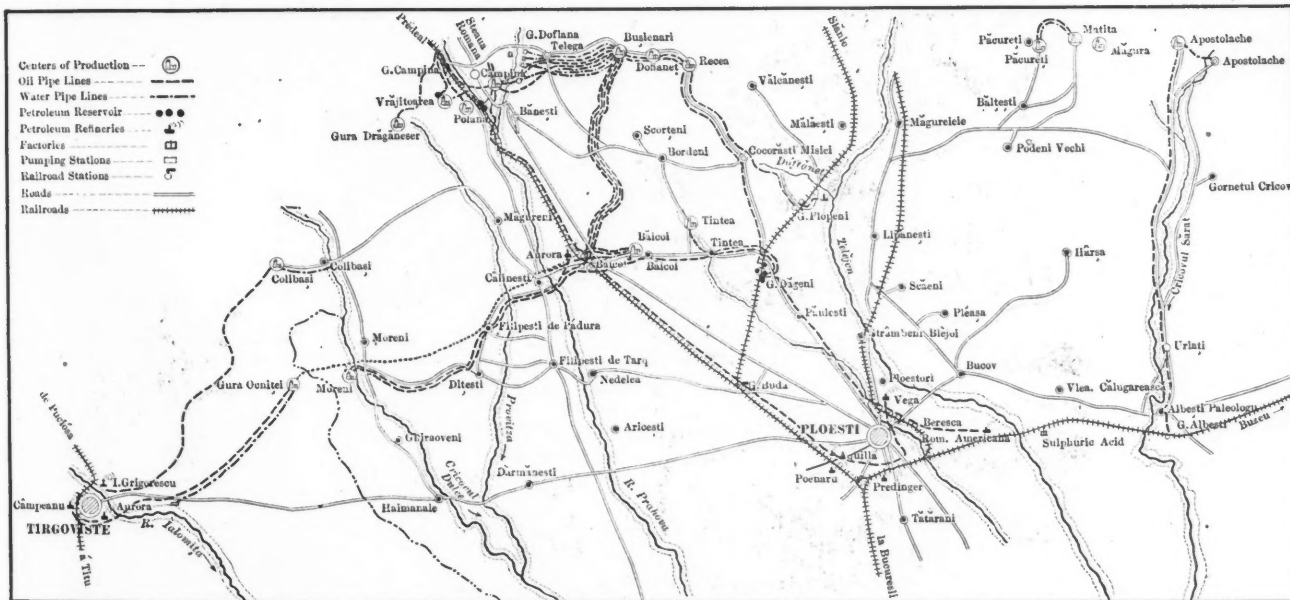
BY DAVID T. DAY\*

In all over 400 men interested in the petroleum industry, together with quite a number of ladies, gathered at Bucharest, Rumania, for the Third Petroleum Congress. The local committee had labored valiantly for two years, and when the Government joined the movement in the interest of State oil-land development, and financed the entertainment of the congress, besides sending to the homes of the delegates free transportation wherever needed in Rumania, the private oil companies joined in, and the success of the movement became assured. The measure of the success was, however, greater than expected. Beyond doubt, no such important event has ever been known

the petroleum chemists present represented the best talent known, and perhaps the same is true of the geologists, when we consider the presence of Mrazek, Hofer, Tietze, Soczi, Stephanescu, Rakusin, Basskakoff, Benkendoff, Sameigna, Mircea, Murgoci, de Richard, Tanasasciu, and Goulischambaroff.

The meeting began, on Sept. 4, with an explanatory lecture by Professor Mrazek, on the geology of the main or western oilfields of Rumania. For this he was not only fitted as the chief of the geological survey, but also as the geologist for the Government commission for the investigation and supervision of the oilfields—especially those of the State. He

in carriages the congressists began a drive which landed them at Baicoi again on the third day thereafter. They banqueted three times a day and at night slept in the residences of their hosts of that day, where again gastronomic hospitality was driven to the limit. But no time was lost in answering all questions and every possible facility was placed at our disposal for examining oils, drill cores, chemical laboratories, and refining details. Publicity was the motto. Thus we saw the refinery of Aurora, where nothing looks like American practice; but it is, nevertheless, designed with a care which commands respect. Then we got among the oil wells at Tsinea, near by. Hydraulic



MAP OF FRAHOVA AND DAMBOVITZA DISTRICTS, RUMANIA, SHOWING OIL WELLS, PIPE LINES, ETC.

in the petroleum industry. The proceedings touched all lines of scientific work and joined the chemists with the geologists; the result being a great gain in our knowledge of the theories of the origin of petroleum, and in the development of the technology of petroleum.

### RESULTS AND PERSONNEL

Perhaps the best result was the development of the manifest necessity for adequate means of separating every variety of crude petroleum into its constituent hydrocarbons before many more conclusions can be drawn in regard to the nature of various oils. Beyond question

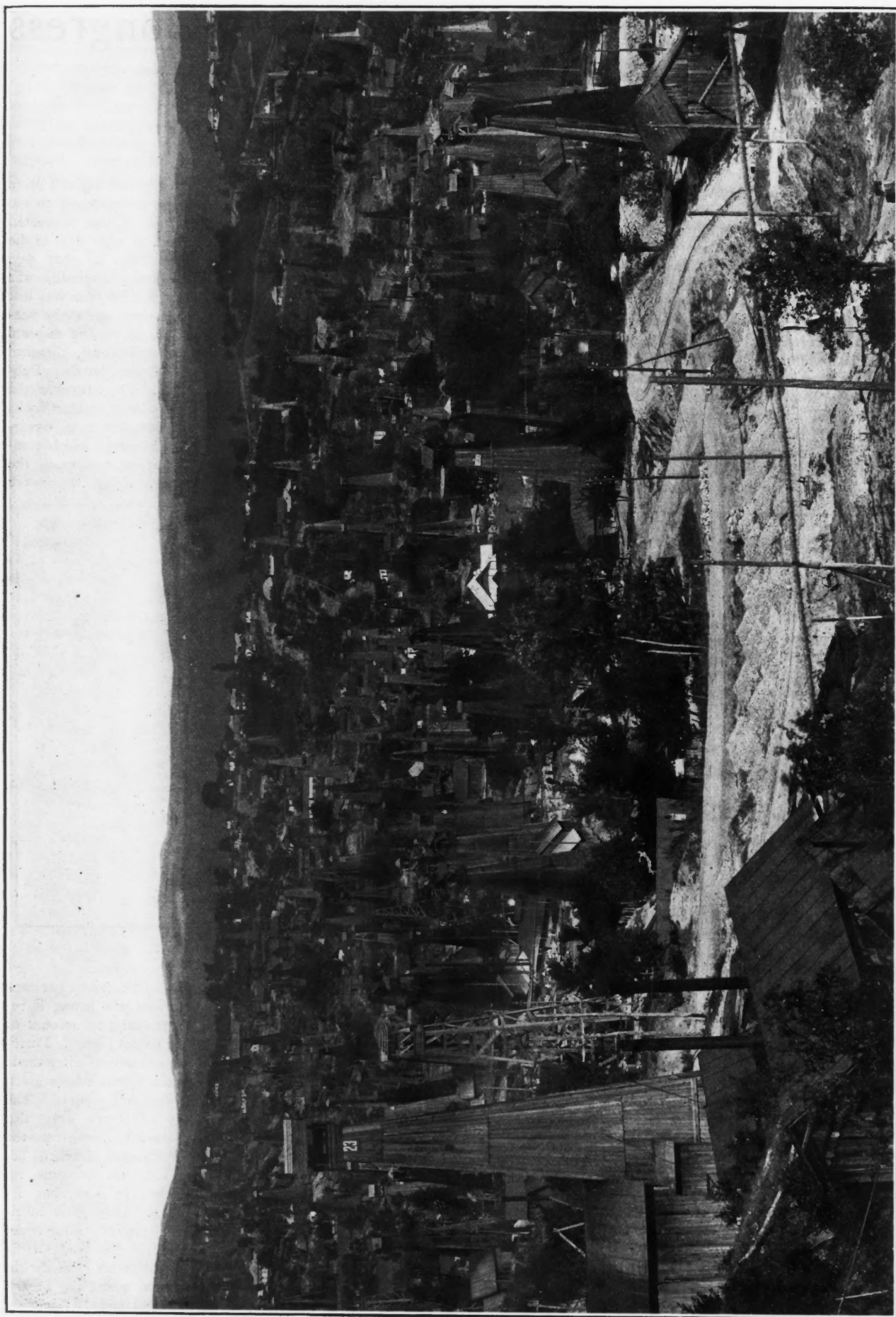
\*United States Geological Survey; delegate to the Congress.

traced not only the geological structure, showing how some of the oils have undoubtedly reached their present situation by migration from elsewhere, but he also outlined the recent development of oil territory to the southwest from the important Bushtenari region.

### THE BUSHTENARI OILFIELD

An excursion to this field followed, lasting three days, in which the refining interests were well seen, and all the important oil pools as thoroughly studied as possible, even with the strenuous hours—daylight to dark with banquets till midnight or worse. First came the refinery of Baicoi, reached at 8 a.m., after two hours in a special train, highly creditable to the Government railway system. Then

drilling has made a hit there. It was instructive, too, to see how baling is resorted to on a large scale, on account of the fine sand which baffles pumps. Fortunately the pumping question is often made unnecessary by gushers, which have given much wealth to the well-owners. The wells and refinery of Recea were also visited and Bushtenari the great—the Rumanian oil Messa—was reached before sundown. This oil contains no paraffin wax, or next to none, but its prolific yield and the fairly good lubricating oils obtained from its residue make it the foremost field in the land. It is piped to several refineries, chiefly in Ploestiti and Campina, where the Steana Romana (Star of Rumania) Company has a model plant. Here good engineer-



THE BUSHTENARI OIL FIELD, THE SOURCE OF MOST OF THE RUMANIAN OIL



ing and fine chemical talent have put up the most economical plant in the land, though the product of the Standard in Ploeshti is a better oil for lamps. The great drawback to the burning oils from Rumania is the presence—usually 20 per cent.—of coal-tar hydrocarbons in the crude. Benzol and toluol abound in the kerosene and it is difficult to burn them without smoke. The wax produced is well refined, though they do not get as hard products as are common in America. This paraffin comes from the new wells near Campina.

The third day's work was given to Moreni, where almost every oil company is looking for (and getting) gushers, some of which flow for many months. The field is in high favor, although the complicated geology—well explained by our indefatigable Professor Mrazek—makes drilling a veritable lottery.

#### OPENING OF THE CONGRESS

On their return to Bucharest at night, on Sept. 7, the excursionists would doubtless have appreciated a rest, but instead they were introduced to Prime Minister Demitri Sturdza, and Madame Sturdza, at a reception for 1500 in their beautiful palace. Even the Bucharest citizens, experts on social functions, pronounced this a marvelous fête, but it was only a premonitory symptom of the Prime Minister's interest in the Congress. He attended every session, presided at most of the banquets and accompanied the Congress on its last excursion to Constanza on the Black sea, to show what the Government is doing for the export trade in petroleum.

After the official (evening dress) opening of the Congress on Sunday morning at the beautiful Atheneum palace, the Congress settled down on Monday morning to scientific papers. In three sections—geology, chemistry and economics—they discussed about 70 papers; the University building being given up to the work. As a working machine the Congress was a model in efficiency.

#### THE MIGRATION OF PETROLEUM

In section I, geology, Monday was devoted chiefly to papers on the migration of petroleum in the earth's crust; and the subject was given sharp analysis, chiefly by the papers of Mrazek. He gave much in the way of detailed study of the courses taken by oils in Rumania, and surely the place of meeting for this purpose was well chosen on account of the great variation of the oils within a small territory. He then showed experimentally the behavior of petroleum to shales and insisted upon the great importance of moisture in the shales. Dry shales absorb oils readily and so will most other dry rocks—the effect of the absorption on the character of the oil depending upon the fine or coarse pores in the rock.

Still more important was his demonstration that such absorption of oil in a

shale does not furnish an oil supply. For, while the oil is there, it will not leave the shale when a drill penetrates it and we get no oil. Super-saturation is the essential thing, For this he showed that it was only necessary for water to enter the oil saturated shale and drive out the oil into some other—often a sandstone—reservoir. The writer showed as a corollary the fact that when water, drives out an oil from a saturated shale, the portion rich in paraffins, solid and semi-solid, remains behind, and to this the Scotch shales are probably due, as the oils extracted by solvents from shales are like these residues. The necessity of a good water trap below the oil was also made evident. Professor Mrazek demonstrated the capacity of a moist shale to serve as the best possible cover for an oil pool.

#### THE ORIGIN OF PETROLEUM

Professor Engler re-elaborated his ideas of the animal origin of petroleum, and added the results of experiments proving that only certain fractional distillates from crude petroleum show optical activity. He asserted that he had found certain natural crude oils which agreed in optical activity with his artificial product. He then showed that search for an animal residue which could yield petroleum optically similar to the usual natural crudes had been successful, with cholesterol and he regards this as the original petroleum source. Perhaps this takes him farther than ever from an adequate source of supply for our petroleum—to say nothing of what must have escaped us by leakage—but Professor Engler did not deal with quantitative statements. Altogether it was a valuable and valiant support of the theory of animal origin, and helped to offset an obvious tendency towards the inorganic theory. Professor Engler made an eloquent and graceful reference to our loss in one year of the three chemists, Moissan, Bethelot and Mendeleef, who have contributed most to the inorganic theory.

In the discussion of this paper Hoefler spoke decidedly for the animal theory. Mrazek, without any decided partisanship and in a remarkably able address, laid much, perhaps too much, stress on the absence of oil deposits in volcanic regions, as an argument against the inorganic origin.

#### STRUCTURE AND EXPLOITATION OF OILFIELDS

A long series of papers followed showing structural details in the European oilfields; and others in regard to practical questions in the exploitation of oilfields, drilling methods, etc., but with a lamentable lack of data concerning the United States. The exceptions were found in the excellent contributions of Capt. A. F. Lucas on the Texas fields, H. F. Bain on the Illinois field, and Ralph Arnold, on the complicated conditions in Santa Maria field in California. Consideration of these must be left to a subsequent letter.

#### THE CHEMICAL SECTION

In Section II, Engler, Zaloziacki, Rakusin and others were fortunate in carrying the war as to theories of the origin of petroleum into the camp of the chemists. The discussion which was provoked emphasized the necessity for a method of separating each crude oil into its hydrocarbons, and the classification of each oil by the quantity of each hydrocarbon which it contains, instead of naming an oil geographically as is now done. The Rumanian chemists, Poni, Edeleano and Haussmann, are entitled to most credit for efforts in this line, by which our knowledge of the constitution of Rumanian oils is more complete than for any other—even the Russian. Zaloziacki and others have done much also toward giving a quantitative idea of the constitution of Galician oils, and the Russians are not far behind. But the dearth of information in regard to the quantitative composition of American oils is a positive reproach to every one connected with American chemistry, with the sole exception of Mabery; and especially is it to be regretted that the Government has been so neglectful that now it will be difficult for any corps of men ever to catch up with the oils now important in the industry, and by that time the discovery of new pools and new problems will make the situation equally hopeless. In Europe the large number of able petroleum chemists might have aided in the American problem, but for the meager samples that they have received of oils and their doubtful authenticity.

#### POSSIBILITIES OF RUMANIAN OILS

The Rumanian work has shown that their crude oils offer a better source of supply than coal tar for hydrocarbons of the benzol series. It is evident that Germany, and let us hope Rumanian laboratories also, will soon draw on these oils as the basis of the aniline dye and similar industries. The Russians also showed great progress in the direction of obtaining valuable products from the naphthenes from their crudes. The information will have a world-wide welcome that genuine spirits of turpentine can easily be derived from Russian mazoot, to say nothing of soaps, etc.

#### THE ECONOMIC SECTION

In Section III several valuable papers were represented in regard to statistical details. Dr. Paul Schwarz, of Berlin; Dr. Paul Dvorkovitz, of London, and several others studied the statistical conditions of their respective countries, and then the discussion drifted toward methods of unification of tests of oil products. The French delegates in four preliminary meetings had prepared a complete program of tests for international adoption, but these were in general less acceptable than those in use in Germany, which were offered by the German members. As a

compromise a tentative set of international methods was adopted where there was no conflict and the remainder were referred to an international committee consisting of two members from each country. Dr. David T. Day was selected to represent America, and was asked to nominate the second member, and on this point he will welcome suggestions from all interested.

When the third section wandered into the discussion of regulations of the dimensions of tank cars and other matters more germane to a railroad congress, it

#### LITERATURE OF THE CONGRESS

Much of the success of the congress was due to the unprecedented preparatory work. The Germans fortified themselves by bringing many of their papers bound in a jubilee volume, handsomely printed and illustrated. The French printed the views they wished adopted. The local committee not only printed many of the Rumanian papers in advance, but all the foreign contributions received in time. Then, besides bound guides containing maps of the oil regions, and the usual

photographic record of every act. A member of the local committee proved indefatigable in directing this work and exposed more than 2000 plates of the congress and its progress, in rain, sunshine and by flash-light.

#### THE NEXT MEETING

This evidence of the committee's activity is alone enough to appal the workers for the next congress; but when the Government appropriation is considered and 16 banquets that were banquets, free spe-



THE PORT OF CONSTANZA ON THE BLACK SEA. EVERYTHING IN SIGHT IS THE WORK OF THE RUMANIAN GOVERNMENT—EVEN THE TANKS

was Prime Minister Sturdza who raised his voice to recall them to more strictly petroleum matters. Again, a vigorous effort to constitute a permanent commission to serve as a perpetual congress was successfully opposed by Dr. Day, on account of its necessary tendency toward meddling with trade matters, and the neglect of the scientific work which had made the congress successful.

daily bulletins of events, a handsome album of views was given to each member. Better than all was the daily edition of the *Moriteur du Petrole Roumain*, which kept up with the progress of excursions, debates, contributions and speeches at banquets so as to constitute an efficient *compte rendu* of the congress, ready each morning. Another admirably executed literary feature was the official

cial trains and sleeping cars, nearly two miles of carriages for four days, automobiles without stint, and free steamers on the Danube with sufficient room for 400 to banquet at once without the least inconvenience, and finally a free steamer to Constantinople, the committee of arrangements for the next congress deserves sympathy. The next meeting will be held in Lemberg, Galicia, in 1910.



## The Meeting of the American Electrochemical Society

The twelfth general meeting of the American Electrochemical Society was held at the Chemists' Club, 108 West Fifty-fifth street, on Oct. 17 and 18, and on Saturday, Oct. 19, at Earl hall, Columbia University.

### FIRST DAY

After a meeting of the board of directors at 7 p.m. a general reception was held and this was followed by illustrated lectures by Dr. Geo. F. Kunz and E. G. Acheson. Dr. Kunz spoke of the history and occurrence of diamonds and the methods of cutting and polishing gems and reviewed the work of Moissan in the production of artificial diamonds. The genesis of the diamond with regard to deposits of iron was also discussed in view of the discovery of diamonds in meteorites. Dr. Kunz exhibited models of many of the more famous gems, also specimens of blue ground from South Africa.

E. G. Acheson demonstrated, by experiments, the properties of "Deflocculated Graphite," discovered by him, and discussed its qualities as a lubricant. A number of articles, manufactured from this product, were on exhibition. A discussion of both lectures followed.

### SECOND DAY

The meeting was called to order shortly after 9 a.m. by President C. F. Burgess. The first paper was on "The Electro-thermic Reduction of Iron Ore," by A. E. Green and F. S. MacGregor. The ores used were ilmenite and a titaniferous iron ore from Essex county, New York.

Several phenomena occurring at measured temperatures were mentioned among which was that with a low lime content more titanium was reduced at a higher than a lower temperature.

Joseph W. Richards then discussed the experiments made with the electric furnace on iron ores at Saulte Ste. Marie, in which he deplored the fact that, so far, no attention had been paid to the gases coming from the electric furnace. He predicted that the advance in the future would be made by studying the analysis of these gases. He also remarked that no stress should be laid upon the manufacture of gray pig iron in the electric furnace. It would be sufficient to produce white iron and add the proper ferro-alloys to give the desired result. The main stumbling block, he pointed out, was too much carbon in the charge. The carbon can be consumed only by the oxygen in the charge, and any excess of carbon, over the proper amount, will give less heat and will require more power.

Dr. H. N. Potter then read a paper on "Silicon Monoxide," and was followed

by A. B. Albro, who described an original method for the analysis of silicon compounds.

C. E. Baker read a paper on "New Applications of Chlorine in Metallurgy," which consists in rendering soluble the metallic contents of an ore and leaving the gold unaltered. No chloridizing roast is required. This started a discussion between Messrs. Hering and Speyers and the author in which the question of the cost of chlorine and the non-solubility of gold in chlorine was taken up. It was claimed that the by-product, caustic soda, more than paid for the gas, and therefore the chlorine cost nothing. Also that gold was insoluble in chlorine if iron chloride was present in the ferrous form and that gold was not acted upon by perfectly dry chlorine gas.

F. A. J. Fitz Gerald briefly gave some data on the heat conductivity of carbon and promised further particulars in a subsequent article.

The paper on "The Electrometallurgy of Zinc," by Gustave Gin, that of Messrs. Tucker, Doty and Cauchois on "Granular Carbon Resistors," and that of W. R. Mott on "Electrochemical Methods for the Quantitative Determination of Free Silicon in the Presence of Silica, Silicates, Oxides, Free Carbon and Carborundum," were postponed until the following day. A written discussion was invited for the papers by Messrs. Gin and Mott.

In the afternoon an excursion to the laboratories of Thomas A. Edison took the members to New Jersey, and in the evening the annual banquet of the society was held at the Liederkrantz hall.

### THIRD DAY

The papers of the last day of the meeting were read at Earl hall, Columbia University.

The first paper was that of Messrs. Tucker, Doty and Cauchois, read by Dr. Tucker, on "Granular Carbon Resistors," and was followed by discussions by Messrs. Hering, Richards and Speyers.

Dr. Tucker then read a paper entitled "Electrolytic Separation of Copper and Silver," by H. W. Gillett, which was followed by a paper, not on the program, by L. H. Dushak and G. A. Hulett, on "A Study of the Silver Coulometer." This gave details of experiments to determine the true electro-chemical equivalent of silver.

E. E. Free then read a paper on the "Electrolytic Determination of Minute Quantities of Copper."

The industrial uses of "Monax" was the subject of the second instalment of Dr. Potter's paper and described the use of silicon monoxide as a filler for paints used especially for brick and structural steel. It is used also in the manufacture of printing ink and ceramics, and has various other commercial uses. A description of the furnace in which it is made then followed.

Dr. A. F. Cushman gave a lecture on the "Electrolytic Theory of the Corrosion of Iron," which he gave before the Society for Testing Materials, and which has been published in a bulletin of the Agricultural Department of Washington.

The papers postponed from the previous day and several others down on the program were not read, owing to lack of time.

After the morning session the members and guests formed two parties, one visiting the new power plant of the Pennsylvania railroad at Long Island City, and the other inspecting the plant of the United States Metals Refining Company at Chrome, New Jersey.

## Electric Steel Plant in Germany

According to the *Iron Age*, a new plant for the production of steel in a modified Kjellin induction furnace was recently inspected by representatives of German, Belgian and Russian steel manufacturers at the works of the Röchling Iron and Steel Works, Völklingen, Germany. The furnace has a charge of three tons and had been in operation for several weeks. It purifies a liquid charge from the basic converter down to mere traces of sulphur and phosphorus. The furnace is founded upon a combination of the original Kjellin furnace, with various improvements which have been carried out by Messrs. Röchling and Rodenhauser.

It is stated that a company has been formed in Berlin, known as the Gesellschaft für Electrostaahl-Anlagen, which will utilize the Kjellin and Röchling-Rodenhäuser type of furnace for the production of iron and steel and ferro products. The Siemens-Halske Company and the Röchling Iron and Steel Works are prominent in the new company. Its operations will extend to all countries except Great Britain and its colonies, the United States, Norway and Sweden, in all of which companies already exist for the exploitation of these furnaces.

## Tin Production in the Malay States

The following table furnished by Consul-General G. E. Chamberlin, of Singapore, shows the output of tin from the Federated Malay States for the first six months of 1907, as reported by the senior warden of mines; also output for same period of 1906, showing a decrease of 630 tons (ton = 2240 lb.).

	1907.	1906.
Perak .....	12,582	12,723
Selangor .....	7,664	7,945
Negri Sembilan .....	2,170	2,331
Pahang .....	938	985

Total output..... 23,354 23,984  
The decrease was 2.6 per cent.; it was distributed among the four States, all showing smaller productions.

## Mining in Minas Geraes

According to a recent consular report, the most immediate development in Minas Geraes will come in mining. The State takes its name from its mines. The exports of manganese probably exceed in value \$1,000,000 annually, it being difficult to trace the exact share the State has in the exports of Brazil as a whole. The exports in 1906 were 124,646 tons. The production of gold is also somewhat problematical, the existence of an export tax interfering with statistics, but it is probable that the average annual yield at present does not exceed 120,000 oz., if indeed it will reach that amount. The output in 1906 was 123,254 oz.; for 1905, 116,111 oz. None of the mining companies can be said to be making money. One reason for this has been in the great fluctuations of exchange, another is in the high wages of labor, high taxes, incessant litigation over titles, and other burdens. The real trouble, however, has been in the poor ores. Legislation has been unfavorable, and for that reason the State government is now engaged in revising its mining laws and preparing to offer more liberal inducements to investors.

### POSSIBILITIES FROM IRON ORE

What may be of vastly more importance to the State and to the world in general than all of its gold and diamond mines, however, is its iron-ore beds. The only practicable means of using what iron ore it possesses, however, is to export it, and this is possible only where transportation facilities are available or at least may become available. The president of Minas Geraes believes that both suitable ore and transportation facilities are available at this time. In his message he says:

"In the vicinity of the capital (Bello Horizonte) in a single deposit the quantity of ore in sight is calculated to be over 200,000,000 tons—ore of the first quality, of which the export value is, consequently, many millions of *contos* of *reis*. The matter of the distance at which our deposits are from the sea is of no moment, because in the United States ore is carried to the smelters of Pennsylvania an approximate distance of 1240 miles. When the port works of Rio de Janeiro are completed and equipped for the automatic discharge of ore, and the railroads are adapted to such purposes, it is easy to form an opinion of the immense proportions the exploitation of these riches of ours can assume. It is necessary for us to cause to disappear those conditions which lead foreigners to wonder at the contrast of the poverty of the people and the richness of the country."

### EXPORT OF ORES DEPENDS ON THE PRICE OF EXCHANGE

What the possibilities of these ore

fields may be remains to be seen. The cost of extraction, even with a minimum of labor and trouble, is great, so long as present labor conditions obtain in Brazil, while transportation, on the basis of present service and charges, is impossible. But possibilities with more modern equipment, changed conditions, and the demand of the future merit consideration and investigation. As things now are here at present the cost of mining and shipping manganese ore is so great that the possibility of mining and shipping it at a profit rests altogether upon whether or not exchange goes materially above 15d. (30c.). With few *milreis* to the dollar, the value of the *milreis* locally remaining practically the same, it is impossible to handle manganese at a profit, and the difference between mining manganese and iron ore in Minas Geraes at the present time is certainly not as great as the difference in price of the ores.

## Jury of Awards, Jamestown Exposition

The jury of awards, consisting of a jury at large and several special juries, was in session at the Jamestown Exposition, Sept. 10 to 20, inclusive. The officers of the jury are: Albert Shaw, New York, president; Ambrose Swasey, Cleveland, O., vice-president; and James L. Farmer, secretary.

In addition to the special juries for judging the various exhibits, there is a jury at large consisting of the chairmen of the individual juries; also a committee of five to act for the jury at large. The members of this committee are: Dr. O. H. Tittman, Washington, D. C., chairman; Dr. Joseph Struthers, New York, secretary; Dr. G. F. Kunz, New York; Carl Hering, Philadelphia, Penn.; and Chas. E. Dodge, Washington, D. C.

The members of the jury on mines and metallurgy are: Dr. Joseph Struthers, New York, chairman; Dr. Geo. F. Kunz, New York; Jefferson Middleton, Washington, D. C.; M. Otagawa, Tokyo, Japan; Dr. John A. Birkinbine, Philadelphia, Penn.; Dr. Chas. Baskerville, New York (special alcohol); Dr. Chas. E. Munroe, Washington, D. C.

## Crows' Nest Pass Coal Company

Statements having been widely circulated that J. J. Hill had obtained a controlling interest in the company and had secured the discharge of Manager G. G. S. Lindsey, Hon. Robert Jaffray, of Toronto, vice-president of the company, has published a specific denial. He states that the Granby Copper Company, of Grand Forks, has recently purchased a considerable block of Crows' Nest stock, paying for it about \$700,000 and is naturally

heavily interested in its operations as being the greatest consumer of coke in British Columbia. The Granby company is prepared to double its capacity for the treatment of ores as soon as it can rely on a supply of 1200 tons of coke equivalent to 2000 tons of coal per day from the Crows' Nest Pass Company. The present output of coal is about 3500 tons per day. With additional capital secured from the Granby company and Mr. Hill, apart from any sale of stock, it is intended to increase the output to 7000 tons daily. There has been no question of control of feud between parties in the directorate, and Manager Lindsey holds his position having the full confidence of the board and of J. J. Hill.

## African Diamond Production

Consul-General Julius G. Lay, writing from Cape Town, reports that the export of Cape Colony diamonds during 1906 amounted to \$33,247,076, a large increase as compared with 1905, the greater part of which, both cut and uncut, went to the United States through European ports. In addition the export of Transvaal diamonds through Cape Colony last year amounted to \$7,729,301, Orange River diamonds, \$4,046,928, and Rhodesia diamonds, \$28,469.

It is reported that the De Beers company at Kimberley has discharged 500 men in order to reduce its output until the surplus stock of stones on hand is disposed of and to maintain the price of diamonds. There is a movement now on foot to levy a 10 per cent. export tax on uncut diamonds, its advocates contending that such a tax would bring many of the lapidaries in Holland to South Africa, and millions of pounds in wages to be spent in that country.

## Iron Production of Leading Countries

A paper read by Wilhelm Kestraner before the recent meeting of the Iron and Steel Institute in Vienna makes a comparison between the pig iron production of the leading countries in 1882 and 25 years later, in 1907. The outputs are given, in round figures, in metric tons:

	1882.	1906.	Increase.
United States.....	4,600,000	27,000,000	22,400,000
Germany.....	3,400,000	12,800,000	9,400,000
Great Britain.....	8,600,000	10,100,000	1,500,000
France.....	2,000,000	3,400,000	1,400,000
Russia.....	400,000	2,800,000	2,400,000
Austria-Hungary...	600,000	1,900,000	1,300,000
Belgium.....	700,000	1,500,000	800,000
Sweden.....	400,000	600,000	200,000

Of the leading countries Great Britain shows the smallest proportional increase. In 1882 it made more than the United States and Germany together; in 1906 only about one-fourth as much as those two countries.



# Mine Gases and Methods of Preventing Explosions

A Discussion of the Various Gases Found in Coal Mines,  
Methods of Identification and Means for Preventing Accidents.

B Y H. E. G R A Y\*

As deep mining becomes a necessity, and that time is not far distant, the importance of this subject will be more fully appreciated than it has in the past. It has received attention at the hands of a great many able men throughout the entire mining world, yet the study given has been so lax and remittent that our knowledge of mine gases and their treatment has not made the same advancement that has been made in other lines of scientific investigations connected with mines and mining.

As explosions in coal mines constitute the chief factors to be dealt with in their economic and successful operation, a thorough and exact knowledge of the mechanical appliances used for the prevention of such catastrophes is becoming more apparent every day.

## NATURE OF THE GASES

In dealing with mine gases I shall aim at giving the standard knowledge of mine gases, both in explosive and explosive, how and where produced, where generated and the general characteristics of the gases.

It may be well to state here, that we have two distinct classes of mine gases: First, gases which are produced by the actual work of operating and developing mines, such as the blasting of coal and rock, the burning of lights, the breathing of men and animals, and the oxidation and decomposition of iron pyrites and other materials contained in abandoned parts and gobs. To these gases which are mostly in explosive as found in mines, we will apply the term, "gases produced in mines"; second, gases evolved or transpiring from the coal at the working faces, the bottom or top rock, and which are mostly explosive gases, we shall apply the term, "gases generated in mines."

The gases produced in mines are: Black-damp—carbon dioxide ( $\text{CO}_2$ ); white-damp—carbon monoxide ( $\text{CO}$ ), and stink-damp—hydrogen sulphide ( $\text{H}_2\text{S}$ ).

## BLACK-DAMP

Black-damp is in explosive and in some mines is found as an occluded gas, but as a rule it is the product of combustion, when a body containing carbon is burned in the presence of a plentiful supply of

air. It is produced by the oxidation of coal and other bodies, the burning of lamps, the breathing of men and animals and the explosion of powder and gas. This is a heavy gas, being one and a half times as heavy as an equal volume of air, and where there is no current motion it stratifies near the floor of the roadways and working places.

With reference to stratification of gases, it might be well to explain that, contrary to the general belief, gases do not stratify in mines except where there is no current motion, or where the ventilating current cannot reach them. Lights are extinguished in air containing 10 per cent. of this gas, and this mixture, if breathed for any great length of time, produces death by asphyxiation.

Much of what is called black-damp in mines, is nothing more than vitiated air, or air which has been deprived of its proper proportion of oxygen, which fact may readily be proved by the common flame test when made by a skilled operative. True black-damp is found most frequently in shallow mines which are poorly ventilated, more especially during wet weather, the water coming from overhead strata holding the gas in solution and from which it escapes into the mines as the water evaporates.

The method of its detection as given by one authority is: "The presence of carbonic acid gas is readily detected by the flame of a lamp becoming reduced in size, and when more gas is present, by its extinguishment." This is not correct, however, as I would take this test to prove the presence of vitiated air or free nitrogen, or some gas of the same nature.

In black-damp, the flame is lifted bodily from the wick, floating upward into the surrounding atmosphere where it is extinguished and lost. No red cinder or ash remains on top of the wick and the wick at once becomes black and inky in appearance and cannot be readily relighted. In free nitrogen, the flame is gradually reduced in size from the top downward until it is extinguished, red cinder remaining for a considerable time after the flame is lost.

## WHITE-DAMP

Next in the order of our study is white-damp, carbon monoxide, which is usually produced in mines when a body containing carbon is burnt in places con-

taining a limited supply of air or oxygen. Thus it is largely produced by blasting, where a large number of shots are fired at one time, in places poorly ventilated or which are working in advance of the ventilation. It is always present in dangerous quantities at the time of explosions in dusty mines. It was no doubt the combustion of coal dust and the far reaching effect of the flame of white-damp which produced a continuous explosion at the time of the Harwick mine disaster. It is sometimes the result of mine fires and when coal is slowly burned in old goaves.

Carbon monoxide is the most dangerous of all mine gases, because of the fact that there is no way to prove its presence in mines except by the appearance of the lamp flame. There is one factor, however, which is a great consolation, and that is, that it is very rarely found in mines except in case of mine fires where sealing has been resorted to and in explosions of gas where coal dust has been a factor. As a safeguard, never depend upon the flame test but suspect its presence where much blasting is done if the ventilation is bad.

This gas is generally considered colorless, odorless and tasteless; but the term colorless is clearly superfluous, for this gas, like all other mine gases, is colorless.

All gases may be colored by using some suitable material, but as nothing is to be gained by this process except to make visible the air or wave lines and lines of stratification, and as this is not material to the study of the present subject, no further notice will be taken of this matter. Lines of force cannot be seen, and remain invisible even when the gases are colored.

Carbon monoxide is somewhat lighter than air. It burns with a pale blue flame, like that over a freshly fed anthracite coal fire. It is poisonous, and it is said that 0.25 per cent. is fatal to life. The percentage of poisonous gases in mine air which are fatal to life are understood to be the percentage of such gases in air containing the same proportion of oxygen as atmospheric air. But as the amount of oxygen in mine air is reduced, the percentage of gas fatal to life is correspondingly lessened.

When present in mine air, white-damp may be detected by its effect on the lamp flame. It increases the brilliancy of the flame, making it a silvery color, and the

NOTE—From a paper read before the Mining Institute at Meyersdale, Penn., Tuesday, July 30, 1907. Copyrighted, 1907, by H. E. Gray, Berlin, Penn.

\*Mine superintendent, Berlin, Penn.

flame reaches upward to a narrow bluish pointed tip.

#### HYDROGEN SULPHIDE

This gas is rarely found in mines, except in cases of spontaneous fires in old goaves. It is detected by its smell, which resembles rotten eggs or the fumes of sulphur. The mine official may always know of its presence, in the absence of other proof, by keeping a record of the temperature of the old goaves. If the temperature of the gobs increases gradually until a very high point is reached, we may rightly conclude that hydrogen sulphide is being produced by decomposition of bodies containing sulphur in the presence of water. The chemical interchange of the atoms of the different gases increases the temperature gradually until it reaches the ignition point for hydrogen sulphide, when the whole of the body of gas bursts into flame. This, then, is the completed process of spontaneous combustion.

As already explained, it rarely affects any part of a mine except old goaves, so that its presence may always be detected by watching the thermometer. This is a sure and reliable test. Being a rather heavy gas it will fill an unventilated gob and remain in it much the same as water fills a sponge and its presence may not be known until ignition takes place. Therefore the temperature test should be regularly and carefully made.

#### GASES GENERATED

The two gases generated in mines, are: Olefiant gas ( $C_2H_4$ ), and marsh gas ( $CH_4$ ). The first named gas is found in mines in very limited quantities, and then only as a constituent of marsh gas, or more correctly speaking of fire-damp. When decomposition of vegetable matter occurs in a dry place away from air, olefiant gas is formed. We need consider it only as we find it in connection with fire-damp.

Marsh gas ( $CH_4$ ) is the most disastrous in its effects of any gas known to the mining fraternity. It is the product of decomposition of vegetable matter, when all air is excluded, and water present. It is always an occluded gas, and is to a greater or less extent a part of all coal formations.

Marsh gas is generated and evolved in mines in the following ways: First, as it is liberated by the opening of the pores and crevices of freshly cut faces of coal seams it transpires from the coal faces into the ventilation very quietly and cannot be noticed by any sound; second, in larger volumes from blowers and feeders in the coal; it also issues from crevices in the floor and roof of the coal seam, usually accompanied by some sound; third, when pillars are being removed in mines where the gas has found lodgment in some soft porous

stratum overlaid by a hard sandstone and when this stratum is broken and subsides, very large volumes fill the cavities, and in this form it is most troublesome to remove; fourth, it is sometimes given off as outbursts. We have no knowledge of such an occurrence in this country, but it has happened frequently in mines in Great Britain and Europe. Outbursts are no doubt due to top and bottom pressure in very gaseous seams having a hard impenetrable top and bottom. When marsh gas is mixed with mine air, it is called fire damp, and as such it is found in large quantities in nearly all of the large underground operations of western Pennsylvania.

The treatment of mine gases might be said to be the ways and means of providing for the "lives, health, safety and welfare of persons employed in mines," and as fire-damp is the chief source of mine accidents of large magnitude, I will discuss in detail the successful treatment of fire-damp in coal mines.

#### METHODS OF DETECTION

The first and most important step in the treatment of fire-damp is the detection of its presence. This is not as easy as it might appear to be. Of course, any miner by using an ordinary safety lamp may discover the presence of large quantities of the gas, but it requires careful, expert training to discover very small percentages. If we ever conquer this demon of the mines, and eliminate gas explosions, it will only be by a system of training for mine officials far in advance of the methods contained in text books of the past and present.

This system of training will enable the fire boss or mine official to determine the exact condition of the atmosphere of all places which he is required to examine, and as the safety lamp is the only practical device for testing such conditions, it will be necessary to train the fire boss with the safety lamp, what it is, and how to use it. He should understand the construction of the lamp, what should be its shape inside and out; the construction of a flame and how to use it; the kind of oil to use to obtain a flame of the proper quality for testing.

This flame should have the appearance of being glued to the wick; it should have no movement, either vertical or lateral. It should be a flame of great strength and tenacity and should have a strong, clean-cut outline. This can be attained by using a lamp of the proper construction, such as the Marsant, slightly improved, or the Gray lamp, and by using pure sperm oil or an oil of the same consistency.

He must know how to remove a section of the flame in making the "blue cap test." How to measure the cap by a graduated scale; how to measure the depth of gas between the roof-line and

the point where it intersects the flame.

It will scarcely be necessary for me to say to those familiar with this part of the subject, that the general belief is, that there must be a sufficient depth of gas so that it will intersect the point of the lamp flame before we can begin to measure it. But by using a lamp producing a motive column, and allowing one second for ignition, and then counting as, 1, 2, 3, 4, the depth of gas may be measured at almost any point between the roof-line and the flame.

In using the safety lamp, the fire boss should know how to make a test and then prove it. For this purpose he will first make a test of the outside atmosphere, note carefully the color, size and outline of the flame, photograph it upon his brain and then proceed to make his test in the mine workings. Any change in the size, color or outline of the flame will indicate the presence of some undesirable or dangerous condition which may be determined as already explained.

He will at all times use atmospheric air as his standard of comparison in proving tests made by him in mine air. The tests for proving the presence of fire-damp, are: First, where there are large accumulations, by the smell, which is a peculiar pungent odor, and by the touch or feeling, when the face comes in contact with it, as a cold, damp sensation will be noticed at the cheek bones, this being the most sensitive part of the body; second, in small accumulations and percentages, by the lamp flame; change of outline, vertical and lateral movement; size of flame and by the blue cap test, which proves its composition as well as its presence. In large dusty mines the Shaw gas testing machine should be used. Samples of air should be taken daily from the return currents and a careful record be kept of the percentage of fire-damp in the main returns.

#### EXPLOSIONS

The direct cause of many gas explosions is the inability of the fire boss to detect an exceptional condition in the atmosphere of the working place. This is usually a dip working, where the air is permeated from top to bottom with a very small percentage of fire-damp. The mine official has failed to detect this condition in his examination of the place. The miner has gone to work and after putting a charge of powder in a badly placed hole he has a blown-out shot. The compressive effect of the blown-out shot increases the pressure of the air and the percentage of gas. The flame from the powder ignites it and an explosion follows with its attendant results.

The most prolific source of mine explosions in western Pennsylvania, is from the improper and excessive use of materials for blasting, the use of open lights and mixed lights, and as long as



the present methods continue in effect we may expect repetitions of the calamities that have brought sorrow to hundreds of homes in the past 15 years as well as heavy losses to the mine owner by the destruction of property.

A few preventive measures could be adopted that would have a wonderful effect in reducing the frequency of mine explosions: First, adopt a thorough system of training for mine officials; second, forbid the use of open lights in gaseous mines; third, limit the charge of material used in holes for blasting rock and coal; fourth, in dusty mines have all coal dust and fine cuttings loaded and sent to the outside of the mine; fifth, rigidly enforce the provisions of the mine law with regard to gases, safety lamps and the use of explosives for blasting.

#### REMOVAL OF GASES

Nothing so far has been said about the removal of the gases, but as the method and means for the removal of one gas is the method and means for the removal of all gases, I have purposely omitted mention of this until now.

A plentiful supply of good, pure air, properly distributed according to some approved system of ventilation, is the only known remedy for the dilution and removal of mine gases. It has been proved from past experience, that, no matter how thoroughly a mine may be ventilated, it is not possible to so ventilate all of the places as to prevent some accumulations of gas and the accidents resulting therefrom in the way of explosions.

To enable us to make headway in the work of eliminating explosions, we must first know the nature of an explosion—and then we may be able to prevent it by the use of a mechanical device which will intercept it before it reaches the explosive or *trill* stage of development. Such a device would no doubt prove a success and is the only way in which mine explosions can be successfully and absolutely prevented and eliminated.

#### EXPLANATORY

The terms "fire-damp," "black-damp," etc., originated in coal mines in the north of England. One writer states that the word damp was derived from the German word *Dampf*, but the men who first used the term, knew as much about the German language as we know about the man in the moon. The British miner of that day, as a rule, did not have sufficient education to enable him to read and write the language of his own country, and his knowledge of mathematics consisted of what was known as a "nick stick," which was a piece of wood with notches or nicks cut in it something after the fashion of the teeth of a hand saw. Upon this and by the use of his ten figures he

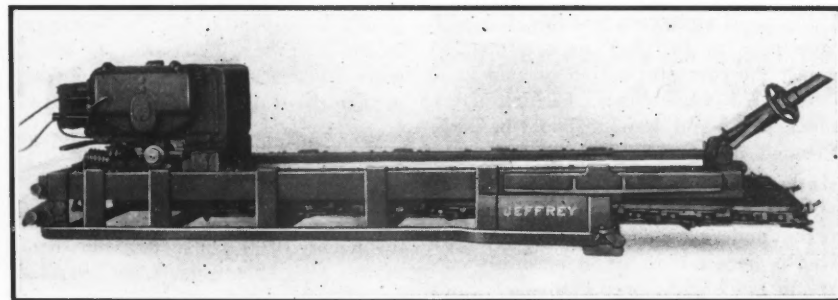
counted up his problems in arithmetic. The term "fire-damp" originated in the following way: It was first called "fire" because it could be ignited, and the word "damp" was added because there was a damp sensation when the miner came in contact with it.

So in black-damp, the gas extinguished the flame of the lamp, making the wick black and inky in appearance and it was only with great difficulty that he could relight it. In white-damp the flame became much whiter and brighter.

The British miner complained that all of these gases "put a damper" on his work; for at that time the safety lamp was unknown and it was not until the year 1816 that the miner's safety lamp came into use in the coal mines of Great Britain.

#### Coal Mining in Belgium

Consul H. A. Johnson, of Liège, states that the opening of the new coal mines in the Campine district is going ahead in a satisfactory manner. In the commune of



JEFFREY INCLOSED-MOTOR COAL-MINING MACHINE

Zolder the sinking of the first pit is nearing completion, and the company working this concession proposes sinking a number of other pits. At Coursel four pits will be sunk, work on them to be started at the earliest possible date. The two most important companies holding concessions in the district of Mechelen-sur-Meuse have amalgamated, and the preliminary work of opening these mines is going ahead rapidly. At Asch the work of exploiting is also being energetically pushed.

The most engrossing question in connection with the opening of these new mines is the difficulty of procuring sufficient labor. It is estimated that about 10,000 Flemish workmen are at present employed in the Walloon districts, and it is thought that nearly all of these men will return in time to take up-work in the mines; but this number is not nearly sufficient to meet the demand that will be created. Each of these concessions to be successfully operated will require probably from 2000 to 3000 men, and no one seems to know where they are to come from.

#### Jeffrey Inclosed-motor Mining Machine

Recognizing the danger of permitting electric motors of mining machines to run exposed to the gases of coal mines, the British Departmental Committee recommends the use of inclosed motors and auxiliary devices such as starters, terminals, etc., for all mines falling under the general rule No. 8 of the coal mines regulation act of 1887. In this country many of the mines are comparatively free from explosive gases and the open motor has found favor because of its accessibility and the smaller amount of space occupied. The Jeffrey Manufacturing Company has designed a motor which is entirely inclosed and still occupies practically no more space than motors of the open type. The motor is employed to drive the machine shown in the accompanying illustration.

The starting switch of the motor is also inclosed and all contacts are sealed in flame-tight metal casings. Over the commutator is a plate-glass door pro-

tected by an iron lid, through which the brushes may be observed without exposing the machine while in operation. The ring oiling bearings are so arranged that the oil seals the motor casings. The armature is drum-wound with machine-formed coils, and the pole pieces are of laminated sheet steel.

#### Creosoted Timber for Coal Mines

As a result of the successful test made of the chemical treatment for the preservation of mine timbers, a number of the large coal producers have adopted the creosote treatment for all timbers to be used about the mines. The Philadelphia & Reading will erect a plant of sufficient capacity to supply all the collieries of the company and possibly to supply some of the independent operators. The Lehigh Coal and Navigation Company has decided to build a plant of its own in the Panther Creek valley and the Luzerne companies are expected to do likewise.

# Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

## DEVELOPMENT AND MANAGEMENT

Where a check valve is used in a suction pipe it is essential to have also a foot valve to keep the suction pipe full. This foot valve is absolutely necessary when a condenser is started by priming. The check valve, when used, should be so constructed that it can be placed either horizontally or vertically.

Many of the most serious boiler explosions are due to defective blow-offs. Blow-off pipes should be protected by an asbestos sectional covering which will overcome the corrosion of the pipes by hot gases, and the undue expansion and contraction due to sudden cooling of temperature when the fire door is opened for coaling.

Experience has shown that it is well, in the anthracite field, to paint the interior of the water end of pumps with a thick coat of asphaltum and then line with white pine  $\frac{3}{4}$  in. thick as a protection against the corrosive action of acid mine water. All valve seats, backing-plates, guides, stems and springs should be made of tough acid-resisting phosphor-bronze.

In locating an air shaft in a gassy mine the best location is in the highest part of the underground workings. As fire damp is lighter than air, it naturally collects in the highest part of the workings and by locating the air shaft there the removal of gas is greatly aided. In the southern part of the anthracite field it is not uncommon to find air shafts located on the outcrop of the veins.

When the dip of a slope does not exceed 40 deg., the usual height is 7 ft. clear from the top of the rail to the roof, measured at right angles to the dip. On steeper pitches where the raising of cars is done on slope cages a greater height is necessary. It all depends on the manner in which the cages are constructed. Where the cars are hoisted on "gun boats" the ordinary height of 7 ft. is sufficient.

In dealing with a stubborn mine fire the damage done by fire is very small compared with that done by the water. After a fire in a gassy mine is extinguished a careful examination of the mine will show that the confined gas in the high parts of the mine has played an important part in extinguishing the fire. For this reason it is well, in such cases, to keep all the gas in the mine as long as the mine is on fire. Much depends on the extent of the fire and the quantity of gas generated. If the water is withdrawn too early, before the fire is out, explosions are sure to follow.

A common style of timbering at the foot of shafts includes center props. Many of the accidents to mules and drivers can be traced to this center prop. In modern mines this kind of timbering is largely eliminated by using heavier timber which does not require a center prop. A still further improvement in the bituminous and anthracite coalfields is the use of I-beams at the foot of the shaft as well as at turnouts in various parts of the mines.

Before connecting an injector, the steam pipe should be well blown out with steam to clear it of scale and dirt that may be lodged in the pipe. If this precaution is omitted the red lead or dirt will interfere with or stop the action of the injector. At the feed end of the pipe a strainer should be attached, the openings of which should correspond to the smallest openings in the injector. This strainer should always be attached when there is dirt or dust in the water.

When installing a pump, careful attention should be given to the size of the water supply and discharge pipes. As the resistance increases with the increase in the length of the pipe line the diameter of the pipe should increase correspondingly. The correct sizes for certain distances may be found as follows, taking 25 ft. as the unit: For a distance of 50 ft., increase diameter 20 per cent.; 100 ft., 30 per cent.; 150 ft., 40 per cent.; 200 ft., 50 per cent.; 300 ft., 60 per cent.

In both anthracite and bituminous mines where much local water is encountered, the electric pump has demonstrated its great value. The pumps are usually mounted on a truck so that they may be taken from point to point in the mine and used wherever desired. Sumps may be located at different places in the mine and the pump may be moved to them without drawing all the water to one sump. Little attention is required by a sump of this kind and the operating expenses are proportionately low.

In an anthracite colliery boiler plant where a blower is used, the blower should be effective in producing a draft perfectly under control and at the least expenditure of steam. Firing with positive draft is always necessary when inferior grades of fuel, such as rice and barley, screenings of bituminous coal, and gas-work breeze are used. It provides a means of increasing the steam capacity of boilers with low-grade fuels. When a blower is used on a boiler of 200 h.p. the

diameter of the steam pipe for the blower should be at least  $1\frac{1}{4}$ -in. in diameter which will deliver about 25,000 cu.ft. of air per hour.

The idea that wire rope is a modern invention is erroneous. The excavation of Pompeii brought to light a piece of bronze wire rope about 15 ft. long and one inch in circumference. It is made up of three strands, each strand of 15 wires twisted together. In construction it does not differ materially from the wire rope of today. Pompeii was buried 1829 years ago. How long wire rope had then been known it is not possible to tell, but judging from the construction of the sample discovered it must have been known for some time. Ropes in tramways are said to have been in use as early as 1644. Rope driving was common a century and a half ago.

The body and yoke of a blow-off valve should be made heavy. The main valve should be operated by a large hand wheel and should be made with a renewable hard composition seat and soft disk. To open an anti-leak valve the small wheel is turned and the piston is drawn up into the main stem; then the large wheel is turned which opens the main valve. On closing this valve, the large wheel is first turned, bringing the main valve to its seat and then the other part of the valve is brought down by means of the small wheel. If the main valve leaks the water will find its way around the inner spindle and press the indurated fiber disks against the body of the valve and thus prevent leaking.

Reliability and economy in using a steam trap depend chiefly upon the way it is manipulated. To get the best results the following order of manipulation should be observed. First, let the steam into the trap, then run the nut that is on the spring bolt, between the lever and frame of the trap, up against the frame and continue turning it until the lever is pressed down sufficiently to insure the passage of steam through the trap. When the brass pipe is thoroughly heated by the steam, run this nut down again until the short piece of pipe between the nut and the under side of the frame is sufficiently loose to be turned readily with the thumb and finger. When the trap is attached to pipes where a lower temperature is required, which is often the case when applied to vacuum pans, run the nut down the bolt a little more. A little practice will enable an engineer to get just the heat desired. If possible, the trap should be placed vertically.



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## Copper

Never within present memories has there been such a remarkable decline in the price of copper as 1907 has witnessed. At the middle of last March the price for electrolytic copper was 25 $\frac{3}{8}$ c. per pound; at the middle of October its price was 12 $\frac{3}{4}$ c. (and today is much lower), showing a decline of 50 per cent., although at the beginning of the year we were being assured by the prophets that the price for copper would never again be less than 20c. because the electrical development of the world was to be so marvelous.

The decline in copper has been accompanied by declines in the prices for the other metals, but with the exception of antimony they have not been so severe. Lead, which stood firmly at 6c. from Jan. 1 to June 3, is now at 4 $\frac{3}{4}$ c. nominally, but actually is lower. Spelter was at 68 $\frac{1}{2}$ c. on March 13, and was at 5.10c. on Sept. 14, since when there has been a slight recovery. Tin was at 43 $\frac{7}{8}$ c. on May 22 and at 33 $\frac{1}{4}$ c. on Oct. 16. Pig iron, No. 2 foundry, was \$25.85 at Pittsburgh, Jan. 10, and \$20.40 on Oct. 17. Ordinary brands of antimony sold at 24 $\frac{1}{4}$ c. on Jan. 22, and for 8 $\frac{7}{8}$ c. on Aug. 27, since when there has been a slight recovery. It is obvious, consequently, that the price for copper has suffered from conditions which have affected all the metals, but if we except the case of antimony, which is of comparative insignificance, the decline in copper has been most severe because of the intimacy of a large part of its consumption with broad questions of finance.

At present it appears as if we had not yet seen the end of the decline in spite of the artificial curtailment of production. The combination of many factors which have destroyed confidence in the commercial situation, and the pressure of producers of copper to realize cash, have led to a continuously declining tendency which apparently can be stopped only by the operation of natural forces. These are a resumption of demand or a further curtailment of production for the good and sufficient reason that copper can no longer be produced profitably for the price it brings in the market. The situation offers only this consolation: If the bottom has not yet been reached, it is not row so far away as it was, because we have approached more nearly to the actual cost of a large part of the production.

Together with the decline in the price for the metal there has been a heavy fall in the stock market. In the pessimism that results from such a break, many persons have come almost to believe that our great mines—the rich veins of Butte, the large and persistent lodes of Lake Superior, the immense masses of Bisbee, the extensive blanket deposits of Ely and Clifton, and the mountain of ore at Bingham—have shrunk in size and in tenor of the metal. It is needless to say that these mines are as good now as they were six months ago, although they are not yielding the unnatural and ephemeral profits of that time. The depression in the stock market has been caused by many, who do not doubt the real value of the shares they have been holding, being compelled to sell. Persons who hold such stocks for investment, where no doubt exists as to the cash resources, ore reserves and conservative management of the property should under existing circumstances practically disregard current quotations for the shares. The elimination of the wild-cats and doubtful enterprises floated on an 18c. market is salutary, although it may be painful to the thoughtless who were led into them.

As to the future of copper we are not so pessimistic as the common feeling at the present time. There is an old adage that it is "always darkest before dawn." Sentiment changes quickly, and another month may see people as hopeful as now they are depressed. There are several precedents for a quick recovery in copper after a great decline. The collapse of the Secretan corner put the price for Lake copper down to 11c. in September, 1889, but in September, 1890, the price was 17c. The collapse of the Amalgamated umbrella in 1901 caused the price for Lake copper to go down to 11 $\frac{1}{2}$ c. in November, 1902, but by the following March it was 14 $\frac{3}{4}$ c. Attention is called to the past history of the copper trade by an exceptionally well informed correspondent whose communication is published elsewhere in this issue. His views are worthy of most careful consideration. It is true that the present accumulation of copper has been greatly overestimated. Our own estimate under date of Sept. 21 was a stock not exceeding 180,000,000 lb. Our correspondent estimates 170,000,000 lb. on Sept. 30. A stock of that amount is only a small percentage of the consumption under normal conditions, and it

is confidently to be expected that it will be quickly swept away when confidence is sufficiently restored to lead consumers into the market again. It is absurd to assume that the extraordinary recession of consumption that we have lately experienced is going to continue indefinitely, and when the rate does return to the normal—when the banking troubles are over, when the speculators have been finally curbed, and when business confidence is generally restored—we may see a revival of demand so sharp that the crippled producing facilities can not promptly meet it. Before that we may see a further depression, even to nearly cost of producing the bulk of the output, which probably is between 10 and 11c. per lb., but who can doubt that after the market has come into a natural balance the beam will swing upward again? What we should hope for is an elimination of the unhealthful conditions which have created prices of 25 $\frac{3}{4}$ c. and 11 $\frac{3}{4}$ c. in but little more than a half-year. The natural laws of trade cause fluctuations in price, but not so tempestuously.

The present is a time for cool thinking and conservative action. Those who own good copper-mining stocks should keep them, relying confidently upon the day when they will sell for their intrinsic value and far above the panic prices of this October.

### Gold and Silver Production in the United States

The corrected and final statement of Director of the Mint George B. Roberts, the issue of which in his last official act, shows, on comparison with the preliminary estimate made early in the year, a decrease of 1.8 per cent. in the total production of gold reported for the United States, but an increase of 0.6 per cent. in that of silver. The early estimate and the corrected figures compare as follows:

	Estimated.	Complete.	Difference.
Gold, value....	\$96,101,400	\$94,373,800	D. \$1,727,600
Silver, ounces.	56,183,500	56,517,900	I. 334,400

In compiling the earlier figures of gold production which are, of necessity, largely estimated, it is difficult to avoid some exaggeration. The tendency in every State and district is to make the total as large as possible, and the data at hand are not always sufficient to make the necessary corrections. Hence it is not surprising that the final figures should

show some changes; but the total difference is not, after all, a large one.

The final statement is as follows, gold being given in our table by values only; silver in fine ounces and commercial value:

	Gold. Value.	Silver.	
		Ounces.	Com. Value.
Alabama.....	\$23,500	100	\$ 68
Alaska.....	\$21,365,100	203,500	137,747
Arizona.....	2,747,100	2,969,200	2,000,322
California.....	18,832,900	1,517,500	1,027,180
Colorado.....	22,934,400	12,447,400	8,425,520
Georgia.....	23,700	300	203
Idaho.....	1,035,700	8,836,200	5,981,135
Michigan.....	.....	186,100	125,969
Missouri.....	.....	31,300	21,187
Montana.....	4,522,000	12,540,300	8,488,404
Nevada.....	9,278,600	5,207,600	3,524,972
New Mexico.....	266,200	453,400	306,902
North Carolina..	90,900	24,700	16,719
Oregon.....	1,320,100	90,700	61,394
South Carolina..	74,600	100	68
South Dakota....	6,604,900	155,200	105,053
Tennessee.....	800	25,600	17,328
Texas.....	3,400	277,400	187,769
Utah.....	5,130,900	11,508,000	7,789,650
Virginia.....	10,300	100	68
Washington.....	103,000	42,100	28,497
Wyoming.....	5,700	1,100	745
Total.....	\$94,373,800	56,517,900	\$38,256,400

Changes in the various States are larger in proportion than those in the total. This was to be expected, since the earlier statement is compiled largely from returns made by various assay offices and smelters, most of which handle gold and silver from different States, and the exact separation according to origin is a matter of time and care. The more important changes in the gold returns are reductions of \$537,200 in Nevada production; \$476,700 in Arizona; \$249,600 in Washington. The larger increases were \$199,000 in California; \$163,200 in Colorado; and \$114,000 in Alaska. In silver the notable changes were a reduction of 1,535,300 oz. in Nevada, and of 578,900 oz. in Idaho; these were offset by increases of 1,061,600 oz. in Montana, 221,400 oz. in Arizona and 199,300 oz. in Colorado.

Comparing the completed returns with those for 1905, there were increases of \$6,193,700, or 7 per cent., in the gold production; and of 416,300 oz., or 0.7 per cent., in silver. The increase in the commercial value of the silver was \$4,397,942, or 13 per cent., owing to the higher average value of the metal in 1906.

### Treatment Charges on Cripple Creek Ores

The recent cut in ore treatment charges announced by the Mill Trust, effective Oct. 15, and heralded by the daily press as "Sweeping Reductions, etc.," are by no means so.

Two rates have been in effect for some time past, viz. (1) the "open rate" available to anyone having ore to sell to mill or

sampler, and (2) the "contract rate" available to those who saw fit to contract the output of their mines for one or more years. A comparison of the following table will show that the reduction over contract rates in force is not worth considering. (The prices include freight in all cases).

On Ore Assaying.	Old Rate Open.	New Rate Open.	Contract Rate, Old.
Up to $\frac{1}{2}$ oz.....	\$6.25	\$5.25	\$5.75
$\frac{1}{2}$ to $\frac{3}{4}$ oz.....	7.50	5.75	6.50
$\frac{3}{4}$ to 1 oz.....	8.00	6.50	6.75
1 to 1 $\frac{1}{4}$ oz.....	9.00	7.25	7.25
1 $\frac{1}{4}$ to 1 $\frac{1}{2}$ oz.....	9.25	7.50	7.50
1 $\frac{1}{2}$ to 2 oz.....	10.25	8.50	8.50
2 to 5 oz.....	11.50	9.50	9.50

Thus it appears that the reduction from the previously existing contract rates is only 50c. per ton in the case of ore containing less than 0.5 oz. of gold, 75c. on ore of 0.5—0.75 oz. grade, and 25c. on ore of 0.75—1 oz. grade. Above 1 oz. there is no reduction. Consequently when it be remembered that the average of Cripple creek ore is probably somewhere between 1 and 1.25 oz. gold per ton the "sweeping reduction" in Cripple Creek ore treatment is not very apparent. The small shipper, who has not contracted his output, will it is true receive some advantage from the recent change, but those who have contracted their ore in advance and borne the burden of the heavy treatment charges, will not see much in the new situation to be thankful for.

JUDGING BY THE ACTIVITY of the prospector the present mining industry of Mexico is only a promise of what it will be later on. According to statistics issued by the government of that republic, more than 2600 titles to mines were granted during the half year ending last June, which shows an increase of 600 as compared with the first half of the year. The titles for the year cover 71,347 pertenencias, or claims, equal to 176,227 acres of mineral land.

THE STEAM SHOVEL and huge open-pit operations are conspicuous features of American metal mining. The method now promises to extend to the mining of coal. The Lily-Jellico Coal Company of Lily, Ky., has awarded a contract to remove 9,000,000 cu.yd. of earth, equivalent to 10 ft. over approximately 600 acres of coal lands. The property is said to contain a 4-ft. seam of coal, which will be laid bare by this extensive stripping operation.



# Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

## CORRESPONDENCE AND DISCUSSION

### Copper—Past, Present and Future

The present unsettled state of the copper market makes it advisable to look back at the development of the copper industry during the last 20 years. When Secretan conceived the idea that the demand for copper for electricity would overtake production, the world's production in 1887 was 224,000 tons; last year's production has been estimated at 735,000 tons, an increase of 511,000 tons in 19 years, or about 228 per cent., i.e., about 12 per cent. per annum. Looking closer at these figures and comparing the world's production at five-year periods we find:

1887.....	224,000 tons	
1892.....	310,000 tons	+ 39%
1897.....	310,000 tons	+ 39%
1902.....	541,000 tons	+ 64%
1906.....	735,000 tons	+ 86%
		228%

During the last 25 years production increased every year except 1893, when there was a decrease of 7000 tons, or hardly 3 per cent.; but the American production did not show a falling off even in 1893 in spite of the depression prevailing here. The domestic production has increased from 181,000,000 lb. in 1887 to about 918,000,000 lb. in 1906. The year 1907 is, however, going to be a remarkable one, inasmuch as it is going to show a decrease in this country's and the world's production.

The domestic production for the first six months of 1907 is estimated at 450,000,000 lb.; for the remainder of the year the actual and probable production may be estimated as follows: July, 70,000,000 lb.; August, 65,000,000; September, 60,000,000; October, 50,000,000; November, 50,000,000; December, 40,000,000. This will give a total of 785,000,000, or a falling off of over 130,000,000 lb. as compared with 1906. This falling off in the American production is most likely going to bring the figures of the world's production to below 685,000 tons, or to the level of 1905. Can anybody familiar with the development of the copper industry, for a moment doubt that this means an extreme shortage of supplies within a year or two, when financial conditions will have righted themselves?

The world's consumption of copper has fallen off repeatedly in the past, especially in 1888, 1893 and 1901, and large stocks were accumulated during these periods which disappeared, however, in the shortest possible time. The stocks which are being carried by producers to-day will disappear the moment confidence is re-

stored. The consumption of copper in the United States is estimated as follows:

	Tons.
1901.....	176,000
1902.....	224,000
1903.....	241,000
1904.....	214,000
1905.....	277,000
1906.....	316,000
1907.....	200,000

Such a falling off in consumption is unprecedented and unnatural and cannot last; it must rebound and we are bound to return to more normal conditions. At the beginning of 1902 about 225,000,000 lb. of copper were thrown on the market and in spite of this electrolytic sold at 15c. a little over a year later. When Secretan failed in 1889, nearly 400,000,000 lb. had been accumulated, yet copper sold at 17c. within a year after the failure. Consumers ought to bear this in mind.

Reports respecting stocks of refined copper on hand are vastly exaggerated; everybody knows that stocks were practically exhausted at the beginning of the year. I estimate the present stock of refined copper as follows:

	lb.
On hand January 1.....	45,000,000
Production January-September as above .....	645,000,000
Imports .....	220,000,000
	910,000,000
Exports .....	380,000,000
	530,000,000
Absorbed by consumption.....	360,000,000
Stocks, Oct. 1.....	170,000,000

This estimate assumes consumption at 450,000,000 lb. for the year compared with 700,000,000 lb. last year, 620,000,000 lb. in 1905 and 480,000,000 lb. 1904.

It is true that present conditions are not normal, but sooner or later more normal conditions are going to exist and the present production of copper will be inadequate for the consumption.

CUPRUM.

Boston, Oct. 19, 1907.

### Grubstaking Up-to-date

The Alaska Mines Exploiting Syndicate of Nome, Alaska, as its name signifies, is not a modest enterprise. It aims to do business on a grand scale, and to surround its operations with an atmosphere of the utmost respectability. It wishes to acquire extensive holdings of mineral lands, but to go out into the market and buy claims is frequently inconvenient. Moreover, the syndicate wishes to associate with it mining men of standing and

reputation; and the last of its needs is some ready cash. All of these needs are to be supplied at one and the same time by an ingenious scheme.

Mining men have recently received communications from the syndicate calling attention to certain highly promising new mining districts in Alaska. The letter continues: "We are acquiring large acreage of the newly discovered placer ground by location and intend to prospect and mine it extensively next summer. We would ask you to read over carefully the inclosed contract, which is self explanatory, and suggest that you execute same, together with your power of attorney, and return to us with deposit of \$50 covering expense and we will stake you in, sending you duplicate contract at once, and certified copies of location certificates as soon as the locations are completed. An offer to buy or lease any interest acquired in your name will be made you in the winter by us. We desire to use only the names of prominent mining men in locating up this ground for the best interests of the company and the country."

In addition to the deposit of \$50 the recipient of this generous offer is asked to surrender his power of attorney to some person to be selected by the party of the first part, the syndicate, the name to be filled in "on the ground."

#### TERMS OF THE CONTRACT

The contract which the fortunate possessor of a spare \$50 is to sign before the proper authorities, contains among others the following clauses:

"The party of the first part," i.e., the syndicate, "agrees to pay all the necessary expenses of grubstaking and maintaining said agent, of exploitation, prospecting and locating mining claims where unappropriated mineral ground may be found in Alaska, and recording the location notices thereof; that the name of the party of the second part shall be used as locator of at least two mining claims; that such location shall be made in accordance with the United States mining laws, and the notices recorded in the office or the recorder of the respective districts in which such property is located and sent to the office of the party of the first part in Nome, Alaska, and a certified copy thereof be sent to the party of the second part."

"It is further understood and agreed between the parties hereto that this contract shall not in any wise be construed as a grubstake contract, and neither party hereto shall be liable unto the other

in any other manner than herein above set forth."

The syndicate's generosity is almost reckless; there is a clause binding it to return the money in case its prospector fails to find any ground in Alaska not already located. However, people do not seem to be crowding each other over the edges of that vast, bleak territory. There is no mention of development work; but that is a petty detail which the syndicate will probably settle out of its \$25 per claim.

Most remarkable omission of all; the contract contains no agreement to buy or sell the claims that prove valuable. How is the syndicate going to live if it retains no hold upon the claims which it so generously finds and develops for prominent mining men? What is to prevent the holder of a rich claim from boosting the price away out of sight, and robbing the syndicate of all profit? Can this be an oversight? Surely, a concern so modern and progressive as the Alaska Mines Exploiting Syndicate could not be guilty of so serious a lapse of business sagacity. Generosity is fine and noble, especially in a mining corporation, but no great syndicate can afford to give away all hope of profit.

BROMIDE.

Pueblo, Colo., Oct. 10 1907.

### Multiple Arrangement of Drills on the Rand

In the JOURNAL of Sept. 28 appeared an interesting article by Edgar Nichols, entitled "Multiple Arrangement of Drills on the Rand." I called the attention of W. P. J. Dinsmoor, of Denver, to this article, and requested him to make some comment on it in comparison with Colorado tunnel practice. Mr. Dinsmoor is the author of an article entitled "Western Practice in Tunnel Driving" which appeared in the May number of *Mine and Quarry*. I inclose a copy of Mr. Dinsmoor's reply.

S. BOWLES KING.

Chicago, Ill., Oct. 14, 1907.

The article in the JOURNAL of Sept. 28, by Edgar Nichols, entitled "Multiple Arrangement of Drills on the Rand," opens the way for some very interesting investigations as to the conditions governing the speed of driving mining tunnels. *Mine and Quarry* for May, 1907, published an article under the title "Western Practice in Tunnel Driving," which gives figures that cover a rapidly driven tunnel in the Cripple Creek district of Colorado. Taking the figures from these two articles we have the following comparative table:

	Rand.	Cripple Creek.
Size of bore.....	5 x 7 ft.	9 x 9 ft.
Rate of progress per mo.....	225 ft.	375 ft.
Number of machines used per shift.....	3	2
Number of men employed per shift.....	8	6
Number of holes drilled per round.....	15	20
Length of shift, hours.....	8	8
Max. distance over which spoil had to be trammed	800 ft.	8500 ft.

From the above figures we can strike averages and derive the following:

	Rand.	Cripple Creek.
Lineal feet advance per shift	2.43	4.03
Cu. ft. rock broken per shift	85.05	326.43
Percentage of advance, lineal feet.....	60%	.....
Percentage of advance, cu. ft.	26%	.....
Percentage of machines used	150%	.....
Percentage of men used.....	133%	.....
Percentage of holes drilled per round.....	75%	.....

The work on the Rand was carried on with a greater number of men and machines. The article in the JOURNAL also brings out the fact that the Rand tunnel was driven to single track size to be later widened to accommodate double tracks. Not so with the Cripple Creek tunnel, which was at all times kept up to its required width.

That there must be causes for the difference in speed as shown above, is self evident. These causes must rest upon four things, viz., the hardness of the rock; the method employed in doing the work; the efficiency of the men; and the efficiency of the machinery.

The rock encountered in the Rand tunnel was undoubtedly harder on the average than that in the Cripple Creek tunnel, though some of the rock at Cripple Creek was probably as hard. The cylinder diameter of the drills used in the Rand tunnel was  $3\frac{1}{4}$  in. and that of the Cripple Creek drills was  $3\frac{1}{8}$  in. The drills in the Rand tunnel put in on an average five holes each per shift, while those in the Cripple Creek tunnel averaged 10 holes each per shift. In view of these facts it would hardly seem that the rock, even if much harder on the Rand, could be held entirely responsible for the difference in the speed accomplished.

It may be that the Rand tunnel was being widened at the same time that the heading was being advanced, in which case it is possible that the tracks over which the spoil from the heading was being trammed were more or less blocked by the drills and the broken rock at the point where widening was in process. This blocking, if extensive enough, might well be the cause of delays in getting the spoil away from the heading and thus delay the work of advancing the heading. From the data that we have at hand, this would not seem to be the case, and it would appear that a round of holes was drilled and shot each shift. Therefore, it would not be right to charge delays to this until further confirming information be secured.

The fact that the Rand tunnel was driven smaller than the Cripple Creek tunnel may also account for some delay. While it would naturally seem that a small tunnel could be driven faster than a large one, at the same time this has not always been the case. The larger tunnel in some cases can be driven faster than the smaller tunnel owing to the fact that the rock breaks more easily. The powder having a larger face to work on, consequently breaks deeper per round, and the larger

tunnel also gives more room in which the drillmen and shovelers may work, so that a round of holes is drilled fully as quickly in the larger tunnel, or even more quickly, and the additional size gives the shovelers the additional room necessary to get out a larger amount of rock.

The difference in the speed of drilling can hardly be charged up to the hardness of the rock. Therefore, it would seem that it must be charged either to the method employed, i.e., that of driving a small tunnel instead of a larger tunnel, or to the efficiency of the men or machines employed.

Mr. Nichols in writing his article had quite another point in view and so did not give additional data that would be interesting and valuable in trying to arrive at these conclusions. In reading the two articles, one is at once struck by the fact that it is likely that nearly the same methods have been followed in driving these two tunnels, as to ventilation, time saving, etc., and that the principal difference in methods were in the manner of using the rock drills and in the breaking the full tunnel either in one or in two operations. The securing of additional data and the stimulation of discussion of this matter might well bring results that would be instructive and valuable.

W. P. J. DINSMOOR.

Denver, Colo., Oct. 5, 1907.

### Mining in the Forest Reserves

The recent articles on this subject in the JOURNAL have led me to investigate the matter in Idaho. I do not find that the department has, as yet, refused to issue patents to mineral lands within the lines of the forest reserves, but I find that it is the practice to send an agent of the Forestry Division to look into the merits of mineral applications for patent. These agents do not appear to know very much about the business, and have, as a consequence, caused some ill feeling. One occurrence is that of the Federal Mining and Smelting Company, which is developing a large group of claims called the "Western Group," located on the west end of the Wardner mineral zone. The company paid nearly \$250,000 for this group, and has since expended about \$50,000 in equipping and sinking a shaft on the same. The claims have been located and held from 10 to 20 years, in accordance with the mining laws. Since the creation of the reserve an application has been made for patent. The department sent an inexperienced kid to pass on the matter. He looked over the ground and proposed to the general manager of the Federal company that if the claims were really held in good faith as mineral claims, the work, instead of being confined to a shaft and the cross-cuts and drifts from it, should be scattered on each of the claims of the group! The final action of



the department is not known, but it is likely sooner or later to lead to some difficulty.

I know also of other cases where the department has looked into claims without regard to the fact that the claims have been located and held many years before the establishment of the reserve, but in all the final decision has not been reached. I have also heard some complaint from the mining companies in regard to the regulations governing the removal of mining timber, this complaint, especially from the Federal company, which is by far the largest user, but as any departure from the former free and easy methods of the past is bound to meet considerable adverse criticism, I think it is hardly time to say that the industry of mining is hampered in this regard.

H. N. W.

Wallace, Idaho, Oct. 12, 1907.

### New Publications

- MAP OF BULLFROG DISTRICT, NEVADA, 1907. 22x26 in. Paper covers, 50c. Denver, Colo., 1907: Clason Map Company.
- HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES (FOR BUYERS AND SELLERS). Pp. 1224. 7½x10 in.; cloth, \$10. New York, 1907: Samuel E. Hendricks Company.
- ANNUAL REPORT OF THE COMMISSIONER OF MINERAL STATISTICS, MICHIGAN. By James L. Nankervis, Commissioner. Pp. 245; illustrated. 5¼x9 in.; cloth. Houghton, Mich., *Gazette* Print.
- JOURNAL OF THE IRON AND STEEL INSTITUTE, VOL. LXXIII, No. 1, 1907. Edited by Bennett H. Brough. Pp. 638; illustrated. 5½x8½ in.; cloth. London, 1907: E. & F. N. Spon, Limited. New York: Spon & Chamberlain.
- THE GRANITES OF MAINE. By T. Nelson Dale, with an introduction by George Otis Smith. U. S. Geological Survey, Bulletin No. 313. Pp. 202; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.
- THE GEOLOGY OF NORTH CENTRAL WISCONSIN. By Samuel Weidman, Geologist, Wisconsin Geological and Natural History Survey. Bulletin No. XVI. Pp. 697; illustrated. 6½x9½ in.; cloth. Madison, Wis., 1907: Published by the State.
- PUBLIC ROADS, THEIR IMPROVEMENT AND MAINTENANCE. By E. R. Buckley. Missouri Bureau of Geology and Mines, Vol. V, 2d Series. Pp. 124; illustrated. 6½x10 in.; cloth. Jefferson City, Mo., Hugh Stephens Printing Company.
- THIRTY-SECOND ANNUAL REPORT OF THE CHIEF INSPECTOR OF MINES TO THE GOVERNOR OF THE STATE OF OHIO FOR THE YEAR ENDING DEC. 31, 1906. George Harrison, Chief Inspector of Mines. Pp. 483; illustrated. 6¼x9½ in.; paper. Columbus, Ohio, 1907: F. J. Heer, State Printer.
- TRANSACTIONS OF THE INSTITUTION OF MINING AND METALLURGY, Volume XVI. Edited by A. C. Claudet, S. Herbert Cox, William Gowland and C. McDermid. Pp. 444; illustrated. 5½x8½ in.; paper, \$7.50. London, 1907: E. & F. N. Spon. New York: ENGINEERING AND MINING JOURNAL.
- REPORT OF A COMMISSION APPOINTED BY HIS EXCELLENCY THE LIEUTENANT-GOVERNOR TO INQUIRE INTO AND REPORT UPON THE USE OF WINDING ROPES, SAFETY CATCHES AND APPLIANCES IN MINE SHAFTS. Pp. 324; illustrated. 8½x13½ in.; paper. Pretoria, Transvaal, 1907: Government Printing and Stationery Office.
- NEW ZEALAND. PAPERS AND REPORTS RELATING TO MINERALS AND MINING, COMPRISING STATEMENT BY THE MINISTER OF MINES; REPORT ON THE GOLD-FIELDS; REPORT ON COAL MINES; STATE COAL MINES. Pp. 197; illustrated. 8½x13 in.; board covers. Wellington, New Zealand, 1907: John Mackay, Government Printer.
- THE GEOLOGY OF THE PARAPARA SUBDIVISION, KARAMEA, NELSON. By James McIntosh Bell, assisted by J. H. Webb and E. DeC. Clarke. Bulletin No. 3 (new series), New Zealand Geological Survey. Pp. 111; illustrated. 8½x11 in.; paper. Wellington, New Zealand, 1907: John Mackay, Government Printer.
- JOURNAL OF THE IRON AND STEEL INSTITUTE, VOL. LXXIV, 1907, No. II. Edited by Bennett H. Brough, Secretary. Pp. 247; illustrated. 5½x8½ in.; cloth. London, 1907: E. & F. N. Spon, Limited. New York: Spon & Chamberlain.
- Contents. Copper steels, by P. Breuil. Cast iron as cast and heat treated, by W. H. Hatfield. The non-metallic impurities in steel, by E. F. Law. The geology and origin of the Lapland iron ores, by O. Stutzer. Boron steels, by L. Guillet. The effect of air and moisture on blast-furnaces, by J. Dawson.
- INDIANA DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES—THIRTY-FIRST ANNUAL REPORT, 1906. W. S. Blatchley, State Geologist. Pp. 772; illustrated. 6x9 in.; cloth. Indianapolis, Ind., 1907: Department of Geology and Natural Resources.
- Contents. Introductory. The natural resources of Indiana, by W. S. Blatchley. On the peat deposits of northern Indiana, by A. E. Taylor. The iron-ore deposits of Indiana, by C. W. Shannon. The petroleum industry in Indiana in 1906, by W. S. Blatchley. The Princeton petroleum field of Indiana, by R. S. Blatchley. Report of the State Supervisor of natural gas for the year 1906, by B. A. Kinney. Report of the State mine inspector for the year 1906, by J. Epperson.
- ANNUAL REPORT OF THE STATE GEOLOGIST OF NEW JERSEY FOR THE YEAR 1906. Henry B. Kümmel, State Geologist. Pp. 192; illustrated. 6x9 in.; board covers. Trenton, N. J., 1907: Geological Survey of New Jersey.
- Contents. Administrative report. The fire-resisting qualities of some New Jersey building stones, by W. E. McCourt. The glass-sand industry of New Jersey, by H. B. Kümmel and R. B. Gage. The origin and relations of the Newark rocks, by J. Volney Lewis. The Newark (Triassic) copper ores of New Jersey, by J. Volney Lewis. Properties of trap rocks for road construction, by J. Volney Lewis. Notes on the mining industry, by H. B. Kümmel.
- ILLINOIS STATE GEOLOGICAL SURVEY, BULLETIN No. 4. Year-Book for 1906. H. Foster Bain, Director. Pp. 260; illustrated. 5¼x8½ in.; cloth. Urbana, Illinois, 1907: University of Illinois.
- Contents. Administrative report for 1906, by H. Foster Bain. Report on the cooperative topographic survey, by H. M. Wilson. Preliminary investigation of Illinois fire-clays, by R. C. Purdy and F. W. DeWolf. Limestones available for fertilizers, by F. B. Van Horn. Analyses of certain silica deposits in southern Illinois, by H. Foster Bain. Contributions to the study of coal, by H. Foster Bain, S. W. Parr, F. F. Grout, W. F. Wheeler, A. N. Talbott, David White and J. A. Udden. Stratigraphic work in the vicinity of East St. Louis, by N. M. Fenneman. Notes on the geology of southern Calhoun county, by S. Weller. Water resources of the Springfield quadrangle, by T. E. Savage. The mineral industry in 1906, by H. Foster Bain.

### Erratum

In the article on "Construction of Tracks in Coal Mines," by M. S. Hachita, in the *JOURNAL* of Oct. 5, line 48, col. 1, p. 643, should read "in the gage-line of the outside rail" instead of "in the center of the curved track."

In the *Revue Scientifique* (Aug. 31, 1907) C. Féry gives a short illustrated account of the new methods of determining high temperatures in industrial operations. For temperatures from 700 to 1300 deg. C. he recommends a thermoelectric couple of platinum and its alloys, in combination with a self-registering arrangement. Where the thermo-couple would be injured if brought into direct contact with the source of heat, he advocates the use of his own pyrometer, in which the radiation from the source is concentrated by a concave mirror upon the thermo-junction. For sources of small dimensions at temperatures above 900 deg. C. optical pyrometers, e.g., Wanner's, are the most useful.

# 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.

### ALUMINUM

**ALUMINUM ALLOYS**—Process for Improving Aluminum Alloys by Heating and Chilling. Ferdinand G. A. Wilm, Drewitz, Germany. (U. S. No. 868,383; Oct. 15, 1907.)

### CHROMIUM

**BY-PRODUCT RECOVERY.** Chemische Fabrik Buckau, Magdeburg, Germany. An electrolytic process for recovering chromic acid from solutions of sulphate of chromium. (Brit. No. 9636 of 1906; Sept. 8, 1907.)

### COAL AND COKE

**ARTIFICIAL FUEL AND METHOD OF MAKING THE SAME.** Daniel Drawbaugh, Eberlys Mill, and Blake E. Gamble, Bowmansdale, Penn.; said Drawbaugh assignor to Drawbaugh Artificial Fuel Co., Harrisburg, Penn., a Corporation of Pennsylvania. (U. S. No. 867,915; Oct. 8, 1907.)

**CHARGING GAS-RETORTS, COKE-OVENS, AND THE LIKE.** James G. W. Aldridge, Westminster, and Ralph E. Gibson, Liverpool, England. (U. S. No. 866,177; Sept. 17, 1907.)

**COAL-CHUTE.** Harry W. Richards, Manitowoc, Wis. (U. S. No. 867,156; Sept. 24, 1907.)

**COAL CUTTER.** F. Stiepel, Essen, Germany. A coal cutter in which the frame carrying the cutting tool is vibrated horizontally by means of an eccentric. (Brit. No. 2733 of 1907; Oct. 12, 1907.)

**COAL CUTTER.** Mavor & Coulson, Glasgow, Scotland. Improvements in the inventors' coal cutter of the undercutting type. (Brit. No. 26,458 of 1906; Sept. 28, 1907.)

**COAL HANDLING**—Apparatus for Loading Coal into Vessels. John A. Johnson, Tacoma, Wash. (U. S. No. 866,203; Sept. 17, 1907.)

**COAL WASHER.** J. Shaw, Kirby, Moor-side, Yorkshire, England. Improvements in the inventor's coal washer of the traveling belt type. (Brit. No. 20,305 of 1906; Oct. 5, 1907.)

### COPPER

**CASTING**—Mold for Casting Copper. Frank L. Antisell, New York, N. Y. (U. S. No. 867,692; Oct. 8, 1907.)

**COPPER EXTRACTION**—Method and Process for the Recovery of Copper and Other Metals from Their Ores. Charles H. Ehrenfeld and Jacob R. Grove, York, Penn. (U. S. No. 866,849; Sept. 24, 1907.)

**COPPER SULPHATE**—Method of Obtaining Pure Copper Sulphate. Raimondo Conedera, Massa Marittima, Italy. (U. S. No. 866,625; Sept. 24, 1907.)

**ELECTROLYTIC COPPER EXTRACTION**—Electrometallurgical Process for Extracting Copper from Its Ores. Lucien Jumeau, Paris, France. (U. S. No. 867,046; Sept. 24, 1907.)

**WELDING**—Method of Welding Copper. William A. Barnes, Woronoco, Mass. (U. S. No. 867,632; Oct. 8, 1907.)

### GOLD AND SILVER

**AMALGAMATOR.** William H. Stigitz, Louisville, Ky. (U. S. No. 866,084; Sept. 17, 1907.)

**CYANIDE PRACTICE.** B. Solis, Mazatlan, Mexico. An improved method of stirring and introducing oxygen in cyanide vats by means of jets of compressed air. (Brit. No. 13,275 of 1906; Oct. 12, 1907.)

**EXTRACTION**—Process of Extracting Gold and Silver from Ores. Benjamin Hall, Nevada City, Cal. (U. S. No. 868,551; Oct. 15, 1907.)

**HYDRAULIC DREDGE.** Charles A. Frayer, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis., a corporation of New Jersey. (U. S. No. 867,492; Oct. 1, 1907.)

### IRON AND STEEL

**ALLOY STEEL.** James Churchward, New York, N. Y. (U. S. No. 867,642; Oct. 8, 1907.)

**ALLOYED STEEL.** James Churchward, New York, N. Y. (U. S. No. 868,327; Oct. 15, 1907.)

**BLAST FURNACE SLIPS**—Device for Arresting the Explosion Discharge from Blast Furnaces. Lars Larsson, Chicago, Ill. (U. S. No. 868,102; Oct. 15, 1907.)

**BLAST-FURNACE-CHARGING DEVICE.** Charles P. Turner, Harrisburg, and John W. Dougherty, Steelton, Penn. (U. S. No. 868,508; Oct. 15, 1907.)

**BLAST FURNACES**—Safety Device for Blast Furnaces. Warren R. Clifton, Sharon, Penn. (U. S. No. 867,244; Oct. 1, 1907.)

**CASE HARDENING.** W. R. Hodgkinson, London, England. Case-hardening mild steel by heating in an atmosphere of acetylene and ammonia. (Brit. No. 19,493 of 1906; Sept. 28, 1907.)

**CASTING APPARATUS**—Apparatus for Casting and Delivering Pig Metal. Edgar A. Weimer, Lebanon, Penn. (U. S. No. 866,607; Sept. 17, 1907.)

**CASTING APPARATUS.** Edgar A. Weimer, Lebanon, Penn. (U. S. No. 866,608; Sept. 17, 1907.)

**CHARGE-DISTRIBUTING APPARATUS FOR BLAST FURNACES.** Walter Kennedy, Allegheny, Penn. (U. S. No. 868,346; Oct. 15, 1907.)

**BLAST-FURNACE-CHARGING DEVICE.** Charles P. Turner, Harrisburg, and John W. Dougherty, Steelton, Penn. (U. S. No. 868,506; Oct. 15, 1907.)

**BLAST-FURNACE-CHARGING DEVICE.** Charles P. Turner, Harrisburg, Penn., John W. Dougherty and James E. Little, Steelton, Penn. (U. S. No. 868,507; Oct. 15, 1907.)

**ELECTRIC SMELTING.** J. J. Van der Loo, The Hague, Holland. An electric furnace for smelting iron sands containing titanium. (Brit. No. 598 of 1907; Oct. 5, 1907.)

**FERRO-VANADIUM**—Process of Producing Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a corporation of West Virginia. (U. S. No. 866,561; Sept. 17, 1907.)

**FERRO-VANADIUM**—Process of Producing Ferro-Vanadium. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a corporation of West Virginia. (U. S. No. 866,562; Sept. 17, 1907.)

**HARDENING HIGH STEELS.** S. O. Cowper Coles. A cementation process for hardening high steels, using vanadium oxide and carbon as packing material. (Brit. No. 13,979 of 1907; Oct. 12, 1907.)

**MANGANESE STEEL.** C. H. Kelsall, Horwich, Lancashire, England. An improved method of manufacturing a high percentage manganese steel. (Brit. No. 20,452 of 1906; Oct. 5, 1907.)

**NICKEL STEEL.** J. Churchward, New York, N. Y. A nickel steel containing 90 per cent. iron, 0.6 per cent. carbon, nickel 5 per cent., tungsten 1 per cent., chromium 2½ per cent., manganese 1 per cent. and vanadium ½ per cent. (Brit. No. 18,792 of 1906; Sept. 28, 1907.)

**OXIDE OF IRON.** Carl Wülfing, Hönningen, Germany. (U. S. No. 868,385; Oct. 15, 1907.)

**PIG IRON**—Treating Pig Iron. George S. Page, Pittsburg, Penn., assignor to Crucible Steel Co. of America, Pittsburg, Penn., a corporation of New Jersey. (U. S. No. 867,593; Oct. 8, 1907.)

**PURIFICATION OF IRON**—Process of Purifying Iron. Joseph Misko, Buffalo, N. Y., assignor of one-half to E. N. Dickerson, Stovs'l, N. C. (U. S. No. 868,610; Oct. 15, 1907.)

### LEAD

**LEAD PIGMENT and Similar Compounds.** Elmer A. Sperry, Brooklyn, N. Y. (U. S. No. 867,436; Oct. 1, 1907.)

### RARE METALS

**TANTALUM**—Process for Producing Technically-Pure Ductile Tantalum. Marcello von Piranl, Wilmersdorf, near Berlin, Germany, assignor to Siemens & Halske Aktiengesellschaft, Berlin, Germany. (U. S. No. 866,385; Sept. 17, 1907.)

**TUNGSTIC ACID.** General Electric Company, Schenectady, N. Y. The use of an organic compound for precipitating tungstic acid in a pure form from its acid solutions. (Brit. No. 18,489 of 1906; Sept. 21, 1907.)

### TIN

**ELECTROLYTIC REFINING.** O. Steiner, Krefeld, Germany. Improvements in the inventor's apparatus for refining tin electrolytically. (Brit. No. 10,230 of 1907; Sept. 21, 1907.)

**SMELTING TIN SLAGS.** H. Brandenburg, Kempen, Germany. Smelting tin slags, etc., with silicate of tin to produce a silicate free from iron. (Brit. No. 22,033 of 1906; Sept. 21, 1907.)

### ZINC

**ELECTRIC SMELTING.** F. T. Snyder, Chicago, Ill. An electric furnace for smelting zinc ores that are not suitable for distilling owing to high lime contents. (Brit. No. 18,712 of 1906; Sept. 21, 1907.)

**FERRUGINOUS BLENDE**—Process of Treating Ferruginous Blende. Woolsey M. Johnson, Iola, Kan. (U. S. No. 868,345; Oct. 15, 1907.)

**GALVANIZING WASTE LIQUORS.** G. F. Thomson, Bedford, England. Precipitating iron from waste galvanizing liquors by the addition of magnesia and magnesite mixed. (Brit. No. 20,057 of 1906; Oct. 12, 1907.)

**MANUFACTURE OF CHLORIDE.** G. Mojana, Milan, Italy. Producing zinc in the form of chloride by acting on the ores with a spray of gaseous chlorine in the presence of carbon. (Brit. No. 28,575 of 1906; Sept. 28, 1907.)

**SMELTING FURNACE.** J. J. C. Fernau, Nelson, B. C. An improved furnace for smelting zinc sulphide by immersion in a bath of molten iron. (Brit. No. 24,905 of 1906; Sept. 28, 1906.)

### MINING—GENERAL

**DRILLING.** J. M. and J. H. Holman, Cambridge, England. Method of conveying water through hollow drill to the working face of rock drills. (Brit. No. 22,291 of 1906; Sept. 21, 1907.)

**FIRE EXTINGUISHING**—Apparatus for the Use of Carbon Dioxide for the Extinguishment of Fires. Eugene F. Osborne, Chicago, Ill., assignor to The Osborne Steam Engineering Company, Chicago, Ill., a Corporation of Illinois. (U. S. No. 868,218; Oct. 15, 1907.)

**ILLUMINATION IN TRAMMING.** J. Zyder, Osterfeld, Germany. Method of mounting lamp on the last of a line of mine trucks so that it shall be visible to the driver at the front. (Brit. No. 16,041 of 1907; Sept. 14, 1907.)

**TUNNELING**—Method of Excavating Rock Tunnels. Patrick Ford, Chicago, Ill. (U. S. No. 868,259; Oct. 15, 1907.)

**TUNNELING**—Method of Tunneling. David Maxwell, Detroit, Mich. (U. S. No. 867,392; Oct. 1, 1907.)

**VENTILATION**—System for Ventilating Mines, Etc. George M. Capell, Passenham, England. (U. S. No. 867,791; Oct. 8, 1907.)

### ORE DRESSING

**CRUSHING.** W. H. Fetton, Leeds, England. Improved toggle joints for rock breakers. (Brit. No. 26,348 of 1906; Sept. 21, 1907.)

**DECANTING APPARATUS.** John V. N. Dorr, Lead, S. D. (U. S. No. 867,958; Oct. 15, 1907.)



**GRINDING PANS**—Shoe and Die of Grinding Pans. William Middleton and Hervic N. G. Cobbe, Kalgoolie, Western Australia. (U. S. No. 867,989; Oct. 15, 1907.)

**GYRATORY SCREEN**—Means for Imparting Gyrotory Motion to Sieve-Boxes and Other Bodies. Emil R. Draver, Richmond, Ind. (U. S. No. 868,333; Oct. 15, 1907.)

**HYDRAULIC CLASSIFIER** for Ores. Seth R. Swain, Denver, Colo. (U. S. No. 866,536; Sept. 17, 1907.)

**HYDRAULIC CLASSIFIER FOR ORES.** Seth R. Swain, Denver, Colo. (U. S. No. 866,402; Sept. 17, 1907.)

**MAGNETIC SEPARATOR.** James B. McCabe, Buffalo, N. Y. (U. S. No. 867,744; Oct. 8, 1907.)

**MILLING**—Combined Stamp and Grinding Mill. George C. Richards, South Berkeley, Cal., assignor to Western Mill and Machine Co., a corporation of California. (U. S. No. 866,600; Sept. 17, 1907.)

**ORE CONCENTRATOR.** Abel Gulonneau, Denver, Colo. (U. S. No. 867,267; Oct. 1, 1907.)

**ORE SEPARATOR.** John A. Haralson, Mexico, Mexico. (U. S. No. 867,360; Oct. 1, 1907.)

**ROCK BREAKERS.** Sturtevant Mill Co., Boston, Mass. Improvements in rock breakers of the pair type. (Brit. No. 13,192 of 1907; Oct. 5, 1907.)

**SEPARATION**—Apparatus for Separating Finely-divided Material. Andrew J. Cook, San Rafael, Cal. (U. S. No. 866,626; Sept. 24, 1907.)

**SEPARATOR**—Centrifugal Separator. Ramon F. Cordero, Ruhio-Tachira, Venezuela. (U. S. No. 867,800; Oct. 8, 1907.)

**STAMP MILLS.** J. C. Anderson, Chicago, Ill. Improvements in the inventor's stamp mills. (Brit. No. 9217 of 1907; Sept. 21, 1907.)

### METALLURGY—GENERAL

**ANNEALING** or Heating of Metals. Darwin Bates and George W. Peard, Huyton, England. (U. S. No. 868,154; Oct. 15, 1907.)

**CASTING**—Wire-Bar Mold-Core. Frank L. Antisell, New York, N. Y. (U. S. No. 867,693; Oct. 8, 1907.)

**CASTINGS**—Process for Doing Away With Blow-Holes and Like Flaws in Castings. Adolph E. Menne, Creuzthal, Germany, assignor to the firm of Cöln-Müsenner, Bergwerks Aktien Verein, Creuzthal, Germany. (U. S. No. 866,497; Sept. 17, 1907.)

**LEAD OXIDE**—Electrolytic Process and Product. Clinton P. Townsend, Washington, D. C., assignor to Elmer A. Sperry, Brooklyn, N. Y. (U. S. No. 867,320; Oct. 1, 1907.)

**ORE ROASTING**—Process of Roasting Fusible Ores. Albert G. Davis, Washington, D. C. (U. S. No. 866,580; Sept. 17, 1907.)

**ORE-TESTING TABLET.** John E. Hunsinger, Saginaw, Mich., assignor to Earl A. Cheney and Frank Cheney, Saginaw, East Side, Mich. (U. S. No. 868,270; Oct. 15, 1907.)

**REDUCTION**—Process of Effecting Chemical Reductions and Producing Metals or Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a corporation of West Virginia. (U. S. No. 866,421; Sept. 17, 1907.)

**SMELTING PROCESS.** R. W. E. MacIvor and M. Fradd, London, England. In treating complex sulphides, throwing the roasted ores into calcium chloride and passing sulphurous acid into the mixture. (Brit. No. 19,130 of 1906; Sept. 21, 1907.)

### MINING MACHINERY AND APPARATUS

**AERIAL TRAMWAY.** Walter S. Gemmer and Emil J. Schleicher, St. Louis, Mo., assignors of one-third to Broderick & Bascom Rope Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 867,497; Oct. 1, 1907.)

**BELT GUIDE AND SHIFTER.** Rudolf E. Horinek, Atwood, Kan. (U. S. No. 867,974; Oct. 15, 1907.)

**CHUTE.** Charles H. Shultz, St. Joseph, Mo. (U. S. Nos. 867,164 and 867,165; Sept. 24, 1907.)

**CONVEYER.** Joseph M. Griffith, Cardiff, Md. (U. S. No. 867,124; Sept. 24, 1907.)

**CONVEYER SYSTEM.** Charles Merritt, Pomeroy, Ohio. (U. S. No. 867,739; Oct. 8, 1907.)

**CONVEYER SYSTEM.** Samuel L. G. Knox, Milwaukee, Wis. (U. S. No. 866,792; Sept. 24, 1907.)

**CONVEYERS.** Automatic Feed-Gear for Conveyers. Charles W. James, Sheffield, England, assignor to Edgar Allen & Co., Limited, Sheffield, England. (U. S. No. 866,864; Sept. 24, 1907.)

**CONVEYING DEVICE.** John D. Musser,

Easton, Ohio. (U. S. No. 867,995; Oct. 15, 1907.)

**DREDGER BUCKET**—Sectional Dredger Bucket. Harley L. Sherwood, Oakland, Cal. (U. S. No. 866,971; Sept. 24, 1907.)

**DREDGING MACHINE.** George M. Brown, Tacoma, Wash. (U. S. No. 867,788; Oct. 8, 1907.)

**DRILL ATTACHMENT.** Wilber R. Hitchcock, Cornwall, Ontario, Canada. (U. S. No. 866,361; Sept. 17, 1907.)

**DRILLS.** Maschinenfabrik, Westfalia, Gelsenkirchen, Germany. Improvements in air hand drills. (Brit. No. 12,006 of 1907; Oct. 5, 1907.)

**EXCAVATING BUCKET.** Henry Channon, Chicago, Ill. (U. S. No. 868,595; Oct. 15, 1907.)

**EXCAVATING SHOVEL.** Henry Channon, Chicago, Ill. (U. S. No. 867,947; Oct. 15, 1907.)

**LOADING AND UNLOADING APPARATUS.** George W. Theiss, Pittsburg, Penn., and Robert J. W. Whann and William J. English, New Orleans, La. (U. S. No. 866,166; Sept. 17, 1907.)

**MINE CAGE SAFETY DEVICE.** J. Owens, Johannesburg, Transvaal. An improved safety brake mechanism for mine cages. (Brit. No. 24,849 of 1906; Oct. 5, 1907.)

**MINE CAGE SAFETY DEVICE.** W. Kleinhreit, Walsum, Germany. Safety device for preventing mine cages from being overwound. (Brit. No. 18,208 of 1906; Sept. 14, 1907.)

**MINER'S PICK.** F. W. Brown, Sheffield, England. Improved miners' picks, especially in connection with the securing of the wooden shafts to the metallic sockets. (Brit. No. 13,301 of 1907; Sept. 14, 1907.)

**MINING-MACHINE CHAIN.** Horace E. Rawlins, Derwent, Ohio. (U. S. No. 868,291; Oct. 15, 1907.)

**ROCK DRILL.** H. Hellman and S. C. Bayles, Johannesburg, South Africa. Detailed improvements in the inventor's rock drill. (Brit. No. 4739 of 1907; Sept. 14, 1907.)

**ROCK DRILL.** M. Kellow, Croesor, Wales. Improvements in the inventor's rock drill, in which the drill is rotated by means of a water turbine mounted on the drill shaft. (Brit. No. 20,317 of 1906; Oct. 5, 1907.)

**ROCK DRILLS**—Device for Sharpening Rock Drills. Elias Lewis, Denver, Colo. (U. S. No. 866,041; Sept. 17, 1907.)

**SAFETY LAMPS.** E. A. Hallwood, Morley. Improvements in the method of fringing the gauze in miners' safety lamps. (Brit. No. 18,195 and 18,195A of 1906; Sept. 14, 1907.)

**SURVEYING LEVEL.** Edward Heih, Railroad, Penn. (U. S. No. 868,089; Oct. 15, 1907.)

**TRAMWAY BUCKET.** Walter S. Gemmer and Emil J. Schleicher, St. Louis, Mo., assignors of one-third to Broderick & Bascom Rope Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 866,271; Sept. 17, 1907.)

**TUNNELING APPARATUS**—Apparatus for Tunneling. David Maxwell, Oakmont, Penn. (U. S. No. 867,284; Oct. 1, 1907.)

**TUNNELING APPARATUS**—Apparatus for Tunneling. David Maxwell, Oakmont, Penn. (U. S. No. 867,520; Oct. 1, 1907.)

### METALLURGICAL MACHINERY AND APPARATUS

**BRIQUET MACHINE.** Charles W. Reynolds, Los Angeles, Cal. (U. S. No. 867,210; Sept. 24, 1907.)

**DEPOSITION OF METALS**—Apparatus for Depositing Metals. Wilbur A. Hendryx, Denver, Colo. (U. S. Nos. 866,858 and 866,859; Sept. 24, 1907.)

**FURNACE CHARGING.** L. Mond, London, England. An improved apparatus for evenly distributing the charge in blast furnaces, gas producers, etc. (Brit. No. 19,312 of 1906; Sept. 28, 1907.)

**GAS PRODUCER.** Martin V. B. Smith, New York, N. Y. (U. S. No. 868,026; Oct. 15, 1907.)

**GAS-PRODUCER FEEDING**—Feeding Mechanism for Gas Producers, Furnaces, Etc. John A. Waldhurger, McKeesport, Penn., assignor to Forter Miller Engineering Co., Pittsburg, Penn., a corporation of Pennsylvania. (U. S. No. 868,147; Oct. 15, 1907.)

**HEAT TREATMENT**—Apparatus for the Heat Treatment of Metals. Theophilus V. Hughes, Birmingham, England. (U. S. No. 868,185; Oct. 15, 1907.)

**HYDROCARBON BURNER.** Jacob Gogel, Toledo, Ohio. (U. S. No. 868,084; Oct. 15, 1907.)

**OIL BURNER.** Herschel C. Finley, Cherryvale, Kan. (U. S. No. 868,175; Oct. 15, 1907.)

**ORE ROASTING.** S. I. Clawson, Salt Lake City, Utah. An ore-roasting cylinder adapted

for volatilizing the metal values. (Brit. No. 19,229 of 1906; Sept. 28, 1907.)

**ROLLER MILL.** Edgar S. Moulton, Central City, Colo. (U. S. No. 866,799; Sept. 24, 1907.)

**WATER-JACKET SAFETY VALVE**—Safety Valve for Water Jackets. Oren H. Shafer, Potoskey, Mich. (U. S. No. 868,022; Oct. 15, 1907.)

### FURNACES

**CRUCIBLE FURNACE**—Portable Crucible Furnace. Matthew Harvey, Walsall, England. (U. S. No. 868,181; Oct. 15, 1907.)

**ELECTRIC FURNACE.** A. Petersson, Albz, Sweden. An improved electric furnace in which the carbonic oxide obtained from the charge is utilized as a reducing agent. (Brit. No. 5655 of 1907; Sept. 14, 1907.)

**ELECTRIC FURNACE.** John T. Marshall, Metuchen, N. J., assignor to General Electric Co., a corporation of New York. (U. S. No. 867,519; Oct. 1, 1907.)

**ELECTRIC FURNACES.** General Electric Company, Schenectady, N. Y. In electric furnaces of the induction type, dividing the primary coil into sections and so preventing the reactance between different parts of the induced current. (Brit. No. 26,867 of 1906; Sept. 28, 1907.)

**GAS BURNER FOR FURNACES.** John C. Krieg, Newark, Ohio, assignor to Krieg Gas Burner Co., Newark, Ohio, a corporation of Ohio. (U. S. No. 867,382; Oct. 1, 1907.)

**KNOBBLING FURNACE.** William F. Westlund, Washington, Penn. (U. S. No. 867,861; Oct. 8, 1907.)

**MELTING FURNACE.** Thomas D. Bauscher, Reading, Penn. (U. S. No. 867,781; Oct. 8, 1907.)

**REGENERATIVE FURNACE.** Gerhard Brauer, Duisburg-Beeck, and Hermann Gewecke, Darmstadt, Germany; said Brauer assignor to said Gewecke. (U. S. No. 867,105; Sept. 24, 1907.)

**REGENERATIVE GAS FURNACE.** George Hatton, Saltwells House, near Brierley Hill, England. (U. S. No. 867,038; Sept. 24, 1907.)

**THAWING FURNACE.** Thomas D. Bauscher, Reading, Penn. (U. S. No. 868,247; Oct. 15, 1907.)

### INDUSTRIAL CHEMISTRY

**ARTIFICIAL CLAY.** R. Gans, Berlin, Germany. The manufacture of crystals of hydrated alumina silicates by melting kaolin borax and carbonate of soda together. (Brit. No. 8232 of 1907; Oct. 5, 1907.)

**BIARIUM CYANIDE.** Badische Anilin and Soda Fabrik, Ludwigshafen, Germany. A commercial method of preparing barium cyanide by heating barium oxide with carbonaceous material in the presence of nitrogen gas. (Brit. No. 22,039 of 1906; Sept. 14, 1907.)

**CENTRIFUGAL FILTER.** Frans O. Nilsson and Johan A. Jonson, Stockholm, Sweden, assignors to Aktiebolaget Vincentrifugen, Stockholm, Sweden. (U. S. No. 868,288; Oct. 15, 1907.)

**METAL TRIMMING BY ACIDS.** S. O. Cowper Coles, London, England. In the inventor's process for producing metal strip electrolytically, removing the burr on the edge of the strip by passing through an acid bath. (Brit. No. 27,099 of 1906; Oct. 5, 1907.)

**NITRIC ACID.** G. H. Goutard and F. W. S. Valentiner, Leipzig, Germany. Improvements in the process for producing concentrated nitric acid by the decomposition of nitrate of soda under a partial vacuum, the improvement being chiefly with the object of keeping the nitrate properly immersed in the sulphuric acid. (Brit. No. 4254 of 1907; Oct. 12, 1907.)

**OXIDIZING AGENT.** S. F. Jaubert, Paris, France. Improved method of producing peroxide of potassium by blowing air through a liquid alloy of potassium. (Brit. No. 7641 of 1907; Sept. 21, 1907.)

**PURIFYING SOLUTIONS**—Removing Copper Salts from Alkaline Liquors. Rudolf Linkmeyer, Brussels, Belgium. (U. S. No. 866,371; Sept. 17, 1907.)

**SULPHURIC ACID**—Apparatus for Separating Sulphuric Acid. Frederick G. Cottrell, Berkeley, Cal., assignor of one-half to Harry East Miller, Oakland, Cal. (U. S. No. 866,844; Sept. 24, 1907.)

**SULPHURIC ACID.** Chemische Fabrik Griesheim Elektron, Frankfurt, Germany. The use of benzene or its derivatives for collecting arsenical compounds out of sulphuric acid, or other acids or acid gases. (Brit. No. 974 of 1907; Oct. 12, 1907.)

**SULPHURIC ACID**—Manufacture of Sulphuric Acid. Frederick G. Cottrell, Berkeley, Cal., assignor of one-half to Harry East Miller, Oakland, Cal. (U. S. No. 866,843; Sept. 24, 1907.)

## Personal

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

Percy E. Barbour, consulting mining engineer, has returned to Goldfield after five weeks in the east.

R. R. Moore has resigned his position as superintendent of the Oaxaca smelter at Oaxaca, Mexico.

J. R. Thorndry, of Deadwood, S. Dak., has been examining some mining claims near Lander, Wyoming.

W. N. Carr has resigned his position with the Guanajuato Development Company, at Guanajuato, Mexico.

A. B. Denish, of Los Angeles, Cal., is examining the Belmore Bay gold mine in the Sturgeon Lake gold area in Ontario.

J. E. Spurr, of the Geological Survey, is completing his examination of the geology of the Leadville district in Colorado.

Robert S. Oliver, formerly superintendent of the Utah Apex mine, has been appointed general manager of that property.

Claud Hafer, cyanide expert, has returned from the Tennessee zinc mines and is again at the Iola gold mines, Candor, N. C.

Cary Wright, who has been operating the Hiddenite gem mine in Alexander County, N. C., has closed down the mine and gone to Idaho.

Dr. J. M. Bell, director of the Geological Survey of New Zealand, was in Toronto, Ont., recently. He is making an inspection trip to Canada.

R. N. Dijkman, of Chicago, has been examining copper properties in the Goose Creek district in Oregon and the Seven Devils district in Idaho.

Arthur S. Dwight, metallurgical engineer of New York has just returned from a long trip to the West, extending as far as Canañea, Sonora.

John D. Ryan, managing director of the Amalgamated Copper Company, who has been seriously ill at Butte, is now reported to be out of danger.

R. W. Higgins, of the American Direct Concentrator Company, of New York, is putting in a plant at the Gold Hill Copper mines, Gold Hill, N. C.

Edward K. Judd, of New York, is inspecting operations of the Buffalo & Susquehanna Coal and Coke Company, in Clearfield county, Pennsylvania.

James MacNaughton, general manager of the Calumet & Hecla properties, has returned to the Lake Superior district after a short business trip to Boston.

Albert Geiser, for 10 years past engaged in mining near Baker City, Oregon, has removed to Eugene, Oregon, where he will operate mines on Blue river.

Walter C. Geddes has resigned as general superintendent of the mines of the Goldfield Consolidated Mining Company at Goldfield, Nev., to take effect Nov. 1 next.

J. P. Hutchins, consulting mining engineer, of New York, who has been in Alaska during the past summer on professional engagements, returned home last week.

Thomas Hoatson, managing director of the Keweenaw Copper Company, has returned to the Lake country, after attending a meeting of the company in New York.

John G. Chynoweth, formerly of the Adventure mine, has succeeded Thomas Pollard as head mining captain of the Victoria mine in the Lake Superior copper district.

George S. Binckley, manager of the Compañía Metalurgica y Refinadora del Pacifico, at Fundicion, Sonora, Mexico, has resigned, and has been succeeded by E. J. Wilson.

It is feared that John Markle, the well-known coal operator of Jeddo, Penn., may become totally blind. He is afflicted with impaired eyesight and is under treatment by an expert.

R. J. Hawke, formerly with El Progreso Mining Company at Triunfo, Lower California, is now superintendent of El Cobre mines of the Douglas Copper Company in Sonora, Mexico.

David H. Thomas, who has been general superintendent of the Thomas Iron Company, Hokendauqua, Penn., since 1893, has resigned for the purpose of engaging in another line of business.

George Kingdon, who has been superintendent of the Pilares mine at Nacozari, Sonora, has been appointed superintendent of the Old Dominion and United Globe mines at Morenci, Arizona.

J. Parke Channing, consulting mining engineer of New York, who has been in the West for several months, is now in Arizona. He is expected in New York about the end of this month.

R. L. Armit, formerly superintendent of mines of the Guanajuato Development Company, has accepted the position of general superintendent of mines and mills of the Pinguico Mines Company.

W. D. Schellinger, superintendent for the San Javier Copper Company of Chicago, Ill., is opening a new copper property in the vicinity of Batascosa, some 30 miles from Fundicion station, Mexico.

Richard B. Stanford, manager of the Siempre Viva Mining Company at Bluefields, Nicaragua, is in Colorado Springs, Colo., where he will spend a short vacation before returning to Central America.

Rollin H. Wilbur has been chosen first vice-president of the Lehigh Coal and Navigation Company, and will have charge

of the railroad and transportation department. George B. Harris is now second vice-president.

J. B. Tyrrell, who has been mining engineer for Mackenzie & Mann, owners of the Canadian Northern Railway, is now in general practice as mining engineer; his office is at No. 9 Toronto street, Toronto, Ontario.

Walter C. Orem has been relieved, at his own request, of the management of the Utah Apex mine at Bingham, Utah, and will now devote his entire time to the management of the Nevada-Douglas mines at Yerington, Nevada.

Theodore L. Lammers has resigned his position as general manager of the Panhandle Smelting Company, at Ponderay, Idaho, and will take the management of mining interests in Montana and Idaho. His office is at Spokane, Washington.

John W. Young has resigned his position as general European manager of the Allis-Chalmers Company and will return to the United States about Dec. 1. After Nov. 1 his address will be, at the Engineers' Club, 32 West 40th street, New York.

L. W. Trumbull, mining engineer, has tendered his resignation as professor of mining at the University of Wyoming, to accept the supervision of properties in Sierra county, California. After Dec. 1, his permanent address will be Downeyville, California.

G. W. Pope, who has been contracting agent of the Minneapolis Steel and Machinery Company at Salt Lake for several years, has been promoted to the position of general contracting agent of the same company with headquarters at Minneapolis. Mr. Pope is succeeded at Salt Lake by T. E. Beyer, who has been his assistant.

A. L. McCarty, until recently general superintendent of the Comanche Mining and Smelting Company, Silver City, N. M., J. W. Crowds, superintendent for Eckles & Co., Chloride Flats, and chief engineer for the Comanche Mining and Smelting Company, and E. P. McCarty, assistant professor of mining engineering at the University of Minnesota, have recently formed an engineering firm with offices at El Paso and Minneapolis.

David B. Carse has resigned from the chairmanship of the advisory committee of the United States Steel Corporation. Mr. Carse and his brother, John B. Carse, have composed this committee since its formation five years ago, its duties being to keep track of all expenditures of the corporation under the appropriations by the finance committee. John B. Carse still remains with the corporation, and will take care of the future work of the committee. In leaving the Steel Corporation, Mr. Carse does so with the idea of taking up again the business of Carse Brothers Company. The company has been reorganized and its headquarters removed from Chicago to New York.



## Obituary

James B. Wilkes, who died in Sharon, Penn., Oct. 8, was born in Tredegar, England, 73 years ago and received his early iron mill training in the plant at Tredegar where he was employed. He came to America in 1861 and located in Sharon two years later, where he obtained employment in an iron mill. Mr. Williams was one of a company that erected a mill at Canal Dover, O., in 1865-1866, and was connected with that plant until 1874. In 1891 he organized the Wilkes Rolling Mill Company and erected a plant at Sharon, serving as president and general manager until his death.

## Societies and Technical Schools

*International Bureau of Weights and Measures*—This body assembled at Sevres, France, Oct. 15. Prof. Samuel W. Stratton, director of the National Bureau of Standards at Washington, and Henry Vignaud, first secretary of the American embassy at Paris, are the delegates of the United States.

*Columbia University*—Columbia University, New York, will offer at night during the season of 1907-1908 twenty evening courses specially adapted to the needs of technical and professional workers. This includes work in applied mechanics, architecture, electricity, fine arts, industrial chemistry, mathematics, surveying and structures. The work begins Oct. 28 and will continue for 25 weeks.

*Harvard University*—The School of Applied Science, established last year at Harvard University, shows this year a great increase in attendance. There are several advanced students who are specializing in metallurgy with the intention of taking the degree "metallurgical engineer." The prospects in the department of applied science never looked brighter at Harvard, and the McKay bequest, which should soon become available, will enable the faculty greatly to increase the facilities for advanced work in mining and metallurgy, as well as in the other departments of applied science.

*California Miners' Association*—The executive committee of this association has decided to hold the annual convention in San Francisco, Nov. 25. There has been little activity in the association during the past year, mainly because there has been no special work to attend to. While the dredge-men have been somewhat annoyed by the Anti-Debris Association, and the smelting companies have been also annoyed by suits and threatened litigation on account of fumes, the aid of the Miners' Association has not been invoked. In both these matters it seems to have been the policy of those interested to avoid any special publicity,

and to refrain from controversy when possible. The association has been to some extent weakened by the defection of the Nevada county men, who have not for two or three years taken an active interest, as they formerly did. An effort is to be made to enlist their support again. It is probable that Nevada county can have almost anything it wants when the convention meets, and it is probable that a Nevada county man will be elected president, if one can be found who is willing to accept, especially if he is prominent in mining at Grass Valley or Nevada City. It is the intention of the executive committee to ask the supervisors of the different mining counties to select delegates to the convention in those counties where there are no branch miners' associations. In this way it is expected to obtain delegations interested in the development of the mineral resources of the respective counties.

## Industrial

The Pilling Air Engine Company, Detroit, Mich., manufacturer of pneumatic hoists and air-hoisting machinery, will change its name to the Detroit Hoist and Machine Company, a new corporation. The Pilling corporation will be retained with a nominal capital to protect the name and good will. This company has just installed and is now operating a new plant.

The Ridgway Dynamo and Engine Company, of Ridgway, Penn., is distributing to all who have use for them a set of templets made to scale of  $\frac{1}{4}$  in. to the foot, of the standard generating units from 10 kw. to 200 kw., inclusive, which it manufactures. This is a new idea which ought to be useful to engineers and designers of plants, who frequently have to write to manufacturers for precisely this information.

The Alberger Pump Company has been organized to manufacture and sell centrifugal and turbine pumping machinery embodying important improvements. The apparatus has been designed to meet the demand for a higher class of work and more economical performance and includes centrifugal and turbine pumps of all capacities and for operation against any head, either steam power or electrically driven. Louis R. Alberger is president, and the company has offices in New York and Chicago.

In the JOURNAL of Sept. 14 it was stated that the Bradley Pulverizing Company had been awarded the contract for supplying Griffin mills for the entire grinding equipment of the Ajax Portland Cement Company. We are informed that, while the Bradley company received a contract for all the Griffin mills to be used, Thomas Prosser & Son, New York, secured from the Ajax company a contract for Krupp patent ball mills to be

used for preliminary grinding, the Griffin mills being used for finishers only.

The American Steel and Wire Company proposes to operate the plant of the National Wire Corporation, New Haven, Conn., which it recently purchased, as soon as the necessary formalities of the transfer can be completed, including the delay provided by the bankruptcy act to protect the rights of creditors. The plant is in excellent condition and little preparation will have to be made before starting up the machinery. It is possible that the purchase of this plant will have some effect on the proposed extension of the American company's plant at Worcester, Mass., as part of the New England trade can now be covered from the New Haven works.

## Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Edward Parrish, Newport, R. I. Parrish Continuous Filter. Pp. 8, illustrated, paper, 6x9 in.; July, 1907.

Miner's Smelting Furnace Company, 29 Broadway, New York. The Medbery Rotary Smelting Furnace. Pp. 8; also two illustrated folders, 6x8 in.

H. W. Johns-Manville Company, 100 William street, New York. Catalog No. 404. Victor Combination Meters. Pp. 33, illustrated, paper,  $4\frac{1}{2}$ x7 in.; 1907.

## Construction News

*Telluride, Colorado*—The Black Bear Mining Company is considering the addition of 60 stamps to its mill. Oscar Mantylla, Telluride, Colo., is president.

*Sierra City, California*—A 10-stamp mill and other machinery will be put in at the Keystone mine, to replace plant destroyed by snow-slides last winter. Perryman, Botting & Co., Sierra City, Colo., are lessees of the mine.

*Pandora, Colorado*—The Consolidated Mines Selection Company proposes to build a concentrating mill at the Japan-Flora group; also a wire-rope tramway from the mines to the mill. F. C. Bowman, Telluride, Colo., is manager.

*Masontown, West Virginia*—It is reported that the Elkins Coal and Coke Company will extend its mining operations and will build 300 additional coke ovens. J. B. Hanford, Morgantown, W. Va., is general manager of the company.

*Dante, Virginia*—The Clinchfield Coal Corporation is making extensive preparations to open new coal mines, build an electric plant and establish a mining town. John H. Winder, Columbus, O., is president. The company's address is Dante, Virginia.

# Special Correspondence from Mining Centers

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

## REVIEWS OF IMPORTANT EVENTS

### San Francisco

Oct. 17—The gold-dredging companies, it seems, have rather a pull over the railroad companies which are building in the vicinity of Oroville. They are now asking about \$250 per acre for land piled high with cobbles and tailings, the cobbles being found valuable for ballasting purposes. This seems rather odd, and knocks out the contention of the State Anti-Debris Association that the dredges are doing so much damage by making piles of cobbles behind them. That these piles should be considered so valuable never entered into the heads of the anti-debris people. They are supposed to be valueless and an actual detriment to the county and the State. But it seems they are a valuable asset to the dredging companies, which paid an average of about \$1000 an acre for the land originally, and got out by their work several thousand dollars an acre. Now they are done with the land it is still worth about \$250 an acre, which is more than the general run of agricultural lands. This is rather an unexpected result even to the dredge-men. Steam shovels have been set at work on some of these piles of rock tailings by the railroad companies, which need the rock for ballasting, etc. There are hundreds of thousands of cubic yards of these tailings which are useless to the dredging companies, but are valuable to the railroad companies.

Oil-bearing lands have been discovered in the range of hills about Byron, Contra Costa county, and land-owners are being approached with offers to purchase. Thus far no actual developments have taken place. Oil-bearing land has also been found near Petaluma, in Sonoma county, and some prospecting is to begin. Thus far, however, nothing of value has been found in oil land in any of the counties of the State north of the lands of the San Joaquin valley. The oil company which has been at work in Glenn county has had to quit and sell its plant, as was the case with the companies in Colusa, Mendocino and Marin counties.

The boundary line of the Golinsky group of copper mines near Kennett, Shasta county, has been decided by the judge of the Superior Court in favor of the Golinskys, as against Mrs. Eugenia Goss, of San Francisco. The property values were about \$100,000. The decision gives Golinsky undisputed ownership of the copper property. The case was an important one in Shasta county.

The labor union members who were

employed by the Standard Consolidated Mining Company, of Bodie, Mono county, who were about to strike for shorter hours, have finally agreed to submit the dispute with the company to arbitration. After the arbitrators decide, the findings will be submitted to the officers of the company for consideration. The Standard is not only the most important company at Bodie, but the most productive in Mono county. It pays higher wages than any other company in California for its miners and helpers. The point at issue is an eight-hour day.

The executive committee of the California Miners' Association, of which Charles G. Yale, of San Francisco, is chairman, has decided to call the annual convention of the association at San Francisco, on Nov. 25, the deliberations to continue about three days. It is considered of importance that certain subjects of vital interest to the California mining industry should be thoroughly discussed with a view to taking such action as may be thought necessary. Among these are the location of mineral lands in forest reserves; the restriction of the area to be located under single ownership; the segregation of timber land and mineral land; the damage done by smelter smoke and relation of smelters to the mining industry; the work of the California Debris Commission as it relates to hydraulic mining in the central watersheds of the State. The executive committee has asked men prominent in mining affairs to present papers on these and kindred subjects. While it is not expected that the convention this year will be as large in number of delegates as in former periods, it is considered that the papers will be of perhaps a higher standard and that there will be more of them. Wm. C. Ralston, United States sub-treasurer at San Francisco, is the president of the association.

### Salt Lake City

Oct. 20—The curtailment in production does not seem to be at an end yet. During the past week, the Bingham Consolidated Mining and Smelting Company closed its Dalton & Lark mine; but will keep the smelter at Bingham Junction going, at limited capacity from the Commercial mine in Bingham and the Eagle & Blue in Tintic, both of which are assets of the Bingham company. During a recent visit of President E. L. White, of the Bingham consolidated, he made the statement

that contracts would soon be let for the construction of the proposed smelter of the Miners' Smelting Company, which is expected to absorb the properties of the Bingham company. It is believed here, however, that there will be a delay in the program owing to the financial disturbances in the East. The Last Chance mine of the Nevada-Utah Mines and Smelters Corporation in Bingham has been closed and 50 men laid off. This property has been producing lead-silver-copper ore. The company has operated a small concentrating mill.

The Mammoth Mining Company, in the Tintic district has returned to the dividend list. The directors have posted one of 5c. a share, or \$20,000.

The annual meeting of the Tintic Mine Owners' association has resulted in the election of Clarence E. Allen, mine manager of the United States Smelting, Refining and Mining Company, president; John Dern, president of the Lower Mammoth Mining Company, first vice-president; Lafayette Holbrook, director Grand Central Mining Company, second vice-president; H. S. Joseph, secretary; Jackson McChrystal, superintendent Gemini Mining Company, treasurer. The mine-owners of the Tintic district paid out \$260,000 more in wages to miners during the past fiscal year than during the previous one.

There has been no curtailment as yet in the production from the mines of Alta; however, it is anticipated that there will be an easing down before very long. The Columbus Consolidated is the principal shipper, while the South Columbus is an important second. In the Tintic district the output of the Colorado and Beck Tunnel has been cut one-half.

The shutting down of so many mines in the West during the past few weeks has worked to the benefit of the Western Pacific railroad, now building between Salt Lake and San Francisco. Ever since the construction of the road was begun a scarcity of labor has been experienced. Not long ago advertisements appeared in the papers for 7000 men and this number is being supplied from many of the mining camps.

### Duluth

Oct. 21—Lake iron ore shipments for the year to Oct. 1 were 30,559,206 gross tons, which is an increase of 2,409,500 tons over a similar period of 1906. This looks as though the totals for the year will exceed forty million tons, for last year's total was 38,522,239 tons, and con-



ditions are fully as good now for the two months of late navigation as then. October is showing a gain from the Mesabi range, though older districts are going at a slower rate than earlier in the year, due to the shipment of all stocked ore and the consequent lessened amount to be moved. Stockpiles have not been moved so completely in years as now, and the Lake district will enter the winter with bare boards. This should have an effect on winter operations, but it is generally considered that there will be a slackening of business at mines, and that the coming year will see a slight reduction of shipments. This will not occur if the Steel Corporation carries out its long expressed intentions of securing a stock of ore at lower Lake ports sufficient to guard against any probable break in the continuity of supply. A large stock of ore on hand at lower Lake ports will have a wholesome effect on labor situation around the mines.

For a part of September the Duluth, Missabe & Northern road was hauling at the rate of 2,250,000 tons a month, but has let down recently. The month of October will show a decline from present figures, but the total for the year should be well up to 40,000,000 tons. Labor conditions are constantly improving, and underground mines, which suffered the most, are getting their full crews again. The Western Federation of Miners has made changes in its official list on the Mesabi, indicating discouragement with what has been done, and is becoming very weak all along the line.

#### Scranton

Oct. 21—The war between the Lehigh Valley Coal Company and the Reliance Coal Company, of Pittston, broke out again last week in connection with the ownership of some coal lands in Pittston. On the night of Oct. 17 employees of the Reliance Company claimed that they found some employees of the Lehigh Company working in one of the veins owned by the Reliance Company, whereupon the officials swore out warrants for their arrest upon the charge of trespass. The warrants were given to the State constabulary and 35 foremen, miners and laborers were arrested and fined \$10 each and costs. While making the trip out of the mine 16 of the men escaped from the constabulary by secret passages but were afterward secured. As soon as the action of the Reliance company became known to the officials of the Lehigh Valley company, the latter swore out warrants for the arrest of a score of the employees of the Reliance Company and these were, in turn, arrested and fined \$10 each and costs. The attorneys of both companies afterward met in conference and agreed not to make any further arrests until the courts pass upon the respective claims, which have been in litigation for some time.

A meeting of the Conciliation Board was held in Wilkes-Barre this week when a grievance was presented from the miners employed at No. 9 colliery of the Lehigh Coal and Navigation Company, who asked that the standard price for yardage be established at that colliery where it is \$6.82 or, as they claim, \$1.02 less than the standard. The company volunteered to pay \$1.03 per yard for back-cutting which the men refused to accept. A meeting of the board will be held in Mauch Chunk next week to take testimony.

The Shaleen case, which has been so much discussed, has been finally dropped. This case involved the validity of the miners' certificate law, which provides that experience in the anthracite fields is a condition prior to the issue of a certificate to a miner. It was claimed that this law was unconstitutional, since it discriminated against miners from other States. After passing through the lower courts the case came before the Supreme Court of Pennsylvania, which held the law to be valid and in force. The Delaware & Hudson Company gave notice of appeal to the United States Supreme Court on the constitutional question, but it has now decided to drop the case. It may, therefore, be considered that the law will stand, without further question.

#### Toronto

Oct. 18—The project of erecting a large iron-smelting plant in Toronto, for treating the ores of the Moose Mountain mine, north of Sudbury, which has been contemplated for some time, has now assumed a definite shape. D. D. Mann, of the firm of Mackenzie & Mann, who are heavily interested in Moose Mountain, Ltd., the operating company, has entered into negotiations with the city of Toronto, for 350 acres of land in Ashbridge's marsh in East Toronto. It proposes to erect a plant with a capacity for treating 1400 tons of ore daily and ultimately to establish other works such as steel plant, rolling mills and car shops, employing in all about 15,000 men. The slag from the smelter will be used for gradually filling in the marsh. The proposal came up before the Board of Control on Oct. 15 but definite action was deferred pending reports from the city engineer and other officials.

American capital is largely interested in Moose Mountain, Ltd., the president of which is John W. Gates, of New York. Other leading shareholders are Charles Gates, John Mitchell, of the Illinois Trust and Savings Company; Col. Lambert, of Chicago, and Capt. Selwood, of Duluth. The company has \$2,500,000 paid-up capital.

The Grand Trunk Pacific officials, who recently returned to Montreal after a trip of inspection to the Pacific coast, announce that they have obtained absolute confirmation of the occurrence of enormous coal beds in the Telqua region of

British Columbia through which the main line of the Grand Trunk Pacific passes. The company owns 16,000 acres of land in the most valuable part of this district, and the engineers who have been examining the land for the company, report that the region is one of the best coal-bearing areas on the continent.

A criminal prosecution has been instituted by the *Canadian Mining Journal* against Law & Co., mining brokers, of Toronto, for violation of the law in connection with the advertisements of the Highland Mary mine, a Larder Lake wildcat. The infraction of the law alleged consists in the omission to furnish information of the amount paid for the mine, payments for commissions and promotion expenses, names and holdings of directors, etc. The act provides for a penalty of \$200 for each violation. Law & Co. have been summoned to appear before the police magistrate on Oct. 24. The attorney general's department will conduct the prosecution.

#### London

Oct. 14—The report of the Mexico mines of El Oro, Ltd., just issued, announces that the mill commenced operations on Oct. 1. This company was formed by the Exploration Company three years ago to acquire the Mexico mine, which adjoins the Esperanza mine on the north, and is in the vicinity of El Oro and the Somera, also under control of the Exploration Company. The Mexico mine has been fortunate in finding rich shipping ore, similar to that found in the Esperanza, and thus has been able to complete payment for the plant and to make a considerable profit before the plant came into operation. The reduction works comprise 40 stamps of 1180 lb. each, six tube mills and a cyanide plant. Electric power is used throughout, and the ore treated will amount to 200 tons a day. At the present time it is estimated that there is 178,000 tons of ore ready for extraction, averaging \$11.50 in gold and 6 to 7 oz. of silver per ton. This is not reckoning the high-grade ore already mentioned, of which there is a considerable amount, though no estimate is given by the engineers. An idea of its quality can be formed from the fact that from January to June of this year 2739 tons were shipped to the smelters, having an average value of \$87.20 gold and 72 oz. silver, and yielding a net return of \$301,245. This income has provided funds for completing the machinery outfit, and for additional development; still leaving a balance of working capital on hand. The company, therefore, starts its plant under auspicious circumstances.

The second annual report of the Ceylon Company of Pearl Fishers, Ltd., which is another of the Exploration Company's group, shows a profit of £18,267 for the year ended June 30 last.

# 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

**Amalgamated Copper Company**—At a meeting held in New York, Oct. 17, the directors voted to declare a quarterly dividend of \$1 per share, payable Nov. 25. This is only half the amount paid in August. The dividends paid by this company since its organization have been: 1899, \$2; 1900, \$8; 1901, \$7.50; 1902, \$2.50; 1903, \$2; 1904, \$2; 1905, \$4.50; 1906, \$7; 1907 to November, \$7.

### Arizona

**Superior & Boston**—The Globe district has a new producer in this property, which has been at work since last January. It has sunk three shafts, the deepest, 430 ft., to the 500-ft. level of the adjacent Blackhawk shaft of the Arizona Commercial Copper Company, and drifts are being run from both ends to connect the two. These have cut orebodies carrying about 4 oz. silver and 6 per cent. copper.

### California

#### AMADOR COUNTY

**Kennedy**—High-grade rock has been met in the orebody in the south drift of the 3000-ft. level of this mine at Jackson. The shaft is to be sunk 150 ft. deeper. The orebody south of the shaft is the best in size and character that has been found in the mine and continues from the 2400 to the 3000 level. In some places it is 30 ft. wide. The ledge in the south drift is 3 ft. wide at the 3000 level.

#### BUTTE COUNTY

**Mammoth Channel**—At this mine they are laying 6000 ft. of 4-in. pipe for water supply, and sinking the three compartment shaft.

**Oroville Dredging, Ltd.**—The treasurer of this company writes as follows: "In your issue of Oct. 19, page 752, under Special Correspondence you mention the loss of the machine shops at Oroville, Cal., in which your correspondence states that a heavy financial loss is incurred, and no mention is made of insurance. As a matter of fact the machine shops were heavily insured, and a telegraphic report from General Manager W. P. Hammon, indicates that the loss will not exceed \$2000, and that all patterns and blue prints are practically intact."

#### EL DORADO COUNTY

**Crusader**—Hill Bros. and W. P. Frick are placing machinery on this mine in Diamond Springs district preparing for operation.

**Morey**—These properties at Grizzly Flat have been bonded by W. A. Covert and Geo. Ardery, who will continue the development now in progress.

#### INYO COUNTY

**Panamint**—Capitalists have bought in this old camp a group of 10 claims from Mehler & Forg; these include the Jumbo, Crown Point and Blue Bell. Work will commence at once on these silver claims.

**Union Mining Company**—This property at Cerro Gordo continues to ship galena and zinc ores from the 900 level. The zinc occurs in the largest quantities in the San Felipe, paralleling the Union.

#### KERN COUNTY

**Karma-Ajax Consolidated**—This company, organized last January, owns the Karma, Ajax, Extension and Double Standard groups in Soledad district, near Mohave. The old mill has been re-fitted and an electric plant added. The mill is running.

#### MARIPOSA COUNTY

**Copper**—San Francisco and San Jose men are opening a copper mine near Bagby and will soon ship 10 carloads of ore to the Selby smelter.

#### NEVADA COUNTY

**Austin**—In this mine at Willow Valley ore has been found in the north drift, not far from the shaft. The ledge is narrow but carries high-grade ore.

**Gold Mound**—The strike of rich ore in this mine on Deadman's Flat is considered of great importance, as it is some distance to the west of the other mines and in a new field where only prospect shafts have been sunk. A double-compartment shaft has been put down and a gasoline plant is furnishing power.

#### ORANGE COUNTY

**Lucas**—This company, near San Juan Capistrano, has struck ore reported as worth \$40 per ton. There was considerable activity in Lucas cañon some years ago and a number of claims were located.

**Western Zinc Company**—The mines of this company at Silverado are shipping about 80 tons of ore monthly; the company will soon have its own reduction plant at San Francisco.

#### PLACER COUNTY

**Crater**—A force of men is now at work on this old mine at Ophir, from which the water is being pumped out. The old shaft is 700 ft. deep.

**Herman**—Machinery is being hauled to this mine and 6000 cords of wood have been cut for winter use. The battery blocks are in place and the buildings for the power plant nearly finished; 30 stamps are being added to the 10-stamp mill. As soon as the power plant is ready, sinking will commence.

#### PLUMAS COUNTY

**Crescent Hill**—W. F. Oddie and associates, who recently purchased this mine south of Quincy, are preparing to do development work during the winter months.

#### SAN BENITO COUNTY

**New Adria Quicksilver Mining Company**—The mines of this company are running full and the three furnaces are handling 220 tons of ore daily. This is the most productive and profitable quicksilver mine in the United States, being one of the few paying dividends.

#### SAN BERNARDINO COUNTY

**Crackerjack-Bonanza**—The hoist of this company will soon be in place. Two more leases have been granted. The first cross-cutting is now being done.

#### SIERRA COUNTY

**Appel & Grant**—The mine near Alleghaney, operated extensively about 20 years ago, will shortly resume operations with Harrison Appel as superintendent.

#### TEHAMA COUNTY

**California & Massachusetts Copper Mines Company**—Near the surface in this mine some native copper has been found. The mine is being examined by an expert for Chicago capitalists.

#### TUOLUMNE COUNTY

**Spring Gulch**—It is expected that operations will shortly be resumed on this mine. Arrangements have been made for electric power and a new mill is proposed.

### Colorado

#### FREMONT COUNTY

**Cañon City Coal Company**—This company has been sinking a shaft on its tract of 960 acres. near Coal Creek, and recently struck a good vein of coal, 4 ft. thick.

**Loyd & Walton**—On the property of the firm, south of Railroad, a 6-ft. vein of coal is being opened by shaft, at a depth of 90 ft. below the surface.



## SAN MIGUEL COUNTY

**Black Bear**—This company has recently completed and put into operation two wire-rope tramways, one extending from its mill at Ingram Falls to the Black Bear group of mines in Ingram basin, one mile, and the other from the mill down the mountain side to the shipping station at Pandora, another mile. The 20-stamp mill has a capacity of 75 to 90 tons of ore per day, and will begin shortly turning out concentrates carrying gold, silver, lead and zinc. The high-grade ore is sent direct from the group to the shipping station, thence to smelters. This company is capitalized for \$650,000. At the last meeting of the stockholders, Oscar Mantylla, of Telluride, was elected president in place of Leonard Kaanta. The company intends increasing its mill by the addition of 60 stamps early next spring.

**Buckeye Mining and Leasing Company**—This company was organized about 18 months ago to operate the Butterfly-Terrible group of mines at Ophir loop, 16 miles from Telluride. Recently the full 30 stamps in the mill were started. The company has a lease on the mine and mill for a term of five years. The ore, free-milling, runs \$5 and upward in gold per ton. The vein is from 3 to 10 ft. wide. V. U. Rodgers, of Telluride, is manager of the company. The property is owned by the Butterfly-Terrible Gold Mining Company, of which Calvin Bullock, of Denver, is president.

## LAKE COUNTY—LEADVILLE

Leadville will be the distributing center for electric power for all the tributary camps in Summit and Park counties. The first link in the chain will be completed by Nov. 1; the work of constructing the steel towers to carry the wires is being rushed and the one at Kokomo is completed. The use of electric power will be the means of starting up a number of properties.

**Hibschle**—It was generally supposed that the Wolcott ore-shoot at the head of East Seventh street had been pretty well exhausted, but recent development to the south above the Cambrian quartzite has proved an extension. Manager Covey is shipping about 50 tons daily of an excellent grade of iron and carbonate.

**Joy Group**—These claims are located on Grant's peak, about two miles west of the St. Kevin district, Saguache range. They have been worked through a tunnel for the past two years by Albert Fennel. During the week a good looking quartz vein in the granite was opened that carries gold and copper.

**Manganese Ore**—When the Illinois Steel Works closed its contracts with Leadville miners for this class of ore, the owners of manganese claims had to quit mining the ore until a market could be secured. The Pueblo Steel Works came into the market and are now taking in

the neighborhood of 4000 tons per month, for which the miner is receiving a net price of \$3 per ton. The principal shippers are the Morocco Mining Company, and the Morning and Evening Stars.

**Mammoth**—In this property, Big Evans gulch, the drift that is being run from the top of the upraise toward the shaft caught a 2-ft. vein of ore that ran high in silver and lead; with work this vein has widened out to 4 ft. A carload of ore is now ready for shipment, also 200 sacks of the high-grade stuff.

**Minneapolis**—Since the discovery of placer gold in the gulch in early days considerable work has been done in sinking shafts and driving tunnels with a view to locating the mother vein. The Minneapolis is under lease to Flood & Bover, who have been driving a tunnel for the past year; a small streak is being followed carrying values of 1½ oz. gold and a fair percentage of silver; as the tunnel gains headway and depth the vein widens and the values also are slightly on the increase. The property is owned by John C. Morgan, of Denver.

**Rock Hill**—A combination that has been operating in this section for the past month or two has filed papers of incorporation and is now known as the Dolcoath Leasing and Exploration Company. It controls the Ben Burb, Raven, Great O'Sullivan, Only Chance, and Oro City. Some ore is being shipped from the Ben Burb, which is worked through the Raven, and a force is at work cleaning out the Only Chance.

**Shamus O'Brien**—This property, Yankee hill, which has been idle for a number of years, has been leased to Andrew Clooney. The surface plant and shaft are being repaired.

**Wellington Syndicate**—This company has secured the control of the Tingley S. Wood holdings in Lake county, and it is understood that the principal work of development will be carried on from the Yak tunnel. Among the holdings are the Antioch, at one time a heavy gold producer, and the Tribune, Brece hill. The group of claims known as the Benton, Iron hill, will also be worked from the tunnel.

## Idaho

## SHOSHONE COUNTY

**Bunker Hill & Sullivan**—This company has just declared a monthly dividend of \$120,000. The management announces that this rate can be maintained at the reduced price of lead.

**Frisco**—This company has laid off part of its crew and is now confining attention to development work and the remodeling of its zinc concentrating plant. Next to the Success mine, the ores of the Frisco carry more zinc than any others in the district, but the effort to recover the zinc has not been wholly successful thus far.

**Idaho Northern Railway**—This line has been surveyed up the North fork of the Cœur d'Alene river, from its intersection with the Oregon Railroad and Navigation line to Murray. It has begun clearing its right of way and grading at Enoville. The road, when completed, will be 37 miles long and will bring much needed transportation to several new mines near Murray, notably the Monarch and Bear Top properties, which would be steady shippers if they had transportation.

**Oro Fino**—Missoula, Mont., capitalists, operating this property under bond, have just made a second payment of \$9500. The property adjoins the Bear Top group, near Murray.

**Rex**—This company has resumed development. The company was launched some years ago by the Finch & Campbell interests, then large operators in the Cœur d'Alenes. It attained wide celebrity, under the name of "16 to 1," owing to the lawsuits Finch & Campbell were obliged to fight to protect their title. It has been idle the greater part of the last four years. The present operations are being conducted by B. M. Francis and associates. A promising new ore-shoot is reported as being developed. The concentrator is being remodeled under the supervision of W. A. Bradley.

**Sierra Nevada Mining Company**—This company has won a decision in the district court in a suit with Senator Jonathan Bourne, of Oregon, owner of the Ontario lode. Bourne sued to quiet title to the orebodies under the Sierra Nevada, claiming that they apexed within the surface lines of the Ontario. The Sierra Nevada claimed that the apex of the vein cut across the side line of the Ontario, and that if it had any extra-lateral rights they extended to the west under the ground of the Stewart Mining Company instead of to the south, as claimed by the plaintiff. The Sierra Nevada is controlled by the Federal Mining and Smelting Company and, by many, it is believed that Senator Bourne's interest has really passed to the Bunker Hill & Sullivan Company, and that this litigation is a renewal of the long fight waged between the Bunker Hill & Sullivan and the interests of President Charles Sweeny, of the Federal company.

**Stewart Mining Company**—This company, operating the Stewart and other claims on the Wardner belt near the Bunker Hill and Federal properties, has suspended operations. The Stewart is controlled by F. Aug. Heinze, of Butte, and the suspension is locally supposed to be due to a dispute and pending litigation between Heinze and the Silver King company controlled by F. W. Bradley and associates.

**Snowstorm**—This company, owning the only producing copper mine in the Cœur d'Alenes, has been obliged to lay off some of its crew owing to the inability

of the smelters at Anaconda to receive the usual quantity of ore. The ore of the Snowstorm is highly silicious and is principally in demand by the smelters for converter linings. The mine has large reserves of ore blocked out. The company has a leaching plant in successful operation treating the low-grade carbonate ores of the upper levels.

**Surprise**—This company started, on Oct. 5, its new concentrator, planned to have a capacity of 150 tons per day. The property is located on Pine creek, about two miles south of the Bunker Hill & Sullivan. It is in a new part of the district and is the first of a number of properties there to arrange for steady production. The property has been financed by Senator Alfred Page, of Wardner, and is controlled by himself and friends.

#### WASHINGTON COUNTY

**Cuddy Mountain**—Good ore has been opened up in the mine operated by Lyon, States & Calvin, on Cuddy mountain, 15 miles from Council. Its chief value is in copper, with some gold and silver.

### Michigan

#### IRON—MEMOMINEE RANGE

Our Duluth correspondent writes: "A statement made in the JOURNAL a week or two ago as to the connection between Messrs. Whiteside and La Rue, of Duluth, as to explorations in lands on the Menominee range, was incorrect. Both men are at work there, but not together. They were associated in the Baraboo district in Wisconsin formerly, but are now working independently."

#### COPPER

**Allouez**—Sinking is going forward at the rate of about 100 ft. a month in the new No. 2 shaft. No. 1 shaft is furnishing about 750 tons of rock daily to the mill. The addition to the mill has been completed and parts for the three new Nordberg steeple compound heads are on the ground.

**Cliff**—A large shipment of copper rock has been sent to the Tamarack mill and other shipments will be made from time to time. Five drills are at work in this mine and some promising looking rock is being taken from a drift on the third level. This drift is being run on the amygdaloid formation.

### Montana

#### BEAVERHEAD COUNTY

**Dillon-Argenta**—In this mine, in the Argenta district, the shaft is down 100 ft., and has cut a body of copper ore 3 ft. wide. The vein is nearly vertical.

**Dacotah**—At this mine, in the Polaris district, west of Dillon, high-grade ore has been struck in the new tunnel, which is now in 50 ft. D. Burkholder is manager.

#### BUTTE DISTRICT

**Butte & Superior Copper Company, Ltd.**—This company, holding a group of claims in Butte, having an aggregate of 90 acres and joining the North Butte property, is finishing up construction work which has been going on for several months. There is installed a surface equipment which will be adequate for all the demands of deep mining. An Oregon fir gallows-frame, 60 ft. high, a 20x60 Allis-Chalmers first-motion hoist, with a battery of four Springfield internally-fired boilers, all housed in a structural-steel building with concrete floors, ash tunnels, etc.; also a Sullivan air compressor which furnishes air for the mine. The company has built and equipped a timber framing shop and machine shop; power in both being electric. In the mine a three-compartment shaft is down 700 ft., with an 18x35 station cut at this depth and a 250-gal. station pump installed. The company will resume sinking Nov. 1, and at the same time proceed with development work and mining on the upper levels where commercial silver ore has been found in the Black rock vein. Robert C. Davis is engineer in charge.

#### CARBON COUNTY

**Northwestern Improvement Company**—This company's coal mines at Red Lodge have now a full force and are shipping 1800 tons of coal daily, the highest output ever reached.

#### MEAGHER COUNTY

**Copper Belle Mining Company**—This company has been organized to develop a property near Martinsdale, on which there is reported to be an outcrop of ore carrying copper, silver and gold. A test shaft sunk 50 ft. shows a 5-ft. vein. The new company has bought machinery and will sink a shaft 400 ft. on the vein.

### Nevada

#### ESMERALDA COUNTY

A tract of 160 acres, near Coaldale, has been sold to Louis K. Koontz and others. There are said to be several veins of bituminous coal on the property. The new owners propose developing the property, to ascertain its value. Coaldale is about 40 miles west of Tonopah, and a market is assured if coal is found in any quantity.

#### ESMERALDA COUNTY—GOLDFIELD

Financial stringency in the East has occasioned some depression in Goldfield. Very few leases are working, except those already shipping ore. The complete collapse of the market for shares is weeding out the wildcatters and boomers. There are seven large stone buildings being rushed to completion.

**Production**—Owing to the car shortage no ore was shipped to outside points East for the week ended Oct. 12, and the

production of the camp was curtailed. Nevertheless the two custom mills here are nearly buried with ore. The week's production amounted to \$392,200 against \$379,300 the preceding week. The output for the week is as follows: Combination mill, 540 tons; Jumbo Dump, 385; Mohawk Junbo, 1393; Little Florence, 242; Mohawk, 500; Red Top, 134; Begole lease, 220; Combination Fraction, 50; Mohawk Combination, 280; Original Velvet, 6; Florence Leasing and Mining, 97; Hayes-Monette Dump, 30; total, 3877 tons.

**Lease Results**—The following figures are compiled from statements made by two of the noted leasing companies, covering operations for the month of September:

	Mohawk-Jumbo.	Florence.
Ore production, tons.....	3,837	446
Gross value.....	\$209,067	\$22,536
Net value.....	128,497	13,541
Total net to Oct. 1.....	301,653	857,073
Gross value per ton, Sept..	\$54.48	\$50.49
Net value per ton, Sept.....	20.99	20.15

During the 40 weeks from Jan. 5 to Oct. 5, 1907, Goldfield produced and shipped 79,308 tons of ore.

**Goldfield Daisy**—An eight-drill Ingersoll-Rand two-stage air compressor is being installed by this company at the Truett shaft on the Daisy property. The 4-in. calyx drill used for exploration purposes on this property has been shut down indefinitely. The ground was so badly broken that satisfactory results could not be obtained.

**Yellow Tiger**—The Elk Consolidated Company, operating on this claim, is putting up a 40-ft. steel gallows frame, the first steel frame in Goldfield. The shaft, now down 420 ft., will be sunk to the 500-ft. level, where extensive lateral work will be done.

**Rosebud**—The vein was lately cut in the north drift on the 400-ft. level. The average assay value of the ore is \$50 per ton. The vein is believed to be an extension of the Little Florence, that is being successfully worked by the Rogers-Goldfield Leasing Company.

**St. Ives**—A rich pay-streak was cut in the 100-ft. level. A winze is being sunk on the vein, and is down 30 ft. The ore streak is 6 in. in width and averages very high in gold. Some of the ore being sacked for shipment promises to yield sensational returns.

**Velvet**—A cross-cut on the 75-ft. level in the Original Velvet lease has cut a rich pay-shoot. The vein is 3½ ft. in width, but a few inches of the vein carries very rich ore. A crosscut is being run from the 150-ft. level to cut the shoot at that depth. The shaft is down 290 ft. in all.

#### NYE COUNTY—MANHATTAN

**American Flag**—Good ore is being exposed in the 75-ft. level, but the management is chiefly employed in sinking the shaft to the 150-ft. level, with the view of developing the vein at that depth.



*Gold Crest*—The tunnel has been driven a distance of 90 ft. At a point 80 ft. from the entry a winze has been started with the view of intersecting one of the ledges cut in the surface trenches on the dip.

*Gold King*—Preparations are in progress for resuming shaft sinking on this property under the management of C. E. Mayne. Parts of the company's holdings have recently been let on lease and the lessees are now engaged in developing their ground.

*Gold Ridge*—Work has been started on the Gold Ridge, located east of the Manhattan Consolidated. Initial development is to consist of sinking a double-compartment shaft to water level at a point about 50 ft. north of a large cropping which carries a quantity of iron gossan. The shaft will tap the ledge at a depth of from 50 to 60 ft. When cut the ledge will be cross-cut and tested.

*Manhattan Mill*—It is expected that the mill will be able to undergo a trial run within a month.

#### NYE COUNTY—TONOPAH

*Ore Shipments*—Shipments over the Tonopah Railroad for the week ended Oct. 10 were: Tonopah Company, 324 tons; Tonopah Extension, 95; Jim Butler, 62; total, 481 tons. Shipments to mills were: Tonopah Company, 1320 tons; Tonopah Belmont, 500; Montana-Tonopah, 1260; total, 3080. This makes a grand total of 3561 tons for the week.

*West End*—The new working shaft has been sunk to a depth of 290 ft. Drifting is in progress both east and west at the 275-ft. level and stoping is being done on the 400-ft. level in the old workings. Machine drills are employed throughout the mine.

#### New Mexico

*Santa Rita*—The low price of copper has compelled several leasers on low-grade deposits to close down temporarily, but shipments from the camp continue regularly.

#### GRANT COUNTY

*Laura*—A large body of ore was recently encountered in starting an upraise for stoping on the 300-ft. level. The ore carries argentite, cerargyrite, pyrrargyrite and gold. Two carloads have been taken out for shipment.

#### Ohio

##### ATHENS COUNTY

*Hisylvania Coal Company*—This company has made a lease of 850 acres of coal lands near Trimble, where mine No. 23 of the company is located. The property is owned by J. W. Blower and others, who purchased it some time ago. Only 70 acres of the land has been developed. The lease provides that royalties shall begin July 1, 1908. The property will be

developed from the opening of the Trimble mine or from another opening which is now being worked on another portion of the acreage.

#### BELMONT COUNTY

*Colburgh Mining Company*—This company will soon be ready for its first shipment of coal. Delay in securing materials for the equipment caused a postponement of active operations. The mine is located on the Baltimore & Ohio near Barnesville, and there are 1200 acres, on both sides of the railroad. The output will be about 400 tons daily.

#### MUSKINGUM COUNTY

*Carding Mining Company*—This company is putting up an electric plant at its mine at Deavertown, and expects later to add new engines and boilers.

#### PERRY COUNTY

*Valley Colliery*—This mine, near Lexington, on the Cincinnati & Muskingum Valley road, has been sold by the Imperial Coal Company to Columbus parties. The property consists of 800 acres upon which a fine electrically equipped mine has been operated for some time. The output is between 500 and 600 tons daily. The Imperial company will continue to operate its mines in other sections of the Hocking valley.

#### Pennsylvania

##### ANTHRACITE COAL

*Pine Hill Coal Company*—This company has leased the Herbine property near Minerville. The property is on the Black Heath vein; it will be opened and a breaker built. The rental is \$10,000 yearly and in addition to this a royalty of 40c. per ton on all coal shipped of prepared sizes, 20c. on pea coal and 10c. on smaller sizes.

##### BITUMINOUS COAL

*Pittsburg & Westmoreland Coal Company*—This company has recently put additional boilers, a new engine and dynamo in its Shoenberger mine at Baird. Work has been begun on a new tippie much larger than the old one.

*Provident Mining Company*—This company has sold its property in Armstrong county to a syndicate headed by E. T. Norton, of Connellsville, Penn. The property includes 3250 acres of land along the Allegheny river, 40 miles north of Pittsburg. The price paid was \$250,000, it is reported.

##### COKE

*Mount Pleasant Coke Company*—This company has let contracts for the sinking of two shafts on its coal property near Hecla. It is also preparing to build 100 bee-hive coke ovens.

*Peerless Connellsville Coke Company*—This company has let a contract to Christian Echard, of Unionville, to build 40 coke ovens on its property near Mayfield.

#### Texas

##### ROBERTSON COUNTY

*Southwestern Fuel and Manufacturing Company*—This company has succeeded in getting sufficient labor, and is pushing the work on its coal mine near Calvert. The product is lignite of good quality, and contracts have been made which will require large shipments.

#### Washington

##### KING COUNTY

*Northern Pacific Coal Company*—An explosion of gas in this company's coal mine at Ravendale on Oct. 7 killed one man and wrecked the mine badly, the shaft caving in.

#### West Virginia

##### HARRISON COUNTY

*Landstreet Coal and Coke Company*—This new company has taken the property of the Allegheny Coal Company, which includes 5000 acres of land and a modern coal plant. F. S. Landstreet is president and J. S. Galbraith engineer. The company has an office at No. 1 Broadway, New York.

##### TAYLOR COUNTY

*Western Maryland*—This company's property at Simpson has been sold to John T. McGraw, of Grafton, W. Va. The property includes 3000 acres of land on the Pittsburg vein. It has been held in the interest of the Western Maryland Railroad, a Gould property, but has been shipping over the Baltimore & Ohio.

#### Wisconsin

##### PLATTEVILLE DISTRICT—ZINC-LEAD

*Acme*—The equipment for the calciner is being transported from the Blackhawk to its new location by the big traction engines of the Galena Iron Works Company. The 100-ton mill is turning out 100 tons of concentrates per week.

*Burrichter*—The new shaft is down and shows rich disseminated jack 15 ft. below the green rock opening; the company has one of the richest drybone and lead dumps in the district.

*Clark*—The Clark, owned by the Mineral Point Zinc Company, is milling night and day; the day shift in the mine breaks sufficient dirt to keep the 100-ton mill going two shifts.

*Empire*—On account of the expense involved in installing its big new power plant this company has passed the last monthly dividend.

*Franklin*—The mill is turning out from 15 to 17 tons of drybone concentrates per day. Not more than one-tenth of the ore in the surface dumps will be milled this year.

*Hodge*—The mill is meeting with good success in the use of slotted grates in jigs

and is making a satisfactory recovery. A test of its raw concentrates is being made at the Enterprise roaster this week, to determine the advisability of adding a calciner.

*Minter*—The company has tested the flow in its two wells and is satisfied that there is sufficient water for milling purposes. The 50-ton mill will shortly be started on carbonate ores.

*Wallace*—Worked on a small scale without expensive machinery, this mine yields a fair profit. The mine is entirely dry, the ground is easily broken and good headway is made by hand drill; the mine dirt is rightly disseminated high-grade zinc ore and is readily cleaned with old-fashioned hand jigs and log washers. A nearby creek furnishes water for cleaning purposes.

#### ZINC

*Etna*—This property has settled down to steady production and is turning out a good daily tonnage. Running one 10-hour shift, the 150-ton mill recently turned out 9 tons of zinc and 5 tons of lead concentrates. The ore lies in solid sheet formation, lead and jack, averaging 18 in. in thickness.

*Frontier*—Foundations are laid for the new 100-ton mill which will contain two sets of jigs, 7 cells each, and one short sand jig; an over-shaft mill hopper and immediate railway facilities are among the natural advantages of location which favor a lower cost of production. The main shaft is being sunk 15 ft. deeper to the oil rock, which will allow a working stope 40 to 50 ft. high and a breast about 100 ft. wide.

*Grant*—This mill has increased its daily output to 23 tons of concentrates. Between 600 and 700 tons of green concentrates are on hand and are being hauled to the Empress for calcining. The building for mill No. 2, on the old Rooney & Swift property, is erected and machinery is being installed. The plant will soon be ready for operation.

*Kennedy*—An enlarged force is working on the day shift. The 100-ton mill is kept grinding 12 hours per day, turning out an average of 25 tons of concentrates per day, which are then calcined.

*La Fevre River Consolidated Company*—This concern, backed by Milwaukee and Indianapolis capital, is sinking two shafts on leases, comprising 1700 acres, lying between Cuba City and Elmo. The shaft on the tract lying just south of the Best is down within 25 ft. of the orebody. A steel-frame derrick is erected over this shaft.

*Midway*—This company is testing its ore at the Cook mill in order to determine whether or not a roaster and magnetic separator would be desirable. The new 100-ton mill building is reared and machinery is being installed. The latter includes a 150-h.p. Corliss engine, two 10-

in. cross-head pumps, one Class A Ingersoll-Rand air compressor.

*Mills*—This company has built an inclined tram, 1400 ft. long, from its ore and coal bins to the tracks of the Northwestern Railway. The tram cars carry 4 tons of ore or 1½ tons of coal to the load. It is estimated that by use of this tram the cost of loading ore and unloading coal will be reduced from 45c. to less than 5c. per ton. The mine is shipping again after a temporary shutdown for repairs. Between 800 and 900 tons of jack and 90 tons of lead are on hand. The 200-ton mill turns out between 30 and 40 tons of concentrates per shift. Five drill machines are used in the mine, which affords a working stope 80 ft. high. The contract system of tramming and shoveling is employed with good results.

*Trio*—This mine, located at Linden, was sold at foreclosure sale, Sept. 28, to William Bell, of Racine, Wis., for \$6700. The property consists of 27 acres. It is proposed to re-organize the company and operate the mine as soon as possible.

#### Wyoming

##### LARAMIE COUNTY

*Chicago Iron Mine*—This mine, owned by the Colorado Fuel and Iron Company, was submerged three months ago by a sudden flow of water. Since then all efforts to clear the mine of water have failed, and it is still full up to the 175-ft. level.

##### SHERIDAN COUNTY

Shipments of coal have been begun from the new mines at Cool, near Sheridan. The work on the slope and tippie are well advanced, and it is expected that shipments will be 1000 tons daily by the end of the year.

#### Philippine Islands

Development work, which has been in progress for some time on the property owned by A. U. Betts, on the island of Batan, has resulted in opening a coal deposit of such importance that arrangements are now being made to install an electric plant for lighting, pumping and haulage. The property is being opened by two slopes, one of which is now in 500 ft. The plant ordered is sufficient for an output of 300 tons daily. The coal has been tested in a number of coasting steamers, and is of good quality, though not equal to the best Australian. It is clean, low in ash, and generally free from sulphur. The mine is situated near the water, and two wharves have been built, extending out to a depth of 33 ft. of water, one 1100 ft. in length and the other 1400 ft. There is a secure harbor, almost completely land-locked, good holding ground with mud bottom and the harbor is capable of accommodating the largest ship that visits the islands.

#### Canada

##### ONTARIO—COBALT DISTRICT

*Ore Shipments*—Shipments of ore for the week ending Oct. 12 were as follows: Buffalo, 60,000 lb.; La Rose, 87,000; McKinley-Darragh, 144,720; Nipissing, 61,010; and Townsite, 42,000; total, 394,730 pounds.

*Right of Way*—A decision has been handed down by the Court of Appeals confirming the previous judgment declaring that the La Rose Mining Company had no right or title to the land sold to the Right of Way company by the co-defendants the Temiskaming & Northern Ontario Railway commission.

*Silver Queen*—This company reports that it has a full force of men and that the strike which is still in progress is not affecting its operations. The new vein, which is from 4 to 8 in. wide, runs high in silver. The company has installed an experimental furnace to treat high-grade ore; running the silver into bars.

*Temiskaming & Hudson Bay*—The main shaft is down 80 ft. At the 65-ft. level, a station is cut and drifting both east and west on the vein has been commenced. In sinking this shaft three carloads of rich ore have been produced, two of which have been shipped and have netted the company more than \$50,000.

##### FRONTENAC COUNTY

*Wilbur Iron Mines*—The first shipment of iron ore has been made to Sault Ste Marie via Renfrew, on a contract calling for 100,000 tons. Ore is being extracted at the rate of 250 tons per day.

##### STURGEON LAKE DISTRICT

*Douglas*—Three shafts are down 30, 20 and 17 ft. respectively. At the bottom of the 30-ft. shaft every sample taken out shows visible gold, the lowest assay showing \$17 to the ton.

#### Europe

##### SPAIN

*Mineral Exports and Imports*—Exports of metals from Spain for the eight months ended Aug. 31 are reported as follows, in metric tons:

	1906.	1907.	Changes.
Pig and man. Iron.....	34,612	42,479	I. 7,867
Copper.....	4,948	5,218	I. 270
Copper precipitate.....	15,077	11,938	D. 3,139
Zinc.....	692	791	I. 99
Lead.....	119,057	125,347	I. 6,290
Quicksilver.....	1,474	1,488	I. 14

The exports of minerals and ores for the eight months are reported as follows:

	1906.	1907.	Changes.
Iron ore.....	6,642,751	6,218,775	D. 423,976
Copper ore.....	757,713	871,629	I. 113,916
Zinc ore.....	100,192	112,013	I. 11,821
Lead ore.....	3,111	4,217	I. 1,106
Manganese ore.....	65,835	54,449	D. 11,386
Pyrites.....	717,793	889,559	I. 172,766
Salt.....	322,724	350,247	I. 27,523

Imports of phosphate of lime this year were 44,213 tons; of superphosphates and basic slag, 67,720 tons.



# 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. 23—In the West the coal trade is beginning to be more disturbed by car shortage and slow transportation. At most distributing points trade is good, and consumers appear to be laying in winter stocks to a much greater extent than they did last year. The lake trade is rather quiet for this time of year, chiefly because of the large shipments earlier in the season. There is still a bad congestion at the upper lake ports.

The movement to restore the old interstate agreement is extending. Invitations have been sent to the leading coal operators of the "Central Competitive Field," inviting them to meet with representatives of the United Mine Workers in Indianapolis Oct. 29, to discuss a re-establishment of the joint conference between the operators and miners at the meeting next January with a view of entering into a new scale to become effective next April when the present scale expires.

In the East the chief feature in the bituminous trade is the activity of the coastwise business. The demand for coal is large and prices higher than they have been for some time. There is some complaint of car shortage, and more of scarcity of labor at the mines.

The anthracite trade is steady, with little change from recent weeks.

**Coal Conditions in Western Canada**—F. Dillinger, for the Canadian Railway Commission, reports that since July the car supply for the shipment of Canadian coal in the West has been good. There was in store at prairie towns west of Winnipeg over 250,000 tons of coal for domestic use, exclusive of current deliveries to consumers, with supplies still coming in. The Canadian Pacific had in store over 100,000 tons of steam coal west of Winnipeg for winter use, 150,000 at Fort William and 150,000 more booked to arrive before the close of navigation. From Winnipeg west the Canadian Northern had in store 200,000 tons of steam coal for winter use and 160,000 tons at Port Arthur. Mr. Dillinger thinks the car supply will be sufficient to obviate any danger of a coal shortage.

#### COAL TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Oct. 12 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	3,410,910	4,427,580	I. 1,016,670
Bituminous.....	24,929,009	30,429,198	I. 5,500,189
Coke.....	9,869,184	10,964,547	I. 1,095,363
<b>Total.....</b>	<b>38,209,103</b>	<b>45,821,325</b>	<b>I. 7,612,222</b>

The total increase this year to date has been 19.9 per cent.

Coal receipts at St. Louis for the eight months ended Aug. 31 were 4,695,870 short tons in 1906, and 4,883,953 tons in 1907; an increase this year of 188,083 tons.

The coal and coke tonnage of the Chesapeake & Ohio railway for the two months of its fiscal year from July 1 to Aug. 31 was as follows, in short tons:

	Coal.	Coke.	Total.
New River.....	1,027,947	41,715	1,069,662
Kanawha.....	865,450	19,117	884,567
Kentucky.....	43,964	.....	43,964
Connecting lines...	48,444	20,670	69,114
<b>Total.....</b>	<b>1,985,805</b>	<b>81,502</b>	<b>2,067,307</b>
<b>Total, 1906.....</b>	<b>1,479,152</b>	<b>51,155</b>	<b>1,530,307</b>

Deliveries of tonnage originating on the road this year were: Points west of mines, 1,005,170 tons coal and 39,166 tons coke; points east, 293,671 tons coal and 21,666 tons coke; tidewater, 638,520 tons coal. The total increase in tonnage this year was 537,000 tons, or 35.1 per cent.

### New York

#### ANTHRACITE

Oct. 23—Prepared sizes are fairly active, especially in the stove and chestnut grades. There is not so heavy a demand for broken and egg; but taken as a whole the prepared sizes are in good demand. For the first time in several months small steam sizes are inclined to be dull. The recent cold weather did not have the expected result in increasing the demand for small coal. Prices are quoted as follows: Broken, \$4.75; egg, stove and chestnut, \$5; pea, \$3.25; buckwheat No. 1, \$2.75; buckwheat No. 2 or rice, \$2.15@2.25; barley, \$1.75, all f.o.b. New York harbor.

#### BITUMINOUS

The pressure which has been brought to bear upon shippers has somewhat abated, but this has not increased stocks and there is the same scarcity of coal which has characterized the market for several weeks. Consumers are now entirely upon their monthly proportion, and what little coal there is to spare is selling at a premium of about 50c. per ton. George's Creek coal brings \$3.50@3.75 f.o.b. New York harbor, and good grades of steam coal from the Pennsylvania districts bring from \$2.85@3.15. Quotations, however, are no criterion of the market, because the price depends largely upon the

needs of the consumer and what he is willing to pay.

The shortage of coal has been brought about by the lack of cars in nearly all the coalfields, the labor conditions at the mines and the fact that consumers have been demanding their full contract amount. At the present time the shoal-water ports are receiving the entire attention of shippers and when these consumers are fully supplied the market conditions will be relieved. Vessel brokers have succeeded in raising the rates of freight to certain shoal-water ports, claiming that ice troubles menace delivery, although it is not expected that the ports making fresh water will freeze up for several weeks.

All-rail trade is very poor, especially in New England. Here the trade is almost at a standstill because consumers are afraid of demurrage charges. Nearer the mines this trade is in better condition. Transportation has been slow but if shippers are insistent the railroads furnish better facilities. No improvement can be reported in the car supply.

Light draft vessels, in the far East trade, are in small supply but no scarcity is reported among heavier vessels. Freight rates have advanced, especially to the shoal-water ports. The rates are as follows: From Philadelphia, to Boston, Salem and Portland, 90c.@\$1; to Lynn and Newburyport, \$1.25; to Portsmouth, \$1.05; to Saco, \$1.35 and towage; to Gardiner, \$1.75 and towage; to Augusta, \$1.75@2.25, depending upon the arrangements made with different brokers.

### Birmingham

Oct. 21—The coal mines are working on full time and the railroads are being called on to handle the product as quickly as they can. There is some complaint as to a car shortage in Alabama. The production is greater than it ever was in this State.

It is given out in this district now that a plant is to be erected that will produce briquets from the accumulation of coal slack at the mines. The parties back of this movement assert that they will be able to utilize considerable product that now does not receive much attention.

Coke is in strong demand with good prices prevailing. The make is healthy.

### Chicago

Oct. 22—Sales of coal continue large in almost every branch of the trade. Western coals especially are strengthening. Eastern coals, due probably to

greater diversion of shipments to Chicago, are not so rapidly increasing. The demand for both Western and Eastern is increasing largely with the autumn season.

Lump continues the favorite in Western coals. For lump and egg Illinois and Indiana coal continues to bring \$2.25@2.65; run-of-mine holds to \$1.75@2.50; screenings are in light demand at \$1.10@1.40.

Eastern coals are weakening slowly. Smokeless is in fair demand at \$4.30@4.50 for lump and \$3.30@3.50 for run-of-mine. Hocking is still firm at \$3.50, with the supply much better, and Youghiogheny is in fair demand at \$3.30 for 3/4-in. Pittsburg No. 8 is firm at \$3 for 1 1/4-in. Car service is reported much better.

Anthracite is selling exceptionally well, with chestnut in demand far exceeding supplies. The country demand for anthracite is perhaps better than the city demand.

### Cleveland

Oct. 22—Coal dealers continue to report a scarcity in local yards. Car shortage remains the chief factor in the situation. Contracts cannot be filled on any of the lines entering the city with any degree of certainty. On Monday the price for all grades of soft coal was advanced by wholesalers, the following prices being quoted: No. 8 district slack 75@80c.; mine-run \$1.20@1.25; 3/4-in. lump \$1.30@1.35; Middle district slack 85@90c.; mine-run \$1.25; 3/4-in. \$1.35. Heretofore, a 10c. difference has existed in the quotations of the two districts, but the scarcity of cars has caused No. 8 operators to advance their prices.

### Indianapolis

Oct. 21—The State Railroad Commission has entered on a general investigation of the railroads of the State in relation to coal transportation. This will include rates, the distribution of cars and all charges of discrimination. The shippers' bill, passed at the latest session of the legislature, gives the commission extensive powers.

The tremendous explosion of the Dupont powder mill near Fontanet has had a demoralizing effect upon mining operations in that field. The officials of the Coal Bluff and other companies report that it has been impossible to get the men back in the mines to work. Some, of course, had ruined homes to look after and some had injured or dead in their families, but the fear that so powerful a shock must have affected the mines by loosening the timbers and supports is the principal cause of the disinclination of the men to enter the mines. The State mine inspector is making a careful investigation of all the mines of the region.

### Pittsburg

Oct. 22—While the demand for coal exceeds the capacity of the mines in the Pittsburg district, the railroads yesterday and today only supplied about 70 per cent. of the number of cars required. The large concerns have received a number of important inquiries for bituminous coal for foreign shipment, but declined to make any quotations, as it is impossible to take care of the business offered. Prices remain firm on the basis of \$1.40@1.50 for mine-run coal at mine. Slack is slightly higher this week and is quoted at 80@90c. The river mines are in full operation and will run steadily for some time, as there is a good supply of empty coal boats and barges in the pools and harbor. There is not a large tonnage on hand, as the rivers have been navigable almost continuously for several months.

**Connellsville Coke**—Coke prices have declined again and the demand is slowly falling off, indicating that still lower prices may be expected. For standard Connellsville furnace coke for any delivery this year \$2.65@2.75 is quoted; foundry coke is \$3.20@3.30. The blast furnaces have stored considerable coke and are not likely to need a great deal more this quarter. According to the *Courier*, the production for the week amounted to 429,038 tons in both fields and the shipments aggregated 13,415 cars distributed as follows: To Pittsburg, 4929 cars; to points west of Connellsville, 7631 cars; to points east of Connellsville, 855 cars.

### Foreign Coal Trade

Coal exports from Great Britain, with coal sent abroad for the use of steamers engaged in foreign trade, for the nine months ended Sept. 30 were as follows, in long tons:

	1906.	1907.	Changes.
Coal.....	41,229,705	46,883,755	I. 5,654,050
Coke.....	570,713	656,198	I. 85,485
Briquets.....	1,072,435	1,107,737	I. 35,302
Total exports..	42,872,853	48,647,690	I. 5,774,837
Steamer coal.....	13,845,545	13,884,782	I. 39,237
Total.....	56,718,398	62,532,472	I. 5,814,074

The total increase was 10.3 per cent. The exports to the United States, included above, were as follows:

	1906.	1907.	Changes.
To Atlantic ports.....	21,947	14,137	D. 7,810
To Pacific ports.....	28,002	31,682	I. 3,680
Total.....	49,949	45,819	D. 4,130

The larger exports this year were 7,819,657 tons to France; 7,208,095 tons to Germany; 6,315,277 to Italy; 2,543,134 to Sweden.

Imports of coal into Spain for the eight months ended Aug. 31 were 1,301,641 metric tons, a decrease of 202,568 tons from last year. Imports of coke were 166,147 tons, an increase of 34,222 tons.

### Iron Trade Review

**New York, Oct. 23**—The iron and steel markets at present are waiting for new developments. Financial conditions are uncertain and few consumers are ready to enter into engagements extending far ahead. There is some inquiry, but it seems to be directed chiefly to the point of possible concession from present quotations. Actual business has been limited to small orders for early delivery; that is, to material needed to make up deficiencies in stocks. Manufacturers' needs for 1908 business are still largely unknown quantities, and not much business can be expected until there is some light on that point.

Ore shipments from the Lake Superior district have been heavy. Already some trouble has been caused at the upper ports by ore freezing in the cars and bins. It seems, probable, however, that there will be no shortage in ore supplies this winter.

### Baltimore

Nov. 22—Included in receipts for the week were 148 tons ferro-manganese and 187 casks ferro-silicon. Receipts of iron ore were 9670 tons from Cuba; of manganese ore, 6000 tons from India; of iron pyrites, 3824 tons from Spain.

### Birmingham

Oct. 21—There is very little business being done now, except to fill a few orders for what might be termed spot delivery. There is no iron being sold for delivery next year, consumers holding off evidently in the expectations of a reduced price. The furnace people, despite the dullness that is on, are holding prices up, No. 2 foundry being quoted still at \$18@18.50 per ton. There is no great alarm felt in this section, and no inclination has yet developed to curtail the production. The Alabama Consolidated Coal and Iron Company has started up the furnace at Gadsden after a thorough repairing, while another furnace of this company at Ironaton will be ready before the close of the present month. Williamson furnace, in Birmingham, will be ready for operation again about the middle of November. With the exception, perhaps, of a few tons of low-grade iron, there is no accumulation of iron in Alabama.

Steel, cast-iron pipe, soil pipe, foundries and machine shops and other industries report business quiet. The announcement that a large number of hands had been laid off at the steel plants at Ensley during the past week caused considerable comment. It is believed that the action is only temporary.

### Chicago

Oct. 22—Pig iron continues to be in little demand. The tendency of the market



for the last two months—to buy only for immediate needs—is unchecked. The average melter is still of the opinion that the bottom will drop out of the market. Once he is convinced that it is not going to drop he will buy; until he is convinced there will be no change.

Iron for last-quarter delivery brings \$22.50@23 for Northern No. 2, and \$18@18.50, Birmingham, for Southern No. 2 (\$22.35@22.85 Chicago). Nearly all orders are for carload or other small lots.

Coke is firm at \$5.90 for Connellsville 72-hour.

**Cleveland**

Oct. 22—The local iron situation shows little change. Pig-iron prices are quoted unchanged as follows: Bessemer \$22.90; No. 1 foundry \$21.50@22; No. 2 \$21@21.50; No. 3, \$20@21; No. 2 Southern, \$22.85; gray forge \$20@20.50, Cleveland.

The coke market is showing some improvement, but no price changes are reported. This year deliveries are quoted: Foundry \$3.25@3.50; furnace \$3@3.15; both at ovens.

**Philadelphia**

Oct. 23—The pig-iron market is dull and there is little to say about it. The weakening tendency is still apparent. The only ray of light that breaks through the clouds is a little inquiry from some of the larger consumers of iron for basic and for foundry irons. The selling interests are following up these inquiries very closely and arguments are being used to demonstrate to buyers that now is the day of salvation. Among the inquiries just received are some from mill-owners who are willing to place orders for forge at their own price. The greatest activity will probably develop in basic iron and in No. 2X foundry. The smaller consumers are all busy. The engineering plants in this territory are also short, but they are awaiting cheaper prices. In a general way there is a hesitancy to buy far ahead. Quotations are close to what they were last week.

**Steel Billets**—Billets are doing better than last week. Manufacturers are evidently quoting the market. Purchases are light, most users of steel preferring to buy in a hand-to-mouth way.

**Bars**—Our retailers and country store keepers report a continued and gratifying activity in bar iron, especially refined and steel bars. The car builders are again in the market for common iron, but they are merely making inquiries.

**Sheets**—The sheet-iron market is, according to some authorities, in a vigorous condition. They report that they have captured the renewal of a number of large orders.

**Pipes and Tubes**—Pipes have been under better inquiry this week. Tubes are quiet, but at retail very firm.

**Plates**—The business in iron and steel plates is of the same character as a month ago. The orders are not large. The mills are busy. In a small way plates are as high as ever.

**Structural Material**—Nearly all of the orders heard of are small. The railroad companies are buying small lots for bridge work. Inquiries for export are occasionally met with. Prices are firm as the business is in small lots.

**Steel Rails**—The only business that has been spoken of this week is in trolley rails and the amount of this kind of work is satisfactory.

**Scrap**—Nearly all of the larger dealers claim to be doing business, but they are not getting the prices they would like. Two or three dealers have instructions to gather up a large amount of special scrap and they are on the war path for it.

**Pittsburg**

Oct. 22—The only actual new business booked this week of any consequence was 5500 tons of standard steel rails taken by the Carnegie Steel Company for delivery this year. Some small orders in various lines of finished iron and steel products were received and the only shading in prices noted is in sheets. The mills continue busy, as specifications are coming in satisfactorily. The tin-plate trade is the duller of the finished lines. The American Sheet and Tin-Plate Company this week is operating but 30 per cent. of its capacity, there being 74 mills running and 168 idle. Its sheet mills are operating more fully, the week opening with about 90 per cent. going.

On Oct. 21 the Carnegie Steel Company announced the price of sheet-bars for November shipment. There was no change from \$31, the rate that has prevailed for several months. The Carnegie company will be unable to complete all of its rail orders this year, and a large tonnage will be taken over into 1908. It had been intended to close the Edgar Thomson rail mill early in November to enable the company to make repairs and improvements, but this work must be postponed until the holidays.

**Pig Iron**—There was some activity in the pig-iron market, sales of basic iron aggregating over 7000 tons having been made for deliveries running through October and November at \$19.25@19.50, Valley furnaces. No sales of bessemer iron have occurred for several weeks, and the price remains nominally \$22, Valley furnaces. Some readjustments of contracts have been made on a basis of \$21.50, Valley furnaces, and this might be regarded as the market, but it is doubtful, as there seems to be a scarcity of bessemer iron. Foundry and gray forge have declined in price, and No. 2 foundry is quoted this week at \$19.50, at furnaces, but some large producers refuse to shade

\$20 for early delivery. Gray forge is quoted nominally at \$18.75 at furnace.

**Steel**—The demand for billets has declined and prices have dropped. For prompt delivery bessemer billets may be had at \$28@28.50, and open-hearth at \$29.50@30, Pittsburg. Sheet-bars remain at \$31, plates at 1.70c., and steel bars at 1.60c.

**Sheets**—There is no change in the sheet market. A few independents continue to shade black sheets \$2 a ton and galvanized sheets about \$1 a ton. Regular quotations remain at 2.60c. for black and 3.75c. for galvanized sheets No. 28 gage.

**Ferro-Manganese**—One sale made today at \$56 for prompt delivery is regarded as the maximum price for prompt, and from 50c. to \$1 a ton less might be done for deliveries running the rest of the year.

**Metal Market**

NEW YORK, Oct. 23.

**Gold and Silver Exports and Imports**

At all United States Ports in Sept. and year.

Metal.	Exports.	Imports.	Excess.
<b>Gold:</b>			
Sept. 1907..	\$ 1,503,836	\$ 2,734,086	Imp. \$ 1,230,250
" 1906..	1,178,922	31,431,038	" 29,152,116
Year 1907..	49,879,813	30,837,287	Exp. 19,042,526
" 1906..	35,789,962	111,776,017	Imp. 75,986,055
<b>Silver:</b>			
Sept. 1907..	6,048,457	3,789,113	Exp. 2,259,344
" 1906..	3,594,311	3,262,559	" 331,752
Year 1907..	47,970,793	34,454,571	" 13,516,222
" 1906..	45,441,339	32,994,069	" 12,447,270

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

**Gold and Silver Movement, New York**

For week ending Oct. 19 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week....	\$ 4,472	\$ 22,560	\$ 927,320	\$ 28,719
1907.....	32,511,030	8,260,484	42,387,908	2,290,005
1906....	5,972,183	90,441,067	44,005,960	1,785,648
1905.....	32,309,728	10,283,854	28,345,351	3,724,215

Exports of gold for the week were to Central America and Panama; of silver chiefly to London. Imports for the week, both gold and silver, were from the West Indies and South America.

Specie holdings of the leading banks of the world, Oct. 19, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	\$205,553,500
England.....	\$173,382,190	.....	173,382,190
France.....	554,006,535	\$186,011,315	740,017,670
Germany.....	150,495,000	41,630,000	192,125,000
Spain.....	77,845,000	127,365,000	205,210,000
Netherlands....	31,347,000	25,948,000	57,295,000
Belgium.....	16,116,665	8,058,335	24,175,000
Italy.....	173,685,000	24,345,500	198,030,500
Russia.....	621,845,000	27,670,000	649,515,000
Aust.-Hungary..	226,235,000	59,405,000	285,640,000
Sweden.....	21,225,000	.....	21,225,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.							
Oct.	Sterling Exchange.	Silver.		Oct.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
17	4.8620	60 $\frac{1}{2}$	28 $\frac{1}{8}$	21	4.8565	61 $\frac{1}{2}$	27 $\frac{1}{4}$
18	4.8615	60	27 $\frac{1}{4}$	22	4.8535	61 $\frac{1}{2}$	28 $\frac{1}{8}$
19	4.8590	60	27 $\frac{1}{4}$	23	4.8515	61 $\frac{1}{2}$	28 $\frac{1}{2}$

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to Oct. 10:

	1906.	1907.	Changes.
India.....	£ 12,637,763	£ 9,702,354	D. £ 2,935,409
China.....	430,700	.....	D. 430,700
Straits.....	1,750	625,950	I. 624,200
Total.....	£ 12,070,213	£ 10,328,304	D. £ 1,741,909

Imports for the week were £9000 from the West Indies, £180,000 in bars and £12,000 in Mexican dollars from New York; a total of £201,000. Exports were £573,100 in bars and £13,000 in Mexican dollars; £586,100 in all, to India.

Indian exchange has been slightly easier, the Council bills offered in London bringing an average of 15.98d. per rupee. Buying of silver for Indian account has been very small, owing to reports of crop failure in the Northwestern Provinces, and deficient rains elsewhere.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.48 $\frac{1}{2}$	\$0.52 $\frac{1}{2}$
Peruvian soles and Chilean.....	0.49 $\frac{1}{2}$	0.47 $\frac{1}{2}$
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.87	3.92
Spanish 25 pesetas.....	4.78	4.80

Other Metals

Oct.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
17	13	12 $\frac{1}{2}$	58 $\frac{1}{2}$	32	4.75	5.45	5.30
	@13 $\frac{1}{2}$	@12 $\frac{1}{2}$				@5.50	@5.35
18	12 $\frac{3}{4}$	12 $\frac{1}{2}$	57 $\frac{1}{2}$	32 $\frac{1}{2}$	4.75	5.45	5.30
	@13	@12 $\frac{1}{2}$				@5.50	@5.35
19	12 $\frac{1}{2}$	12 $\frac{1}{2}$	.....	32 $\frac{1}{2}$	4.75	5.45	5.30
	@12 $\frac{1}{2}$	@12 $\frac{1}{2}$				@5.50	@5.35
21	12 $\frac{1}{2}$	12	57 $\frac{1}{2}$	31	4.75	5.45	5.30
	@12 $\frac{1}{2}$	@12 $\frac{1}{2}$				@5.50	@5.35
22	12	11 $\frac{3}{4}$	56 $\frac{1}{2}$	31 $\frac{1}{2}$	4.75	5.45	5.30
	@12 $\frac{1}{2}$	@12				@5.50	@5.35
23	11 $\frac{3}{4}$	11 $\frac{1}{2}$	55 $\frac{1}{2}$	31 $\frac{1}{2}$	4.75	5.45	5.30
	@12	@11 $\frac{1}{2}$				@5.50	@5.35

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b.'s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

**Copper**—Along with the financial disturbances of the week the market for copper has naturally been affected. The transactions have been devious and hard to follow. It is well known that copper for some time past has been exported for financial purposes and also that it has been contracted for delivery against sales of "standard" in London. Some interesting transactions of the latter character have been effected. Another interesting feature of the past week has been further sales for Chinese account.

At the declining prices of the week there have been sales for export and to domestic consumers—chiefly the former—to a rather large amount in the aggregate. The leading Lake interest has been aggressive and the price for Lake copper has moved downward to nearly equal terms with electrolytic. While consumers in Europe have bought more freely at the lower level, on this side they are still pursuing a hand-to-mouth policy, which is easily to be understood in view of the disturbed financial conditions.

At the close the market is weak at 11 $\frac{3}{4}$ @12c. for Lake and 11 $\frac{3}{4}$ @11 $\frac{3}{4}$  for electrolytic. Business has been done in casting during the week at an average of 11 $\frac{3}{4}$ @12c., closing at 11 $\frac{1}{2}$ @11 $\frac{3}{4}$ c.

In London a large business in standard copper was done on a scale downward, and prices declined gradually to £55 10s. for spot and £55 for three months.

Refined and manufactured sorts we quote: English tough, £54; best selected, £60; strong sheets, £66.

The detailed statement of exports from the United States which was published yesterday by certain financial papers is incorrect.

In connection with the reduction of the Amalgamated dividend from \$2 to \$1 per share, the following statement has been issued: "The directors of the Amalgamated Copper Company, in arriving at a decision to reduce the dividend from \$2 per share to \$1 per share, for this quarter, have been governed by the fact that the copper market has been, for the past few months, in a most unsettled condition. The business of the manufacturing consumer has been so depressed that only a small portion of the copper produced has been sold, and that at such a decreased price that necessarily the earnings realized by the producing companies have been affected.

"It was deemed advisable some time ago, after thorough consideration by the directors of the companies from which the income from the Amalgamated company is derived, to curtail the output from the mines by about 60 per cent. of their normal production, so that at the present time but about 40 per cent. of the regular output is being maintained.

"The officials of these companies report that the physical condition of the mines is the best in their history, the re-

sults from the development work of the past year having been most satisfactory, and that they have on hand large stores of refined copper.

"The smelters and reduction works generally are in a most excellent condition, and everything as being maintained at such a standard that a normal output can be resumed as soon as the condition of the copper metal market will warrant that action."

**Copper Sheets and Wire**—The base price for copper sheets is 20c. per lb.; of wire, 13 $\frac{1}{2}$ c. per pound.

**Tin**—Toward the end of last week tin in London had one of its casual erratic spurts; brought about by manipulators interested on the bull side. This movement against the bears forced prices up about £9 from the close of last week. However, as soon as the bear commitments were covered, prices dropped as rapidly as they had previously advanced, and the close is cabled as weak at £139 for spot, £138 for three months.

Consumers in this market were not at all influenced by the advance in London and bought for their immediate requirements only. Spot tin is still at a premium and selling at the close at about 31 $\frac{1}{4}$ c. per lb.

Shipments of tin from the Straits for October are cabled as 5200 long tons. For the 10 months ended Oct. 31 the total was 47,543 long tons in 1906, and 46,599 tons in 1907; a decrease this year of 944 tons.

**Lead**—The price of the American Smelting and Refining Company for desilverized remains unchanged at 4.75c. New York and 4.67 $\frac{1}{2}$ c. St. Louis. Outside brands continue to be offered at 4.55@4.60c., New York, and 4.45@4.50c., St. Louis.

In Europe the demand for lead for early delivery continues good, while future deliveries are still offered at a discount. The close is weak at £18 5s. for Spanish lead, £18 7s. 6d. for English lead.

The movement of foreign lead in the United States for the eight months ended Aug. 31 is reported by the Bureau of Statistics as follows, in short tons:

	1906.	1907.	Changes.
In bond, Jan. 1.....	8,148	5,691	D. 2,457
Imports, eight months.....	61,407	49,289	D. 12,118
Total supplies.....	69,555	54,980	D. 14,575
Re-exports, eight months..	32,595	30,053	D. 2,542
In bond, Sept. 1.....	6,187	5,966	D. 221
Total deductions.....	38,782	36,019	D. 2,763
Balance.....	30,773	18,961	D. 11,812

The balance has, presumably, entered into consumption in the United States.

**Spelter**—The market is quiet. There is but little business doing and prices are unchanged at 5.45@5.50c. New York, 5.30@5.35c. St. Louis.

The London market is unchanged, closing at £21 15s. for good ordinaries and £22 for specials.



**Zinc Sheets**—The base price is now \$7.50 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

**Antimony**—The market is dull, with practically no demand. Prices show a decline. The situation abroad is the same as in the local market. Prices at New York are as follows: Cookson's, 11½c.; Hallett's, 10@10¼c.; ordinary brands, 9¾@10c.

**Nickel**—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

**Quicksilver**—This metal is steady. Current prices in New York are \$40.50 per flask of 75 lb. for lots of 100 flasks or over. For smaller orders prices run up, according to conditions, San Francisco prices are \$37.50@39 per flask for domestic business, and \$36@37 for export. The London price is £7 7s. 6d. per flask.

**Platinum**—The principal change is a decrease in the price offered for scrap. There was also a drop of 50c. in the price of ordinary and hard metal. Quotations are: Hard metal, \$29.50; ordinary, \$27; scrap, \$20@21 per troy ounce.

**Wisconsin Ore Market**

**Platteville, Wis., Oct. 19**—The 60 per cent. ore was sold this week on a market of \$42; the highest price paid on this basis was \$43 per ton. Lead ore sold at \$26 per thousand for 80 per cent. lead. All buyers represented in this field are purchasing more freely again, excepting the Grasselli Chemical Company, formerly the most active buyer in the field for middle grades of zinc. With the price advanced to \$42 for 60 per cent. zinc and an open market for the output, tonnage shipments will show a healthy increase.

The adjoined session of the Tri-State Mining Association meets Oct. 25 at Platteville. A general shutdown or curtailment of output is no longer discussed, and the meeting of operators will scarcely take action in this matter.

Shipments from the district, by camps, were as follows for the week ended Oct. 19:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Hazel Green.....	1,044,100	.....	.....
Benton.....	386,150	81,660	.....
Platteville.....	140,000	.....	.....
Highland.....	126,100	.....	.....
Linden.....	120,000	.....	.....
Livingston.....	103,000	.....	.....
Elmo.....	86,450	.....	.....
Rewey.....	59,000	.....	.....
Mineral Point.....	58,000	.....	37,300
Galena.....	.....	117,700	.....
Total for week.....	2,122,800	199,360	37,300
Year to Oct. 19.....	81,652,447	3,993,740	425,760

Missing shipments not heretofore re-

ported were: Week ended Aug. 31, 2,570,740 lb. zinc ore and 250,200 lb. lead ore; Sept. 7, 2,749,770 lb. zinc ore and 216,680 lb. lead ore; Sept. 14, 1,908,030 lb. zinc ore, 153,670 lb. lead ore and 53,400 lb. sulphur ore.

**Missouri Ore Market**

**Joplin, Mo., Oct. 20**—The assay base price of all zinc ore grading 60 per cent. or better was advanced \$1 to \$43.50 during the week, and the demand was strong, but a lack of cars prevented shippers loading out their purchases, therefore the shipments was 544 tons less than the previous week. The highest price reported paid was \$46.50 for ore assaying 63 per cent. zinc. Two bins of lead were reported sold at \$55.50 per ton, 50c. higher than last week, but prices generally were unchanged, while the latter end of the week brought light buying orders and a very light shipment. Medium grade ore sold at \$50@54 per ton.

Following are the shipments of zinc and lead in pounds by the companies and individuals owning land and first leases in the various camps of the district for the week ending Oct. 19:

	Zinc, lb.	Lead, lb.	Value.
Joplin.....	2,596,540	224,280	\$61,769
Webb City-Carterville.....	2,446,630	263,950	58,241
Galena.....	1,248,870	111,980	28,503
Badger.....	851,710	.....	18,738
Duenweg.....	594,930	169,500	16,900
Alba-Neck City.....	679,930	.....	14,958
Aurora.....	560,360	13,690	9,254
Granby.....	700,000	90,000	8,930
Prosperity.....	340,050	33,210	8,004
Oronogo.....	356,310	.....	7,616
Baxter Springs.....	85,370	39,900	2,809
Cave Springs.....	81,000	3,550	1,752
Stott City.....	65,420	.....	1,373
Carl Junction.....	43,750	14,420	1,315
Sarcoxie.....	61,580	.....	1,292
Totals.....	10,712,450	964,480	\$241,454
42 weeks.....	481,593,960	72,263,230	\$13,569,796
Zinc value, the week, \$216,222; 42 weeks, \$10,927,703			
Lead value, the week, 25,232; 42 weeks, \$2,642,093			

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January...	47.38	45.84	January...	75.20	83.53
February...	47.37	47.11	February...	72.83	84.58
March.....	42.68	48.66	March.....	73.73	82.75
April.....	44.63	48.24	April.....	75.13	79.76
May.....	40.51	45.98	May.....	78.40	79.56
June.....	43.83	44.82	June.....	80.96	73.66
July.....	43.25	45.79	July.....	74.31	58.18
August.....	43.56	43.22	August.....	75.36	59.54
September.	42.58	40.11	September.	79.64	53.52
October....	41.55	.....	October....	79.84	.....
November..	44.13	.....	November..	81.98	.....
December..	43.68	.....	December..	81.89	.....
Year.....	43.24	.....	Year.....	77.40	.....

**Mining Stocks**

**New York, Oct. 23**—The stock market has seen strenuous times this week, with a close approach to a panic. The flurry in United Copper, briefly referred to last

week, resulted in a complete collapse of that stock; the failure of a large brokerage house; the overhauling of the affairs of the Mercantile National Bank and the retirement of F. A. Heinze from the management of that bank. This was followed again by the closing of the Knickerbocker Trust Company, which had been largely involved in speculative enterprises. There has been a general calling of speculative loans by the banks, and on Oct. 22 call money was up to 50; and in some cases even 70 per cent. was paid.

The natural result of all this has been a general liquidation and the forcing of stocks down to extremely low prices. Thus Amalgamated Copper sold down to \$45, closing at \$45½; American Smelting common to \$68; Tennessee Copper to \$19¼; United States Steel to \$22 for common and \$31½ for preferred.

On Oct. 23 the situation was intensified, a run upon another trust company and the statement that the Westinghouse Company in Pittsburg had been placed in the hands of a temporary receiver. The results was a further general break in stocks, and the demoralization of the market.

The curb market has been utterly demoralized, with heavy losses on all the leading stocks, especially the coppers. A list of prices means little, since at such times people do not discriminate, and good stocks suffer as much or more than the doubtful ones. The market is in a state of nervous tension, where any rumor is accepted. When this will stop depends largely on the banking position, and it will take some time to determine that fully.

**Boston**

**Oct. 22**—A few mining stocks show slight net gains for the week but the rule is declines and drastic ones. A depreciation of some \$590,000,000 in the value of 46 mining stocks this year is certainly a serious affair. At the present time it looks as if liquidation had ceased, but there is no telling whether it will break out again or not. As illustrating this, while the New York market was breaking badly today, due to the stress of banking institutions there, copper shares held well, some even making net advances for the day. The United Copper episode affected Boston but little, although the firm of Otto Heinze & Co., had accounts in this city which were fairly well protected, but not at going prices. It is understood, however, that the stock is margined down to \$20 a share.

United States Smelting was persistently offered and has been the most noticeable for its weakness. The common broke \$7, to \$28, but is up \$1.50 from this, and the preferred fell \$4.37½ to \$31, with slight recovery. What has happened is that directors Holden, Clark and Coolidge were obliged to dispose of 50,000 shares of

common and 17,000 shares of preferred stock privately, and it represented a considerable loss to the original owners.

Another \$1 call has been made by the Adventure Consolidated Copper Company, making a total of \$21 paid in per share.

Davis Daly has been hard hit on the curb, touching \$3.12½, against a high of \$19.25 last March. The company had an unexpended cash balance equal to \$2.40 per share on June 30. F. A. Heinze's connection with this company accounts for the sharp decline. Bingham made its low at \$4.62½. Calumet & Hecla is off \$10 only, to \$590; Osceola \$4.75 to \$79.25; Wolverine \$2, to \$95, and Tamarack \$3, to \$55; while Quincy has gained \$2 to \$75 per share.

STOCK QUOTATIONS

NEW YORK Oct. 22		BOSTON Oct. 22	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	.....	Adventure.....	1½
Am. Nev. M. & P. Co. ....	.....	Allouez.....	20
Amalgamated.....	45½	Am. Zinc.....	.....
Anacosta.....	26	Arcadian.....	3
Balaklala.....	4	Atlantic.....	7½
British Col. Cop. 4	.....	Bingham.....	5½
Buffalo Cobalt... 1½	.....	Boston Con. ....	11
Butte & London... ¾	.....	Calumet & Ariz. ....	93
Butte Coalition... 11½	.....	Calumet & Hecla, 590	.....
Butte Cop. & Zinc. ....	.....	Centennial.....	17½
Cobalt Contact....	.....	Con. Mercur.....	25
Colonial Silver....	1	Copper Range... 46	.....
Cum. Ely Mining... 4½	.....	Daly-West.....	9½
Davis Daly.....	4½	Franklin.....	6½
Dominion Cop....	2	Greene-Can.....	5½
El Rayo.....	2½	Isle Royal.....	13½
Foster Cobalt....	62	La Salle.....	9
Furnace Creek....	¾	Mass.....	3
Giroux Mine.....	3½	Michigan.....	7½
Gold Hill.....	¾	Mont. C. & C. (new) 1½	.....
Granby, New.....	¾	Mont. C. & C. (old) 6½	.....
Greene Gold.....	¾	North Butte.... 33½	.....
Greene G. & S.....	¼	Old Colony.....	50
Greenw'r & D. Val. .75	.....	Old Dominion... 19	.....
Guanajuato.....	2½	Osceola.....	79½
Guggen. Exp.....	127½	Parrot.....	9
Hanapah.....	35	Phoenix.....	.....
McKinley Dar....	¾	Quincy.....	75
Micmac.....	3	Rhode Island... 1½	.....
Mines Co. of Am. 1½	.....	Santa Fe.....	2
Mitchell Mining... ¾	.....	Shannon.....	8½
Mont. Sho. C. (New) 4½	.....	Tamarack.....	56
Nev. Utah M. & S. 2½	.....	Trinity.....	11½
Newhouse M. & S. 6	.....	United Cop., com. 8	.....
Nipissing Mines. 5½	.....	U. S. Oil.....	8½
Old Hundred.....	2	U. S. Smg. & Ref. 29½	.....
Silver Queen.....	¾	U. S. Sm. & Re., pd 31½	.....
Stewart.....	¾	Utah Copper.... 27½	.....
Tennessee Cop'r. 19½	.....	Victoria.....	3½
Union Copper.....	¾	Washington....	.....
Utah Apex.....	5½	Winona.....	.....
West Columbus... 11	.....	Wolverine.....	95
Wyandotte.....	50	.....	.....

N. Y. INDUSTRIAL		
Name of Comp.	High.	Low.
Am. Agri. Chem..	10	.....
Am. Smelt. & Ref	68	.....
Am. Sm. & Ref., pf	85½	.....
Bethlehem Steel..	9	.....
Colo. Fuel & Iron	15½	.....
Federal M. & S., pf	57	.....
Inter. Salt.....	10	.....
National Lead....	39	.....
National Lead, pf	85	.....
Pittsburg Coal... 8½	.....	.....
Republic I. & S... 14½	.....	.....
Republic I. & S., pf	60	.....
Sloss-Sheffield... 33½	.....	.....
Standard Oil.....	405	.....
Tenn. C. & I.....	135	.....
U. S. Red. & Ref. ....	.....	.....
U. S. Steel.....	22½	.....
U. S. Steel, pf....	82½	.....
Va. Car. Chem.... 15½	.....	.....
Va. I. Coal & Coke	40	.....

ST. LOUIS Oct. 19		
Name of Com.	High.	Low.
Adams.....	35	25
Am. Nettie.....	03	02
Center Cr'k.....	2.25	2.00
Cent. C. & C. 67.00	65.00	.....
C. C. & C. pd. 77.00	75.00	.....
Cent. Oil.....	110.00	100.00
Columbia.....	3.00	2.00
Con. Coal.....	27.00	25.00
Doe Run.....	135.00	125.00
Gra. Bimet.....	30	25
St. Joe.....	15.00	13.00

BOSTON CURB		
Name of Comp.	High.	Low.
Ahmeek.....	.....	.....
Ariz. Com.....	.....	.....
Black Mt.....	4¾	.....
East Butte....	5	.....
Hancock Con....	4¾	.....
Keweenaw.....	4¾	.....
Majestic.....	1	.....
Raven.....	.78	.....
Shawmut.....	.21	.....
Superior.....	9	.....
Superior & Pitts. 8½	.....	.....
Troy Man.....	.74	.....

LONDON Oct. 23		
Name of Com.	High.	Low.
Dolores.....	£1 2s 6d	.....
Stratton's Ind. 0 3 0	.....	.....
Camp Bird.....	0 17 3	.....
Esperanza.....	1 18 0	.....
Tomboy.....	1 7 0	.....
El Oro.....	1 3 9	.....
Oroville.....	0 14 6	.....
Somera.....	.....	.....
Utah Apex.....	0 10 3	.....
Ariz. Cop., pd. 0 12 6	.....	.....
Ariz. Cop., def ..	.....	.....

NEVADA STOCKS. Oct. 23. Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
<b>TONOPAH STOCKS</b>			
Belmont.....	1 06½	Golden Sceptre... ..	.....
Extension.....	1.25	Homestake King... .50	.....
Golden Anchor... ..	07	Montgomery Mt... .05	.....
Jim Butler.....	.48	Mont. Shoshone C. 4 75	.....
MacNamara.....	.20	Original Bullfrog. 03	.....
Midway.....	.60	Tramp Cons... ..18½	.....
Montana.....	1 70	<b>MANHAT'N STOCKS</b>	
North Star.....	.10	Manhattan Cons. .30	.....
Tonopah & Cal... ..	.....	Manhat'n Dexter. .06	.....
Tono'h Mine of N. 8.12½	.....	Jumping Jack.... .10	.....
West End Con....	.43	Stray Dog..... 10	.....
<b>GOLD FID' D STOCKS</b>			
Adams.....	.06	Indian Camp..... .05	.....
Atlanta.....	.25	<b>GREENW'R STOCKS</b>	
Blue Bell.....	.09	Furnace Creek.... .26	.....
Blue Bull.....	.18	Greenwater & D.V. .10	.....
Booth.....	.20	Green'Cop. M. & S. .08	.....
Columbia Mt....	.20	United Greenwa'r .06	.....
Comb. Frac.....	.86	<b>MISCELLANEOUS</b>	
Cracker Jack....	.08	Golden Boulder... .20	.....
Dia'dfield B. B. C. .16	.....	Hayseed..... .30	.....
Goldfield Belmont	.18	Lee Gold Grotto... .14	.....
Goldfield Gold... 5.00	.....	Nevada Hills..... 3 75	.....
Goldfield Daisy... 51	.....	Nevada Smelting. 1 00	.....
Goldfield Mining.	.....	Pittsburgh S. Pk.. 1 00	.....
Great Bend.....	.27	Round Mt. Sphinx .28	.....
Jumbo Extension	.70	<b>COLO. SPRINGS Oct. 19</b>	
Jumbo Mining....	.06	Name of Comp.	Clg.
Katherine.....	.12	Acacia.....	7½
Kendall.....	.12	Black Bell.....	.....
Laguna.....	.12	C. C. Con.....	4¾
Lone Star.....	.12	Dante.....	5½
Lou Dillon.....	.12	Doctor Jack Pot... 6½	.....
May Queen.....	.07	Elkton.....	49½
Mohawk.....	.10	El Paso.....	36
Oro.....	.10	Findlay.....	38
Red Hill.....	.25	Gold Dollar.....	6½
Red Top.....	.10	Gold Sovereign... 3½	.....
Roanoke.....	.10	Isabella.....	25
Sandstorm.....	.18	Index.....	.....
Silver Pick... ..	.23	Jennie Sample... ..	.....
St. Ives.....	.40	Jerry Johnson... ..	.....
Triangle.....	.07	Mary McKinney... 3	.....
<b>BULLFROG STOCKS</b>			
Amethyst.....	.....	Pharmacist.....	105
Bullfrog Daisy... ..	.....	Portland.....	105
Bullfrog Mining. .05	.....	Un. Gold Mines... 5½	.....
Bullfrog Nat. B... .09	.....	Vindicator.....	.....
Gibraltar.....	.10	Work.....	16
Gold Bar.....	.37	.....	.....

New Dividends

Company.	Pay-able.	Rate.	Amt.
Amalgamated.....	Nov. 25	\$1 00	\$1,530,879
Arizona Copper, pfd.	Oct. 1	0 06	75,967
Batopilas.....	Dec. 31	0 12½	56,250
Bost. & Montana ..	Nov. 6	0 00	900,000
Buffalo Mines, Ltd.	Oct. 1	0 03	27,000
Camp Bird, Ltd.....	Nov. 2	0 24	196,800
Cons. Mines Co., Nev.	Oct. 25	0 10	360,000
Consolidated Coal ..	Oct. 31	1 50	75,000
Elkton Con.....	Oct. 24	0 01½	37,500
Esperanza.....	Oct. 1	1 37½	625,625
Inter. Nickel, pfd.	Nov. 1	1 50	131,123
Jamison.....	Oct. 15	0 02	7,800
Mines Co. of Am....	Oct. 26	0 02	40,000
Nipissing.....	Oct. 21	0 15	180,000
Philadelphia Gas, com	Nov. 1	0 75	454,296
Rio Tinto, com.....	Nov. 1	0 60	375,000
Rio Tinto, pfd....	Nov. 1	1 51.40	4,275,000
Tonopah of Nev....	Oct. 21	0 25	250,000
U. S. Smg., Ref. & Mg., com	Nov. 1	0 87½	304,646
U. S. Smg., Ref. & Mg., pfd.	Nov. 1	0 87,	656,250
Utah Con.....	Oct. 15	1 00	300,000
Va. Car. Chem., pfd.	Oct. 15	2 00	360,000
Va. I. C. & C.....	Oct. 1	5 00	432,000
Vindicator.....	Oct. 25	0 03	60,000
Wolverine.....	Oct. 14	7 50	450,000

Assessments

Company.	Delinq.	Sale.	Amt.
Alturas, Ida.....	Nov. 8	Nov. 29	\$0.02
Andes, Nev.....	Oct. 30	Nov. 20	0 10
Diamond Creek, Cal.	Oct. 20	Nov. 26	0 02
Dollarhide, Ida....	Nov. 8	Nov. 29	0 02
Emerald, Utah.....	Dec. 14	Jan. 11	0 01½
'49 Gold Placer, Ut.	Nov. 13	Dec. 6	0 02
Herkimer Gravel, C.	Oct. 7	Dec. 28	0 03
Independence, Ida.	Oct. 10	Oct. 30	0 01
La Palma, Mex.....	Oct. 26	Nov. 26	0 08
Nevada-Fairview... .	Sept. 23	Oct. 28	0 02
New Bunker Hill, C.	Oct. 31	Nov. 21	0 05
Occidental Con., N.	Oct. 3	Oct. 28	0 10
Overman, Nev.....	Oct. 23	Nov. 13	0 05
Patoti, Nev.....	Oct. 29	Nov. 21	0 10
Patterson Creek, Ca.	Oct. 19	Nov. 11	0 01
Pitts. C. M. & M., U.	Nov. 4	Nov. 25	0 01
Posey Canyon, Cal.	Oct. 5	Oct. 26	0 01
Sheba G. & S., Utah.	July 30	Nov. 2	0 10
Trade Dol. Ex., Ida.	Nov. 4	Nov. 20	0 01½
Union Con.....	Nov. 15	Dec. 6	0 10

Monthly Average Prices of Metals AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	65.288	68.673	30.113	31.769
February.....	66.108	68.835	30.464	31.852
March.....	64.597	67.519	29.854	31.325
April.....	64.765	66.462	29.984	30.253
May.....	66.976	66.981	30.968	30.471
June.....	65.394	67.090	30.185	30.893
July.....	65.105	68.144	30.113	31.366
August.....	65.949	68.745	30.529	31.377
September.....	67.927	67.792	31.483	31.313
October.....	69.523	.....	32.148	.....
November.....	70.813	.....	32.671	.....
December.....	69.050	.....	32.003	.....
Year.....	66.791	.....	30.868	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

Month.	NEW YORK.		LONDON.	
	Electrolytic	Lake.	1906.	1907.
January.....	18.310	24.404	18.419	24.825
February.....	17.869	24.869	18.116	25.236
March.....	18.361	25.065	18.641	25.560
April.....	18.375	24.224	18.688	25.260
May.....	18.475	24.048	18.724	25.072
June.....	18.442	22.665	18.719	24.140
July.....	18.190	21.130	18.585	21.923
August.....	18.380	18.356	18.706	19.255
September.....	19.033	15.565	19.328	16.047
October.....	21.203	.....	21.722	.....
November.....	21.833	.....	22.398	.....
December.....	22.885	.....	23.350	.....
Year.....	19.278	.....	19.616	.....

New York, cents per pound. Electrolytic, lbs for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January.....	36.390	41.548	July.....	37.275	41.091
February.....	36.403	42.102	August.....	40.606	37.667
March.....	36.662	41.313	September	40.516	36.689
April.....	38.900	40.938	October.....	42.852	.....
May.....	43.313	43.149	November.	42.906	.....
June.....	39.260	42.120	December.	42.750	.....
Av. year.....	.....	.....	.....	39.819	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	5.600	6.000	16.850	19.828
February.....	5.464	6.000	16.031	19.531
March.....	5.350	6.000	15.922	19.703
April.....	5.404	6.000	15.959	19.975
May.....	5.685	6.000	16.725	19.688
June.....	5.750	5.760	16.813	20.188
July.....	5.750	5.288	16.525	20.350
August.....	5.750	5.250	17.109	19.063
September.....	5.750	4.813	18.266	19.675
October.....	5.750	.....	19.350	.....
November.....	5.750	.....	19.281	.....
December.....	5.900	.....	19.609	.....
Year.....	5.657	.....	17.370	.....

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

AVERAGE PRICE OF SPELTER

MONTH.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January.....	6.487	6.732	6.337	6.582	28.225	27.125
February.....	6.075	6.814	5.924	6.664	25.844	25.938