

The Engineering and Mining Journal

VOL. LXXXVI.

NEW YORK, OCTOBER 17, 1908.

NO. 16.

Operation of an Anaconda Copper Converter

Reactions of the Process, Details of Lining, Charging, Blowing, Pouring and Changing the Vessels and Methods of Overcoming Difficulties

B Y C. O F F E R H A U S*

In smelting sulphide ores or mixtures containing sulphide ore, matte is obtained as a first concentration product.

Matte is cuprous sulphide with a varying quantity of ferrous sulphide (Cu_2S , $x\text{FeS}$). It contains more or less magnetic oxide of iron and the silver and gold, which were present in the ore. It may contain metallic iron and copper, depending upon its grade. The outcome of

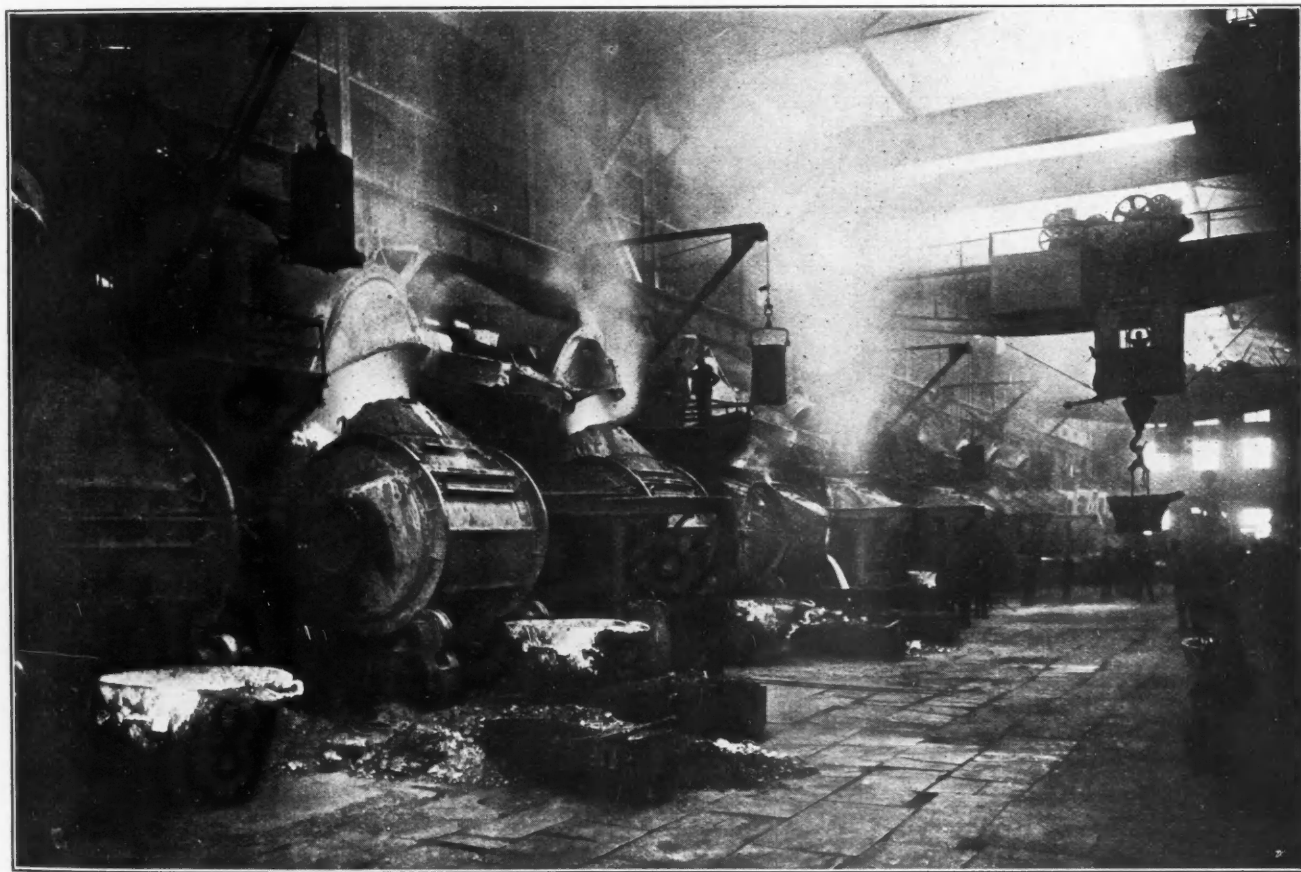
will serve our present purpose, however. The valuable substances in the matte are copper, gold and silver. If a matte is rich in silver and gold, different wet processes are practiced to extract the valuable metals directly from the matte. In producing copper from matte (applying dry processes) the gold and silver remain with the copper.

Two dry processes are practiced to

dize matte in the melting stage; it is the older process and the slower one. The converter process oxidizes matte in the molten state, by forcing air through it. It is much more rapid and has replaced the blister process almost entirely.

THE CONVERTER

A suitable apparatus for carrying out the oxidation of the molten matte by forc-



GENERAL VIEW OF CONVERTER FLOOR, ANACONDA, MONTANA

researches of different experimenters regarding its constitution do not agree (Gibb & Philip, *Trans. A. I. M. E.*, XXXVI, p. 665; Paul Röntgen, "Zur Kenntniss der Natur des Kupferstein," *Metallurgie* 1906, p. 479; H. O. Hoffman, "Constitution of Ferro-Cuprous Sulphides," *Trans. A. I. M. E.*, 1906, LXXIII). The definition given above

*Metallurgical and chemical engineer, Columbia University, New York City.

make copper from the matte, the blister process and the converter process. Both work on the same principle; the impurities (mainly iron and sulphur) are burned off and since the affinity of sulphur for copper is greater than that of sulphur for iron, we get rid of the ferrous oxide formed in the form of ferrous silicate, copper still being present as cuprous sulphide. The sulphur burns off as sulphur dioxide. The blister process oxi-

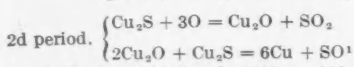
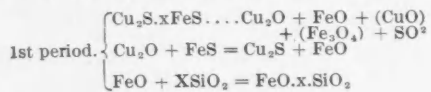
ing air through it is the converter. Apparatus as well as process are taken from the iron industry. The operation can be divided in two periods.

The products of oxidation formed during the first or slag-forming period are cuprous oxide, ferrous oxide and sulphur dioxide. The cuprous oxide formed, however, reacts immediately with the ferrous sulphide, reforming cuprous sulphide. Ferrous oxide, as soon as it is

formed, combines with the silica of the lining of the converter. Sulphur dioxide goes off as such. At a certain moment practically all the iron is oxidized to ferrous oxide and is present as a silicate, the copper being in the form of cuprous sulphide and this moment can be recognized distinctly by the appearance of the flame at the nose of the converter. The slag is now poured off and the second period starts in.

The content of the converter is now practically pure molten cuprous sulphide (white metal containing about 70 per cent. copper; cuprous sulphide contains 77 per cent. copper). The oxidation of this white metal is carried on as before in the same converter. Cuprous oxide is formed, but interacts promptly with unoxidized cuprous sulphide, forming copper. Finally practically all the copper is present as metal, and this state is again indicated by the appearance of the flame. At this time practically all the sulphur is burned off and copper oxides are not yet present in a noticeable quantity.

The following are the main reactions which take place during both periods:



¹ O. Doeltz, *Metallurgie*, 1907; p. 442 and 468.

The process of matte converting proceeds without the help of external heat. The heat of combustion of the sulphur and the iron and the heat of combination of the ferrous oxide and silica provides the necessary energy to heat the blast, to decompose the matte and compensates for the heat lost by the escaping gases, with the slag and by radiation. Considering the reactions, which take place in each period, the quantities of the different elements present and their heat of combustion, one will find that the heat developed during the first period is much greater than that generated during the second period. The first period blow produces the initial temperature for the second period.

The first experiments of blowing matte in a bessemer converter date from 1878. Manhès (1880) replaced the bottom tuyeres of the bessemer converter by horizontal tuyeres in the side of the converter some distance above the bottom, leaving in this way a bottom space, where the copper collects and stays protected from the direct action of the blast. In doing so he made the bessemerizing of matte a practical process. Matte converting in a vertical converter with bottom tuyeres is possible, provided the size of the converter surpasses a certain limit; the size of the converter being under this limit, its content will freeze up some time during the second period. Vertical converters work more quickly, the mechanical wear of the lining is less than in the hori-

zontal converter and the wear of the lining even. A blast of higher pressure is necessary, however, and the critical points are far more difficult to recognize. The operation of lining a vertical converter is more difficult. The tendency is to use horizontal converters with side tuyeres and low-pressure blast.

The main difference between iron and matte converting is, that in bessemerizing iron the product to start with is comparatively pure and the impurities (about 6 per cent.) have a high combustion value. The greater part of the oxidized impurities are volatile and the oxides which are not volatile require a proportionally small quantity of flux to slag them. Only a part of the flux required is provided by the lining. In bessemerizing matte, however, the impurities have a comparatively low heat of combustion, but they are present in large quantities (50 per cent. and more). The product of combustion, which is not volatile (ferrous oxide) needs a large amount of silica to slag it, and this silica is provided by the lining. The main function of the lining in this case is, therefore, to be eaten away, rather than to protect the shell of the converter.

LINING THE CONVERTER

The Anaconda converters are of the horizontal barrel type. They are 8 ft. in diameter and 12 ft. 6 in. long. The shell is of boiler plate. It consists of two parts, body and top, to facilitate the operation of lining. Both are first lined with 9-in. firebrick at the ends and 4-in. firebrick around the shell (bricks 4x9 in.). They are then transferred to the lining stand.

The material for the lining of the converter must be sufficiently plastic and cheap, and should contain as much free silica as possible. Since there is a considerable quantity of lining material consumed, it will be profitable to use silicious ores containing gold, silver or copper. The extracted metals pay for the cost of the operation of lining, or at least reduce it. The material that will be used for the lining will depend upon local conditions. In Anaconda Snowstorm ore from Idaho (a silicious ore with about 85 per cent. silica and 3.5 per cent. copper as carbonate) is used with pond slum (precipitate of the settling ponds, which receive the slum water from the mill) containing 2.5 per cent. copper and 60 per cent. silica, as a binder. The ore is ground, sized (all sizes are used) and then mixed with the pond slum. Two to four parts by volume are mixed with one part of pond slum, the relative proportion depending upon the humidity of the materials. The proportion of the constituents of the lining material, its size, humidity and also the operation of tamping the lining in, are matters which require a good deal of experience.

The lining material is dumped in layers by means of wheelbarrows and each layer is rammed in place by a special Ingersoll-

Sergeant tamping machine, 5 in. diameter and a 20-inch stroke. This is supported by a revolving jib crane and is movable in the direction of the axis of the crane. The vertical motion of the crane is controlled hydraulically. As the tamped material in the body of the converter reaches the tuyere openings, an oval pear-shaped mold for the cavity, consisting of three pieces, is set in place, lining material is filled in around it in layers, each layer being rammed. The tuyere-openings are then punched through and the mold is withdrawn. The top of the converter is lined around a mold in the same way and then fastened to the body by means of bolts having a slot in the end, through which a wedge is inserted and driven up tight. The joint is made with a plastic material. The brick part of the lining, as a rule, only needs local repairing and the old lining is not always entirely taken out, but is trimmed and cut away to expose a fresh surface to which the new lining may adhere.

The operation of lining requires about an hour and a half; the weight of the lining is about 16 tons and that of the converter with lining 42 tons.

DRYING

A freshly lined converter is transferred to the other side of the building by a 60-ton electric traveling crane and here dried by means of a scrap-wood fire within and by forcing a current of air, provided by an ordinary Root blower, through the tuyeres. It takes two hours to bring the fire to its heat and five hours to dry a lining sufficiently, that is seven hours in all.

A dried converter is taken up by the crane, placed in a stall, and the connection with the airpipe is made by means of a stuffing-box connection. The converters are operated hydraulically, water pressure of 40 lb. per square inch being used. At the side of each converter are two levers, one for tilting the converter and one for the admission of the blast. The operator stands between them, protected by two sheet-iron walls covered by a roof. Above each converter there is a telescopic hood, which conducts vapors and gases to the dust chamber and then to the main flue. For each converter there is a puncher and a helper; for every four converters there is one skimmer.

The next operation is to dump the ashes. The converter is then turned back in the blowing position and the end section of the launder, which conveys the matte from the charging floor is turned over the mouth. The air is turned on (air pressure 16 lb. per sq.in.) and the converter is ready to receive the charge.

CHARGING

The molten matte from the reverberatory and blast furnaces comes in lined sheet-steel ladles of 10 tons capacity, mounted on cars, to the charging floor of

the converter building, which is 23 ft. above the working floor. The grade of matte charged varies but slightly and averages 45 per cent. copper. The limits between which matte is converted vary generally from 35 to 65 per cent. copper; at Anaconda they vary from 38 to 52 per cent. copper. The grade of the matte preferred by the men who run the converters is about 45 per cent.; a higher matte is apt to run too cold and a lower matte will run hot and consume considerable of the lining. The chosen concentration, however, will depend upon the amount of work each plant is to do in order to work most advantageously, and this depends again upon the character of the ore, its supply, kind, cost of fuel, etc.

The temperature of the blast-furnace matte as it flows into the ladles averages 1170 deg. C., that of the reverberatory furnaces 985 deg. C. The average temperature of the matte entering the converter is 900 deg. C. There are three men on the charging floor; two to dump the ladles (one man can dump a ladle which is in good working condition) and one sampler. The operation of dumping a ladle takes about five minutes. Three samples are taken from each ladle during the flow at equal intervals; the average sample goes to the assay office. A freshly lined converter takes but a small charge (seven tons), the second and succeeding charges may be larger as the cavity increases; but it is not customary to charge more than nine tons at a time. A considerable quantity of frozen matte accumulates in the ladles. These ladles are then dumped out in an annex to the converter building and relined or patched up there. The dumped matte is taken to the blast furnaces.

Before or during the charging a few lumps of coal are thrown into the mouth of the converter. They prevent the shooting out of matte which occurs during the charging and for several minutes after. The cause of this shooting out of matte may be, in the case of a freshly lined converter, due to insufficient dryness of the lining. In the case of a converter which has been used and in which a charge has been finished, the cause is due to a sudden liberation of sulphur dioxide, formed by the reaction of the matte with the copper-oxides or copper silicates respectively, which have remained in it. This reaction has caused serious explosions in pouring molten matte on an overblown charge. Simple overloading may be a cause of "shooting." The main reason, however, may be, an insufficient initial temperature of the charge, which causes irregularities in the reaction (local overblowing). If the initial temperature of the charge is comparatively high, shooting out of material during charging will rarely occur.

BLOWING A CHARGE

During the first part of the blow, dense white vapors due to the volatilization of

zinc, lead, etc., leave the mouth of the converter. The color of the flame is red, but it soon turns to a greenish yellow. A small flame or a jumping flame indicates that the blast is not properly received and consequently that the tuyeres need punching. If the tuyere openings are hard to punch and cannot be punched by hand, which rarely occurs during this first or slag-forming period, the punch-rod, which is a $\frac{3}{4}$ -in. cylindrical iron rod with a knob at the end, is driven in with a hammer, and then pulled out by means of a

scarcely formed, reacts with the ferrous and cuprous sulphide is reformed. As long as ferrous sulphide is present, cuprous oxide and also silicates of copper can exist only in a limited and very small quantity. Sulphide dioxide goes off as such. Observing the flame one notices that after some time pale blue flashes appear in the greenish yellow. These pale blue flashes increase in number and finally become constant. Soon the pale blue, which is probably a cuprous-silicate flame, will dominate and



TAMPING CONVERTER LINING

small but heavy iron rod, bent at one end to an eye. This rod is hooked on the punch-rod and knocked against the knob. Only in case of a cold run will continuous punching be necessary during the first period. The products of oxidation formed during the first period are ferrous oxide, cuprous oxide and sulphur dioxide. Higher oxides of iron and copper may be formed locally. They are, however, again reduced by matte still intact. Ferrous oxide as soon as formed is slagged by the silica of the lining, cuprous oxide,

this indicates that practically all the iron has been oxidized and is present as silicate, the copper being in the form of cuprous sulphide, white metal with about 70 per cent. copper. The average time required to bring a charge of seven to nine tons up to this point, the end of the first period, is one hour.

At this moment the slag should be poured off. The converter is turned and the blast is cut off as soon as the tuyeres are free. The slag is poured into cast-steel ladles of five tons capacity, placed

on the floor in front of the converter. It is difficult to recognize the slag from the matte at this high temperature. However, by cutting the back part of the stream, where the heavier white metal may be expected, slowly with a rabble having a blade of 5x3-in. forming an angle of about 135 deg. with the handle one is able after some practice to recognize the first few drops of white metal. This white metal looks like boiling grease against the darker smooth surface of the slag, which adheres to the rabble blade. As soon as the skimmer sees the matte on the rabble blade, he indicates to the man at the lever by a rapid to and fro motion of the rabble, to pour more slowly or to stop altogether. The white metal should boil on the rabble, which indicates that the temperature is high enough to raise all the slag.

The full slag-ladle is taken by the crane

grade matte. It produces more heat, and a lighter, more silicious slag is formed. Not only the chemical but also the mechanical wear of the lining is greater in case of low-grade matte. The chemical wear takes place especially at the tuyeres, the mechanical wear opposite the tuyeres at the top of the body of the converter. In converting matte with 45 per cent. copper, the quantity of the slag produced amounts to 60 or 70 per cent. of the weight of the matte charged.

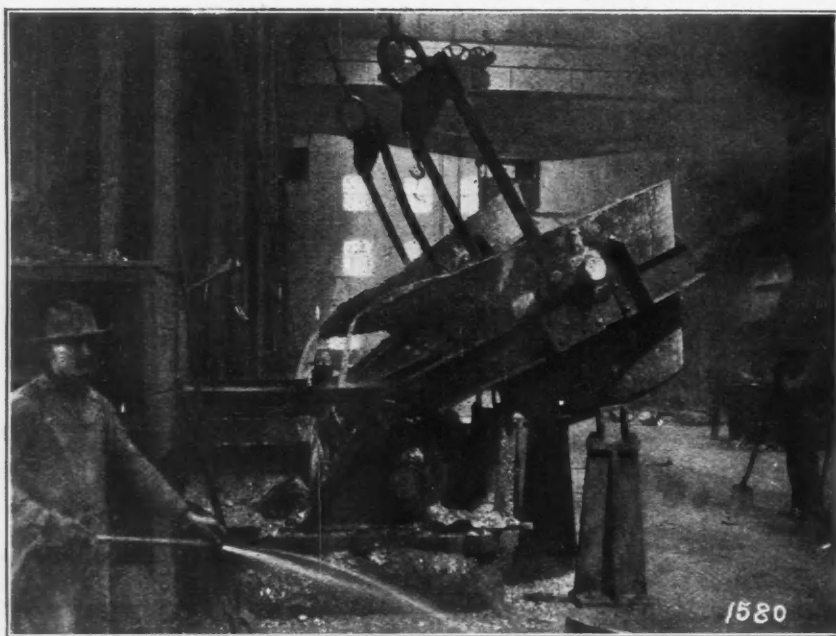
The slag is practically a ferrous silicate. It contains the silicates of the lining, which lowers its melting point and makes it lighter and more fluid. The average copper content is 2.39 per cent. taken over a period of six months. This copper is almost entirely present as suspended white-metal. This explains why a heavy slag from a high-grade matte will contain much more copper than a light

In blowing white-metal, which is the contents of the converter in this stage of the process, the cuprous sulphide is partly overoxidized to cuprous oxide and locally perhaps to cupric oxide. As long as cuprous sulphide is present it will interact, respectively, with the oxides of copper forming copper. The copper oxides formed can, however, also react with the silica of the lining, and this reaction seems to be preferred at high temperatures. It is found, that if the converter runs too hot during the second period, the tuyeres will very likely become stopped up; they will not only be hard to punch, but will need continuous punching due to cuprous silicate, which is formed and which is rather infusible. The desired reaction between cuprous sulphide and cuprous oxide on the other hand will progress very slowly. The quantity of dope charged depends upon the temperature of the white-metal in the converter, and the latter is judged by the color of the flame. The color of the flame should be brownish, yellow, or orange; a reddish flame indicates too low a temperature. Then coal is charged. A white yellow flame and hard punching indicates too high a temperature, and that more dope has to be charged. In such a case dope is charged from buckets with dumping bottoms, the converter remaining in the blowing position. At the side of each converter is a hoist by means of which a filled bucket is taken up and turned over the mouth of the converter. Previously the converter is tilted somewhat, so that the hood will not be in the way. With one stroke of an iron rod at the lever of the dumping bottom arrangement, the contents of the bucket drop into the converter, which is then turned back under the hood. Recent practice is to charge all the dope into the converter by crane, a third crane being in operation for this purpose.

Another means for regulating the temperature is changing the direction of the tuyeres by tilting the converter somewhat.

The end of the second period is reached when practically all the copper is present as metal. The time required for the second period of the blow with an initial charge of seven to nine tons of matte is 60 to 90 minutes. The critical point is recognized by examining the copper on the punch rod, or by the appearance of the flame. The brownish yellow or orange flame becomes darker, takes a bronze color and slows down. Little balls of metal, which leave the nose of the converter, no longer stick to the hood, but rebound from it. They are no longer dull, but brilliant (burning copper). This is the moment when practically all the sulphur has burned out and only a small amount of copper oxides are present.³ It takes long experience to discover this

³For a graphical representation of the relative elimination of iron, sulphur and arsenic and concentration of copper during a blow see: E. P. Mathewson *Bull. A. I. M. E.*, 1907: 7.



METHOD OF HANDLING LADLES

and placed in a hydraulic cradle, which pours the contents into the passing molds of a casting machine of the conveyer type. The slag is chilled by sprays of water and drops into a steel bin outside the building, from which it is loaded on railroad cars and transported to the storage bins of the blast furnaces. Some white metal collects on the bottom of the slag-ladles and will cause explosions if it falls into the wet slag molds. The last slag in the ladles is, therefore, poured out very slowly. Finally a good deal of frozen material accumulates in the ladle; this is then dumped out and the empty clean ladle is provided with a thin coating of lime, by rinsing it out with limewater to prevent the slag from sticking to it. The quantity of the slag produced depends upon the grade of the matte and consequently upon the temperature during the blow. A low-grade matte takes a disproportionately greater amount of lining than a high-

slag from a low-grade matte. The slag has, of course, to return into the process. It forms in consequence of its basic character a very suitable and desirable constituent for a blast-furnace charge, the bulk of our sulphide ore having a silicious gangue.

SECOND PERIOD

The slag being poured off as clean as possible (a thin layer of slag always remains on the top of the white-metal), one or two boats of "dope" are charged in the tilted converter by means of the traveling crane, the blast is turned on and the converter is turned back in the blowing position. "Dope" consists mainly of solid white-metal, but matte, slags, old lining, floor cleanings, shortly all materials which can be found on the working floor are intermixed. This is charged to cool the contents of the converter.

moment and to recognize it with certainty. The distinctness with which one recognizes this final point depends greatly upon the size of the charge. A medium charge shows this critical point best. The flame reaction gets less distinct with the depth of the charge. A small charge, on the other hand, gives a small flame and throws up little material.

POURING THE METAL

The converter is then called down and a small sample is poured on the floor. The metal stream as it leaves the converter must show a bright luster; the copper sample on the floor may or may not show blisters. It is called clean or honey copper, blister copper or black blister, depending upon its sulphur and oxygen content, respectively. Clean copper does not show blisters; it contains more sulphur than blister copper, and blister copper contains more sulphur than black blister, which contains considerable oxygen. The contents of the converter poured into a sheet-steel ladle of about five tons capacity, lined with fireclay. In pouring a wooden pole is inserted into the nose of the converter to keep the solid second-period slag back. This slag consists of small balls ordinarily having a nucleus of silica. The quantity of these balls is small, and they remain in the converter, provided it is in good condition. If it is necessary to change the converter they are dumped out. The following is a partial analysis of a second-period slag, which shows that it runs high in copper: Cu, 21.43 per cent.; SiO_2 , 22.7 per cent.; FeO , 39.4 per cent.; S, 0.4 per cent.

The copper ladle is removed by means of the traveling crane to a hydraulic cradle, which pours the contents into the refining or casting furnace. The converter copper in Anaconda is refined in reverberatory furnaces before it is cast in anodes. The first ladles charged into the casting furnace may contain clean copper, i.e., copper somewhat high in sulphur; the last ones (a furnace takes 20 to 30 ladles of four tons on the average) should be finished carefully, for, when the last ladles, which complete the charge, are poured in, the copper in the refining furnace contains oxides and the adding of copper comparatively high in sulphur might cause the furnace to boil over by sudden escape of sulphur dioxide.

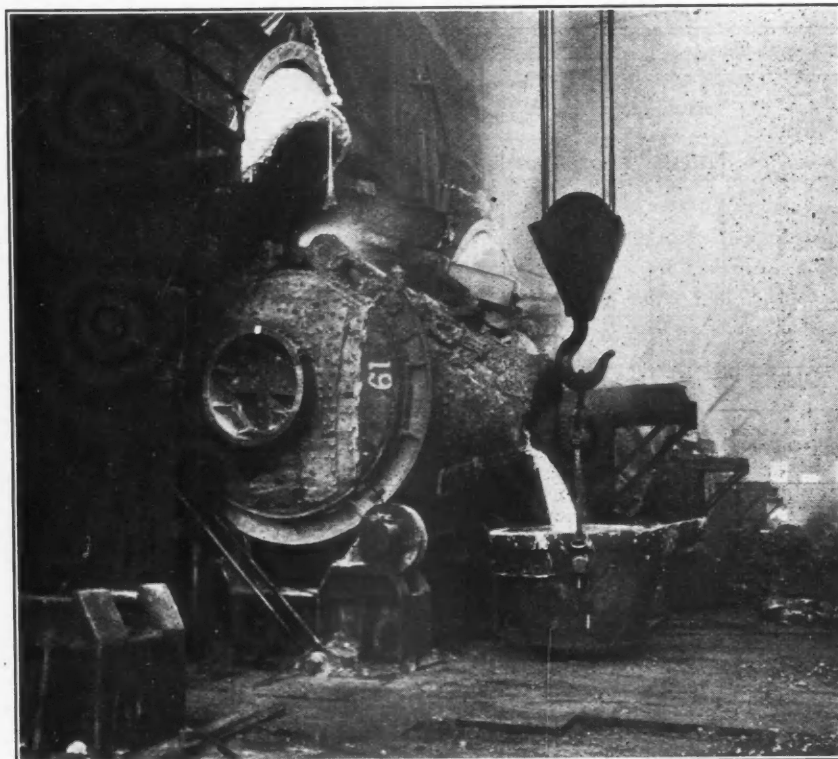
After a time the copper ladles become filled with solid metal. They are then dumped, patched up or relined. The dumped copper and matte bottoms and other large lumps are broken by the sudden blow of a heavy weight dropped on them from a certain height, and the broken material goes back to the working floor. The blowing causes matte, slag, etc., to be thrown up, and part of it sticks to the inside of the nose and to the hood of the converter. If the material, which is sticking to the inside of the mouth, interferes with the blowing, it is removed by hook

and crane; that which sticks to the hood is removed by knocking with heavy iron bars. While changing a converter the time is utilized to clean the hood thoroughly and to give it a lime coating.

Very little fluedust is made by a converter. The 11 converters of the Anaconda plant made 140 tons of fluedust in one month, with an average of 71.23 per cent. copper and 12.5 per cent. sulphur. The fluedust is shipped to the reverberatory furnaces. The material that is too heavy to reach the dust chamber drops down and is caught in a cylinder directly behind the converter. From this it is carried back to the working floor.

The material spilt under the converter sticks to a chain, which is placed on the clean floor. The traveling crane may be

charge requires a disproportionately longer time. We can raise the temperature by charging a few lumps of coal, or by preventing an accumulation of slag, which might possibly obstruct the blast. As a result of lack of heat during the slag-forming period, one is sometimes unsuccessful in raising all the slag. In this case it will be found that in pouring off the slag, the white-metal does not boil on the rabble blade. Another seven tons of matte are generally charged; they will furnish the desired heat to raise all the slag. This is called "doubling," or "double tap." In converting low-grade matte the charge must be doubled in order to obtain sufficient white-metal in the converter to cause its level to be above the tuyeres. For the same reason two



SKIMMING SLAG

hooked on to this chain and employed to remove it to the place where the material is to be broken up.

IRREGULARITIES OF THE BLOW

The above description refers to a single charge and a very regular and smooth run. We will now consider the prevailing irregularities and difficulties which may arise and how to overcome them. If the matte charged happens to be comparatively cold, there will occur during the first 10 minutes a shooting out of a considerable amount of matte and it will require a long time to raise the slag, as has already been mentioned.

It usually takes 60 min. to blow a charge of approximately seven tons up to the end of the first period, but a cold

white-metal charges are often poured together. Also if there is a large supply of matte and two converters are at the same stage, i.e., ready to start the second-period blow, the white-metal of one is poured into the other and finished in it in order to free the first one. All these operations are called "double tap."

If the end of the slag-forming period is reached, the color of the flame being blueish white, and if the pouring of slag is delayed, the white-metal will be oxidized and cuprous oxide will enter the slag and will be slagged by the lining, at the existing high temperature. As soon as suitable conditions arise for the reaction between cuprous oxide and silicate with cuprous sulphide, a large amount of sulphur dioxide will be set free in a relatively short

time. As a result of this the slag foams out of the mouth of the converter, or worse, terrible explosions may take place. This may occur as the converter is in a blowing position, but it occurs especially at the moment the converter is tilted for pouring the slag. Skimming twice, thus avoiding the accumulation of slag, will reduce the violence of the explosion. The foamy, mushy slag runs high in copper; it is practically a ferrous-cuprous silicate, containing cuprous and cupric oxides mechanically mixed.

Foaming may also occur during the second period. The results however, are much less serious in this case, the quantity of slag present being limited. A few lumps of coal ordinarily keep the foamy slag in the converter. The presence of considerable slag during the second period may be due to the fact that not quite all

blown charge for a charge in the early stage of the first-period run. In overblowing a charge, copper oxides are formed; they enter the slag and are slagged by fresh lining. The heat evolved during an overblow is not sufficient to oxidize and slag all the metal. The contents of the converter soon freezes up; it consists then of frozen metallic copper, copper oxides and copper silicates. An overblown charge is worked up with the material on the floor, as part of the dope, or is charged in the refining furnace. In doing so, however, a good deal of slag is brought into the refining furnace.

The lining of a converter usually endures five or six charges or pourings of copper. If in the judgment of the skimmer the lining will not stand another charge, the converter is replaced by a freshly lined one. In case the skimmer

and consequently that to finish a charge, depends very much upon the temperature. In order to get a better idea regarding the time required for a blow, I give below some actual runs in an Anaconda converter:

	Hrs.	Min.
Matte charged	12	25
One ladle slag tapped (flame still greenish yellow)	1	5
Blue flashes appear in the flame	1	25
All slag poured and white metal transferred to another converter	1	35
Matte charged	7	20
One ladle slag tapped (flame blue)	8	10
Rest of slag tapped and one bucket dope charged	8	30
Blister poured	9	25
Matte charged	8	25
1/2 ladle slag poured (flame greenish yellow)	9	35
Blue flashes break through	10	15
1/2 ladle slag poured	10	20
Rest of slag poured and one bucket dope charged	10	35
One bucket dope charged ready for blister pouring	10	55

Considerable time is lost in waiting for matte, in repairing stalls, etc. To control the delays and to find the actual number of stalls running and the total time of blowing, a daily "time lost report" is made out in Anaconda. Table I represents such a report. Table II is the daily report of the converter plant recorded the same day as the above. It gives us a quantitative idea of the working of the plant as a whole.

Efficiency of Mexican Labor

SPECIAL CORRESPONDENCE

As to the greater dollar-efficiency of Mexican labor, note these contract prices

TABLE I. TIME LOST FROM BLOWING.

STALL.	CHARGING.		WAITING FOR MATTE.		CHANGING CONVERTERS.		STALL DOWN.		TOTAL TIME LOST.	
	Hours.	Min.	Hours.	Min.	Hours.	Min.	Hours.	Min.	Hours.	Min.
1		50	1	10		30	2	20	4	50
2		50	2	25		30			3	45
3		55	1	55		30			3	20
4		20				30	15	25	16	15
5		15		15		30	16		17	
6		25		30		40	13	25	15	10
7		55	1	50		30			3	15
8		40		55			7	15	8	50
9		25	1	15			9	30	11	10
10		50	2			30			3	20
11		40	1	20		30			2	30
Total	7	05	13	35	4	40	64	05	89	25

Number of stalls running, 7.26.
Total time blowing, 174.35 min.
Draft, 0.30 in.

the slag was raised during the first period; in charging much dope, a good deal of iron in the form of matte and in consequence slag may come in occasionally. The following is a partial analysis of a mushy slag, formed during the second period: Cu, 27.9 per cent.; FeO, 29 per cent.; SiO₂, 29 per cent.; S, 3.4 per cent. The foamy slag goes back into the converters as part of the charged dope.

The product underneath the foamy slag is copper containing cuprous sulphide. It is called "Regal." The following is a partial analysis of a regal: Cu, 92 per cent.; FeO, 0.8 per cent.; S, 1 per cent. After the removal of the foamy slag a charge is finished in a very short time.

OVERBLOWING

Due consideration has already been given to the case of too high a temperature during the second-period blow. Too low a temperature sometimes occurs at the end of the blow; this is remedied by charging a few lumps of coal, or by doubling, i.e., pouring a hot white-metal charge in the converter; also matte may be charged to raise the temperature.

Overblowing in the second-period run occurs very seldom. If it occurs, the reason for it can generally be attributed to the skimmer's mistaking a slightly over-

decides to change a converter when a charge is completely finished, the second-period slag is first dumped. It returns into the converters as part of the dope. The lining of the converter is coated with copper in this case, and it is very hard to cut this out. If possible the converter is washed with matte or changed at the end of the first period. The matte or white-metal is poured into a lined ladle and transferred to another converter.

The best shape of the barrel converter, the place of the tuyeres and their direction are not yet settled. Experiments concerning these are being conducted all the time; the average time of finishing a charge, taken for a very long period, is the basis for improvements. A converter handles two to four charges per shift of eight hours. The time required for each period

current at a mine of which I am consulting engineer. The vein is about 3 1/2 ft. wide, and varies in hardness, being frequently quite soft. The crosscuts are in hard slate. Values are given in United States currency per foot: Main drifts, 5x7 ft., hand labor, \$2.30; intermediate drifts, 4x6 ft., \$1.85; crosscuts, 4x6 ft., \$2.15; winzes, \$1.85 to 2.25. This does not include hoisting and pumping. Cananea, I understand, has practically eliminated white labor underground.

In Central Mexico an ordinary miner gets 37 1/2 to 50c. gold per day, except in some of the larger camps. Guanajuato, I believe, has raised the scale, but is not paying as much as Cananea does.

During 1907 Trinidad exported to the United States 4145 tons of land asphalt.

TABLE II. DAILY OFFICE REPORT, CONVERTER OPERATION.

Shift.	CHARGES.		Pours Copper.	Boats Dope.	Buckets Dope.	Converters Changed.
	Blast Furnace Matte.	Reverb. Furnace Matte.				
1	16	6	19	8	21	0
2	18	6	23	10	23	3
3	24	4	22	16	18	6
Total	28	16	64	34	62	9

Talc and Soapstone in Vermont

By G. H. PERKINS*

Talc and soapstone are found at many places in Vermont, especially east of the Green mountains. Usually the deposits are not very large, at least so far as surface showings indicate. Most of the outcrops have never been worked to any extent, and it is not only possible, but probable, that both talc and soapstone exist in the State in much greater quantity than is at present known. Inasmuch as soapstone is simply a compact form of talc, the two materials are usually found in the same locality. Occasionally, however, one is found by itself, and we have in Vermont several beds of talc where there is little or no soapstone, and soapstone without talc. This is true of all the quarries which are at present worked. For this reason it will be better to consider the two minerals separately.

TALC

This mineral occurs in beds of noticeable size in or near the towns of Bridgewater, Roxbury, Lowell, Duxbury, Moretown, Rochester, Granville, Stockbridge and Johnson; smaller deposits are to be found at many other points. The talc in these localities is usually massive, but beautiful foliated specimens may be obtained in some of them. This form is nowhere common, however, and plays no important part in the output of the State. During the last four or five years the increased demand for ground talc has caused increased activity in the industry and, while one long-worked mine, the New England, at Stockbridge, has been closed, several others have been opened up. The production has increased greatly and the industry will probably continue to grow.

For several years talc has been mined in Moretown, East Granville, Rochester and Johnson. In Moretown there is a bed 80 ft. wide near the opening, and of unknown depth. This has been worked by several different companies, and machinery for grinding and bolting has been installed. This mine has the disadvantage of being six miles from the nearest railroad, and the quality of the talc is not always such as is desired. At East Granville the bed is reached by a shaft 100 ft. deep; that at Moretown is reached by an open cut and tunnel. The talc at East Granville is shipped in the rough, to be ground by mills in Maine. A few miles east of Rochester is the plant of the United States Talc Corporation. So far as I have information, the work here thus far has been mostly preliminary.

About a year ago the American Mineral Company began work on what is apparently a fine deposit of talc in the town

of Johnson. Previously there had been some months of prospecting on this property. The manager states that both quality and quantity are extra good and that with good fortune 2000 tons of talc will be produced yearly. The deposit is well situated and near a railroad.

SOAPSTONE

As has been noted, this material is sometimes found by itself and sometimes in conjunction with talc. Soapstone has been much more extensively mined in Vermont than talc, the demand for the latter being of recent growth. In the early days, probably because of the ease with which soapstone is worked, it was used for many purposes quite different from those for which it is now sold. Window sills and caps, door sills, hearths, stoves, and even dwellings, were often made of this material, the work in some of the quarries dating back at least 75 years.

There are extensive beds of soapstone in Cavendish, Grafton, Chester, Weathersfield, Athens and Windham; and minor occurrences, some which have been worked at one time or another, in many other towns. Although there is some excellent soapstone to be found in the State, there is a large quantity which is unfit for use.

There are quarries in many sections of the State which for different reasons have been abandoned; only a few are now worked. In Chester, the Union Soapstone Company works two quarries, situated a few miles south of the village on high ground. The soapstone is inclosed by gneiss and is exposed by open pits. One of these is 100 ft. long, 70 ft. wide and 60 ft. deep; the other is a short distance south and is 70 ft. long, 60 ft. wide and 30 ft. deep. The material from these quarries is variable in quality, much of it being broken or cracked, so that good slabs cannot be obtained, while some, unfortunately the less part, is of excellent quality. The stone is quarried by using channeling machines and splitting out the blocks with wedges; it splits easily and in regular blocks, ordinarily 6x4 ft. and of variable thickness. The soapstone lies in the gneiss in lenses from 4 to 20 ft. thick and from 20 to 30 ft. wide. These lenses overlap each other so that the deposit is practically continuous and, as they occur one below another the depth may be considerable. The stone is soft and can be worked up easily; it is sawed, turned, planed, grooved, etc., much as if it were wood. Water is not necessary except on the rubbing beds where the surface is smoothed. The mill where this is done is at Chester depot where the blocks are drawn from the quarries as needed. This company grinds as much of the waste as possible, the powdered stone being used as paper filling, in certain kinds of paint

and in various sorts of plaster. Another plant, that of the American Soapstone Finish Company, is situated at Chester depot. The product of this plant is similar to that just described.

In the neighborhood of Chester there are several beds of soapstone, especially north toward Ludlow, where there has been some work done. The only deposits now worked, however, are those near the town of Weathersfield, where a rather large quantity of stone is quarried. The quarry now worked has been in operation for over 60 years. Near this quarry is an older one which has been idle for many years, but from which large quantities of stone have been taken. The quarries are on a hill, the mills being in the village a mile or so away. Here the blocks are sawed and worked as at Chester. Most of that which is sufficiently sound is sawed into slabs to be used for tubs, sinks, and a great variety of objects. Formerly wood-burning stoves were manufactured in large number, but now very few are to be found.

There is also a mill in Windham which has been in operation at least a part of the time during the last three years. In and about Windham there are deposits of both soapstone and talc; some of the latter appear promising, but they have not been developed.

PRODUCTION

Vermont now stands third among the States in the production of talc and soapstone, and if the deposits already opened are fully worked the output will certainly be largely increased. In one year, 1904-1905, the amount of these minerals produced increased tenfold, from about 1000 to 10,000 tons. I have been unable to secure full reports from the various manufacturers in the State; it is quite possible that if all the facts were known the above figures would be considerably increased.

It is stated that the best method for estimating arsenic and antimony is by the distillation method; and for bismuth the method depending upon the brown coloration produced by dissolving bismuth iodide in potassium iodide.

Most of the silver-lead ore produced in New South Wales comes from the Broken Hill district; during 1907 an average of 8900 men were working in that district.

The production of white arsenic in the United States during 1907 was 2,020,000 lb., valued at \$101,000, as compared with 1,663,000 lb., valued at \$83,150, in 1906.

The cost of milling at the mill of the North Broken Hill Company, New South Wales, for the last half of 1907 was 4s. 8d. per ton.

*State geologist, Burlington, Vermont.

A Remarkable Car-dump

By FRANK A. ROSS*

Four years ago, annoyed by excessive repairs to end gates and latches of the mine cars, G. P. Jones, superintendent of the mines belonging to the Daly Reduction Company, Ltd., Hedley, B. C., built a car dump, or tippie, designed to do away with the necessity of gates on the cars by automatically receiving the car, turning it upside down, and delivering it to a

provement having been found necessary. In the past four years it has dumped more than 80,000 cars, holding two tons each, without a hitch and at an exceedingly low cost for repairs. Most of the repairs that have been necessary have been due to inexcusably rough usage, for so perfectly does this tippie work that the trainmen are in the habit of shunting the first car into it at full speed and the shock is sometimes excessive. Once a loaded car, that had broken loose from the train and run away, entered the tippie, was turned over, dumped and set out on

for it was supposed that the car must pass center before the tippie would begin to turn over. But it was found that this was not necessary, since the impact of the car upon the bell crank, or knuckle, on the back end of the tippie, shown in Fig. 1, is more than sufficient to start the tipping motion, so that cheaper and stronger wooden cars are now made, as shown in Fig. 4. The bell crank serves a three-fold purpose: It cushions the blow of the car; it starts the tippie to turning; and it kicks the car out upon the side track, at the same time easing the shock of return.

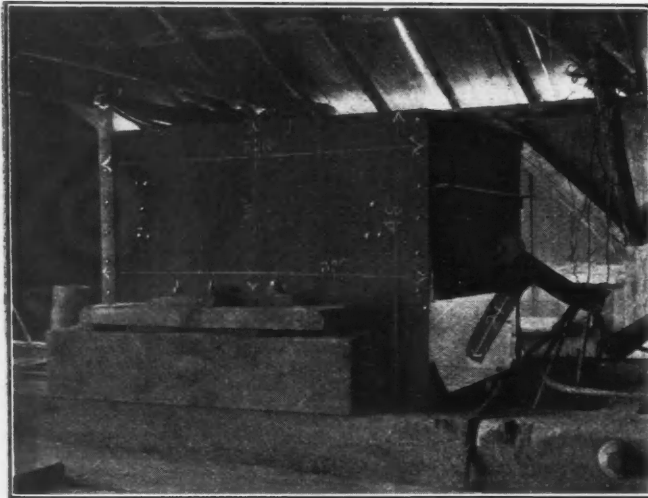


FIG. 1. SIDE VIEW OF TIPPLE

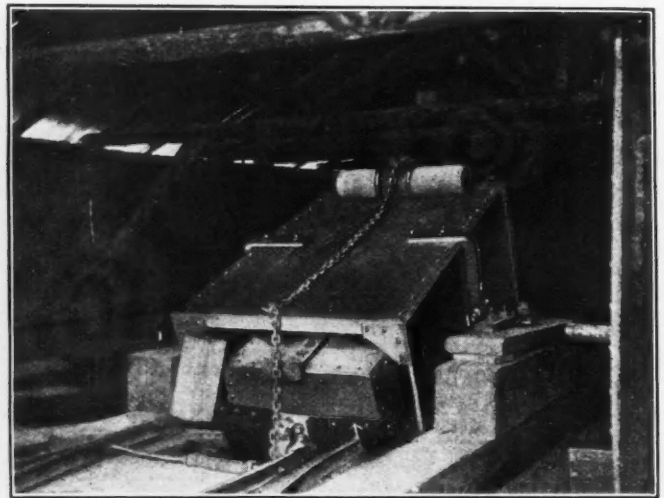


FIG. 2. TIPPLE DUMPING CAR

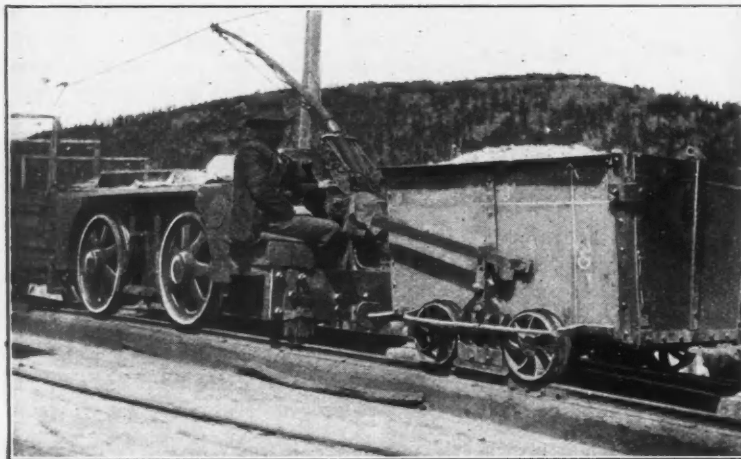


FIG. 3. IRON CAR FORMERLY USED SHOWING BRAKE

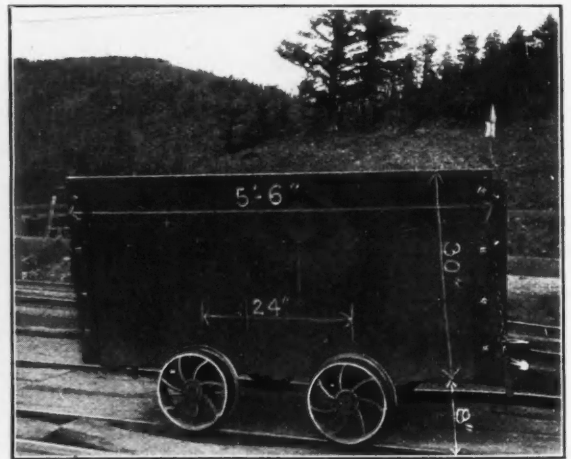


FIG. 4. WOODEN CAR NOW USED

side track for empties. The present well equipped machine shops of the company did not exist at that time, so that the tippie shown in the accompanying illustration was roughly constructed by the mine blacksmith as an experiment, and with little expectation of permanency.

THE TIPPLE

This tippie, however, was a success from the beginning, and has been allowed to stand exactly as first erected, no im-

*Managing director, Daly Reduction Company, Hedley, British Columbia.

provement having been found necessary. Naturally this gave the trainmen great confidence in its absolute reliability.

As will be seen from the cuts, the tippie is 5½x4x4 ft. It is made of ¾-in. boiler plate and 3-in. angle iron. The trunnions are set equidistant from the ends and 18 in. above the bottom, or about 2½ in. below the center of gravity of the empty car.

THE CARS

The first car used, shown in Fig. 3, is 6 in. shorter than the inside of the tippie,

Were a new tippie to be made in a more workmanlike manner, no change in design would be necessary or desirable except, perhaps, to substitute dash pots or rubber cushions for the cables that now limit the motion of this bell crank and absorb much of the shock.

In Fig. 5 will be seen the spring-switch and the spring-frog, respectively, of the ingoing and outgoing tracks. The outgoing track, or side track for empties, passes under the ingoing track on a heavy grade; the empties mount this

grade through the momentum given them by the kick of the bell crank.

No stronger or simpler car can be devised than that shown in Fig. 4. With solid, gateless body, pedestal bearings, solid axles upon which are forced and riveted special manganese-steel wheels, the cars stand an amount of hard usage that is remarkable.

THE TRAMWAY

The electric tramway upon which they are run is 11,000 ft. long with an average grade of 5 per cent., which necessitates the use upon every fourth car of track brakes, such as are shown in Fig. 3. These brakes are made fool-proof in that they either lock the wheels or lift the car from the track, according to the direction in which the brake wheel—not shown in cut—is turned.

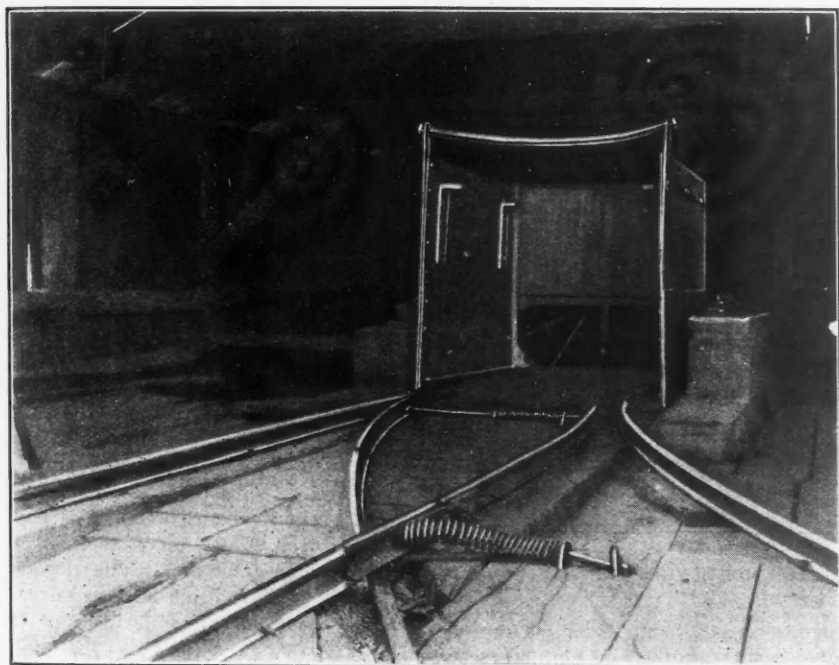


FIG. 5. TIPPLE SHOWING ARRANGEMENT OF TRACKS AND SWITCHES

From the ore-bin, where the tippel is located, the ore goes to the mill in six-ton skips running on a three-rail gravity tramway 10,000 ft. long, with an average grade of 43.1 per cent. and a maximum grade of 71.2 per cent., the rise being 4000 ft. in the entire length.

At the Alaska Treadwell mine, in the year ended May 31, 1908, each machine drill broke an average of 29.35 tons of rock per shift of 10 hours.

During 1907 there was exported from Trinidad to the United States 86,824 long tons of pitch lake asphalt; to other countries 53,560 tons.

During 1907 the United States produced 65,579 short tons of crude barytes, valued at \$251,308, and imported 18,344 tons, valued at \$77,683.

Effect of Temperature on the Electrolysis of Copper

James R. Withrow (*Journ. Am. Chem. Soc.*, XXX, pp. 381-387) has investigated the influence of temperature upon the electrolytic precipitation of copper from a nitric-acid solution. The author, in determining copper electrolytically with stationary anodes, occasionally had the common experience of having the precipitated copper slowly redissolve when the precipitation was nearly complete. While the current conditions did not change on such occasions, there was evidently some slight change in the other conditions whereby the free nitric acid was able to overcome the influence of the current. It was soon found that the copper redissolved when the temperature

total dilution was maintained at 125 cubic centimeters.

The copper deposits, when nitric acid was used, were all bright and compact, except at temperatures above 70 deg. C. When nitric acid was not used the deposits were of a different character, but in no cases was sponginess observed; in fact, the condition of the deposits was such that the use of a drying oven was not necessary.

The deposits were washed with distilled water by siphoning without interrupting the current. When the washing was completed, the dish was removed and rinsed with dilute alcohol, then with absolute alcohol, and finally with absolute ether. The dish was then wiped on the outside and placed in a desiccator for 15 to 20 min. The ferro-cyanide test for copper was applied to the washings.

TESTS UNDER STANDARD CONDITIONS

To determine a standard from which to judge the effect of the addition of nitric acid to the electrolyte, solutions of pure copper sulphate were electrolyzed for various lengths of time. It was found that 0.25 gram of copper in solution could be deposited completely in 16 hours. In the absence of nitric acid the deposition of copper was slower in appearing and the solution took on an olive-green tint before the copper became visible; this was also noticeable in a copper nitrate solution in which there was no free acid. When using sulphate electrolytes the conductivity of the solution increased as the electrolysis progressed. The main objection to electrolysis with sulphuric-acid electrolytes is that the deposits weigh high if the determinations are run too long.

A series of tests, using copper nitrate electrolytes, gave better deposits than with the sulphate, but the rate of deposition after the first hour, was slower. The next tests were made with copper-sulphate electrolytes using varying quantities of nitric acid, the other conditions except time remaining constant. Even with 0.25 c.c. of nitric acid in 125 c.c. of electrolyte its retarding effect was very noticeable. When 6.25 c.c. of nitric acid was present in the same volume, the retarding effect was so great, even after a lapse of 17 hours, that it was deemed unnecessary to proceed longer on that line. The excellent character of the deposits when nitric acid was present proved plainly that it was a desirable addition.

EFFECT OF TEMPERATURE

The question of the influence of temperature upon the rate of deposition was next taken up. The minimum amount of acid (0.25 c.c.) was used and the temperature ranged from 25 to 90 deg. C. In raising the temperature from 25 to 40 deg. C., a marked lessening of the time necessary for deposition was observed,

while a further elevation to 60 deg. decreased the time but not to a proportionate extent. At 70 deg. the results were about the same as at 60 deg., while beyond 70 deg. a retarding effect was noticed. During the first hour the rate of deposition was lessened as the temperature was raised, and it was not until after the first hour that the beneficial effect of higher temperature was noted.

The conclusions of the author are as follows: (1) Even the smallest amounts of nitric acid have a tendency to retard the electrolytic precipitation of copper, under the conditions used. (2) The presence of nitric acid is, nevertheless, desirable because of its beneficial effect on the character of the deposit. (3) While increased temperature generally means accelerated precipitation, yet with the low current strength and conditions used, the reverse is the case above 70 deg. C., no doubt owing to the rapidly increasing solvent action of the acid.

A New Railroad in Mexico

United States Consul Thomas W. Voetter, at Saltillo, Mexico, reports that a new railroad is projected to pass through parts of the States of Coahuila and Chihuahua, which are at present without railway facilities. The eastern terminus of this road is to be at Monclova, Coahuila, on the line of the Mexican International, and it is to extend in a northwesterly direction to Chihuahua, the capital of the State of the same name. The length of the new line will be about 375 miles.

The road will pass through excellent coalfields near Monclova, will then traverse timber, grazing, and agricultural lands, and near the western line of Coahuila it will go through a region with good iron and salt deposits. In Chihuahua it is to pass through a mineralized region, the ores of which are not now utilized for lack of transportation facilities and cheap fuel. The projectors believe that a line can be built with low grades so that cheap transportation of coal from the coalfields of Coahuila to the Chihuahua mining region can be made possible, while at the same time the iron ore along the line can be transported to some point where fuel for smelting is plentiful.

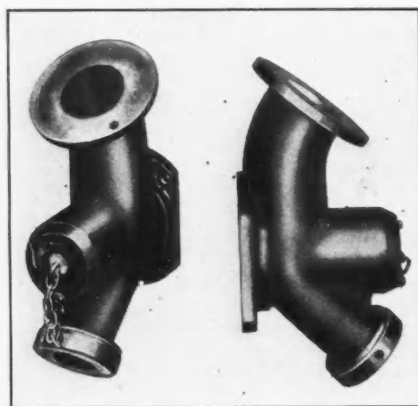
An authority on copper and brass states that in a brass-rolling mill the use of brazed or tinned copper is inadvisable, but this material may be used for casting in sand. Old arsenical copper tubes and plates make good gun-metal, but inferior sheet brass.

The Cobar district is the largest gold producer in New South Wales. Its output increased in 1907.

Loss by Leakage of Blast in Lead and Copper Furnaces

The loss of power due to the escape of blast through leaking tuyeres and through chinks between the jackets may be large enough to warrant careful investigation, especially in places where fuel is an important item in smelter costs. The introduction of the Robinson tuyere in the smelting works at Mapimi, Mexico, led incidentally to the discovery that fully one-third of the power driving the blowers had been consumed in forcing blast through leaks about the furnaces. The latest report of the superintendent shows a power consumption of 23.1 horsepower-hours per ton of charge as compared with about 36 horsepower-hours per ton of charge before the new tuyeres were adopted.

It is not claimed that all or more than a very inconsiderable part of this saving



ROBINSON TUYERE, IMPROVED FORM

was due directly to the Robinson tuyeres. These tuyeres are tight enough to prevent whistling, and when the noise about the tuyere ceased it was easy to detect numerous leaks about the jackets and to stop them. Since the furnaces have been made air-tight the air consumption has gone down from 72,000 to 54,000 cu. ft. per ton charge delivered at a pressure of 48 oz. The accompanying illustration shows the latest form of the Robinson tuyere. The disk which seals the lower slag escape was at first made of an alloy of lead and tin; later it was found that the ordinary base bullion of the furnace answered the purpose quite as well. At present the disks are cast in a suitable mold on the furnace floor, the metal being returned to the stock when it has served its purpose.

The total pitch lake and land asphalt exported to the United States from Trinidad during 1907 was 90,969 long tons; there was exported to other countries 53,760 tons.

Consolidated Mining and Smelting Company of Canada, Ltd.

The report of the Consolidated Mining and Smelting Company, of Canada, Ltd., for the year ending June 30, 1908, issued to the third annual meeting of the stockholders, Sept. 22, states that, although the financial results were not satisfactory owing to the decline in the price of metals, the year was an improvement upon the one preceding; the tonnage handled was much greater, the value higher and the recovery of metals better. The stock of ore and metals on hand at the beginning of the year, June 30, 1908, was very large. Before it was possible to market these metals the prices began to decline, resulting in a loss of profits of more than \$430,000. The operating profits for the year were \$43,416; dividends amounting to \$66,940 were paid; for depreciation of plant and equipment \$132,843 was written off, and \$564,226 expended for development. During the year additions to the various plants amounted to \$315,562, and the cost of new properties and their development to \$621,895.

Development work on the Centre Star and Idaho, Rosslund, amounted to 11,370 ft., and diamond drilling 10,033 ft.; 12,639 ft. of development work was done on the St. Eugene and 4569 ft. of diamond drilling. The ore reserves in the Centre Star group, Rosslund, were increased. Shipments from the properties were 175,799 tons, having a value of \$1,915,954, as compared with \$893,249 during the previous year.

The lower workings of the War Eagle and the Iron Mask mines at Rosslund, produced high-grade ore, this development of higher grade in depth being considered one of the encouraging features of the year.

The probable ore reserves of the St. Eugene group, Moyie, are nearly 50 per cent. greater than a year ago, and ore of better grade than the average of last year has been found between the 600- and 800-ft. levels, on the main vein above the 1500-ft. level and between the 1900- and 2000-ft. levels. In the report of 1907 it was stated that the 2000-ft. level did not promise to yield as much as the 1900-ft. level; but present indications are that the 2000-ft. level will produce more ore than any other level in the mine.

New equipment installed during the year included an aerial tramway for the Richmond Eureka mine; buildings and equipment at the Phoenix Amalgamated; a sorting plant and extension to the St. Eugene mill; additional plant at Trail, electric locomotives and other electric installations.

The company has \$5,500,000 authorized capital stock of which \$5,355,200 has been issued.

Advancing the Hot Time Lateral of the Newhouse Tunnel

BY HENRY M. ADKINSON*

Some of the most ordinary work of mining is not pushed forward with the excellence of result that might be expected; especially is this noticeable in the common work of drifting or crosscutting, where the methods generally in use are deemed good enough, and a monthly progress of from 100 to 150 ft. is found satisfactory. In most cases the less rather than the greater figure is reached. These advances are accepted with satisfaction in spite of the fact that higher records in driving have been made and are made every day.

S. A. Knowles, now superintendent of the Boston Consolidated mine at Bingham, Utah, in driving the 12x12-ft. Newhouse tunnel at Idaho Springs, Colo., advanced the face a total of 2925 ft. in 12 months, or at an average rate of 244 ft. monthly, and at an average breaking cost of \$21.45 per foot, as was carefully described by H. Foster Bain in the *JOURNAL* of April 19, 1902. His record of 7½ ft. average advance per shift in the 6x9-ft. Central tunnel of the Big Five company, at Idaho Springs, was detailed in a pamphlet published by the Leyner Engineering Works Company, of Denver. Lindsay Duncan published in *Engineering-Contracting*, June 20, 1906, the details of cost in Mr. Knowles' work at the west end of the Gunnison irrigation tunnel of the Reclamation Service, in Montrose county, Colo., where advances of 100 ft. in five days were made in adobe ground.

In reading these descriptions of high-pressure work the mine manager is too apt to dismiss the subject with the thought that such rates of progress are possible in bores of the larger dimensions, but are not possible in the kind of work he is carrying on, where the smaller drifts and crosscuts offer increasing difficulties to rapid advance, by making impossible the working of the large force of men which in his experience is the only means to this end. Mr. Knowles has demonstrated that it is possible to make equally satisfactory progress in bores of smaller dimensions. He has described to me, and given me permission to present in some detail, the method he employed in driving an adit 5x7½ ft., the normal size of mine workings. By this method he made monthly advances of more than 250 ft. with a force of 11 men, while the cost of breaking and tramping was approximately \$13.50 per foot.

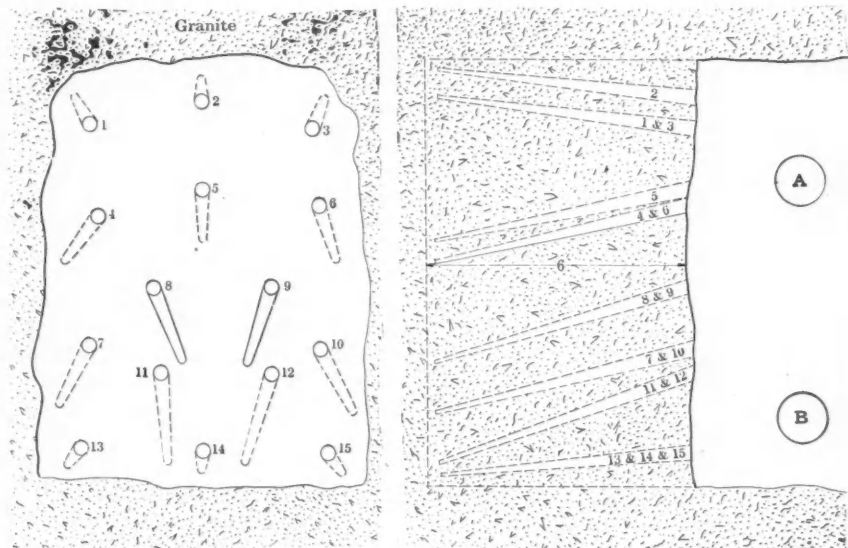
The notable results briefly stated above were obtained in the work of driving the Hot Time lateral, a connection between the Newhouse tunnel and the 2200-ft. level of the Old Town shaft, at Idaho Springs, Colo. During 1907, Mr.

Knowles pushed this connection from a length of 1834 ft. on Jan. 1, 1907, to a length of 4333 ft. at the end of the year, or a total distance in the twelve months of 2499 ft. The rate of advance of the different months was: January, 1907, 253 ft.; February, 237; March,¹ 84; April,¹ 185; May, 263; June, 251; July, 200; August, 200; September, 254; October, 224; November, 260; December,² 88; total advance, 2499 ft.; average monthly advance, 208¼ ft.; average monthly advance, excluding March, April and December, 238 feet.

The adit was driven through granite, gneiss and schist, very hard to drill and so tough and tenacious that it broke badly. There were no soft seams nor any defined walls to follow. The fact that there was no timbering to be done; that the ground was not wet enough to require rubber coats; and that the size of the bore, 5x7½ ft. in the clear above the rails, corresponded so closely with

cars gave what additional assistance the drill crew required in setting up. The accompanying diagram illustrates the position and direction of the holes.

From the first set-up of the cross-bar at position *A*, all the holes except the three bottom ones, the "lifters," were drilled. Holes 1, 2, 3, 4, 5 and 6 were drilled with the machine above the cross-bar, to which it was attached directly without any arm. When these holes were finished the drill was swung under the bar and all others except the three "lifters" were drilled from this position. By the time these 12 holes were completed the muckers had cleaned up the face. Then the bar was torn down and set up in position *B*, close to the bottom, so that the bottom holes might be put in after the same manner as the back holes. The usual round was 15 holes, each 6 ft. or more deep and having a diameter of 1½ in. at the bottom. When the ground showed any peculiarities which indicated that another hole or



METHOD OF DRILLING THE HOLES IN THE HOT TIME LATERAL

the usual size of mine workings, made the problem, in all essential conditions, the counterpart of the problem hundreds of properties are working on every day. For this reason the following details of this rapid progress, made at such a reasonable cost, are the more interesting and valuable

DRILLING AND BLASTING THE HOLES

The machineman and helper set up the drill without waiting for the dirt from the previous shots to be cleaned up. The set-up was on a cross-bar placed high enough in the drift and far enough away from the face to allow the upper row of holes (1, 2 and 3 in the diagram) to be started close to the back and to be drilled with very little rise in their depth of six feet. The muckers at work loading the

two would be necessary in order to break the ground well these were drilled where needed. The ordinary round contained 90 ft. of drill holes, so that to make the set-ups, drill the round, tear down, load and shoot the holes required the full 8-hour shift.

Mr. Knowles used the Model 6, Water-Leyner drill. The use of hollow steel flushed with a stream of water makes it possible to keep the bottom of the hole clear of cuttings, and the bit cool, so that each blow is struck full on the clean face of the rock. By using this drill the crew gained the time usually lost in scraping the hole, and in changing the steel frequently. The saving of this lost time, which in the aggregate consumes a large part of the drilling period, is one of the most important features of this work, and one to which Mr. Knowles ascribes a large part of his success. The power consumption in the use of a hammer type of

¹Work was held up by the Old Town company.

²Work was completed and connection made with this 88 feet.

*Mining engineer, Telluride, Colo.

drill, rather than a piston drill, was here a negligible quantity, since air was purchased at a flat rate of \$4 per shift.

As soon as the drilling was finished the machinemen loaded the entire round of holes. Shoveling plats (steel turn-sheets 4x5 ft. and $\frac{1}{4}$ in. thick) were laid in the drift for a distance of about 25 ft. back from the face.

Mr. Knowles used a 40-per cent. gelatine of the Du Pont brand; 60-per cent. dynamite was also tried, but the results were not enough better to compensate for the extra cost. By using the plastic gelatine any possible air spaces in the holes were avoided, the explosion was equally effective in breaking the ground, and the gas was less trying on the men, so that the muckers were able to get to work sooner after the holes were blasted. No definite amount of powder was assigned to any of the holes, the matter of loading being left to the judgment of the machinemen, except that holes 8, 9, 11, 12, 13, 14 and 15 were loaded more heavily than the others. In the process of loading, a full stick of powder was put in the bottom of the hole; next came another stick containing the fuse and a XXXXXX cap in its lower end, and after that what other powder was necessary. Experience showed that the greatest shattering took place in the ground nearest the primer, and for this reason it was placed as near the bottom of the hole as practicable. On this theory it would have been better to have placed the primer at the very bottom of the hole, but this was not done because the hard tamping of a primer against the rock might have exploded the cap prematurely and with fatal results. To increase still further the effectiveness of the explosion the strongest cap obtainable was used.

Each round broke from 4 to $4\frac{1}{2}$ ft. of ground. If, after the round was fired, it chanced that some of the shots did not break the entire hole, or misfired, these holes were re-loaded and fired again before the work of mucking began. The holes were fired in the following order: Nos. 8, 9, 11, 12; then 5, 7 and 10; then 4 and 6; next 2, followed by 1 and 3, with 14, 13 and 15 at the last. The latter three holes, loaded more heavily than the upper holes, as previously noted, were fired in as close succession as possible, with 14 just before the others. The object of this was to throw the dirt back from the face with the last shots, and leave a space for the following set-up to be made without the extra labor of mucking back.

In this work of loading and firing the holes the important factor is the use of the gelatine with the most powerful detonator possible, thus breaking the ground in an effective manner and also reducing the amount of gases so that the work could be closely followed up. Mr. Knowles believes that there is no economy in making a saving on explosives, and

thus losing ground, after incurring the heavy expenses of labor, air and machines to drill the holes. The labor of mucking back was also saved by the judicious method of loading.

MUCKING AND TRAMMING

When the last shot was fired compressed air was blown into the face and the smoke exhausted through a 12-in. ventilating pipe connected with a positive blower. The ventilating pipe was carried to within 100 or 150 ft. of the face, that being as close as it could be brought without endangering it. Thirty minutes after the shots were fired the air was clear enough to allow the muckers to begin work. There were three muckers, two of whom loaded cars while the third trammed the rock to the point where the mule trains were made up. By alternating in this tramping work each mucker obtained a rest without any loss of time.

The mine cars used had a capacity of 36 cu. ft. and held about two tons of the rock handled. These cars were provided with roller bearings, and six to eight cars constituted a mule train. The muckers used No. 5 square-point, short-handled shovels, and in four or five hours the entire pile of muck was removed, about six or eight cars being handled per shift. From the preceding statement it will be seen that it required two muckers to load 8 or 10 cars per shift, while in Mr. Knowles' work in the Newhouse tunnel the same number of cars of the same size were filled by one mucker in one shift, and that, too, without any rest such as the tramping work afforded here. The variation is accounted for by the fact that the muckers were working in the Hot Time lateral under the handicap of the unavoidable interference by the drilling crew, which interference was a necessary accompaniment of double-shift work.

After clearing out all the dirt, the muckers laid what additional track was necessary. The tracking was of 20-lb. rails, laid on a 1-per cent. grade, and until it was possible to lay the full lengths of rails the cars were run on the shoveling plats. The dirt was trammed by mule train through the Hot Time lateral to the Newhouse tunnel. This was a distance of 1800 ft. in January, 1907, and a constantly increasing distance, until at the last the mule train hauled dirt 4300 ft., or about four-fifths of a mile. From the junction of the Hot Time lateral with the Newhouse tunnel the cars were hauled by electric motor the remaining 12,000 ft. to the dump. For this latter service a transportation charge was made by the "Tunnel" company.

THE CREW AND THE WORK ACCOMPLISHED

The full crew was composed of two machinemen at \$4 per shift each, two machine helpers at \$3.50 each, six muckers at \$3.50 each, and one foreman. The wages paid were higher than usual because the best men were wanted on the

work, and because the conditions under which they worked were very trying. At these higher wages the men were required to complete their allotted work before leaving, and if necessary they worked overtime, with no additional pay. On the other hand, they frequently completed their work before the expiration of the eight hours, and no objection was made to their leaving when they were through.

The day machineman and helper began work at the face at 8 a.m. They usually completed the round and fired by 4:30 p. m. The muckers on the night shift began work at 6 p. m. and completed their work within the eight hours, laying any necessary track in addition. The night drill crew came on at 8 p. m. and usually completed their round by 4:30 a. m. The day muckers began work at 6 a. m. and worked till the dirt was out. Thus it will be seen that both drilling and mucking went on simultaneously, and the set-ups were made with the pile of dirt in the face. Mr. Knowles recognized that this was not the cheapest method of driving the adit, since it would have been possible to save \$2 or \$3 per foot if the drill crews and muckers had worked alternately, and each crew had no interference in its work. But in this work speed was the chief object sought and the difference in cost was not important. Mr. Knowles' work is characterized by rapid progress made under high pressure, rather than the striving for a minimum cost.

Nevertheless, when it is taken into consideration that the mucking crews were working under most unfavorable circumstances in respect to atmospheric conditions, and that in this work all the crews were crowded on account of the size of the drift, the cost per foot shows a very good figure. In order to analyze the costs during the period when the most rapid progress was made, the months of May to November, 1907, inclusive, are chosen. In these months the advance never fell below 200 ft. monthly, and ran as high as 263 ft., averaging 236 ft. per month for the entire seven months. During this time a total advance of 1652 ft. was made at a total cost of \$22,186.36, or an average cost per foot of \$13.43. Mr. Knowles has kindly consented to my presenting the following cost per foot of the different items: Labor, \$5.646; air, drilling, \$1.236; air, blowing, \$0.054; explosives, \$2.828; transportation, \$1.072; supplies, \$0.784; drill repairs, \$0.651; blacksmith shop, \$0.545; mules, feed and shoeing, \$0.112; miscellaneous, \$0.500; total, \$13.428.

IMPORTANT FACTORS OF THE WORK

In examining closely the elements which entered into this work to make it the success that it was, we find a combination of several important factors which may have been used singly else-

where, but which were here coordinated into a working whole with most gratifying results. It would perhaps be difficult to point to any one factor as preëminently noteworthy, but certainly, without the drilling of the holes in rapid time, the rest of the work would have gone for naught. The constant high pressure used at the drill made this machine especially effective. The use of a less gaseous, high-power explosive, such as the gelatine powder, combined with the strongest detonator, was a second factor which may not be lightly passed by. These factors both contributed in a great degree to the rapid breaking of the ground. In the removal of the dirt, the use of shoveling plats and wide, square-pointed shovels, instead of the commonly used round point, were very efficient agents in rapid progress. All these mechanical contrivances aided in no small measure in the work, but Mr. Knowles points to the very efficient work of his foreman, T. W. Grasser, as one of the most important elements in his success. Mr. Grasser has worked with him for years, and he put every ounce of his energy and foresight into the work, and worked diligently in order to bring the work to a successful conclusion. But, after all, a most effective agent was the wonderful *esprit de corps* which was developed in a picked crew of men doing a particular work. This kept them toiling not alone for the money reward, but also because of the determination not to be beaten by the other shift.

Duties of the Cyanide Chemist

C. H. Jay (*West. Chem. and Met.*, IV, pp. 157-164) describes the various duties of a "cyanide chemist" which consist not only of the routine analyses connected with the operations but of experimental tests to improve the metallurgical work, such as the reduction of the cyanide consumption and increased extraction at least cost.

The first essentials are standard solutions, which are made up in convenient quantities. The use of distilled water is imperative. The following solutions are used:

Normal sulphuric acid is made by adding about 30 c.c. of pure sulphuric acid to about 900 c.c. of water. Weigh 0.53 gram of pure ignited but not fused bicarbonate of soda which has been ignited for about fifteen minutes and then cooled in a desiccator. This is dissolved in about 100 c.c. of water and titrated with the sulphuric-acid solution using, as an indicator, a 1-per cent. solution of phenolphthalein made up with 50 per cent. grain alcohol. This titration gives an approximate value for the sulphuric-acid solution and the proper amount of water is then added. The solution is then carefully restandardized in duplicate or triplicate using 5.3 grams of sodium carbonate per liter. 1 c.c.

$\frac{N}{1}$ H₂SO₄ = 0.053 gram Na₂CO₃ = 0.040 gram NaOH = 0.028 gram CaO.

Normal caustic-soda solution is made up with about 40 grams of sodium hydrate per liter and is exactly adjusted to equal the sulphuric-acid solution. Phenolphthalein or a 1-per cent. methyl orange solution is used for an indicator.

For standard silver nitrate solution, weigh out 6.52 grams of c.p. silver nitrate and dissolve in chlorine-free distilled water and dilute to 1 liter. One gram of ignited c.p. sodium chloride is dissolved in exactly 100 c.c. of distilled water. With a pipette 10 c.c. of this solution is transferred to a titrating flask, diluted to 100 c.c., a little sodium bicarbonate added and also a few c.c. of a neutral potassium chromate solution. The solution is then titrated to a faint blood-red color with the silver nitrate solution. 1 c.c. $\frac{N}{10}$ NaCl contains 0.0058378 gram NaCl and is equivalent to 0.016966 gram AgNO₃. One c.c. of the 6.52 grams AgNO₃ per liter solution = 0.005 gram KCN or 1 lb. per ton. The silver nitrate solution gives the best and most accurate results in nearly all cases. A standard iodine solution is made up so that 1 c.c. = 0.005 gram KCN and is standardized with c.p. sodium thiosulphate.

Another standard solution that is sometimes used is one of mercuric chloride. This solution is made of such strength that 1 c.c. = 0.005 gram KCN and is standardized against the silver nitrate solution indirectly by means of a cyanide solution. With the standard solutions prepared the chemist is now in position to start his tests.

TITRATION OF CYANIDE SOLUTIONS

Measure 10 c.c. of the clear cyanide solution into a clean flask and dilute to about 150 c.c.; add a few c.c. of a neutral 1-per cent. solution of potassium iodide and titrate to the first permanent opalescence with standard silver nitrate solution.

For standard iodine solution proceed as above to the 150-c.c. dilution point, add a little pure sodium bicarbonate and titrate to first permanent yellow-brown color, which shows an excess of iodine. This method is useless in the presence of sulphides.

For standard mercuric-chloride solution proceed as before to the 150-c.c. dilution point, add a few c.c. of dilute ammonia water and titrate to first permanent bluish opalescence. The end point in this titration is slowly reached and the solution should be well agitated after each addition of the bichloride.

Sodium hydrate or lime is usually added in excess to the tank solutions to neutralize the free and latent acids in the ore. The excess should be small, usually about 1 lb. per ton of ore and is determined by taking 28 c.c. of the solution and ore from the agitation tank, maintaining the relative proportion of ore and

solution in the sample as in the tank, and adding an excess of normal sulphuric acid. The excess of acid is then titrated back with the normal sodium-hydrate solution. One c.c. $\frac{N}{1}$ H₂SO₄ represents 2 lb. of lime per ton. The alkali value of the cyanide, if present, should be deducted.

To determine the amount of protective alkali present in the clear cyanide solution, first titrate to opalescence with silver nitrate, then add as much silver nitrate as was required for the titration, then add phenolphthalein and titrate with $\frac{N}{10}$ H₂SO₄. Tenth-normal solutions of acid and alkali give better results than solutions of other strengths.

ASSAY OF CYANIDE SOLUTIONS

Of the different methods, the evaporation in a lead boat is not satisfactory on account of the time consumed and the small quantity that can be treated; nor is the evaporation of 5 to 10 a.t. of the solution in a porcelain dish wholly satisfactory on account of the time necessary. The latter method consists of evaporating the solution, with a little litharge, to complete dryness, and then transferring the residue to a crucible and completing the assay in the usual way.

The most satisfactory method is that originated by Alfred Chiddy, in which 5 to 10 a.t. of the solution, containing about 5 lb. cyanide per ton, is heated slowly to the boiling point with 10 c.c. of a 10-per cent. lead acetate solution and 2 grams of zinc shavings. When at the boiling point 15 c.c. of hydrochloric acid are added, the boiling continued for 10 or 15 min. longer, the solution cooled by the addition of cold water, the lead collected, squeezed into a ball and cupelled.

The larger field for the cyanide chemist lies in experimental tests such as the determination of the proper strength of solution and fineness of the ore for the maximum extraction. The amount of lime to neutralize the free acid in the ore as well as the latent acid, fall to the lot of the chemist to determine. These and similar problems are worked out in the laboratory on a small scale. Different ores present different problems and the author has outlined several tests that are indicative of the line to be followed.

In West Australia the signal for hoisting men on the cages is four bells instead of three bells as in the United States. In hoisting men the law provides that the speed shall not exceed 200 ft. per min. within 100 ft. of surface, and 500 ft. per min. in any other part of the shaft.

The old tube mills at the Luipaards Vlei Estate mill were 14x3½ ft. The new one is 14x5 ft. These are smaller than the general size of tube mill used on the Rand.

The New Esperanza Mill at El Oro, Mexico

Drag Classifiers Are to Be Employed for Separating Slimes and a New Method of Washing Colloidal Slimes in Merrill Presses

BY CLAUDE T. RICE

The present cyanide plant at the Esperanza mine at El Oro, Mexico, is one of the oldest in the district; it has been gradually enlarged to its present capacity and shows many peculiarities, most of these due to its being built many years ago. The most striking feature is that Huntington mills are used to crush the ore broken to $\frac{3}{4}$ -in. size by jaw breakers. The company had decided to increase the capacity of the mill by adding Huntington mills to recrush the pulp from the stamp batteries. These were ordered, but it was found that the difference of elevation between the stamps and the cyanide tanks was not sufficient to allow the Huntingtons to be used in this way unless the pulp were afterward raised to the level of the cyanide tanks. Therefore, it was decided to use the mills as direct crushers.

The cyanide plant has become so antiquated that the company has decided to remodel it. This would probably not have been done immediately had it not been that the company has 435,000 tons of old tailings, averaging 4.6 grams gold and 48 grams silver per metric ton, which now can be re-treated at a good profit. Indeed the engineers of the company estimate that these tailings can be re-treated at a net profit of \$250,000, and that the mill to treat this will cost about \$195,000. Screen tests on the tailings show the following results: Above 40 mesh, 2.2 per cent., 40 to 60 mesh, 11.9; 60 to 80 mesh, 12.6; 80 to 100 mesh, 19.8; 100 to 200 mesh, 38; below 20 mesh, 15.5 per cent. At the same time that the plant for re-treating the tailings dumps is being erected, the old mill will be modernized by making a few changes and additions.

In the new mill, designed by H. A. Guess, milling superintendent for the Guggenheim interests, and Charles Hoyle, resident manager for the Esperanza Mining Company, many new features will be introduced. The most noteworthy are the new type of classifier and the new method of using the Merrill press for filtering slimes. The crushing plant consisting of 120 stamps, weighing 950 lb., and 13 five-ft. Huntington mills and the old concentrating system consisting of 9 Wilfley tables will be retained.

PLAN OF TREATMENT

In the re-modeled mill the oxidized ore will be crushed in the stamp batteries, while the sulphide ore will be crushed in the Huntington mills, both classes of ore having been previously crushed in Blake breakers, the oxidized ore fine enough to

pass a $1\frac{1}{2}$ -in. and the sulphide ore a $\frac{3}{4}$ -in. grizzly. The following is the plan of treatment that is to be used in the new mill:

The stamps make 102 drops, 6.5 in. high per min. and crush through a 20-mesh steel-wire screen. The height of discharge is 8 in., and seven tons of solution titrating 0.12 per cent. KCN are used per ton of ore; 4 kg. of lime are added per ton of ore crushed. The Huntington mills run at 90 r.p.m., and crush through 60-mesh slotted screens; two to three tons of water are used per ton of ore crushed. The crushed sulphide ore from the Huntington mills is to go to a classifying box. The underflow from this classifier goes to 8 No. 5 Wilfley tables running at 244 r.p.m. and making $\frac{3}{4}$ -in. strokes. The concentrates are elevated to another No. 5 Wilfley table running at 250 r.p.m. and $\frac{3}{4}$ -in. stroke for further treatment. The tailings from the Wilfleys rejoin the overflow from the box classifier and go to two 4-ft. cone classifiers. The overflow from the two small cones goes to a 6-ft. cone, the underflow from which goes to ten 6-ft. vanners of the suspended type for concentration; the overflow from the 6-ft. cone goes to three 16x16-ft. tanks for thickening the pulp that goes to the Pachuca tanks and for obtaining clear solution to return to the three stock-solution tanks, 30x18x8 ft. The underflow from the two 4-ft. cones goes to a 24-in. duplex Callow screen using an 80-mesh silk bolting cloth. The oversize goes to the Esperanza drag classifier; the undersize goes to the vanners. The concentrates from the vanners join the concentrates from the Wilfley tables and go to two-compartment filter boxes, each compartment being 6x8x2 ft. In this the concentrates will be dried for shipment.

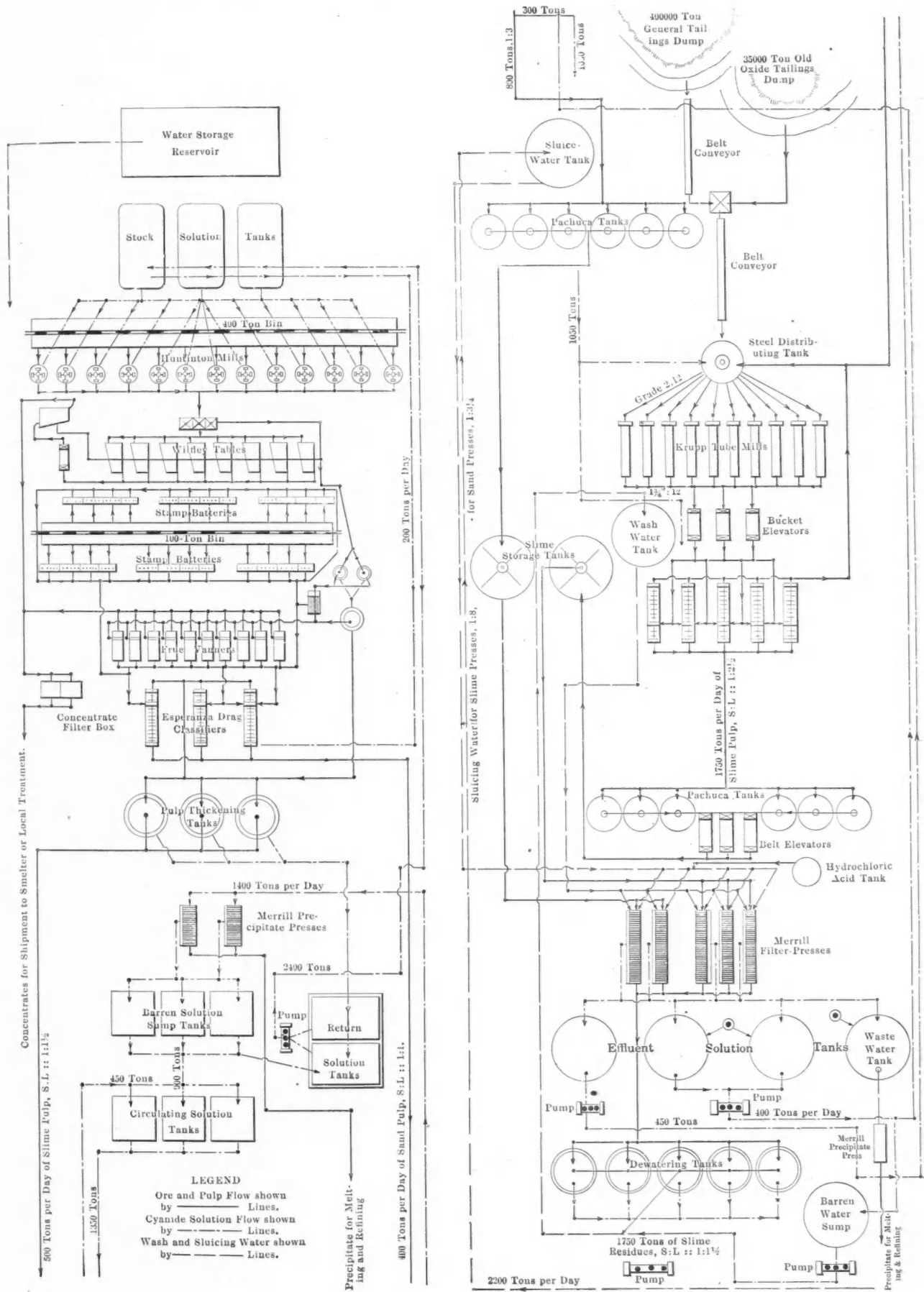
The tailings from the vanners join the pulp from the stamp batteries and go to three two-compartment Esperanza drag classifiers. These classifiers have a two-compartment box, each being 2 ft. 6 in. by 14 ft. 7 in. These classifiers have from a side view a lop-sided V-shape. The short side has a steep slope, while the long side along which the scrapers travel has a slope of 4 in. to the foot. The water stands 2 ft. 6 in. deep at the apex of the V where the lower wheel, over which the scraper belt travels, is placed. The link-belt chain has drag blades on it at intervals of 12 in. These drag blades are 3 in. wide by 30 in. long, made from steel trommel plate having 2-mm. slots in it.

These drags scrape the sand out of the pulp and up the incline, letting the slime flow back through the perforations to overflow from the classifiers. The slime overflows at the short side. The travel of the belt is to be 25 ft. per min. The sand goes to the tube mills below the tailings dumps, and the overflowing slime to the thickening tanks. The overflow from the thickening tanks amounting to 2,400 tons per day is to go to two masonry sumps, 16x26x10 ft., and returns by an 8x8-in. belt-driven Deane triplex pump to the stock-solution storage tanks. The settled slime, containing one part solid to $1\frac{1}{2}$ parts liquid, is then diluted to three parts liquid to one part solid, and fed to one of six 15x44-ft. Pachuca tanks where the pulp is to be agitated for 24 hours. Each tank holds 50 tons of dry slime when the dilution is three to one. After this treatment in a Pachuca tank the slime goes to a slime-storage tank, 30x12 ft. deep, where the slime is kept in suspension by stirring arms moving at 5 r.p.m. The level of the slime in this tank is to be kept 3 ft. below the collar so that the pressure at the Merrill filter presses is constant, being 20 lb. per sq. in. The slime from the storage tank goes to two Merrill filter presses. About 400 tons of mine ore will be crushed per day, 200 to slime and 200 to sand.

TREATMENT OF THE TAILINGS

The sand tailings will be loaded by scrapers upon a belt that dumps into the hopper feeding a 16-in. belt conveyer, 380 ft. long running at 380 ft. per min., and delivering the tailings to the tailings mill; 300 tons dry weight of tailings will be treated each day. This conveyer delivers the ore to a steel distributing tank, 8x13.5 ft. in diameter, where it is joined by the sand from the mill ore. In this tank the sands are diluted with 1050 tons per day of standard solution. This tank delivers equal streams of pulp to any 9 of 10 No. 5 Krupp tube mills, 3 ft. 11 in. by 19 ft. 8 in., one mill always being in reserve. Each mill is directly connected to a 60-h.p. motor making 240 r.p.m., but the speed of the tube mills is reduced to 32 r.p.m. by the gearing.

These tube mills discharge into two of three bucket elevators, 62 ft. centers, having 6.5x16x8-in. buckets on an 18-in. belt, run at 360 ft. per min. The elevators discharge into five Esperanza drag classifiers similar in construction to those used in treating the mine ore. The belt in these will run at 15 ft. per min. The



FLOW-SHEET OF REMODELED MILL AND PLANT TO BE ERECTED FOR CYANIDING TAILINGS AT ESPERANZA MINE

sand from these returns to the tube-mill distributing tank; the overflowing slime is charged into one of six 15x4-ft. tanks at a dilution of one part solid to 2½ parts solution. The slime from the Pachuca tanks goes to two of three bucket elevators, 54 ft. centers, similar in other respects to those elevating the pulp from the drag classifiers. These deliver the pulp to a slime-storage tank similar to the one for holding the treated pulp from the mill. This feeds the slime at 20 lb. per sq.in. to three Merrill filter presses.

FILTER PRESSES

The three Merrill presses for filtering the reground sands will each have 75

tanks, 30x12 ft. deep. The wash water goes also to a tank 30x12 ft. deep. A 3-ft. cone is used to mix zinc dust with the effluent solution, and a similar one is used for the water wash. The slime discharged from the slime presses goes to five 20x20-ft. dewatering tanks from which the slime is to be discharged at a dilution of one to 1½. The overflowing solution will be pumped back to the sluice-water tank by a 6x8-in. Deane triplex pump having a capacity of 140 gal. per minute.

The wash water from the slime presses after being mixed with zinc dust is to go to a 5-ft. 10-frame Merrill precipitate-press. The effluent water is pumped by a 9x10-in. Aldrich pump, having a capacity

For permission to print this description of the new mill together with the flow-sheet I thank not only Mr. Hoyle and Mr. Guess, but also Cortlandt E. Palmer, consulting engineer to the Esperanza company, and Murry Guggenheim.

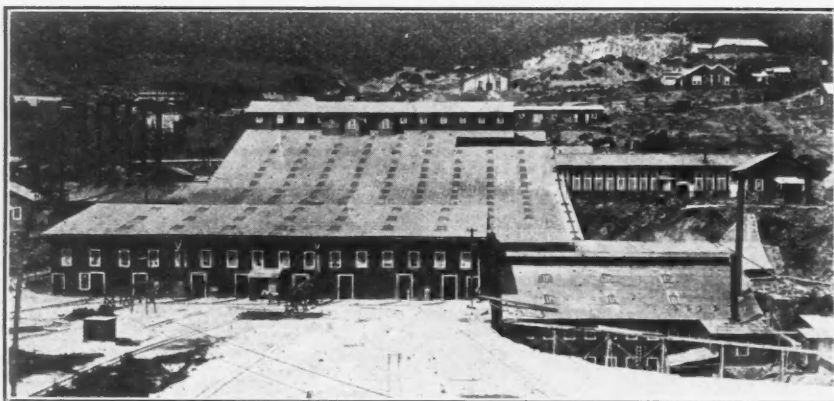
Packages for Blasting Powder in Ohio

The following circular letter has been issued by George Harrison, State inspector of mines of Ohio; it is of interest to makers and users of blasting powder.

The new law, passed April 2 last, regulating the sale and handling of blasting powder to miners and by miners in the mines in Ohio, is now in force and effect. It provides that: "All powder sold to miners by the keg shall be packed in kegs which have an opening at the edge 2 in. in circumference, and that can be conveniently opened to avoid the dangerous use of picks to open same."

All shipments must hereafter be in compliance with this law. The penalties provided in section 2 of the law are: "Any person violating any part of this act, shall be deemed guilty of a misdemeanor, and upon conviction be fined, not more than \$100, nor less than \$5, at the discretion of the court."

For the purpose of uniformity and convenience, the Mines Department advises a



THE PRESENT ESPERANZA MILL AT EL ORO

frames. The two Merrill presses for filtering the original slime from the mine ore will have 90 frames. The filters treating sand will make a solid 4-in. cake, but the filters treating the current or original slime will make a 3-in. cake and use central washing on the cake. This is an entirely new method of operating the Merrill press. Heretofore some difficulty has been experienced in washing colloidal, original slime in Merrill presses, but experiments on original Esperanza slime show that by central washing a 3-in. cake can be successfully treated on a Merrill press. In this way of operating the press the frames are filled almost full with slime, a slight parting being left in the center. The wash water, admitted to the press, enters the cake through the central charging channel. This halves the thickness of cake washed, for the wash water flows both ways through the cake. Experiment has indicated that 8 tons of water at 65 lb. per sq.in. will be required to wash and sluice one ton of slime out of the presses treating original slime, and ¾ tons to wash and sluice one ton of slime out of those treating reground sand. The treatment cycle is three hours per charge. A 12x10-ft. wooden tank, having a capacity of 1000 cu.ft., is to be provided for holding dilute hydrochloric acid for washing the filter cloths. This tank feeds the dilute acid to the presses at 4 lb. per sq.in. pressure.

The effluent solution goes to three



ESPERANZA MILL, SHOWING PORTION OF TAILINGS DUMPS

of 400 gal. per min. to the 30x12-ft. tank holding waste water for the Merrill slime filters.

The effluent solution from the slime presses after being mixed with zinc dust is pumped by a 6x8-in. and a 9x10-in. Deane triplex pump, having a combined capacity of 480 gal. per min., to two Merrill 5-ft., 20-frame precipitate-presses. The barren solution goes to three 15x15x5-ft. barren-solution tanks which feed to the two masonry mill-solution sump tanks and to the three 15x15x5-ft. circulating-solution tanks that supply the tailing plant. The precipitate will be dried in the presses with hot air; clean-ups will be made twice a month.

screw bung opening within ¼ in. of the rim of the keg, the bung hole not to exceed 1 in. in diameter.

In a coal mine with an incline of 10 deg., where the roof is hard, with a tendency to creep and the coal is free, breasts should be narrow, about 14 ft. wide, with pillars from 24 to 30 ft. wide between them; this is done so that the tendency to creep may be overcome by the thickness of the pillars, and the running of coal thus prevented by the narrowness of the breasts. Tracks should be placed close to the rib. Not much timbering will be necessary, but what little is used should be somewhat under-set in the coal.

Removing Accretions in Crucible of Lead-Furnaces

By J. N. GODDARD*

Those who have charge of the operation of lead blast-furnaces are well acquainted with the difficulty of keeping the crucibles and lead wells in satisfactory condition. Soon after blowing in a furnace, the crucible begins to collect accretions of metallic iron or copper, sulphides of zinc and other substances, depending upon the character of material smelted. In time the flow of lead through the lead well is entirely shut off by these accretions and the

application of dynamite has come into use at the smelting plant of the St. Joseph Lead Company at Herculaneum, Missouri. As a cure for crucible accretion troubles, J. O. Bardill, mechanical engineer at the plant, has designed a bomb of simple construction and great efficiency.

The construction of this bomb, which is made from standard pipe fittings, is shown in detail in Fig. 1. The materials required for one bomb are one nipple about 4 in. long, two sleeves and two plugs. These parts may be of any size to suit the conditions, but at Herculaneum 1-in. fittings are used. The iron cylinder is lined with a piece of asbestos paper $\frac{1}{8}$ in. thick and 4 in. square, and is filled with about one-seventh of a stick of 50

The best results have been obtained at Herculaneum by "shooting the lead wells" whenever lead appeared in the forehearth, even if only in small quantity. The effect is most plainly seen when this is done just previous to tapping slag. The force of the explosion is often so widely felt throughout the crucible as to splash slag into all the tuyeres of a furnace 160 in. long. The lead in the well is violently expelled and the rush of fresh lead from the crucible carries with it a great quantity of mushy material and small fragments of accretion which have been dislodged by the explosion. This, of course, must be cleared away from the mouth of the well at once with a suitable scraper. The broken pieces of the bomb

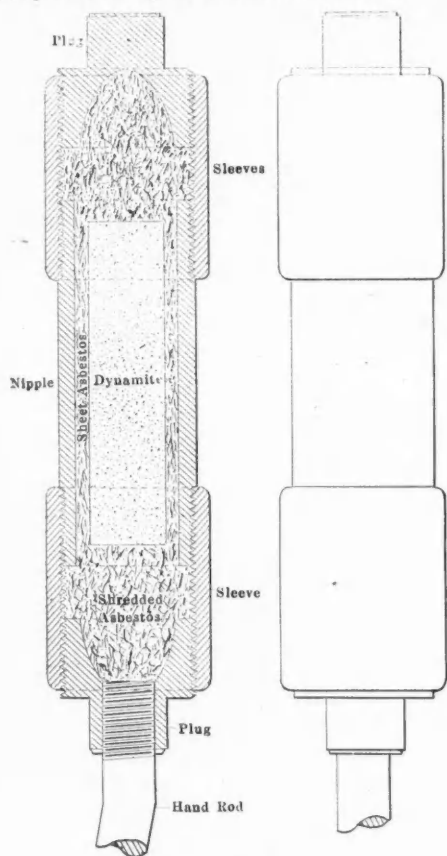


FIG. 1

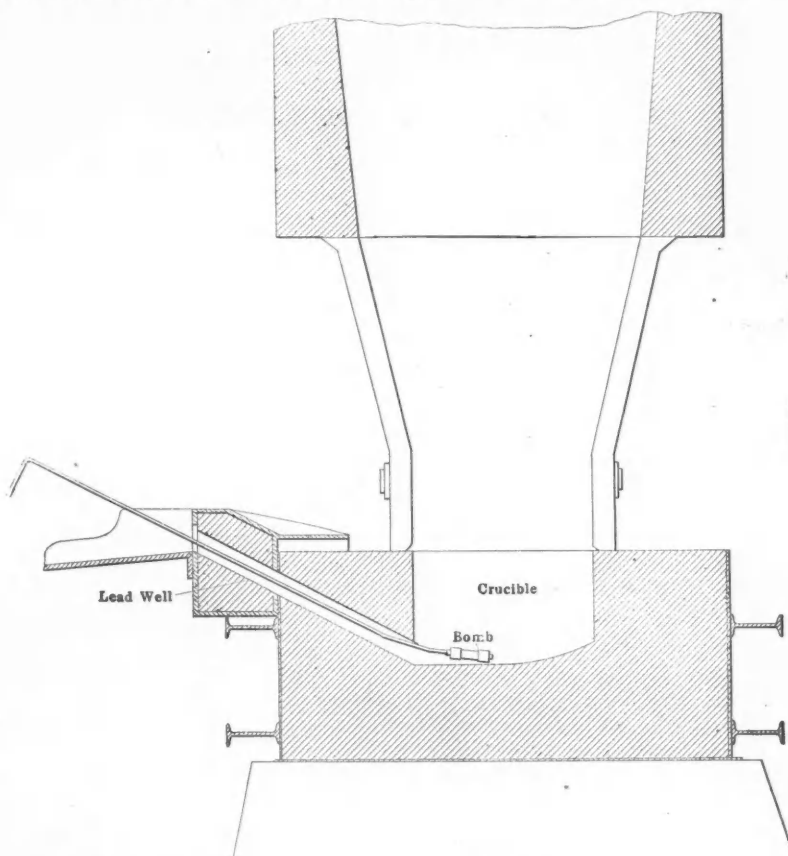


FIG. 2

POSITION OF BOMB IN FURNACE AND DETAILS OF ITS CONSTRUCTION

furnace discharges lead through the slag tap-hole into the forehearth, or matte-settling furnace, causing inconvenience, additional labor and probably a greater loss of lead in the slag.

Up to this time it has been the usual practice when this condition obtained, either to shut down the furnace, remove the tap jacket and endeavor to cut a passage through the crucible from the slag tap-hole to the lower end of the lead well, or to drive long bent bars in the same direction between taps while the furnace is in operation—in either case a laborious undertaking and usually affording only temporary relief.

Within the past 18 months a new ap-

*Assistant metallurgist, St. Joseph Lead Company, Herculaneum, Mo.

or 60 per cent. dynamite, both ends being protected with a plug of shredded asbestos. The iron plug at one end of the bomb is drilled and tapped to receive the threaded end of a $\frac{1}{2}$ -in. round, iron rod from 4 to 7 ft. long. The position of the bomb in the furnace at the moment of explosion is shown in Fig. 2. It is introduced through the lead well using the long rod as a handle. Although the operation of passing the bomb into the furnace appeared at first to be a somewhat hazardous undertaking it has proved to be not at all so. The time required for explosion is from 15 to 25 seconds, giving, at the minimum, ample time for the manipulator to move a few steps to one side and observe in safety the effects of the shot.

sometimes float out with the lead, but as often are thrown up to the slag level and are never seen again.

Usually one bomb is sufficient to re-establish a perfect circulation, but when a furnace has been in operation for some time and the use of the bomb has been too long delayed, three or four shots at half-hour intervals may be necessary.

Observations made after clearing out a furnace which had 49 or 50 of these bombs exploded in it during a campaign of eight months, showed that the damage to the brickwork of the crucible was very slight when the quantity of dynamite used per shot was not greater than that previously mentioned.

This device is protected by United States and foreign patents.

Manganese in Russia During 1907

By I. I. ROGOVIN*

Manganese ore is produced in the south of Russia, near the town of Nikopol and in the Caucasus, Sharopon district, Province of Kutais. The output in these two provinces, during the last three years, was in poods as follows:

	1905	1906	1907
Caucasus.....	20,876,487	50,170,000	40,833,000
South Russia.....	9,235,794	9,580,000	15,500,000
Total.....	30,112,281	59,750,000	56,333,000

This table shows that as compared with 1905 the output of manganese in the Caucasus increased by 29,293,000 poods. This rapid increase was due to the increased demand for manganese ore and to the difficulty of securing supplies elsewhere, Brazilian manganese especially being kept out of the market by floods and lack of transportation.

The bulk of the manganese ore was exported through the ports of Poti, Batum and Mariupol, the quantities in poods being reported as follows:

	1905	1906	1907
From Caucasus.....	21,466,000	30,895,000	33,530,000
From South Russia.....	1,182,000	4,169,000	4,154,000
Total.....	22,648,000	35,064,000	37,684,000

Thus of the total production of manganese ore from 60 to 70 per cent. was exported, the remainder going to supply the needs of metallurgical works in southern Russia.

CONDITION OF THE MARKET

In regard to the specific conditions with which the Caucasian manganese industry has to reckon, the year 1907 may be divided into two almost diametrically opposed parts. The first half of the year, until the end of July, was marked by considerable activity. An immense demand for ore and unheard-of prices attracted to Chiatyry a number of small producers. Intensive working, increased railroad tonnage which called forth a premium on railroad cars, were the characteristic features of this period. Beginning with the month of August this boom began to subside, and when the general financial crisis abroad arrived with many bankruptcies in its train, there was a sudden standstill, which continues until the present time. The crisis affected first the prices for ore, which fell considerably; further it resulted in a reduction in the amount of ore stored and lastly in a decrease of output, which ceased almost completely toward the end of the year.

The chief disadvantage under which the manganese industry is laboring is the inadequacy of the Chiatyry narrow-gauge railroad. Owing to the inability of this road to meet the requirements of the industry there was a great demand for rail-

road cars which are allowed in proportion to the quantity of ore in storage, one car being allowed per 20,000 poods. These cars were sold at 100 rubles each, the amount being charged to the sale of manganese ore stored in cars, in contradistinction to that stored on the platform. Whereas ore stored on the platform was quoted at 10 to 11 kopecks per pood, that in cars was sold at from 18 to 20 kopecks and even from 22 to 23 kopecks per pood. Adding to this the high tariff of the Chia-

tyry railroad and other charges, it is plain to see where the high prices came from. The prices were so high last year that the consumers found it more profitable to ship manganese ore from India, where old deposits were intensively worked and new ones explored.

THE OUTLOOK

As stated above, the manganese industry in the Sharopon district suffered a considerable decline in the second half of 1907, the yield being 40,833,000 poods

against 50,170,000 poods of 1906, a reduction by 9,337,000 poods. The quantity exported through the ports of Batum and Poti amounted to 33,530,000 poods; thus in 1907 the production of the district exceeded the exports by 7,302,000 poods. This surplus accumulating from year to year at the railroad stations reached on January 1, 1907, the excessive figure of 90,000,000 poods.

Owing to the exorbitant prices and the difficulties of exportation, foreign consumers began to look for new markets, chiefly in Brazil and India, and therefore the Russian manganese industry lost its important position. Several years ago the Sharopon ore constituted 47 to 53 per cent. of the world's supply, whereas in 1905 the proportion amounted to 31.46 per cent., and in 1906 to 36.85 per cent. The total output of manganese in all countries amounted in 1905 to 1,339,082 tons and in 1906 to 2,117,816 tons; of this quantity the Sharopon district in 1905 supplied 336,717 tons or 25.15 per cent. and 809,193 or 38.21 per cent. in 1906. No correct data for 1907 are at hand; but it is certain that the share of the Russian manganese industry in the world's market has declined considerably from its proportion of several years ago when it contributed 44 per cent.

According to an authority on brass, high-grade brass sheets should be made only of the best metals, whereas sheathing metal may be made of ordinary material.

Mexico Mines of El Oro

SPECIAL CORRESPONDENCE

The Mexico Mines of El Oro, Ltd., owns a mine adjoining the Esperanza and El Oro mines. The company was formed in 1904 with a capital of £180,000 in £1 shares by the Exploration Company of London. The report for the year ended June 30, 1908, has just been issued. The realized profit for the year amounted to £132,897, and the balance brought forward from last account was £41,900. Out of these sums a dividend, No. 1, of 5s. per share has been paid, absorbing £45,000, £50,963 has been written off development account, £20,000 off plant machinery and buildings account, £8000 is reserved for income tax, leaving a balance for next year's accounts of £50,834.

A new 40-stamp mill and cyanide works commenced operations in October, 1907, and up to June 30, last, 62,394 dry tons of ore were treated, from which bullion to the value of \$807,971 gold was recovered, being at the rate of \$12.95 per ton. The average extraction was 84.4 per cent., or 89.6 per cent., if the estimated gold and silver in the precipitation boxes is allowed for. The practice of sliming all the ore by tube mills is adopted and found a satisfactory method of treatment, especially in getting good extraction of the silver.

Besides the income from the mill the company secured a net profit of \$278,686 gold, or \$136.74 per ton, by shipping 2038 tons of high-grade ore to smelters. The ore reserves exposed in the mine are estimated at 205,310 tons of an average value of \$11.72 gold and 6.6 oz. silver per ton. At the end of the previous year—June, 1907—the ore reserves were 178,000 tons of approximately the same value.

Working costs for the period averaged \$6.33 per ton, the figures for the month of June, 1908, being as follows, in gold, on 8131 tons worked:

	Per Ton.
Mining.....	\$2.13
Development.....	0.60
Milling.....	0.30
Cyaniding.....	1.27
Water supply.....	0.03
Taxes.....	0.66
General expenses.....	0.31
Total.....	\$5.30

The manager, R. M. Raymond, says that actual development work has been rather light during the year, and that very little has been done except on the fifth and sixth levels. The principal work was in opening out the stopes and running drifts along the sill floor on the hanging portions of the vein, and in opening up the Footwall vein, a short distance east of the Main vein, which has developed into a very important orebody on the fifth and sixth levels. The main shaft has remained at the sixth level, but sinking operations have just been resumed and will be carried on steadily.

*Nevsky 134, Petersburg, Russia.

Mining Methods at Seaton-Delaval Colliery

A Thick Coal Seam with Strong Cover Is Mined by Longwall, Which under Similar Conditions Is Considered Impracticable in America

BY LUCIUS W. MAYER*

The Seaton-Delaval Coal Company operates four collieries nine miles south of Newcastle-on-Tyne, in Northumberland, England. Northumberland is a county with approximately 750,000 inhabitants, and lies on the extreme northeast coast of England, adjoining Scotland to the northwest, Cumberland to the southwest and Durham to the south. The largest city, Newcastle-on-Tyne, is the center of a great mining district which is one of the chief coal-exporting ports of Great Britain.

The coal, which is of a semi-bituminous variety, is found in flat seams generally, which vary in thickness from a few inches to 8 ft. and are often overlaid by

ance of 48c. per week is made to help defray the additional expenses of those men who cannot be accommodated by the company. By the payment of 6c. per week, medical attendance is afforded employees.

THE NORTHERN COAL DISTRICT

The Northern coal district presents conditions of roof not found in other parts of England. The roof over the coal seams in this district is uncommonly hard. Outside of the information that certain thick seams in India have particularly strong roofs and are very thick, the roof over certain Northumberland seams is the strongest of which I have record. The

engine is a vertical steam hoist with chain counterbalance, the chain lowering into a well. The construction of the hoist house might be called reinforced stone, the reinforcement being timber. Note also from Fig. 1, the close proximity of the pits in each case, the balance being effected between the two shafts over the same frame.

A typical section of strata over a section of the Main coal or Gray seam at the CD and EF pits is strong, hard sandstone, as shown in Figs. 2 and 3. The floor under the seam is often a gray metal for about 2 ft. and then setter clay comes in, which at times is of sufficiently good quality for the manufacture of firebrick.



FIG. 1. GENERAL VIEW OF THE "CD AND EF" PITS IN NORTHUMBERLAND, ENGLAND



FIG. 2. SHOWING FALL OF HARD SANDSTONE COVER IN THE "CD AND EF" MINE

a hard sandstone formation. Coking is generally practiced, though considerable fuel is shipped in the crude state.

The mines embraced in the Seaton-Delaval group are the Foster, Relief, CD and EF, and the Hastings. The total number of people employed at these collieries is 2880, who in six months ending July, 1907, produced 474,129 tons of coal. The company provides living quarters for its employees as far as possible, charging nothing therefor. The houses, of stone, are built on the party-wall plan in long rows, with pleasant gardens and good facilities. When more miners are employed than can be accommodated in the available houses, the men necessarily have to rent houses for themselves. An allow-

*Mining engineer, 71 Broadway, New York City.

Main coal, which lies on a 2- to 3-per cent. dip, averages from 6 to 7 ft. in thickness, with a 6-in. band of dirt 2 ft. above the floor.

The longwall system of mining is here largely and successfully operated. The two conditions, first, hard roof, and second, comparatively thick seams, makes this district of distinct interest. While the roof is not as hard as that encountered in some coalfields, it is much harder than coal-mining experts in America consider within the sphere of the longwall system.

The CD and EF pits are the collieries on which this report treats. They produce about 1300 tons of hard steam coal daily. Fig. 1 shows a view of the CD and EF surface plants. Note the peculiar arrangement of headframes. The hoisting

The depth of the Main coal below the surface averages about 360 feet.

THE LONGWALL SYSTEM IS USED

Both the longwall and the bord-and-pillar system of mining are in operation, and work which may have been carried on for a time on the bord-and-pillar plan may be changed to longwall, and continued to the boundary on these lines. Fig. 6 illustrates the condition where the ordinary method of bord-and-pillar has been in operation, the work being changed to the longwall system. In making this change certain precautions must be taken. Pillars must be left to protect the main haulage way, should the work emanate in the vicinity of such a roadway, as shown in Fig. 6. In longwalling, it is desirable that the roof should throw its weight on

the coal face in certain measure. This is a feature. With a roof of this strong make-up, the benefit so involved would not accrue if merely a small area was set off for longwall operation.

LONGWALL GIVES LARGER TONNAGE

It has been proved that by longwall a larger tonnage per man can be maintained and that the coal breaks better. It is stated, however, that by longwall, the cost per ton of coal is slightly higher than by bord-and-pillar. Nevertheless, when a large tonnage is desired, the longwall system is favored. It has been found at Seaton-Delaval, nearly twice as much coal is cut per man each day by the longwall system.

It is not proposed here to cite the advantage of one system of mining coal over another, but the evidence here offered certainly controverts the prevailing American disfavor of the longwall system in general; and more important yet, as

6 ft. thick, longwall mining would never have been carried on, in spite of the favorable conditions existing as regards action, influence and control, in the light of American ideas. At Seaton-Delaval lies a thick seam of coal, and in spite of the fact that sufficient head-room is available after the seam is removed, and that the roof is very strong—and would be considered impossible in the United States—the longwall system is not alone practiced, but looked upon with favor over other systems.

MOTHER-GATEWAYS ARE PROTECTED BY STONE WALLS

Between the mother-gateways which are turned off 300 to 600 ft. apart—see Fig. 7—are the subgates. The mother-gateways are maintained until the boundary is reached, and the district divested of coal. Auxiliary gateways are abandoned in the course of the work, and cross-gates *e*, Fig. 6, which are set off from new auxil-

thrown in the center. Details of wall are shown in Fig. 8. It is noted that the roof is brought down only in the gateway itself, Fig. 9, and only to such an extent as to afford sufficient rock material of proper size to build the walls.

THE COAL FACE IS STEPPED TO PREVENT ROOF BREAKING AT FACE

Note in Fig. 7 how the coal face is stepped, *j, j, j*, each stall being about 60 ft. wide and stepped 30 to 45 ft. deep. This layout, as previously described, counteracts the tendency of the roof to break at the face.

The rock walls are kept up within about 10 ft. of the face. At intervals, as shown in Fig. 7, stone cribs *m, m*, about 6 ft. square, are built, and these are supplemented by timber cribs *t, t*, sometimes filled with stone. Fig. 4 shows a crib built and wedged up to the roof at a point where two roads intersect. The thickness of seam at this point, it is seen,

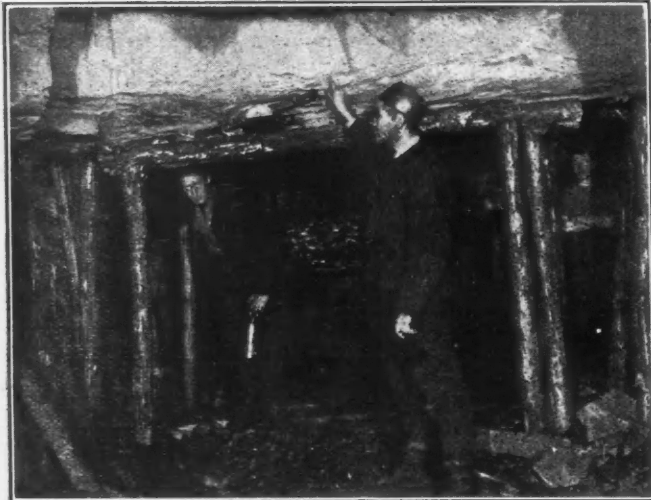


FIG. 3. SHOWING STRONG SANDSTONE ROOF OVER THE GRAY SEAM

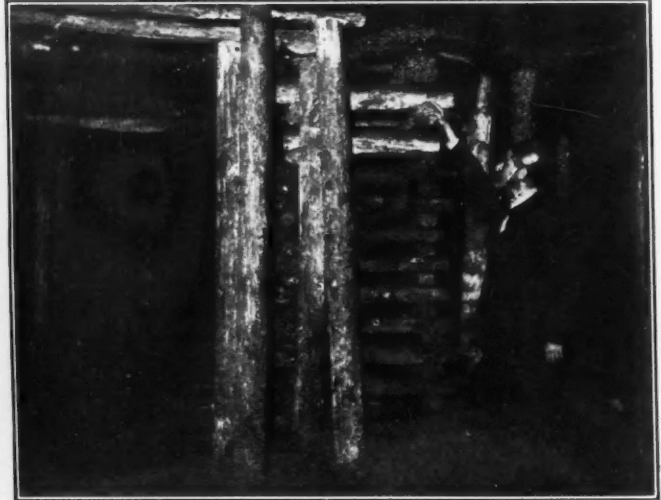


FIG. 4. SHOWS TIMBER CRIB WEDGED TO ROOF AT INTERSECTION OF TWO ROADS

regards the conditions under which it may be successfully operated.

In general the plan of mining at Seaton-Delaval by longwall is to drive out from the shaft with a main gateway, and its parallel air course, as at *a* and *b*, Fig. 5, driving cross-headings *c, c* at intervals. The barrier pillars, *d, d, d*, vary in size according to conditions. The road *e, e*, is protected by packs of rock, *f, f, f*, built up against the main road barrier, and from this road *c, c*, start mother-gateways, which are set off at right angles. These are shown in detail, in Fig. 7. The mother-gateways and the intervening subgates are maintained with pack-walls of rock, which material is shot down from the roof in the gateways for the purpose of building these walls.

In Illinois, a 3-ft. seam of bituminous coal is worked by longwall and the roof brought down to make room in the gateways. This rock was used for packing. I venture to state that had the seam been

regards the conditions under which it may be successfully operated.

The main haulageway is driven 12 ft. wide; intervening pillars are 35 to 45 ft. wide, and the return airway 8 to 9 ft. wide. The barrier pillars *d, d*, Fig. 5, are about 140 ft. wide and 180 ft. long. Walls *f, f*, protecting roadway *e, e*, are 12 ft. wide. Mother-gateways are 12 ft. wide, protected on either side by walls 9 ft. wide. On either side of the mother-gateways there may be four or five auxiliary gates *h, h*, Figs. 5 and 6, which are kept up usually not more than 300 ft., when cross-roads *e, e*, Fig. 6, are driven, protected in a similar manner by rock walls.

Fig. 7 shows typical longwall workings in detail at the face. The main gateways *g* are protected on either side by stone walls, which are built close up to the back. The walls are not built solid, but have a 1½-ft. shell, small stuff being

approximates 8 ft. and is exceptional, rather than the rule. It is not to be inferred that these walls keep the roof up permanently; there is no intention that they should.

In spite of the hard roof conditions here, a regular subsidence is effected. Just what the result would be if the floor were of the same hard nature as the roof, is hard to state. I am inclined to believe, however, that the walls would be crushed, for nothing can stop the roof if it starts to come down. As it is now, the walls are crushed to a certain extent, but the main subsidence is due to the walls being forced into the floor, and the heaving up of the floor due to roof pressure.

As in the softer formations where longwall is used, the mother-gateways have to be gone over periodically, and settlement occurs to such an extent that head-room has often to be recut two, three, or more times, during the life of a roadway.

WORK IS DIVIDED INTO THREE SHIFTS

The mining work is divided into three 8-hour shifts, the first two shifts being hewer, and the third stonemen. During this last shift nothing but stone work is carried on, the men so engaged being called "stonemen" and "shiftmen," the former being wall builders and the latter rock drillers. The foreman over this work is called the master shifter. Rock work is always done by the same crew,

the man points his finger. In Fig. 2 the timber has been removed, and two shots have been fired, having produced the fall illustrated. On the extreme left is shown the wall which protects this side of the gateway. In bringing down the roof, certain timbers are removed and others left. It is surprising to see how the form of break desired is readily controlled by the arrangement of these sticks. The long-wall face is seen in the rear of both illus-

men were getting \$1.24 plus 38 per cent. at the time of my visit. It may be mentioned here that for work in England there is a base price, settled on by a conciliation board, which includes representatives of both operators and workmen. In Northumberland, the board meets every three months and graduates the additional percentage to be added to the base price according to the prosperity of the trade.

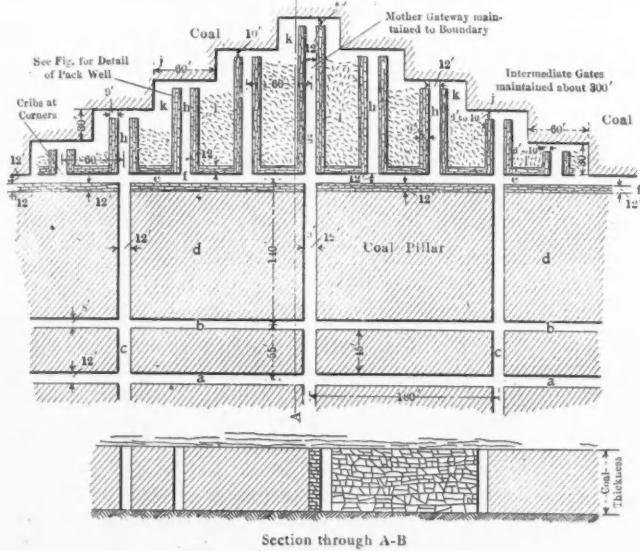


FIG. 5. LONGWALL PLAN OF MINING SHOWING MAIN GATEWAY

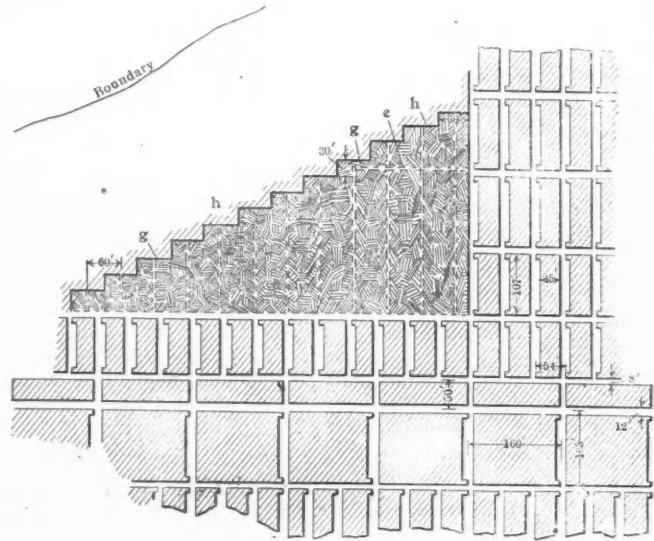


FIG. 6. SHOWING WHERE BORD-AND-PILLAR HAS BEEN CHANGED TO LONGWALL

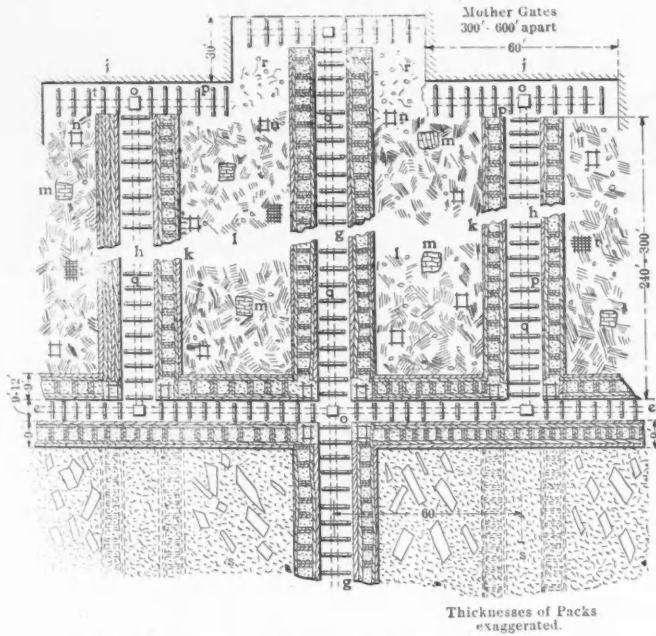


FIG. 7. DETAILED PLAN OF LONGWALL AT THE FACE

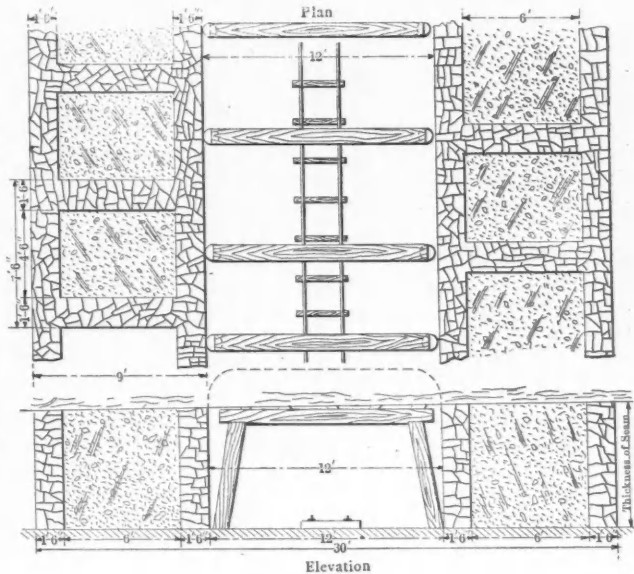


FIG. 8. DETAILS OF SHELL WALLS USED TO PROTECT GATEWAYS

and during the same hours, the stonemen or shifters always working at night. Shifters are in the mine from 4 p.m. until 12:30 a.m., and have some roof rock broken down ready for the stonemen, who come in at 6 p.m., and remain until 2:30 a.m.

Figs. 2 and 3 show a mother-gate within about 15 ft. of the face. In Fig. 3, the roof rock is intact up to the point where

trations, at the head of the mother-gateway; also the 6-in. dirt band about 2 ft. above the floor in Fig. 3. The modifications shown in the rock, Fig. 2, are not necessarily general; at times this sandstone formation is most uniform.

Two men who get from \$1.20 to \$1.44 per day, work down as much rock as can be packed in a single shift by the stonemen, who in turn get \$1.08. The coal

The stone builders work four men in a gang, and aim to build 6 lin.ft. of wall on each side of the road per shift. It is seen in Fig. 8 that cross-walls are built at 4½-ft. intervals; these are also 1½-ft. thick. In Fig. 8, note that 3 to 5 ft. of roof is brought down over the 6-ft. seam, so that the gate area is 9 to 11 ft. high. This is also shown in Figs. 2 and 3, although at that point the seam is only

about 5½ ft. thick. In a 6-ft. seam, each man handles 162 cu.ft. of wall-building material in eight hours. Each 6-ft. advance on both sides of the road means 36 lin.ft. of rock wall built, and 324 cu.ft. of gob. This is 81 cu.ft. of each class of material handled by each man.

BUILDING THE WALLS

The rock which makes up these walls must not be too large. Usually it is broken up so small that two men can handle any piece without over-exertion.

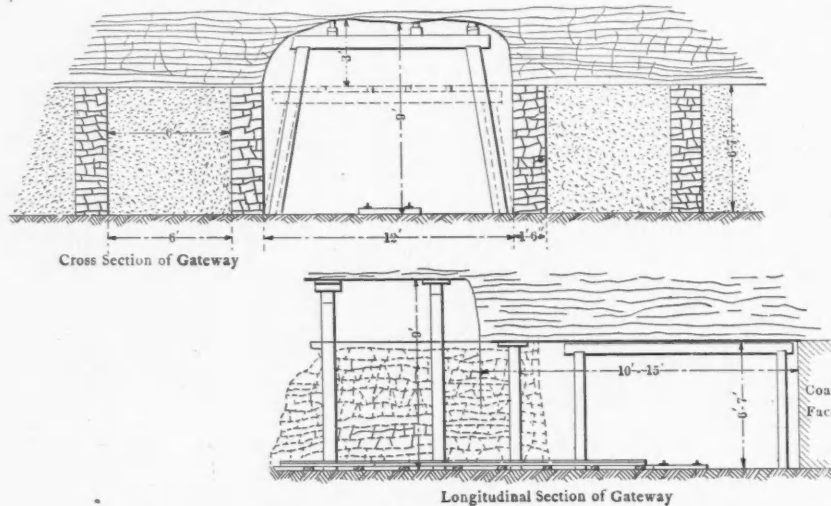


FIG. 9. THE ROOF IS BROUGHT DOWN IN THE GATEWAY TO AFFORD ROCK MATERIAL FOR WALLS

The limit of 200 lb. might be placed, though perhaps for the lower tiers of rock, heavier material can be handled with impunity. The wall building, it is seen, is entirely dry work. Placing short lengths of round timbers in the walls horizontally, as was practiced at the Baltic copper mine in Michigan, in the built-up stone drifts, has been tried with good effect at Seaton-Delaval.

Hand-boring machines are used for drilling the holes. Ordinary augur drills are rigged up, to be set to a 9- to 10-ft. back, the height being adjusted by telescopic standard. In hard rock, the augur is turned by two men, and ¾-in. diameter holes are drilled 4 to 5 ft. in length, slightly inclined upward. The speed of this drilling is variable. A hole 4 to 5 ft. in length may be drilled in from one to five hours, according to the texture of the rock. In just such a place as is shown in Fig. 3, the telescopic standard will be set up and the hole drilled at a point a little above where the man's finger points. Two such holes may be placed to produce the effect shown in Fig. 2. Four to seven sticks, equaling 20 oz. of ammonol powder, are used per charge in dry work, with 5 ft. of black Bickford fuse No. 7 cap. Where the ground is wet, gelatinite made by the Alfred Nobel company, is used. Sticks are 4 in. long by 1¼ in. diameter. This explosive is stronger, but produces considerably more smoke than ammonol.

The roof is necessarily timbered in a thorough manner, as is required by law, though the absolute necessity of the timber is not always urgent. Maximum bracing between spaces and props is stipulated for all conditions of roof, and the law allows little variance. While a certain amount of timber is always used under certain conditions, considerably more is set up than is apparently required. This, of course, is dependent on the nature of the floor, quite as much as it is on the nature of the roof. Where the roof

has been no exception found to this condition. At Seaton-Delaval the floor is sometimes found to be quite hard, but not as hard as the roof. There are certain disadvantages involved in a condition of hard floor, in that where the roof does take weight with the hard floor, the timber fails, while with a softer floor, the posts would have been driven into the bottom and eventual recovery made possible.

The roof having taken weight, removal of timber is made difficult and the use of a stick of powder, or otherwise shattering the post, may be the only means of extricating the props. Again, with a hard floor, undue pressure is thrown on the coal face, with the result that the coal is subjected to excessive crush, which reduces its market value, owing to the excessive amount of slack made. A few sticks of timber standing in the seam may interfere with the regular subsidence of an area; but this rather refers to a softer roof than is here described.

At Seaton-Delaval a large amount of coal is produced from the bord-and-pillar workings, and where the production is not being hurried, it might be that the greatest percentage of the production is obtained by that method of mining. By robbing operations, it is claimed that the yield per hewer is about the same as in longwall, which amounts to approximately five tons per man; whereas in the blocking out of pillars in ordinary bord-and-

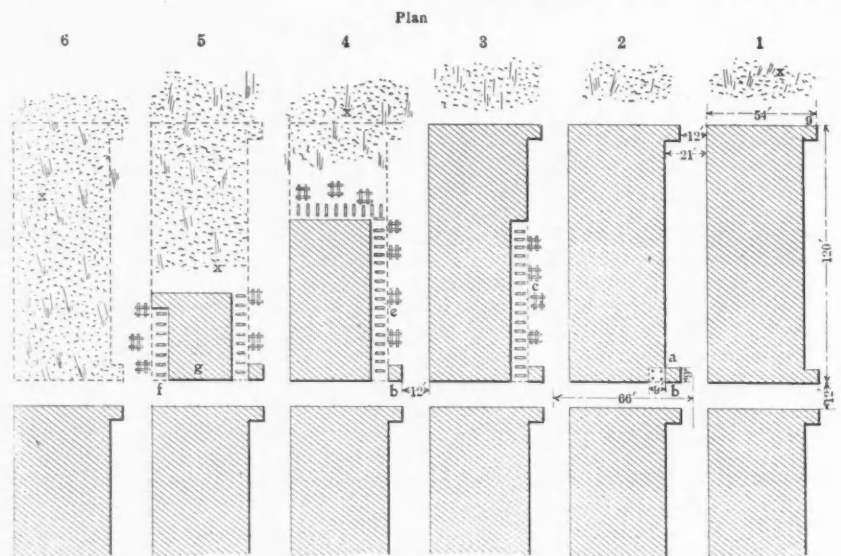


FIG. 10. A SINGLE PILLAR, SHOWING VARIOUS STAGES OF ATTACK

acts too quickly, the coal may be shattered more than is desired, the aim being to produce as much large coal and as little slack as possible. The amount of timber used in the mine is also dependent, to a great extent, on the prevailing atmosphere in the workings.

THE FLOOR AND ROOF

World-wide conditions seem to indicate that the floor of coal seams is generally of a softer nature than the roof. In the course of the investigation in hand, there

pillar operations, the production per man approximates 3½ to 4 tons at Seaton-Delaval.

ROBBING PILLARS

Pillar-robbing operations, called "broken work" are always started from the boundary, and progress on the retreat, but where excessive evolution of gas is not likely to follow the roof falls, the work of robbing may be carried on in isolated districts, pillars being left for the support of haulageways, etc. Fig. 10 shows a single

pillar in various stages when under attack. Starting at 2-a, a place is cut 9 ft. wide; *b*, called a "stock," 9 ft. square, is left as a pillar of protection. A cut-out *a*, is run out the length of the pillar, maintained 9 ft. wide. As this work progresses, timbers are set continually, and withdrawn. The timber sets, consisting of two posts and a cap, are augmented by cribs, as seen in 3, 4 and 5, of Fig. 10. These cribs are set at intervals as required, perhaps 12 ft. apart, and are approximately 6 ft. square; they are often made of old, discarded timbers. On reaching the goaf, a headway lift 9 ft. wide is cut across the short end of the pillar, next the goaf end, and successively other 9 ft. slices, until finally the pillar is all removed within about 15 ft. of the near end. Up to this time the timber has been set and removed, following the judgment of the deputy overman. Only a small portion of the coal now remains in the pillar, and its complete removal is not always certain. The last part of the work is carried on with particular speed, until finally the coal stock *b*, remains to be drawn.

LETTING DOWN THE ROOF

The letting down of the roof does not always follow according to plans. This work is directed by deputy foremen, whose special duties are to oversee the removal of timbers. They are held accountable for the safety of the working places.

It is not unusual for the roof to hang over an area of two or three pillars, and then to fall suddenly, although never without warning. This condition of sudden fall is, of course, undesirable. When the roof does come, more or less crushing of coal, with ensuing loss, occurs in the adjacent standing pillars.

It has been explained how subsidence is dependent on thickness of seam, nature of overlying formation, depth of seam from the surface, and other conditions, such as whether other seams have been worked above or below. At Seaton-Delaval, experience as regards subsidence of the surface has been variable. In one place, a 5-ft. seam of coal 672 ft. from the surface, with 300 ft. of strong stratified post and blue metal, followed by a hard formation to the surface, was mined for an area of about 1500 acres. The floor in this case was hard; there was no surface effect noticed. This was in an area called the "Low Main" seam. Another instance was cited of a seam 5 ft. 8 in. in thickness under a 360-ft. cover, consisting of 12 ft. of strong post over the seam, followed by 20 ft. of gray post and other soft strata, which involved complete subsidence; the floor in this case was considerably softer than in the former instance. It appears that where longwall has been operated, the subsidence was not so severe, the cover being allowed to fall in a more gradual manner.

Colliery Notes

The keeping of rescue apparatus in coal mines is compulsory in Austria.

All men before being allowed to engage in rescue work should be subjected to a searching medical examination.

Load out all old disused wood of any kind, for if allowed to remain in the mine, it is an added source of danger in case of fire.

The quantity of air passing through each district of a mine should be measured at least once in every month, and the air in gaseous mines once a week.

One of the earliest mentions of coal mining in England is where Alexander de Compton in 1275 A.D., accounted \$8.64 received for one perch of sea coal sold. In 1338, pits were sunk near Nuneaton, England.

Foremen should see that all hygrometers, anemometers and water gages are kept in good order. They should be tested from time to time to see that they register the correct quantities or satisfactory results will not be obtained.

When working entries or other narrow places where gas feeders are found, barrels of water conveniently located afford the means by which the miner may early extinguish a fire, and thus prevent what might with delay become a serious mine fire.

Canada has recently made uniform the regulations governing the issues of leases of Dominion and school lands for coal-mining purposes. The ground rent is to be made \$1 per annum, and the royalty 0.5c. a ton. Not more than 640 acres are to be leased to one person.

Experience has shown that soft rubber or graphite packing causes less friction than harder packings. Packing friction may be greatly reduced by oiling the piston rod. The amount of frictional loss that may be caused by the careless using of wrenches is almost unlimited.

During the year 1906, in one of the English mining districts not a single accident from explosives or shot firing was reported, in spite of the fact that twenty-nine different kinds of explosives were used and about three million shots were fired, consuming 1 1/8 million pounds of explosives.

In cold weather, oil barrels should be kept in the oil house for a few days before they are emptied, so that the oil may become thoroughly warm and thus easily drain out. A place should be provided outside the oil house for the empty oil barrels, which should be laid on their sides with the bung hole down to prevent dust from entering.

The average wage of a breaker boy in the anthracite coalfield is \$0.85 per day, or about \$180 per year. Door boys and helpers in the mines average \$1 a day.

Drivers and runners, most of whom are over 16 years old, average \$1.25 per day. It is estimated that the 38,000 anthracite employees who are under 21 years of age, earn about \$870,000 a year.

Mine foremen can do much to improve the foreign-speaking miners working under their directions, if their attitude is one of personal interest, and if they make an attempt to gain the confidence of the men. The result of such charitableness and breadth of mind will be a lower percentage of accidents, a more competent staff of miners and, as a natural result, a larger output of coal.

The advantages of mineral over vegetable or animal lubricating oils are: (1) they are much cheaper; (2) they do not become thick or gummy from exposure to the air; (3) they do not corrode metals; (4) they are capable of being separated into many grades from the lightest to the heaviest cylinder oil; (5) they are free from the danger of spontaneous combustion as they have a low cold test.

The following is a table of tests, made with a Davy lamp, giving the length of cap for the percentage of firedamp:

Percentage of Firedamp.	Length of Cap.
2 per cent.	1/2 in.
2 1/2 "	" "
3 "	" "
4 "	" "
5 "	1 1/4 "
5 1/2 "	2 "
6 "	3 "

The length of cap increases rapidly as the proportion of firedamp rises over 4 per cent.

Lubrication is the chief essential that contributes to the efficiency of compressed air machines, since they are usually small and of light weight and operated at high speed; the closeness of the fit of the different parts is important. As the air used for operation is expanded from a high pressure to a lower pressure it absorbs much of the heat of the surrounding metal and produces intense cold; hence, oil used on these machines should be a pure petroleum with a low cold test.

A check weigher at the South Normanston coal mine in Derbyshire, England, has invented a method of blasting, which is claimed to reduce the liability of accidents, by insuring the firing of every charge. The end of a tube with a loose central needle is inserted into a cartridge of explosive material, and the cartridge with the tube and needle are placed in the prepared shot hole. The hole is then rammed, after which the needle is withdrawn from the tube, and the detonator, attached to a suitable carrier, is then passed through the tube into the space left in the explosive by the withdrawal of the needle. The detonator is then coupled to the battery and fired; if from any cause the explosive is not fired, or the detonator misses fire, it can be withdrawn and another detonator attached to the carrier and placed in the explosive, as in the first case.

Meeting of the West Virginia Mining Association

The most important meeting of coal operators and mine experts ever held in West Virginia was called to order in Charleston, on Wednesday, Oct. 7, by President W. N. Page. More than 300 coal operators and mining men attended the conference, which was the first general meeting of the association since its organization in Washington last winter.

After an opening address by President Page, the following papers were read and discussed:

1. The Effect of Legislation on the Mining Industry in West Virginia. By E. W. Knight.

2. The Proper Relationship Between Capital and Labor in West Virginia Coal Mining. By B. F. Bush.

3. Recent Mine Disasters—Causes and Remedies as far as Ascertained. By J. S. Cunningham.

4. Is Dust, as such, Explosive, and if so, What are the Chemical Reactions and the Most Efficient Preventatives. By Frank Haas.

5. The Standardization of Powders and Explosives for Underground Workings. By J. W. Heron.

6. The Advisability of Standardizing Electrical Appliances in Mines. By W. H. Keller.

7. The Education of Mine Managers in Rescue Work and the Danger Involved by Untrained Men Attempting such Work. By William Leckie.

8. Mine Fatalities in West Virginia as Compared with other Countries and the Present Methods Pursued by the Mine Department of West Virginia in Tabulating the Same. By Neil Robinson.

Among those attending the meeting were Captain Desborough, inspector of explosives for Great Britain; Victor Watteyne, head of the Department of Mines of Belgium, and Carl Meissner, one of the councilors to the Department of Mines, of Germany. Accompanying these experts, who were previously invited by the Federal Government to inspect mining conditions in this country, were Dr. J. A. Holmes, chief of the Bureau of Technology of the United States Geological Survey; Edward W. Parker, Chief of the Bureau of Mines and Mining, and R. Y. Williams, of the Experiment Plant at Pittsburg. Messrs. Watteyne and Meissner made short talks concerning mining conditions and investigations as carried on in their respective countries.

On Thursday morning a special train was placed at the disposal of the association, and carried the operators and their guests on an inspection trip over the new Virginian railway. The special train was arranged through the courtesy of President Page of the Virginian railway, and President Stevens, of the Chesapeake & Ohio. Short stops were

made for the inspection of the mines of the Loup Creek Collieries Company at Page, and at other operations located along the line. Returning, the party reached Charleston about 9.30 p.m.; all of those attending were unanimous in stating that the trip was both beneficial and pleasant.

It is doubtful if this country has yet witnessed a meeting of coal-mining men, that has been more representative of the industry as a whole, than this meeting of the West Virginia Mining Association.

Abstracts of the excellent papers read will be published in early issues of the ENGINEERING AND MINING JOURNAL.

American Institute of Mining Engineers

EDITORIAL CORRESPONDENCE

As stated in the last issue of the JOURNAL, the opening session of the 95th meeting of the American Institute of Mining Engineers was held at Hotel Patten, Chattanooga, Tenn., on Thursday evening, Oct. 1. By Saturday evening the reading of papers was finished, and no further sessions were held.

At 7:30 a.m. on Monday, Oct. 5, the members and guests of the Institute, numbering about 120, left Chattanooga on a special train for a visit to the mines and furnaces of the Roane Iron Company, at Rockwood, Tenn. The Chamberlain mines were first visited. In the afternoon the party went through the plant at Rockwood, returning to Chattanooga at 8 p.m. on that day.

At 9:25 p.m. on Tuesday, Oct. 6, a special train left Chattanooga for Copperhill and Ducktown, Tenn., carrying 26 members of the Institute. All of Wednesday and most of Thursday were spent visiting the mines, smelters and sulphuric acid plants of the Tennessee Copper Company and the Ducktown Sulphur, Copper and Iron Company. On Thursday afternoon, Oct. 8, the special train left Copperhill for Knoxville, whence most of the members returned to their homes. Several of the party went to Birmingham, Ala., to inspect the iron mines and furnaces of that district.

The silver mines of Mexico (A. F. J. Bordeaux, *Trans. A. I. M. E.*, Sept., 1908) represent deposits of three principal classes: (1) veins and stockworks in eruptive rocks; (2) fissure veins crossing the crystalline schists, granite, diorite, etc.; and (3) veins and replacement deposits in limestone. The true fissure veins in some districts contain, in value, more gold than silver. In other deposits, the silver is decreasing in depth, leaving galena and zinc blende as the principal ores.

Granby Consolidated Mining, Smelting and Power Company, Ltd.

This company owns extensive copper mines and smelting works in the Boundary district of British Columbia. Its report is for the year ended June 30, 1908. The capital stock authorized is \$15,000,000, of which \$1,500,000 is held in the treasury. The balance sheet at the close of the year shows: Stock outstanding, \$13,500,000; dividends held, \$1324; accounts and bills payable, \$896,895; surplus, \$2,455,181; total liabilities, \$16,853,400. The assets were: Cost of property, \$15,238,458; stocks, bonds and bills receivable, \$1,008,013; fuel and supplies, \$185,324; cash and copper on hand, \$421,625; total assets, \$16,853,400.

The ore smelted during the year was 858,432 tons Granby ore and 24,179 tons purchased ore; a total of 882,611 tons. The product was 21,126,926 lb. copper, 300,593 oz. silver and 40,139 oz. gold. The average price realized for copper was 13.333c. per lb.; for silver, 56.625c. per ounce. The average cost per ton of ore, including all expenses was \$3.486. The average cost of copper, after deducting values of gold and silver, was 10.31c. per pound.

The income account is as follows:

Sales of product.....	\$3,790,184
Working, selling and general expenses	\$3,013,396
Foreign ore purchased.....	170,266
Total expenses.....	\$3,183,662
Net earnings for the year...	\$606,522
Surplus from previous year.....	2,775,758
Total	\$3,382,280
Bonus to employees.....	\$23,100
Dividends paid.....	675,000
Allowance for depreciation.....	228,999
Total charges.....	\$927,099
Surplus at close of year.....	\$2,455,181

Expenses given above include all development work, renewals and repairs. The total mine development during the year was 9338 lin. ft.; diamond drill, 3129 ft. There was expended for additional mining property, \$23,743; new construction and equipment at mines and smelter, \$242,574; total, \$266,317 for additions.

The president's report says: "The new Victoria shaft and surface equipment, including crusher, electric hoist, belt conveyer, etc., have now been in operation 12 months, and have given satisfaction, both in quantity of ore handled and economy of cost. The Curlew tunnel was connected by an upraise with the workings of the Gold Drop mine, and the ore output now comes through this tunnel, the temporary outlet over another property having been abandoned. At the mouth of the Curlew tunnel, a complete equipment of ore bins, large crusher, motor and conveyer belt for loading have been installed. The tunnel is also equipped with an electric haulage system, consisting of

electric locomotive and cars, motor generator set, etc. Electric haulage was installed at the upper level of the Gold Drop mine, likewise on the 400-ft. level of the Granby mines, which connects the Victoria shaft with all lower workings. This latter consists of a 75-h.p. electric locomotive and 20 steel cars, each having a capacity of about 6 tons. They are self-dumping and automatic in every way and were put in service about Jan. 15 of this year.

"The mechanical devices now in operation, such as hoists, shafts, belt conveyers, mine cars and electric locomotives are able to handle about 5000 tons of ore daily. The mines shipped to the smelter a total of 858,432 tons during the past year against 644,549 tons during the previous year. The grade of ore mined was not as good as in the previous year, carrying about 1 lb. less of copper and 10 to 12c. less per ton of ore in gold and silver. The extraction per ton of ore on the average was 23.42 lb. copper, 0.2865 oz. silver and 0.0454 oz. gold; as compared with 24.43 lb. copper, 0.3088 oz. silver and 0.0503 oz. gold in 1906-1907; and 24.30 lb. copper, 0.3107 oz. silver and 0.0513 oz. gold in 1905-1906. During the summer months a lower-grade ore was shipped, due to mining the Glory holes on the surface, which are low grade and which cannot be mined during the winter months. Consequently, the ores will average richer in winter and spring and poorer in summer and fall. The quantity of ore developed by diamond drilling has been larger than the ore extracted.

"During the entire past year improvements were made at the smelting plant, among the most important being the erection of additional ore and coke bins, which increased the ore storage capacity to about 13,000 tons, while the total storage capacity of coke will be about 8000 tons in bins, besides that stored on the ground. Further improvements for increased coke storage are contemplated. The old flue-dust chamber having been found to be too small and in the way of further enlarging the present blast furnaces, a new steel flue-dust chamber immediately back of the furnace and on a higher level than the previous one was erected, and the brick flue leading from the steel flue chamber to the stack was enlarged. The charging system was greatly improved by installing larger locomotives and larger charge cars.

"As indicated in the last report, it has been decided again to enlarge the furnaces, which have worked very satisfactorily. This will be done successively. One of the furnaces is now being so enlarged, and if found satisfactory, the remaining seven will be rebuilt as fast as practicable. The old wooden blowing engine building has been removed and replaced by a new one of steel and brick, and enlarged sufficiently to accommodate two large rotary blowers of 100,000 cu.ft.

per minute capacity. All former blast pipes will be replaced by larger ones. The converter building and converters have also to be enlarged, in order to take care of the proposed increased quantity of matte. This will be done by extending the present steel building 80 ft. in length. Three large and modern electrically operated converter stands will be installed, replacing one of the present small stands, and when completed there will be two old small stands and three new large ones. A new 40x40x42 blowing engine will be installed driven by 500-h.p. electric motor to take care of the large converters. When completed, the converter plant will have a capacity to turn out 35,000,000 to 40,000,000 lb. of copper per annum.

"All new construction, with the exception of the ore and coke bins, has been either of steel or of steel and brick, thereby greatly lessening the fire risk. It is estimated that all the above improvements will be finished next year, when the benefit from large and continuous tonnage may be expected. The plant and equipment have been kept in a high state of efficiency and all repairs and minor improvements have been charged to current expenses.

"In consequence of a great many changes made at the mines and smelters, some machinery together with the buildings containing it became obsolete, and a careful re-appraisal shows that there should be written off for depreciation at the mines about \$115,000 and at the smelter about \$45,000. In addition it is estimated that further changes will result in depreciation to the extent of about \$45,000 at the smelter during the coming year, and your board has thought it wise to write this amount off during the business year ended June 30, 1908, making the total written off for depreciation about \$205,000.

"The total tonnage of Granby and foreign ore amounted to 882,611 dry tons, against 665,915 tons in the previous year, and there were produced 21,126,926 lb. of copper against 16,403,497 lb. The cost per lb. of copper produced, after deducting the value of gold and silver, was 10.24c. against 10.14 and 8.35c. in the two previous years.

"Smelting operations were greatly interfered with by the construction work and frequent vexatious interruptions. During mid-summer of 1907 the smelter still suffered greatly from a shortage of coke. From Nov. 15, 1907, to Jan. 1, 1908, the entire plant was shut down. At that time, an adjustment of wages, in harmony with those ruling in neighboring camps, was effected.

"Early in August a disastrous fire broke out in British Columbia, laying waste an area estimated to be 70 miles in length and 5 to 10 miles in width, and doing great damage to the properties of the Crow's Nest Pass Coal Company, from which we receive our coke and in which

we are large stockholders; besides, a great many bridges belonging to the Canadian Pacific and Great Northern were destroyed, and the supply of coke for a period of two to three weeks was cut off, necessitating the closing down of one half of the furnaces. Since Sept. 1 the smelter is again in full operation.

"Almost immediately after issuing our last annual report a most severe panic broke out, and among other disastrous consequences the consumption of all metals decreased very materially and prices showed a heavy decline. Of the different metals, copper was among the heaviest sufferer, due perhaps, to the abnormally high prices that ruled throughout the greater part of 1907 and which had not been known before, except when the copper-mining industry in this country was in its infancy. Prices fell from about 25c. to close to 12c. and showed very little recovery during the first six months of the present year, due to the great falling off in the consumptive demand for home trade. Fortunately, Europe was a continuous buyer, thereby preventing large accumulations of stock. Of late, the demand for home trade has shown great improvement, and if this continues, as appears to be the case, it may be confidently hoped that prices will show a further improvement.

"The enormous decline in the price of copper and the marked influence on the cost by reason of the difficulties with which the smelter had to contend, permitted the declaring of only two dividends, one of 3 per cent. on Sept. 30, 1907, and one of 2 per cent. on June 30, 1908."

Transvaal Gold Mines

The production of gold in the Transvaal in September, as reported by the Chamber of Mines, was 587,634 oz. fine, being 179 oz. less than in August. Considering the shorter month, there was really an advance, the daily average for August being 18,962 oz., while that for September was 19,588 oz. For the nine months ended Sept. 30, the total production was 4,864,782 oz. in 1907, and 5,159,859 oz.—or \$106,654,286—in 1908; an increase of 295,077 oz., or 6.1 per cent.

In the Blue Ravine district, near Folsom in California, where drift mining has been successfully carried on for many years, some operators are about to put in dredge machinery on the old Gray Wing mine. Until large dredges made to dig deep came into vogue, they had to drift this ground, as it is too deep to bedrock to operate an ordinary dredge. But with the new machines the Blue Ravine bids fair to become a dredging instead of a drifting field.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the
Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGINIJOUR, N. Y."

Subscription, payable in advance, \$5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. \$6.50 in Canada.

To foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs. Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.
Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for September, 1908, was 40,800 copies.

October 3.....	13,000
October 10.....	9,800
October 17.....	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents PAGE

Editorials:	
The Utah Consolidated Smelter.....	772
The Trinity Copper Company.....	772
The Temagami-Cobalt Mines, Limited	773
Calumet & Hecla—Oscuela.....	773
Connellsville Coke.....	773
Speed in Small Drifts.....	773
*Operation of an Anaconda Copper Converter.....	C. Offerhaus 747
Efficiency of Mexican Labor.....	752
Talc and Soapstone in Vermont.....	G. H. Perkins 753
*A Remarkable Car-dump.....	Frank A. Ross 754
Effect of Temperature on the Electrolysis of Copper.....	755
A New Railroad in Mexico.....	756
*Loss of Leakage of Blast in Lead and Copper Furnaces.....	756
Consolidated Mining and Smelting Company of Canada, Ltd.....	756
*Advancing the Hot Time Lateral of the Newhouse Tunnel.....	Henry M. Adkinson 757
Duties of the Cyanide Chemist.....	757
*The New Esperanza Mill at El Oro, Mexico.....	Claude T. Rice 760
Packages for Blasting Powder in Ohio.....	762
*New Bomb for Lead Furnaces.....	J. N. Goddard 763
Manganese in Russia During 1907.....	764
Mexico Mines of El Oro.....	764
*Mining Methods at Seton-Delaval Colliery.....	Lucius W. Mayer 765
Colliery Notes.....	769
Meeting of the West Virginia Mining Association.....	770
American Institute of Mining Engineers.....	770
Granby Consolidated Mining, Smelting and Power Company, Ltd.....	770
Transvaal Gold Mines.....	771
Correspondence:	
Pull Switches for Electric Mine Signals.....	Sydney F. Walker 775
Rights of Junior Locators.....	Albion S. Howe 775
Peon or Mexican Indian.....	Cyrus Robinson 775
Ore Sampling by Machine.....	E. P. Mathewson 776
Iron and Steel in Sweden.....	776
West Virginia Mine Regulations.....	776
Dredging Troubles in California.....	776
New Publications.....	777
The Virginia Geological Survey.....	777
Questions and Answers.....	778
Personals, Obituaries, Societies and Technical Schools.....	779
Special Correspondence.....	780
Mining News.....	782
Markets, etc.....	787
*Illustrated.	

The Utah Consolidated Smelter

The intention of the Utah Consolidated Mining Company to build new smelting works near Salt Lake City is interesting because of the prospect it offers for further competition in smelting at that point, although, of course, such competition will be limited to pyritic ores and such dry ores as can be smelted upon a copper basis. The management of the company has been criticized for its decision to incur this great expense, estimated roughly to be \$3,000,000, in view of the fact that the mine of the company has only about four years of ore supply developed; and the doubt as to the continuance of ore. With these circumstances it is pointed out that a renewal of the contract with the Garfield Smelting Company would be cheaper in the end.

The management of the Utah Consolidated Mining Company has a good deal of intelligence and also some regard for decency in its actions with respect to the stockholders of the company. Consequently, it is only fair to suppose that it has given due consideration to the important question by which it has been confronted. At the end of 1907 the mine of the company had a development of 1,202,930 tons of ore, against 1,100,000 tons at the end of the previous year. Several new ore-bodies were discovered during 1907, and the outlook for the mine was regarded as promising. In 1905-1907 the company smelted at the rate of a little less than 300,000 tons per annum. We do not know the terms of the existing contract between the Utah Consolidated Mining Company and the Garfield Smelting Company; it has been rumored that they are about \$1.50 per ton higher than the cost used to be to the mining company when it was smelting its own ore. If the mining company were to build a new smeltery at a cost of \$3,000,000 to treat 1,200,000 tons of ore, and that amount only an amortization of something a little less than \$2.50 per ton of ore would have to be figured, besides the interest on the investment, but the expenditure of \$2,000,000 for construction only ought to build works of much larger capacity than 300,000 tons per annum, at least twice as much, and the Utah Consolidated Mining Company is undoubtedly reckoning on smelting a good deal of custom ore, besides a good deal more than 1,200,000 tons from its own mine. Consequently

it is not a question of amortization in the brief period of four years.

The Utah Consolidated Mining Company has always been noted as one of the commendable concerns that make good reports to their stockholders, these reports comprising a statement of an essential factor, namely, the amount of ore developed remaining in the mine at the end of the year, which is commonly kept a secret. The company has had, and still has, a high order of management and technical advice of the best character, and it is only reasonable to suppose that it knows how to figure the difference between the yield of a smelting contract and the cost of smelting on its own account.

The Trinity Copper Company

An illuminating example of one of the greatest evils in modern corporate management was afforded by the recent annual meeting of the Trinity Copper Company. As everyone knows, this is a concern which has been extensively advertised by Thomas W. Lawson, who was the original promoter of the company, and is still its president. According to newspaper reports, the secretary of the company was the only officer present at the last meeting of the stockholders. After the submission of an annual report and balance sheet of the usual perfunctory type, which communicates scarcely any important information, one of the stockholders endeavored to secure more specific information and made a motion that the management issue to the stockholders a detailed statement respecting the financial condition of the company, and the physical condition of its property. This motion was promptly tabled by the representative of the management who through proxies controlled the meeting. This is a reminder of former meetings of the Bigelow companies, and many others which arrogantly consider that minority stockholders have no rights.

The inability of stockholders in a corporation to obtain specific information respecting its affairs is as amazing as the fantastic events in "Alice in Wonderland." Macaulay's "New Zealander" would not recognize this as a part of sober business transactions in the 20th century. The managements say that no one dissatisfied with the régime need continue to be a stockholder, but that talk

is made only after the distribution of the stock has been effected. Any company which offers its stock to the public incurs an obligation to be frank and fair toward its stockholders. In the case of the Trinity company, the stock was not only offered to the public, but the latter was urged, begged and implored to buy it through the medium of spectacular newspaper advertisements. It will be a good day when the public refuses to touch the stock of any company that does not make adequate official reports, such reports comprising not only a properly audited set of accounts, but also a specific statement respecting the physical condition of the property.

As to this notorious Trinity company, the fact is simply this: When the company was brought out in 1901 it developed a lens of ore containing about 400,000 tons, averaging about 3 per cent. copper and 80c. per ton in gold and silver. With that development the orebody was delimited, i.e., its top, bottom and sides were defined, so no continuation of that orebody was to be expected, and moreover the prospects for finding similar orebodies elsewhere in the property were not considered good. No other orebody has since been discovered. The developed orebody was not big enough to justify the erection of an economical smelting works, and the mine remained idle until the Balaklala nearby developed a large orebody and erected smelting works at which the Trinity ore could and is to be smelted. The Trinity mine will begin to produce when the Balaklala smelting works is ready to begin operations.

The Temagami-Cobalt Mines, Limited

We dislike to waste our space upon such a miserable attempt to secure money as that of Julian Hawthorne, to which we have previously referred. In commenting upon his affair we gave him originally the benefit of all doubt and assumed that he was an amateur in the business, but he has disclosed that he does not belong in that class. A fortnight ago we reported his misuse of the name of Ricketts & Banks. He wrote to that firm a feeble letter of apology, in which he said: "I could have easily gotten along without mentioning any name, and in order to avoid any criticism in this regard, I shall certainly be careful in the future." He

promptly showed how he could get along without the mention of any name by bringing out a new circular letter, in which he substitutes for his original phrase, "the firm of Ricketts & Banks, of New York," the following: "A prominent firm of engineers of New York." Also, he refrains from mentioning that the capitalist whom this prominent firm of engineers brought forward was a member of the Tiffany firm. The circulation of this latest letter is, of course, a wilful deception.

W. Fischer Wilkinson, of London, whose name was also used by Mr. Hawthorne, writes to us as follows: "A friend of mine in New York recently received a begging letter about Temagami which made out that all sorts of people were dying to get the property, including myself. It said that I had not done business because I could not get the control. All this is moonshine. I may have met Hawthorne on the Cobalt excursion of the American Institute of Mining Engineers, and perhaps saw him out of civility in New York, but that is all. The use of my name or that of my company is quite unwarranted."

Calumet & Hecla—Osceola

The termination of the long litigation of A. S. Bigelow and associates against the Calumet & Hecla Mining Company to restrain the latter from voting its stock in the Osceola company is a cause for congratulation, although no great principles were involved. The litigation was merely an irritating attempt to block the legitimate expansion of a distinguished industrial enterprise, that has always been characterized by honest methods, and was based upon and sustained by misleading allegations, which could not fail to be exposed.

Connellsville Coke

The production of Connellsville coke is a very fair gage of the condition of the iron trade; partly because it is used so largely in that trade, and partly because the current statistics are readily available. The figures collected by the Connellsville *Courier* show that the coke production in the region for the week ended Sept. 19 was 201,485 tons, which contrasts with 142,346 tons for the first week in January. Taking the middle week of each month

as an average, the make of coke for this year has been as follows, in each week:

January	143,838	June.....	162,404
February	180,948	July.....	185,093
March.....	160,085	August.....	196,144
April.....	147,786	September...	201,485
May.....	169,088		

The spurt in February and March only resulted in the accumulation of stocks which were not cleared off for some time. The net result shows a steady, but slow gain, until now the weekly output runs from 50 to 60 per cent. of that of a year ago.

Notwithstanding this present depression, new development and the construction of new coking plants in the Connellsville region are proceeding actively.

Speed in Small Drifts

In this issue we print an article by Mr. Adkinson on the rapid driving of a crosscut 5x7½ ft. in size. The speed maintained for a year, including two months during which only 84 and 88 ft. were driven, was 208¼ ft. per month. For the nine full months worked the average speed was 236 ft. per month; the greatest for one month was 263 ft. We believe that this is the best on record for drifts or crosscuts of this size. The figures appear even more remarkable when it is considered that the men were working for day's pay.

In rapid drifting, raising, or sinking, three things are essential: First, the details of the system must be thought out so as to economize time to the uttermost. Second, a foreman must be found who will see that the system is followed; who will obtain the right crew of miners, and who will engender a spirit of wholesome rivalry among the different shifts. Third, miners must be found to work with their brains as well as with their hands, and do good work even when hurried. S. H. Knowles especially deserves credit for welding these three diverse elements into a whole with such eminent success. The noteworthy point is that instead of obtaining speed by contracting the work or by using a bonus system, Mr. Knowles used the old Cornish policy of "stints" and increased the daily wage only enough to obtain the best miners in the district. But it was the foreman who begot the *esprit de corps*. He saw from the very beginning that each shift did its work efficiently. This prevented any quarreling between the two shifts, and

instead there arose the healthful rivalry so essential to speed.

In driving mine crosscuts or drifts more study than is usual should be given to the choice of the explosive. In driving or sinking, the rock should be broken no smaller than is necessary for rapidly loading it into a car. Yet in such work, on account of the nearness of the holes to each other, the tendency is to break the rock too small. If the rock is broken smaller than necessary, it entrains an undue amount of gas that later bothers the shoveler. To prevent this the dynamite in most of the holes should have a rending rather than a shattering effect. But in the cut holes a shattering effect is essential as the rock around these holes cannot well be rended but must be shattered, or, as the miners say, "burnt out." In rapid driving the miners should be sufficiently intelligent to use two strengths of explosive, viz., a quicker higher-grade dynamite in the cut holes and a slower, lower-grade dynamite in other holes.

On account of the entrained gases, which are larger in quantity than a person that has not driven a drift would imagine, the nature of the gases generated by the explosion of the dynamite is very important. But of equal importance is the obtaining of a perfect explosion of the charge. Therefore, unusually strong caps should be used, not only to obtain the full effect of the dynamite, but also because the explosion of the dynamite is the more complete the more sudden the shock of the initial detonation.

By using turn-sheets for flooring and also low cars, by supplying a quantity of good air, and by keeping the tracks in good condition and as near the face as possible, the time required for cleaning the drift can be greatly shortened. Broad square-pointed shovels are the best for shoveling the rock off the turn-sheets, but round-pointed shovels are quicker for cleaning the rough bottom ahead of the turn-sheets. Correct loading of the lifters, as is well known, greatly aids in decreasing the amount of rock that falls off the turn-sheets.

The problem in small, narrow drifts is far different from that in large, wide drifts approaching railroad tunnels in size, for the wider the drift the greater the amount of rock broken per foot of hole drilled. Not only does the relative amount of drilling decrease as the size of the drift increases, but the number of

rock drills that can be used also rapidly increases; for instance in a drift 5 ft. wide only one drill can be used, but in a drift 10 ft. wide three drills can be used. On the other hand, as the size of the drift increases, the distance that the broken rock must be shoveled also increases. But the shoveling area increased only as the width of the drift, while up to a certain point the tonnage of rock broken increased more nearly as the square of the width. The only constant, after the width becomes sufficient for a shoveler to work freely, is the amount that a man can shovel. Consequently the problem in a large drift is not the drilling, but the shoveling.

By the same process of reasoning it becomes evident that when the drift becomes narrow so that only one machine can be used at the face the problem changes. Then it is easy enough to get the shovelers; the problem is to get the machinemen.

Small drifts, therefore, require that the most study shall be devoted to aiding the miners. In order that the machinemen may devote their entire time to their work, the shovelers should go on shift earlier than the miners so that they can have the face, roof and sides picked down before the miners come. Then without loss of time the miners can set up a crossbar and begin to drill.

A high air pressure should be maintained at the drill, plenty of sharp steel of varying lengths and a blowpipe should be furnished, a spare machine and spare parts, such as valves, chuck bolts, etc., and an extra hose should be stored near the face. Water for the wet holes should be handy.

The time that is lost cleaning holes is not important, provided that the miners are good machinemen, for if the miner "tending chuck" works a small wire, called in Butte, Mont., a "picker," back and forth in the hole while drilling the dry holes, and properly waters the down holes, he will not lose much time cleaning out the holes. If the ground is damp, drills made from cross steel aid greatly in preventing loss of time while drilling flat or "dry" holes. With round or octagonal steel, unless the hole is scraped out frequently, the drillings gum up and hold the drill steel in the holes, but with cross steel the rotating of the drill bores out the drillings. Provided that a standard type is used, the make of the drill is far from being

as important as the advocates of each represent.

An important thing in rapid driving is good ventilation, for then the gases after blasting are quickly driven away, and the men are given good, pure air that keeps them active. The best way to ventilate the drift is to blow the air back from the face by means of compressed air and then to remove it by means of a suction fan. With a blower the smoke and gases are only driven away from the breast to linger along the rest of the drift. Some provision should be made for laying the dust while drilling the dry holes. Great care must also be taken to avoid "missed" holes. In the most important holes, cuts and lifters, double primers should be used.

The method of loading the holes described in Mr. Adkinson's article is, in our opinion, not the best. Experiments have shown that, provided there is no intervening air spaces, no difference in the effect of the explosion is noticeable whether the primer is near the bottom, near the top, or in the middle of the charge. Therefore, the primer should be placed near the top of the charge as then there is less danger of the dynamite's burning instead of exploding. Mr. Knowles is right in believing that in drifting it is poor policy to economize on explosives.

The Cornish policy of "stints" or a bonus system seems to be the best methods of insuring rapid driving. The trouble with contracting is that the details of the work are turned over, more or less, to the man having the contract. The man drives as fast as his conception of mining allows him, generally no faster than the speed usual in such work. He rarely is capable of working out the details in the manner that a good manager, who has had some experience at drifting, would do. On the other hand the "stint" policy or the bonus system leave the control of all operations, even to details, in the hands of the manager.

Rapid driving is obtained at additional expense per foot. This increased cost per foot is warranted only under special conditions. Yet by studying the methods used in the rapid driving of both large tunnels or adits and mine crosscuts or drifts, the managers at many mines will learn details that will aid materially in increasing the speed, and also in lowering the price of driving below the cost of such work when the planning of the work is left to the foreman and the miners.

Views, Suggestions and Experiences of Readers

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

CORRESPONDENCE AND DISCUSSION

Pull Switches for Electric Mine Signals

In the JOURNAL, of August 15, there is a description, and a very clear illustration of the Q & C electrical pull switch for mine signals. The arrangement of the switch consists of two stout springs, fixed to a piece of insulating material, with a rod carrying at one end a copper disk, and at the other end an eye for the attachment of a cord, and between these a stout spiral spring, the copper disk making contact between the two fixed springs, when the cord is pulled. The apparatus appears to me to be a very good one, and one that should answer its purpose very well indeed, if it is properly constructed.

I should like, however, to give one or two words of warning. The drawing does not give sizes, or strengths of material. In my experience, I have found that electrical men are too apt to make electric contact arrangements, particularly those designed for use in mines, too weak. The electrical signaling current is very small. It will pass easily through very small wires, and it is, therefore, too often assumed that small wires will answer the purpose for contact making. This view leaves out of account two very important considerations; the rough usage that every switch necessarily receives in a mine, and the water, usually impregnated with salts, that is nearly always present in a mine.

Let me suggest that the fixed springs shown in the drawing, between which the moving disk makes contact, when the switch is pulled, should be very large and very strong. Stout, hammered brass rod, 2 in. wide by at least $\frac{1}{8}$ in. thick, will be none too large. In any case they should never be less than 1 in. wide, and $\frac{1}{16}$ in. thick. The rod, the disk, and the spiral spring may be in proportion, but it is not of such great importance to make the disk so strong, as it is not subject to chemical action to the same extent as the fixed springs. The fixed springs which receive the current, are always exposed to electro chemical action, particularly the one that is connected to the positive signal wire, and it is upon them that the water does its principal work. The copper disk, the rod, and the spiral spring, should, however, be sufficiently strong to stand pulling into contact with the strong fixed springs suggested, bringing the contact well clear again, when the pull is released, and to stand the wear of repeated use.

Another suggestion is, that the terminals for connecting the signal wires, should be brought outside of the case containing the apparatus, and should also be made very large. The springs should be fixed to substantial insulating blocks, on the sides of the containing case, by substantial screws, and one substantial screw should pass right through the center of the insulating material, being metallically connected to the spring on the inside, and fitted with a stout washer, and a clamping screw on the outside. The hole through which the screw passes, should be well bushed with insulating material, that will stand a certain amount of moisture, and the hole in the case should be filled with the insulating material, and the hole in the insulating material filled quite tight by the screw shank passing through. The object of this arrangement, which is dictated by my experience of about 30 years is, to confine the chemical action to the outside of the case, where it can be seen. If holes are drilled in the case, and covered wires are led through the holes to screws on the inside, it is absolutely impossible to prevent water finding its way along the surface of the covering of the wire, to the screw and the spring to which the wire is attached. Another reason is, that when fixed on the outside in the manner described, the screws can be made large and substantial, and any chemical action that is going on can be seen. The terminal screws may be as large as there is room for. One, $1\frac{1}{2}$, or even 2 in. will not be too large. These figures may seem extravagant, but they are dictated by experience gained in the usual painful manner.

When the connecting screws are on the outside, there will be no necessity for opening the case, except at rare intervals, and the working parts will, therefore, remain in very much better condition.

SYDNEY F. WALKER.

Bath, England, Sept. 20, 1908.

Rights of Junior Locators

In the JOURNAL of Sept. 5, p. 460, A. H. Ricketts in "Short Talks on Mining Law," says: "The junior locator does not acquire title to the surface within the overlap because of the subsequent abandonment or forfeiture of the elder claim, as in that sense the overlapping location was prematurely made."

This opinion is directly contrary to the following statements from "Martin's Mining Law," edition 1908, section 328, page 241. Martin says: "In the absence of ob-

jections by a senior locator, a junior locator may extend his lines upon and across the surface of such senior claims, and by so doing he acquires both surface and extralateral rights, as against the Government and subsequent locators, as fully as if his entire claim was laid upon unappropriated ground, subject only to the rights of such senior locator from, and in, his prior locations. (Cases: Empire State-Idaho Mining and Development Company vs. Bunker Hill & Sullivan Mining Company, 131 *Federal Reporter* 591, 66 cc. A. 99).

"So, too, if there is no objection on the part of the senior locator, a junior locator may extend the lines of his location upon and across the surface of the senior claim; and in case there is unoccupied land on both sides of the senior location, he will by such location, acquire rights, surface and extralateral, therein against the Government, subject only to the rights of prior claimants. (Cases: Bunker Hill & Sullivan Mining Company vs. Empire State-Idaho Mining and Development Company, 109 *Federal Reporter* 538, 48 cc. A. 665, 21; *Morrow's Reporter* 317).

"And after crossing such planes of senior locations he may resume and follow the vein on its course without regard to the rights of junior locations. (Cases: Bunker Hill & Sullivan Mining Company vs. Empire State-Idaho Mining and Development Company, 134 *Federal Reporter*, 268)."

Where expert mining attorneys and writers of law books disagree, how are the layman and engineer to determine which is right? A misstatement of the law of the case invites litigation between mine-owners, and such a statement should not go unchallenged.

The law, as given by Martin, is certainly the best for the prospector and mine locator, as he is not then compelled to survey all conflicting claims to safeguard his locations.

ALBION S. HOWE.

San Francisco, Sept. 15, 1908.

Peon or Mexican Indian

In the operation described in the JOURNAL of Oct. 3, in "Packing 13,000 Feet of Steel Cable Over a Mountain Trail," all of the men employed for packing the cable were Mexican Indians. I think it rather unfortunate that the article describes these men as "peons." As you probably know, the system of peonage does

not exist, nor has it existed for a long time in Mexico; and there is a growing sentiment objecting strongly to the use of the term as applied to Mexican laborers.

CYRUS ROBINSON.

New York, Oct. 7, 1908.

[The word "peon" was used in the article because it is a short, convenient word in very general use and in good standing in the dictionary; also because the movement to brand it as a term of reproach had not reached this office. Seane's Neuman & Barretti dictionary of the Spanish and English languages, edited by Mariano Velazquez De La Cadena and published by D. Appleton & Co., gives as English equivalents of "peon," "day-laborer," "pedestrian," "foot-soldier," and (Amer.) "Indian laborer hired by the day." The word did not originally, nor, as we understand it, does it now, convey the idea of bondage or serfdom.

In our own experience with Mexican laborers no sentiment against the use of the word has ever appeared. The men called themselves and one another "peon" freely. They seemed to consider the term honorable enough, and, we thought, were rather inclined to use "Indio," "Indito," and "Indigene," colloquial equivalents of our "Indian," in a contemptuous manner. The use of the word is no doubt largely a matter of locality. The Mexican laborer by his efficiency and all-round usefulness is earning the respect of the world for himself and any title he may happen to bear. If he objects to "peon" he certainly deserves to be called by another name.—EDITOR.]

Ore Sampling by Machine

As further evidence that mechanical sampling can be correct, despite the contention of John A. Church and others, I wish to call attention to the following results. This lot was run through the mill twice, the first crushing being to about 2 in., the pulps in both cases ground to 120 mesh:

	Ag. Oz.	Au. Oz.	SiO ₂ Per Cent.	S Per Cent.	FeO Per Cent.
Lot No. 806.....	0.8	0.74	89.4	3.0	5.2
Resample.....	0.8	0.73	89.0	3.2	5.4

While this ore is not particularly high-grade, it is a free gold ore, more or less spotty, and is more subject to variation in sampling than our usual run of ore.

E. P. MATHEWSON.

Anaconda, Mont., Oct. 8, 1908.

Iron and Steel in Sweden

Statistics prepared by Director Richard Akermann, of Stockholm, give the production of raw materials in Sweden for the full year as follows, in metric tons:

	1906.	1907.	Changes.
Coal.....	296,980	305,338	I. 8,358
Iron ore.....	4,502,597	4,480,070	D. 22,527

The production of pig iron and of wrought iron and steel ingots was as follows, also in metric tons:

	1906.	1907.	Changes.
Pig iron.....	604,789	615,778	I. 10,989
Charcoal blooms.....	178,298	174,405	D. 3,893
Bessemer steel.....	84,633	77,036	D. 7,597
Open-hearth.....	311,435	341,893	I. 30,458
Crucible and blister.....	1,979	1,763	D. 216
Total steel.....	398,047	420,632	I. 22,585

The production of finished iron and steel, as far as reported, was as follows:

	1906.	1907.	Changes.
Blooms and billets.....	28,880	44,975	I. 16,095
Bars.....	206,124	198,553	D. 7,571
Nail and wire rods.....	125,051	139,240	I. 14,189
Other shapes.....	11,965	15,025	I. 3,060
Plates.....	21,063	21,246	I. 183

The only decrease reported was in bars. The exports of pig iron and of merchant bars were, in metric tons:

	1906.	1907.	Changes.
Pig iron.....	112,200	129,800	I. 17,600
Iron and steel bars.....	194,400	154,200	D. 40,200

The average number of furnaces in blast in 1907 was 130, against 128 in 1906, and the average daily production of pig iron per furnace was 16.91 metric tons in 1907, as compared with 16.28 tons in 1906. The average time that each furnace was active in 1907 was 280 days.

West Virginia Mine Regulations

The following circular letter has been issued to coal operators by the Department of Mines of West Virginia:

CIRCULAR

At a meeting of the entire inspection force, except District Inspector J. G. Boyd, held at the office of the chief of the Department of Mines on Sept. 29 and 30, 1908, it was deemed advisable that the department should issue a general circular letter containing a note of warning and caution concerning conditions of danger that may be brought about by reason of the changing of the conditions of the weather respecting the probability of mine explosions.

The inspection force is unanimous in its opinion that it is extremely important that every precaution should be exercised in removing dust and wetting down of dusty sections of the mines, especially at and near the working places where explosives are used.

With reference to solid shooting in mines, the inspectors are convinced that the section of the regulations of July 1, 1907, permitting the employment of shot inspectors should be rescinded, since such privilege has been uniformly abused and has not been complied with in any spirit of sincerity. In this regard it is important that those in charge of mines should bear in mind that the danger of solid shooting arises from the excessive use of explosives and improperly placed holes and they will be required to employ methods which will minimize this source of danger.

It is suggested, and it will be exacted

by all inspectors, that all dry dust be removed from the workings of the mines, especially on all headings and rooms, and that the dry or dusty parts of the mine be kept wet by a systematic system of applying water.

The inspectors discourage the use of dynamite for blasting coal, and where used for rock work it should be used by skilled employees and at a time when all other employees are out of the mine. With reference to black powder, the inspectors are fully convinced that the limiting of the charge of the explosive, and properly mining the coal will minimize the probability of mine explosions.

Operators of mines are invited to confer with the district inspector relative to any of the provisions of this circular.

Dredging Troubles in California

SPECIAL CORRESPONDENCE

The trustees of the city of Sacramento are about to take steps to prevent the alleged pollution of the waters of the American river by the dredge companies operating at Folsom, not many miles away. A number of excited citizens, having seen muddy water coming down are anxious to make the dredgemen quit work. As a plain matter of fact, there is not a single dredge at Folsom working in the bed of the river, and there never has been. The dredges are operated on ground away from the river and its banks, and their tailings are, as usual, dumped in the pits dug by the machine and not allowed to escape into the river. Doubtless some muddy water does escape into the stream which eventually reaches the Sacramento river at Sacramento. But there has been no clear water in front of the latter city since the State was settled up by farmers, miners and other people, who contribute their quota toward discoloring the river water as in the case of all settled communities. The dredgemen do not permit their tailings to go into the river. The city trustees have appointed the mayor, city counsel and city engineer to investigate the subject with a view to bringing suit against the dredge companies in case it may be proved that they let their tailings go into the American. This will be hard to prove.

In this connection it may be noted that the Folsom dredgemen are having other troubles as well. It has been discovered that there has been a systematic scheme to rob the plates of the machines and that a total, said to be \$30,000 or \$40,000, has been stolen by employees. Some half-dozen of the suspected men have been arrested and held for trial. The men, through other parties, had the gold disposed of at the United States Mint, but they were being watched and finally caught. These men had easy access to the amalgamation plates used on the dredges.

New Publications

TABLES AND OTHER DATA FOR ENGINEERS AND BUSINESS MEN. Compiled by Charles E. Ferris. Pp. 249. 3x6-in.; leather, 50c. Knoxville, Tenn., 1908: University of Tennessee.

GENERAL INDEX TO REPORTS OF GEOLOGICAL SURVEY OF CANADA, 1885-1906. Compiled by F. J. Nicolas. Pp. 1014. 6½x10 in.; cloth. Ottawa, 1908: Government Printing Office.

RHODESIA CHAMBER OF MINES (INCORPORATED), BULAWAYO. Thirteenth Annual Report for the Year Ended March 31, 1908. Pp. 200. 8x10 in.; cloth. London, 1908: Darling & Son, Ltd.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE. Vol. LXXVI, No. I. Edited by Bennett H. Brough. Pp. 493; illustrated. 5½x9 in.; cloth, \$6. London, 1908: E. & F. N. Spon, Ltd.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE. Vol. LXXVII, No. II. Edited by Bennett H. Brough. Pp. 287; illustrated. 5½x9 in.; cloth, \$6. London, 1908: E. & F. N. Spon, Ltd.

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES FOR BUYERS AND SELLERS, 1908. Seventeenth Annual Edition. Pp. 1240. 7½x10½ in.; cloth, \$10. New York, 1908: Samuel E. Hendricks Company.

ROAD PRESERVATION AND DUST PREVENTION. By William Pierson Judson. Pp. 146; illustrated. 6x9 in.; cloth, \$1.50. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.

RAILWAY TRACK AND TRACK WORK. Third Edition. By E. E. Russell Tratman. Pp. 520; illustrated. 6x9 in.; cloth, \$3.50. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.

DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES. Thirty-second Annual Report. W. S. Blatchley, State Geologist. Pp. 1258; illustrated. 6x9 in.; cloth. Indianapolis, Indiana, 1908: Department of Geology and Natural Resources.

THE PRINCIPLES AND PRACTICE OF SURVEYING. Vol. II, Higher Surveying. By Charles B. Breed and George L. Hosmer. Pp. 432; illustrated. 6x9 in.; cloth, \$2.50. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

GENESIS OF ROCKS AND ORES. By Brenton Symons. Pp. 493; illustrated. 5x7½ in.; cloth, \$3. London, 1908: The Mining Journal

Contents: Sedimentation of rocks and ores. Metamorphism of strata. Segregation of metallic ores in veins.

THE COBALT-NICKEL ARSENIDES AND SILVER DEPOSITS OF TEMISKAMING. Third

Edition. Report of the Bureau of Mines of Ontario, 1907, Vol. XVI, Part II. By Willet G. Miller. Pp. 212; illustrated including 5 maps. 6½x9½ in.; paper. Toronto, Ontario, 1908: Bureau of Mines.

A POCKET HANDBOOK OF MINERALS. By G. Montague Butler. Pp. 298, illustrated. 4x7 in.; leather, \$3. New York, 1908: John Wiley & Sons, London: Chapman & Hall, Ltd.

This book was designed to occupy the field midway between works on mineralogy and handbooks on the subject. Although of pocket size the work contains sufficient details to identify most of the minerals which mining men, students and collectors are apt to encounter. Emphasis is always placed upon certain characteristic physical features of minerals which are liable to be overlooked by the ordinary prospector. The book is illustrated by excellent half-tone reproductions of mineral specimens from all over the world.

COAL. By James Tonge. Pp. 275; illustrated, 5½x8½ in.; cloth, \$2. New York, 1907: D. Van Nostrand Company.

Contents: History. Occurrence. Mode of formation of coal seams. Fossils of the coal measures. Botany of the coal-measure plants. Coalfields of the British Isles. Foreign coalfields. The classification of coals. The valuation of coal. Foreign coals and their values. Uses of coal. The production of heat from coal. Waste of coal. The preparation of coal for the market. Coaling stations of the world.

This book, by Mr. Tonge, although elementary in some details, is worthy the attention of students of coal mining. One of the most interesting chapters in the work is that dealing with "the preparation of coal for the market." Another chapter equally interesting treats of "the production of heat from coal." Included in this latter chapter are descriptions of the Lewis Thompson and the Parr calorimeters; sectional drawings showing the instruments in detail also accompany the subject matter. The most valuable illustrations, however, are the plates showing the many fossils and plants contained in the various seams.

THE GEOLOGY OF COAL AND COAL MINING. By Walcot Gibson. Pp. 341; illustrated. 5x7½ in.; cloth, \$2.50; New York, 1908: Longmans, Green & Company. London: Edward Arnold.

Contents: Varieties—chemical and physical characters. Coal as a rock. Formation and origin. Distribution. Fossils as zonal indices. Prospecting and boring. Study of an exposed coalfield. Study of a concealed coalfield. Coalfields of Great Britain, Southern Province. Coalfields of Great Britain, Midland Province. Coalfields of Great Britain—Northern Province, including Ireland. Coalfields of

Continental Europe. North American coalfields. Coalfields of Africa, India, Australia, and South America. Coalfields of China, Central Asia, Japan, New Zealand and Dutch East Indies.

It is becoming more evident to those engaged in coal mining that a thorough understanding of the geology of the various coalfields is of vital importance in the economical development of the different beds. It has always been recognized in metal mining that the geology of the field is one of the first points to be definitely understood; in coal mining, however, such work has generally been thought unnecessary in the preliminary plans for the development of a coal property. This book, prepared by Mr. Gibson, is deserving of the closest perusal by all those who are concerned with the economic development of coal seams and the practical application of geology to this end. The diversity of opinion with reference to the correct correlation of the various coal beds one to another would be largely dispelled if the superintendent and other practical coal engineers had a better understanding of the nature and characteristic features of the different seams. One of the best chapters in the volume under consideration is that dealing with "fossils as zonal indices." Although a large part of the volume is taken up with a study of the coalfields of Great Britain and Continental Europe, the descriptions given will be of interest to American readers.

The Virginia Geological Survey

The Virginia Geological Survey, recently established by the General Assembly of Virginia, with headquarters at the University of Virginia, is under the direction of a commission composed of Governor Swanson (chairman), President Alderman, of the University of Virginia; President Barringer, of the Virginia Polytechnic Institute; Superintendent Nichols, of the Virginia Military Institute, and Hon. A. M. Bowman, of Salem. At a recent meeting of the commission Dr. Thomas L. Watson, professor of economic geology in the University of Virginia, was elected director of the survey. Dr. J. S. Grasty, of the Maryland Geological Survey, was appointed assistant geologist, and Wm. M. Thornton, Jr., of the University of Virginia, chemist.

Work is in progress on the geology of the coastal plain region, including the underground water resources; cement and cement materials; topography and geology of the Virginia copper district; geology of the rutile deposits, and building and ornamental stones. The studies of the coastal plain geology and topographic mapping of the Virginia district are in cooperation with the United States Geological Survey.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

THE FLOTATION PROCESS LITIGATION

What is the present status of the litigation over the various patents pertaining to the flotation process of ore separation?

E. M. H.

A correspondent who is well posted in this subject sends us the following reply to the above inquiry:

Sulman & Picard vs. Wolf, May, 1905—This was an action by Sulman & Picard, inventors of an oil-gas flotation process against Wolf, inventor of an oil buoyancy flotation process, for fees claimed to be due from Wolf under an agreement in regard to professional work on Wolf's process. This case did not involve the validity of patents, nor the ownership of processes, but Justice Buckley, of the Chancery division of the English courts delivered an opinion in favor of the plaintiffs which contains an interesting discussion of the legal and technical merits of the various flotation processes.

British Ore Concentration Syndicate vs. Webster Ballot et al., Nov., 1907—This was a case in which the Elmore interests sought to recover damages from the defendants, who are also directors of Minerals Separation, Ltd., for an alleged non-fulfilment of contract. This action involved the ownership of the oil-gas flotation process, but had no direct bearing on the validity of patents. In the trial court the defendants (directors of Minerals Separation, Ltd.) won, but the British Ore Concentration Syndicate, Ltd. (the Elmore interests) appealed and the appeal court sent the case back to the lower court for retrial on the ground of insufficient evidence taken at the first hearing.

DeBavay vs. McQuisten, Jan., 1907—McQuisten applied for a patent in Australia for a process which made use of surface tension of liquids in a revolving tube. DeBavay, inventor of the process of that name, opposed the granting of the patent unsuccessfully.

Elmore vs. The Minerals Separation, Ltd., Dec., 1907—The Minerals Separation, Ltd., applied in Germany for a patent on its oil-gas flotation process, and the Elmore interests entered a strong opposition to the granting of the patent on the ground of lack of novelty and lack of ownership. The German patent office held that the idea sought to be patented was novel, and granted the Minerals Separation, Ltd., its patent with limitations. The Elmore interests appealed from this decision; the appeal is still unheard.

Potter vs. The Broken Hill Proprietary Company, Ltd., Feb., 1907—This was an action brought by C. V. Potter, inventor of an acid-flotation process against the Proprietary company for infringement by the use of the Delprat process. Justice a'Beckett delivered a voluminous judgment in which he discussed the merits of the two processes and decided against Potter. Potter appealed to the High Court of Australia, and before the appeal was decided on the merits of the case a compromise was effected. By this compromise Potter granted to the Proprietary company the right to use free his process throughout Australia. The Proprietary company assigned to the Potter company all the Delprat patents in Australia and paid the Potter company £10,000 in cash. Each party paid its own costs.

British Ore Concentrating Syndicate, Ltd., and Stanley Elmore vs. The Minerals Separation, Ltd., July, 1908—This was a case brought in London by the Elmore interests asking for "an injunction restraining the defendants, their servants, agents, and workpeople from importing into, selling, offering for sale, supplying, and using in this realm, ores or mineral substances treated by any one of the processes described and claimed, respectively, in the specifications of letters patent numbered 21,948, of 1898, and 6519, of 1901, of which the plaintiffs are the registered legal owners." The case was heard by Justice Melville, of the High Court of Chancery, who, after an inquiry lasting seven days, pronounced judgment on the 18th of July in favor of the defendants (Mineral Separation, Ltd.). In the course of a lengthy judgment the judge made the following statements: "It seems to me, therefore, that on giving what seems to me a perfectly fair construction of Elmore's specification, that is, that the essence of his invention is the making use of the known law of selection of oil with a view to obtain the carrying up of the particles by the oil to the surface, is a different thing from making use of the same law for the purpose of greasing the particles in a way which does not affect their specific gravity, and then making what I think is an ingenious use of the law of surface tension by agitation and enabling the particles to be carried up by the operation of air bells. I come, therefore, to the conclusion that with regard to the 1898 patent there has been no infringement by what the defendants have been doing."

After referring to the 1901 patent the judge concluded as follows: "I think, therefore, in that case, whether you take it that the patent is confined to the 1898 patent, or whether you take it generally, the defendants have not infringed, or they have infringed a patent which has no validity, and consequently no relief can be granted against them. I think, therefore, that the action fails, and must be dismissed, with costs."

DOES ELECTRIC LIGHTING UNDERGROUND PROMOTE IDLENESS?

Some time ago I read in the JOURNAL a note to the effect that an experienced mining engineer had stated that electric lighting underground tended to decrease the efficiency of the miners. This was a statement that surprised me very much. I should like to obtain, if possible, an explanation of it.

A. D. C.

We addressed an inquiry to the engineer responsible for the statement referred to above and received the following reply: "My own experience has been that a large underground chamber brilliantly illuminated tends to promote sociability among men. In one case, at Globe, Ariz., I went down the shaft and walked quietly into a huge chamber we had, which was brilliantly illuminated. Seated on a large pile of broken ore, in a semi-circle, were about 20 workmen, while perched on a boulder about 4 ft. higher up a man was reading the record of a prize fight by rounds. I entered the chamber unnoticed, and for some minutes was a member of the interested audience. However, when I joined in the applause, at the end of the eighth round, it seemed to take all the joy out of the occasion for the workmen. I only cite this as an instance of what is likely to happen wherever the men are able to distinguish clearly each other's features and to indulge in real sociability. Mind you, I do not consider that, in this case, laziness was the inciting cause for neglecting their work. If a man is lazy and simply wants to neglect his work, his opportunities in the dark are satisfactory; but workmen are gregarious animals, and the tendency toward visiting and social intercourse apparently is only developed when the illumination is sufficient to enable them to see the play of each other's features."

AMERICAN TARIFF ON METALS

What are the rates of duty on new and old metals imported into the United States?

I. S. R.

Pig iron, \$4 per ton. Scrap iron, \$4 per ton. Aluminum, 8c. per lb. Antimony, as regulus or metal, ¾c. per lb. Pig lead, including scrap, 2½c. per lb. Nickel, 6c. per lb. Quicksilver, 7c. per lb. Zinc in blocks or pigs, 1½c. per pound; in sheets, 2c. per pound; old and worn out, fit only to be remanufactured, 1c. per pound. Copper free.

LEAD ORE AND MOLYBDENUM ORE

Please inform me who are purchasers of lead ores; also of molybdenite.

C. M.

Lead ores are purchased by many smelting companies whose advertisements may be found in the JOURNAL. Molybdenite is purchased by the Primos Chemical Company, Primos, Delaware county, Penn., De Golia & Atkins, San Francisco, Cal., E. P. Earle, 31 Nassau St., New York, and Fried. Krupp, Essen, Germany.

Personal

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

Harvey S. Brown is foreman of the Mushett lease at Goldfield, Nevada.

A. F. Kuehn left New York Oct. 10 for Chile, South America, on professional business.

S. F. Shaw will be in Bodie, Cal., during the remainder of October and the month of November.

J. Philip Furbeck, mining engineer, of Chicago, Ill., is engaged in professional work at Benton, Wisconsin.

John Knox, chief mining captain of the Calumet & Hecla mine, has left for a visit to New York and Canadian points.

Allen H. Rogers, of New York, has left for Chile to examine mining property there. He will be absent until February next.

H. E. T. Haultain has been appointed associate professor of mining in the faculty of applied science of Toronto University.

A. D. Moffat, formerly superintendent of the Cactus mine, has been appointed manager of the Majestic Mines Company, in Beaver county, Utah.

Thomas H. Soddy has been appointed acting superintendent of motive power of the Calumet & Hecla mine, succeeding James D. Ramsay, resigned.

Cecil B. Smith has returned to Toronto from British Columbia, where he has been superintending the establishment of electric-power works at Nelson.

S. H. Worrel has resigned as manager of the Southern Mining Company, Urique, Chihuahua, Mexico, and will accept a position as instructor at the University of Texas at Austin, Texas.

James R. Thompson has resigned his position as manager of the Schlesinger mines on the Gogebic iron range, near Ironwood, Mich. Luther C. Brewer has been appointed manager in his place.

W. F. Hannes has resigned as superintendent of the smelter of the Mazapil Copper Company, at Saltillo, Mexico, and will move to the United States. Leslie C. Mott has been appointed his successor.

Cecil Pocock, formerly with the Santa Fé Gold and Copper Mining Company, has recently become general manager of the Montezuma Mines, Inc., with mines at Montezuma, Costa Rica, Central America.

George D. Stonestreet, formerly inspector of mines in South Africa, will have charge of the San Carlos mine, Ures district, Sonora. The company's headquarters are at Hermosillo, Sonora, Mexico.

W. H. Aldridge, general manager of the Consolidated Mining and Smelting Company, was in Cobalt recently, arranging

for the shipment of low-grade ores for treatment by the smelter at Trail, British Columbia.

T. Lane Carter, of Johannesburg, Transvaal, has been in the Lake Superior country, and recently gave a talk to the students of the Michigan College of Mines at Houghton, on mining practice on the Witwatersrand.

Cortlandt E. Palmer left New York Oct. 12 upon a tour of inspection of Pinguico, Peregrina, and Mexican Milling and Transportation Company properties at Guanajuato, Mexico, and of the Esperanza property at El Oro.

Theodore Douglas, president of the Douglas Copper Company, was married to Mrs. Amy Busby Lewis, at Greenwich, Conn., Oct. 7. After spending a few weeks in Massachusetts. Mr. and Mrs. Lewis will go to Fundicion, Sonora, Mexico.

A. N. Humphreys, Jr., who for the past year has been general superintendent of the three mines of the Bituminous Coal Company, at Coalville, Mont., has resigned his position with that company and gone to Philippi, W. Va., to develop a large tract of coal which he recently bought.

John Markle, the largest of the individual anthracite coal operators of Pennsylvania, who has been abroad for several months undergoing treatment by European oculists, has returned to his home in Hazleton, Penn. It is said that while the sight of one eye is practically gone, that of the other eye is much improved.

Obituary

Capt. John Addis died recently at Ipoh, Perak, Federated Malay States, aged 74 years. For many years he had been engaged in tin mining in the Malay peninsula; and he was the first one to introduce machinery in those mines. The first machine for washing tin alluvials was erected by him at the Tronoh mines. His name has long been a household word among the miners of Perak, and he had been interested in many mining concerns there conspicuous among them being the Tronoh mine. At the time of his decease he was largely interested in the Sungei Raia Tin Mining Company, of Melbourne, which company is erecting a large dredging plant on its property.

Societies and Technical Schools

Institute of Metals—The Interim Council of the Institute of Metals has appointed as permanent secretary G. Shaw Scott, who has a large scientific and practical knowledge of metals. The first general meeting of the institute will be held in Birmingham, England, Nov. 11. Papers or communications are expected from a number of persons.

Northern Colorado Coal Operators' Association—This association was organized at a recent meeting, at which all the operators in the district were represented. The association will represent the operators in the settlement of wage scales and of any disputes which may arise, besides devising methods of aiding the coal industry in the northern part of the State.

Leland Stanford University—A smelting plant of modern type, complete in all details but on a reduced scale, has been erected in the metallurgical department of Stanford University, Palo Alto, Cal., for the benefit of the students. An electric smelter of the type in use at the Pitt river iron mines has also been put in place so that experiments may also be made with it.

South Dakota School of Mines—The latest bulletin—No. 8—issued by this school at Rapid City, is a pamphlet of 56 pages on the cement resources of the Black Hills, including tests on cement made from Black Hills material. It is the joint work of C. C. O'Harra, M. F. Coolbaugh, M. A. Ehle, Jr., and Charles H. Fulton. It contains an account of the large supplies of cement material existing in the Black Hills, and is accompanied by maps and diagrams.

American Mining Congress, Utah Branch—The Utah branch of the American Mining Congress has been organized with D. C. Jackling, Samuel Newhouse, C. E. Loose, N. A. Dunyon, John Dern, E. A. Wall, James E. Talmage, David Keith and Duncan MacVichie as directors. An effort will be made to obtain the location of the national headquarters at Salt Lake and the construction of a mining temple building to cost about \$1,000,000, for the headquarters.

Pan-American Scientific Congress—The first meeting will be held in Santiago, Chile, beginning Dec. 25 next. These congresses have heretofore been exclusively Latin-American. For the first time the United States has been invited to participate. Any papers prepared here for presentation to this congress will be taken charge of by Calvin W. Rice, secretary, American Society of Mechanical Engineers, 29 West Thirty-ninth street, New York City, and should be forwarded to him.

American Mining Congress—At the recent convention of mining men in Denver, a committee was appointed to take measures for the organization of a Colorado branch of the American Mining Congress. This committee has been enlarged, and will make selection of a representative from each mining district in this State. A call has been issued for a meeting in the rooms of the American Mining Congress, at the Chamber of Commerce, Denver, on Oct. 14, and each mining company has been requested to appoint a mine operator to serve on the committee.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 7—No rains having fallen, the scarcity of water still continues in the mining regions of the State. The company which provides water for the Grass Valley and Nevada City mines, does the same for properties in Placer county so that many mines in both counties will have to remain idle for a time, or at best work on half time. About the same condition or affairs exists in other parts of the State.

Now that the city trustees of Sacramento are investigating the dredgers at work on the banks of the American river near Folsom the board of health of the same place is also taking a hand. The health officers declare that the water coming down the American and emptying into the Sacramento river is much muddier than it should be and that if this continues additional filtration facilities will have to be provided by the city.

The accidental discovery of phenomenally rich gold-bearing ore at the head of Rush creek, near Silver Lake, about 30 miles from Bodie, Mono county, has started a stampede into that district. The strike is on the same mineral belt, and about equi-distant from the old May Lundy and Mammoth mines which yielded largely. The character of ore is also similar to that taken from these mines. The country is a wild and mountainous one where there is no chance of obtaining accommodations of any kind. There is, however, plenty of timber and water, and it will be a good place for a permanent camp. Much rich float has been found, but thus far the mines are confined to the original discoveries. Some hundreds of men have gone into the new district.

The Keystone mine, at Amador City, Amador county, one of the oldest, if not the oldest, quartz mine in the State, and for many years owned by the Macdonald Brothers, has been placed under bond to Philadelphia men. The mine has been operated continuously for more than 50 years. No very great depth has been attained. Most of the paying ore has come from above the 600-ft. level, although the shaft is more than 1500 ft. deep on the incline. It is only a few miles from the Kennedy, now the deepest developed gold mine in the State and one of the most profitable.

The recent strike in the Oro Belle mine, at Hart, San Bernardino county, is of great importance to that camp and seems to assure more permanency than had been expected. Heretofore the small

rich shoots found have been lost at a depth of 50 to 100 ft., but the discovery of this orebody at more depth gives encouragement to others to sink deeper and find better ore.

The Fulton Iron Works, of this city, which has been actively conducting business here for the past 50 years, has closed down and is to sell its plant and its extensive real-estate holdings on the northern water front. There are some debts, but the assets are considerably over them, so there will be some dividends to stockholders. Losses on the burning of a steamship under repair, damages by earthquake and fire, and loss of business have led the directors of the concern to give up further work. They used to employ 900 men, but of late have had only 150 employees.

Goldfield, Nevada

Oct. 7—Thomas G. Lockhair, chief owner of the famous Florence Goldfield Mining Company, was arrested this week, but upon his arrival at the court house he gave a check for \$117,933.96 to the court, thus purging himself of contempt arising in his refusal to pay the sum as ordered. This sum, as has been already stated in this correspondence, represents money due the Little Florence Leasing Company from the sale of its ores which was withheld by the parent company for alleged breach of contract.

The reported suit by the minority stockholders against the management of the Florence Goldfield Mining Company and the application for a receiver are denied by Judge Lindley and officials of the company. There was a conference of the minority stockholders recently at which a request was framed addressed to the president of the Florence regarding the old and new leases on the company ground. These stockholders feel that the further extension of the leasing system by which the company receives only a 25-per cent. royalty is an injustice to them. Most of the leases on the Florence ground have proved bonanzas and have made many of the leasers wealthy. The fact remains that while the company itself has done no work underground, it has declared several dividends of 10c. per share; this money was derived entirely from royalties. This, although the company's mill, owing to extremely poor and faulty design, had to be partially torn down and entirely remodeled before it was completed.

The T. D. Murphy interests in the Com-

ination Fraction mine have been acquired by Nixon & Wingfield. This stock, in addition to the Myers stock, which was acquired some time ago, as noted in this correspondence, gives Nixon & Wingfield considerably more than control in the company. The new owners deny that the Combination Fraction will be amalgamated with the Consolidated group, but state that they have purchased the stock for themselves solely as an investment.

It is authentically stated that early in October a gasoline motor car patterned after those in use in the Southern Pacific interurban traffic will be run between Blair and Goldfield via Tonopah. This will make travel more convenient between the Silver Peak district with the Pittsburgh 100-stamp mill at Blair, Millers and its two big mills, Tonopah and Goldfield.

A suit for \$2249 has been filed against the Mohawk Extension Leasing Syndicate by E. A. Rathburn for services as superintendent and for money advanced by him to the company.

F. W. Nash and C. J. Callahan have been arrested in Los Angeles on warrants charging them with issuing to the stockholders of the Gold Bullfrog Mining and Milling Company false reports regarding the physical condition of the property. The complaint states that Callahan as consulting engineer prepared a statement which reported the existence of an orebody high in grade and another independent vein of great promise, together with subordinate veins and oreshoots; all this the complaint alleges is a misrepresentation, and that Nash, as secretary of the company, signed and promulgated the report.

The Engineers lease has received a bill from the Western Ore Purchasing Company for damages caused by the head of a single-jack in an ore shipment from the lease which caused trouble in the company's crusher.

A merger of the strongest north-end Comstock mines is rumored including the Consolidated Virginia, Ophir, Mexican, Union and Sierra Nevada.

Salt Lake City

Oct. 10—Several members of the board of directors of the Majestic Mines Company have recently completed an examination of the properties belonging to the corporation in Beaver county. Subsequently they announced that the financial affairs of the Majestic company have been practically straightened out and that operations on a large scale would be re-

sumed immediately. A. D. Moffat, formerly superintendent of the Cactus mine belonging to the Newhouse Mines and Smelters has been appointed manager of the Majestic company. At first mining will be confined to the Harrington & Hickory, a silver-lead mine. The Majestic company owns a smeltery near Milford; it is equipped with one lead stack and one copper furnace, but this smeltery would have to be overhauled extensively before it could run.

While the Utah Consolidated Mining Company has spent approximately \$100,000 in the past two weeks in exercising options and making the initial payment on smoke easements covering nearly 30,000 acres of land in Tooele county, no other steps have been taken toward the erection of a copper smeltery at the site near the town of Tooele. Possibly something may yet happen to prevent the Utah Consolidated from carrying out its plans to build the plant, for a local official of the American Smelters Securities Company states that the taking-up of the Tooele options was not to be taken as an absolute certainty that negotiations for a 5-year contract with the Garfield Smelting Company had been entirely broken off. "Matters have only been delayed," he said. The Garfield company does not desire any more competition in this region if it can be avoided so it probably will try very hard to make it uneconomical for the Utah Consolidated to smelt its own ores. Conditions underground at the Highland Boy mine belonging to the Utah Consolidated Company are reported to be very satisfactory and developments during the present year are said to have been of a highly gratifying character. The Highland Boy Gold Mining Company, the predecessor of the present Utah Consolidated company, was organized a little more than 12 years ago and has the distinction of being the builder of the first copper smelter in Utah. Dividends amounting to \$25.64 per share, or a total of \$7,692,000, have been paid by the company.

While the official report of the Utah Copper Company for September has not been sent out, advance information indicates that approximately 4,500,000 lb. were produced, yielding a net profit of \$225,000. The third quarterly report of the company will be mailed about Oct. 20.

The Wasatch-Utah Mining Company has been organized to take over the properties of the Consolidated Jefferson Gold Mining Company operating in the Big Cottonwood district. Frank Rumel, of Salt Lake is secretary of the new corporation. The property consists of 24 patented claims.

The mines of the Consolidated Mercur Gold Mines Company are in much better condition than last year for development work has been very gratifying. During the year considerable work has been done toward the opening of ground heretofore ignored. It is expected that the

company will return to a dividend basis before the end of the year.

Manager R. S. Oliver, of the Utah Apex Mining Company, recommends the erection of a 500-ton concentrating mill for the Utah Apex mine in Bingham, and the matter is now receiving attention from members of the board of directors. Forty tons of high-grade lead ore is shipped daily to the smeltery which brings a net profit of about \$750 per carload.

The Yampa smeltery, in Bingham cañon, is treating about 800 tons of ore daily, which comes mostly from the Yampa mine, resulting in approximately 1,000,000 lb. of copper monthly at a cost of from 7 to 8c. per pound.

The Tintic Smelting Company has been compelled to suspend the operation of its smelter temporarily. In a letter addressed to shippers asking them to withhold their ore for the time being, the lack of sufficient electric power is assigned as the reason for the shutdown. Others declare that some metallurgical troubles have been experienced. The plant had been in operation about six weeks and it will be at least a month before the furnaces are blown in again. The mines of the Tintic district that hold contracts with the company, are the Lower Mammoth, Colorado Beck Tunnel Consolidated, Dragon Iron, Ajax and Iron Blossom.

The copper production of Utah in September fell slightly under 8,000,000 lb. From the Garfield smelter the output was 6,450,000 lb.; Yampa smelter, 1,080,000 lb., and from the Independent smelter at Ogden, 200,000 pounds.

The Ontario Silver Mining Company, at Park City, has won an important decision in the Federal Court. In the controversy, title to the water flowing from the drain tunnel adit was involved. The Wasatch Irrigation Company, and others set up the claim that the driving of the adit had lessened the supply from which the defendants had obtained water for irrigation purposes. Judge Marshall held, however, that no evidence was introduced to prove that such was the case and, therefore, entered a decree in favor of the plaintiff. The Ontario adit was constructed about 18 years ago.

Information has reached here to the effect that the Ohio Copper Company has placed the balance of its unissued bonds, and that the money derived therefrom is now available to complete the 2000-ton mill and equip the mine for production on the basis indicated. It is stated that \$400,000 of the \$1,600,000 issue have been taken by shareholders of the company. These bonds are convertible into stock at par, \$10 per share.

A special meeting of shareholders of the Utah Development Company has been called for Oct. 19 at Portland, Me., at which time consideration will be given to the matter of disposing of the company's holdings in Bingham to the North Utah Mining Company for \$525,000, payment to

be made in stock of the North Utah company.

Butte

Oct. 8—According to a recent report issued by the Butte Mining Stock Exchange, the sales of stock on the exchange for the past nine months aggregated \$306,156.

At a conference held in Helena last week between the coal miners and operators of Montana a wage scale for two years was agreed upon and signed. The trouble arose about an attempt on the part of the mine owners to reduce the scale of wages on an average of from 10 to 25c. per day. By the new agreement the present wage scale will continue and no reduction will be made, thus averting all possibility of a strike.

Under the agreement between the old Davis-Daly Estates Copper Company and the underwriters of the new Davis-Daly Company stock, those holding the stock of the old company and who failed to pay the 50c. assessment due Oct. 1, have forfeited their rights to the new stock and are only entitled to 50c. in liquidation of their old stock. Since the underwriters receive no commission for their services, their profits will depend upon the failure of old stockholders to take advantage of the offer to purchase the new stock.

Denver

Oct. 10—Two new and important strikes are reported in the Cripple Creek district, one on Gold hill and one on Tenderfoot hill.

The Vindicator Consolidated Gold Mining Company has declared a dividend of \$45,000, payable Oct. 25. This brings the total amount paid to date to nearly \$2,000,000. The Portland Gold Mining Company has declared the regular quarterly dividend of 4c. per share, amounting to \$120,000, and making a total of \$480,000 paid this year. The deep workings of this great gold mine are reported to be better than ever.

The output of Cripple Creek for September is given at 67,313 tons, with a gross value of \$1,396,080.

The engineering enterprise known as the Central Colorado Power Company is offering \$2.75 per day for common laborers, with no takers. Orders for men to supply the construction gangs of the Denver, Northwestern & Pacific, the Denver, Laramie & Northwestern, and the Western Pacific are hard to fill. There is a dearth of labor in this State rather than a dearth of employment.

According to Daniel Guggenheim during his recent visit, the zinc smelter of the American Smelting and Refining Company, at Pueblo, is to be enlarged, and the facilities for handling the ore from all parts of the country much improved; this being the first resumption on an increased scale of any of the plants of that company.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

Copper Queen—The new underground electric-haulage system has been started, all the ore above the 600-ft. level being handled to the Sacramento shaft by motors and then hoisted, and the ore loaded into railroad cars by belt conveyers. The belt-conveyer system is running smoothly, handling 800 tons daily. In a short time practically the whole production will be handled at this shaft.

Superior & Pittsburg—A rich strike of high-grade oxidized ore has been made on the 1300-ft. level of the Hoatson shaft. The orebody has been cut for 100 ft. In a raise from the 1300- to the 1200-ft. level 35 ft. of good oxide ore was opened up. The shaft has been sunk to a depth of 1650 ft., which makes it the deepest in the camp. At present, a sump is being cut below the 15th level. The mine is looking extremely well, and more work is going on than at any time in the past. At the Junction, a number of rich but small orebodies have been encountered. The principal work at present is cutting a large pump station on the 1550-ft. level. Some ore is being shipped daily. The Cole shaft is producing steadily, its output being the third largest in the camp.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—The production for September was 1388 tons of copper.

California

CALAVERAS COUNTY

Hageman—This drift mine on the North fork of Calaveras river has been unwatered and will be bonded to Fox & Donner who are prospecting the Bay State ranch with a view to dredging it.

Petticoat—The cyanide plant at Railroad Flat has been removed to the Sheep Ranch mine where it will be used in working the tailings from the latter property.

EL DORADO COUNTY

Copper Hill—The report that ore shipments had commenced from this mine at Latrobe, owned by W. F. Detert is incorrect. The mine is still being developed the shaft being down 700 feet.

Garden Valley Mining Company—A gasoline engine is being put in to take the place of the present steam power and shaft sinking continues at this mine.

Douglas Mining Company—This company has been organized to work property

in Bear Creek district east of Georgetown and a new mill is to be started after the rains come. The directors are T. H. Douglas, M. B. Potter and O. G. Hopkins, of Sacramento.

INYO COUNTY

Four Metals Company—The new smelter of this company has commenced work on 2000 tons of ore and slag from the company's property at Cerro Gordo.

MARIPOSA COUNTY

Exchequer Mining Company—Dr. E. S. O'Brien, of Merced has been chosen secretary, and general manager of this company, Mr. Littlefield having resigned. The company is developing the old No. 5 mine near the Mount Gaines which they purchased some months ago. Machinery to be run by electric power is being installed.

NEVADA COUNTY

Black Bear Mining Company—At this property, Grass Valley district, J. H. English manager, a new 10-stamp mill is to be erected as well as a new hoist. Air compressors and drills are also to be installed. As soon as the new machinery is placed shaft sinking will be resumed.

RIVERSIDE COUNTY

German-American Mining Company—This company, F. C. Longnecker manager, is working three of its mines, the Texas Chief, Lone Star and Apex. The mines are 30 miles north of Indio, just south of the San Bernardino county line. A new and shorter wagon road is being opened.

SAN BERNARDINO COUNTY

Fremont Milling and Development Company—This company, near Barstow, is preparing to put up a mill, recent developments having proved plenty of ore in sight.

Oro Belle—Hart and Hitt, while drifting on the main tunnel, have opened up 3 ft. of high-grade ore.

SHASTA COUNTY

Mammoth Copper Company—This company, which has for some time been obtaining silicious ore from Salt Lake, has again agreed to treat 150 tons of ore daily from the Reid mine, at Whitehouse, or Old Diggings district.

SIERRA COUNTY

Bonded—A San Francisco company has bonded $2\frac{1}{2}$ miles of gravel ground on the east side of the Scales-Port Wine ridge, including the Hardscrabble, Poor Boy,

Belle Union, Bon Ton and Monitor claims. The Port Wine lead is supposed to pass through them all. Compressors and machine drills will be used to bore a 3000-ft. tunnel.

SISKIYOU COUNTY

California Consolidated Mining Company—This company, in Eddy gulch, owning the Mountain Laurel and Klamath mines, has the mines now in operation on a profitable basis. Concentrates are now being shipped.

TUOLUMNE COUNTY

Confidence—The shaft at this mine is being retimbered and electric power has been supplied to the hoist.

Dutch Mining and Milling Company—It is understood that the chief creditors of this company have secured an option on the property and expect to organize a company to work it.

Contention—This mine has been bonded and active operations will begin under superintendence of A. C. Morison.

North Star and Laura—W. G. Phillips has secured an option on these mines near Cherokee on the east belt, and will proceed to work them at once.

Colorado

LAKE COUNTY—LEADVILLE

Big Six—Drifting on the ore shoot, recently opened in this property, Breece Hill, is being carried north into Big Evans gulch. Development shows the presence of ore in pockets carrying gold, lead and silver. The lessees are shipping 60 tons per week.

Fanny Rawlins—An upraise has been started from the lower level on the orebody recently opened. The property, Breece Hill, is shipping 30 tons daily and some of the ore nets 8 oz. gold per ton.

Independence—A 6-ft. vein of ore was opened lately in a tunnel driven on the property, Twin Lakes; a streak, several inches wide, carries considerable free gold. This ore is being sacked. The balance of the vein matter is of medium grade which will stand shipping.

Emerald Group—A crosscut tunnel has been driven on this property, Delmonico gulch, during the summer and last week the vein was caught at a distance of 800 ft. from the portal; the breast of the tunnel is in ore and holds up to \$75 per ton, an ounce in gold and the balance silver, lead and copper.

Iowa Gulch—Howard Collins, operating

the Anona group, has taken a lease on the Gypsy, adjoining, and will work both claims from the Anona. Shipments are going out from the Anona.

Iron Silver—The work of installing electric power in all of the principal shafts of this company, Iron Hill, is pushed and another month should see the work completed.

Yak Tunnel—The monthly output from this property is in the neighborhood of 10,000 tons, the bulk of which is sent to the mill. In addition to the regular shipments of ore the company is doing a great deal of development work on the trend of the tunnel. The breast of the tunnel is now well into Little Ellen hill and will reach Resurrection No. 2 shaft by the first of the year.

Dinero Tunnel—On account of the heavy flow of water from the breast no work has been done for the last 10 days; the bulk of the water comes from the old workings, and until they are drained the tunnel will not be driven ahead, or any exploration done in the orebody opened. The water is so heavily impregnated with sulphuric acid that it cannot be used in the boilers, so a pipe line will be run into the tunnel 2000 ft. to tap a natural spring of pure water that will be used for steaming and household purposes.

Manhattan—A tunnel is being driven on this property, Twin Lakes, and is in 250 ft., at which point a vein 14 ft. wide was encountered; a 5-ft. streak next to the hanging-wall is rich in gold. Work will be continued during the winter and the owners will probably erect a mill next spring to treat the part of the vein which is of low grade.

Bartlett Tunnel—This property is situated about a mile north of the Dinero, and is shipping steadily from the 2000-ft. mark; the ore is a sulphuret, running high in silver. Several veins have already been cut and will be developed during the winter. The Dinero vein trends to the north, and the Bartlett tunnel will be driven ahead to catch it.

Sunday Tunnel—Ground is being broken at the rate of 12 ft. every 24 hours, and by the beginning of the year it is expected that the Sunday vein will be cut. Before that time several veins will be caught and developed.

Favorite—The recent strike in this claim, South Evans gulch, has turned into a good body of ore 18 ft. high by 6 ft. wide, and shipments are being sent out regularly; the ore carries gold with a fair percentage of lead. To the north the Valley is shipping steadily and developing the ore horizon opened at the 650-ft. level.

Star of the West—This property, Iron Hill, continues to ship a high-grade iron ore at the rate of 30 tons daily; development work is being pushed.

Mosquito Range—John G. Morgan, who owns a number of acres of ground ad-

joining the London, has started work and is sinking a new shaft on a promising vein.

Idaho

SHOSHONE COUNTY

Snowstorm—The company will pay a dividend of \$45,000 on Oct. 20, 3c. a share the first dividend disbursed this year.

Bunker Hill & Sullivan—This company has declared its regular monthly dividend for September, a total of \$75,000. This is the one hundred and thirty-third dividend, making a total for this year of \$705,000, and a grand total disbursed by the present management of \$10,515,000.

Federal Mining and Smelting—This company has started two suits in the Federal court against the Bunker Hill & Sullivan company to quiet title to orebodies within the plane of the end lines extending of the Overlap and the San Carlos lode claims. An accounting will be demanded for the ore already taken from the land in dispute. No restraining order has yet, or will be asked for. This is the commencement of a battle royal in the Cœur d'Alenes between these two companies.

Rex—This company will be allowed to ship ore from its property on Nine Mile. Its affairs have been tangled by litigation for some time past.

Sherlock Placer Claims—A deal for the purchase of these grounds located at the head of the St. Joe district is under way; a number of New York capitalists are endeavoring to close the matter up with the owner, Peter Sherlock, of Wallace.

Silver Cliff—At the annual meeting held in Wallace, the following officers and directors were chosen: President and manager, James D. Young; vice-president, A. Honeker; secretary-treasurer, Ed. C. Young; directors, Edward Godfred and Dr. J. A. McLaughlin. The affairs of the company are regarded as highly satisfactory. Work will be continued all winter.

Indiana

GREENE COUNTY

Water is now being hauled from the Linton water works to the mines in the Linton district to feed mine boilers. In some instances water is hauled a distance of seven miles. There is not a mine belonging to the Vandalia Coal Company in this field that does not now depend absolutely on Linton city water to supply the boilers. The nearest mines have been connected by pipes, but to the more distant mines water is hauled in cars and a special train is kept busy supplying the mines.

SULLIVAN COUNTY

The mine belonging to the Carlisle Coal Mining Company caught fire Oct. 3 and has since been burning fiercely. The

mine is full of smoke and a number of miners are idle on account of the fire.

Kansas

CHEROKEE COUNTY—GALENA

Murphy—O. W. Sparks and J. C. Moore have made a rich strike of ore in their mine in Galena Heights on the Jas. Murphy 40 acres.

ALLEN COUNTY—IOLA

Lanyon—This company has announced that it will reopen eight blocks of its zinc smelter at Iola.

Michigan

COPPER

Atlantic—A crosscut driven from the south drift at the 15th level of section 16 shaft has cut the lode, which has the same appearance as at the 12th and 13th levels; from this point of intersection drifting both north and south will be started and the lode at this depth fully exposed. The shaft is sinking close to the 18th level, and preparations are about completed to begin opening up for the lode at the 16th level. This property is gradually rounding into shape to enter the producing list.

Lake—Preparations are about completed to resume sinking below the second level, 300 ft. from the surface. The faces of the drift both north and south from the shaft at this point show the same characteristic mineralization. The high-duty hoisting engine, recently purchased from the Champion mine, has been delivered and the foundations have been started.

North Lake—This company has started to put down a sand pipe on the site of the first drill hole. The overburden at this point is estimated to be about 200 ft. thick. Operations for the present will be confined to diamond drilling, and two complete cross-sections of the tract are to be plotted.

Wyandot—Diamond drilling continues at this property, and the drill is nearing the approximated point of intersection of the lode. The crosscut from the 700-ft. level of the exploratory shaft is in about 250 ft., and has entered a softer formation; consequently, greater headway will now be made. This crosscut will have to be driven at least 800 ft. before it will encounter the lode.

Seneca—The new shaft is down more than 100 ft., and good progress is now being made. The surface equipment is being put in shape for the winter so that operations will not be interfered with.

King Phillip—A crosscut from the ninth level of No. 1 shaft has cut the lode and found it well charged with copper. At depth a more consistent showing is being made in the character of the formation. No. 2 shaft is sinking at a depth of nearly 400 ft., and a crosscut has been driven to the lode at the 4th level. The levels in these shafts are laid out on the same

horizontal plane as the Winona, with which they will eventually connect.

Missouri

ZINC-LEAD DISTRICT

Alladin—This mining company at Spring City made one of the richest strikes of jack made in the district for some time in driving an air drift. The first shot put in exposed the ore which assays about 64 per cent.

Boston-Aurora—This company has struck 20 ft. of rich jack at 72 ft. depth on its land at Aurora.

Duvall—Carlock, Williams & Hamby have leased 40 acres near Granby on the Duvall land on which they found a dump 20 years old containing 100 tons of rich jack. This was mined when prices were too low and transportation lacking.

Luke—W. J. Briggles has started sinking a shaft on the Luke land west of Joplin in the sheet-ground district. The ore is found at the 180-ft. level and a 20-ft. face of ore averaging nearly 15 per cent. has been struck in a drill hole; 11 drill holes have been put down on the 20 acres.

Coöperation Mining Company—This company has filed papers of incorporation for \$50,000. The stockholders are C. W. Munson, J. W. Boydfield and T. P. Burns, all of Joplin.

Cameron—This company has let the contract for a 250-ton mill on the Dr. Boyd land at Sarcocite.

Granby—J. H. Yonkin has leased the old Hill Top 40 acres at Oranogo and is developing it.

Granby Mining and Smelting Company—This company is prospecting the James Trent land at Granby and has five drills at work.

Merry Widow—This company is drilling a 10-acre lease east of the Osyka, on Turkey creek, east of Joplin, and is reported to have struck good ore.

Montana

BUTTE DISTRICT

Copper Eagle—While sinking the shaft at about the 350-ft. mark a 2-ft. vein of ore was encountered carrying 300 oz. silver and considerable gold. A drift is being run on the vein from the shaft. The same orebody was cut on the 250-ft. level. It is probable that sinking will continue for another 50 feet.

Tuolumne—The foundation for the new boiler plant has been completed. The new first-motion Nordberg hoist will probably not be installed until next spring. On the 1000-ft. level drifting is in progress.

Butte & Superior—The shaft has reached a depth of 1280 ft. It is stated that the shaft will be sunk to the 1600-ft. mark before any further cross-cutting is done.

During the past week deeds have been filed for record transferring to the company portions of the Niagara, Laura and Enterprise lode claims.

North Butte Mountain—Work has been started on the contract for the sinking of a 500-ft. shaft. James E. Higgins, of Butte, is in charge.

Badger State—The shaft on this property of the Boston & Montana Company has reached a depth of over 600 ft. The North Butte company has drifted upon its Jessie vein practically to the end lines of the Jessie claim and it is thought that the Jessie vein will be found in the Badger State.

FERGUS COUNTY

Barnes-King—The company's net earnings for the month of August were \$7000.

DEER LODGE COUNTY

Gold Coin—Operations have been resumed on this property, which is situated 20 miles west of Anaconda. The mill is running at full capacity.

Theodosia—This claim has recently been purchased by Levi Davis. A winze has been started in the tunnel on the property and is now down 50 ft., at which point water has been encountered in sufficient volume to necessitate the installation of a pump.

Milwaukee Gold Extraction Company—Forty men are employed at the mill and in the mine where much development work is being carried on.

JEFFERSON COUNTY

Montana Consolidated—At the company's Comet mine, located in the Basin district, 60 men are employed. The shaft is down 1000 ft. Regular shipments are being made to the smelter at East Helena, and it is expected that by the end of the present month the mill on the property will be completed and the concentrates will also be shipped. The company owns the Hope, Gray Eagle, Deer Lodge, and Alta claims.

Boston & Corbin—The company has decided to install a new first-motion hoist good for a depth of 2000 ft. Superintendent Emerson is securing estimates for an entire new surface plant.

MISSOULA COUNTY

Monitor—On the 400-ft. level of this property a large body of chalcopryite ore has recently been discovered. Its extent has not as yet been determined.

BEAVERHEAD COUNTY

New Departure Mining Company—The board of directors has recently made a report to the stockholders. The statement shows an outstanding indebtedness of \$10,569. To meet this deficit two remedies are suggested—either the sale of treasury stock, or the levying of an assessment.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Output—Production of the Goldfield mines for last week amounted to 2236 tons valued at \$282,075, not including \$16,000 from the Kinkead mill, obtained by re-treating concentrates from the Combination mill. The Combination mill treated 630 tons of ore from the Consolidated mines. The Nevada Goldfield Reduction Company treated: From the Combination Fraction, 243 tons; Consolidated Red Top, 99; Mohawk Jumbo, 26; Baby Florence, 19; Florence Annex, 6; Little Florence, 64; Black Butte Bonanza, 70; Begole Syndicate, 176 tons. The Western Ore Purchasing Company handled: From the Baby Florence, 47 tons; Consolidated Red Top, 126; Engineers Lease, 419; Mohawk Jumbo, 25; Florence Consolidated, 376; Kinkead concentrates, 12; dump ore, 4 tons.

Zinn Florence—The 126-ft. level is being pushed toward the Florence Consolidated oreshoot. The drift on the 180-ft. level is now within a few feet of the Baby Florence side-line.

Old Kaintuck Goldfield Mining Company—The shaft on the Economist claim, which is 200 ft. deep, is being retimbered preparatory to sinking the shaft to a depth of 400 feet.

St. Ives Leasing Company—The oreshoot on the 50-ft. level that was lost has been picked up about 50 ft. south of the old workings; high-grade ore is being sacked from this level.

Florence Consolidated—A large air compressor, machine drills, and an electric hoist are being installed. A spur from the Tonopah & Goldfield railroad is being built to the company's ore-bins. When these improvements are completed the present output, 50 to 75 tons a day, will be doubled.

Consolidated Jumbo—The shaft is now 275 ft. deep. The crosscut on the 250-ft. level has been driven 190 feet.

Mushett—On the 480-ft. level of this lease on the Miss Jessie claim of the Laguna a new shoot of rich ore has been found. The shoot has been followed for 30 ft.; the ore averages about \$75 per ton.

ESMERALDA COUNTY—LIDA

Lida Queen—This property has been bonded to Philadelphia men who have installed a 10-stamp mill equipped with Wilfley tables and Frue vanners.

ESMERALDA COUNTY—HORNSILVER

Great Western Mining Company—Shipments to the Belmont mill at Millers have begun. Some ore has also been sent to a San Francisco laboratory for testing as the company is considering the erection of a mill. The ore developed in the mine is approaching the quantity justifying this expenditure, and the present expensive wagon and railroad haul make a mill a necessity.

Granite Mountain Mining Company—This company has the deepest workings of the four companies operating on the big dike about 3 miles from the Nevada Empress. The main vertical shaft is 500 ft. deep.

ESMERALDA COUNTY—RAWHIDE

Diamondfield-Jack-Davis Placer—Nine shafts have been sunk on the 500 acres of this company; the pay streak is 80 ft. wide and 4 ft. thick. The gravel stands well without timber and averages \$7 per yard free gold in addition to the black sand concentrates, which amount to 60 lb. per yard; the black sand assays over \$2500 per ton.

Rawhide Coalition—Hoisting plants are being installed at the Townsite and Hooligan leases on the Coalition property; hoists have been ordered for the Burns and Marigold leases. When these four are installed the Coalition company will have in operation on its property, 19 out of a total, in the district, of 40 hoists.

Rawhide Consolidated—A shipment, consisting of 30 tons, was made last week from the Big Four lease on Consolidated ground; the ore averaged \$300 per ton. This ore came from the high-grade shoot recently found at the 100-ft. level.

HUMBOLDT COUNTY—NATIONAL

National is a new camp, which is attracting considerable attention among Nevada operators. It is located 60 miles north of Winnamucca, the nearest railroad point. The first discovery of ore was made Aug. 8; since then some remarkable surface showings have been found.

HUMBOLDT COUNTY—SEVEN TROUGHS

Mazuma Hills—At the mill the last clean-up representing a run of 13 days amounted to \$15,000. The adit is now 700 ft. long.

LYON COUNTY—YERINGTON

Nevada Douglas—The drift on the 650-ft. level has broken into a fine body of copper sulphide. This is the same ore-body which was developed for over 500 ft. on the 550-ft. level.

LYON COUNTY—BUCKSKIN

Kennedy Consolidated—This company has started operations with a crew of 30 men. The shaft, which is 120 ft. deep is being sunk rapidly. Only ore from development work is being taken out.

Albany Copper—Work has been resumed on the Albany after a long shut-down, and this low-grade copper deposit will be actively developed.

NYE COUNTY—TONOPAH

The Tonopah mines last week produced 5741 tons of ore having an estimated value (shipping ore calculated at \$60 per ton and milling ore at \$25 per ton) of \$146,675. Tonopah Mining Company mined

3150 tons of ore; Belmont, 700; Montana Tonopah, 1001; Midway, 100; MacNamara, 350; West End, 150; Jim Butler, 200; Tonopah Extension, 90 tons.

Montana Tonopah—Last week the mill crushed 100 tons of ore; this is the largest weekly tonnage treated at this mill.

Tonopah Extension—Henry Krumb has submitted his report to the stockholders; it verified the reports of the company's president and general manager and is a vindication of the management.

Tonopah Mining Company—The Mizpah shaft was sunk 15 ft. during the week; no change has been noticed in the dacite formation.

Belmont—Big orebodies are being opened up below the 1000-ft. level, thus proving that the ore goes to great depth. One of these orebodies is north of the famous Mizpah fault, which is proof of the existence of ore in a section which had been supposed by some to be barren. This vein has already been opened up by the west drift for over 150 ft. on the north side of the Mizpah fault, and there is now exposed in the underhand stopes 4 ft. of the richest ore in the mine. A station is now being cut for a hoist. The winze on the main vein from the 1000-ft. level is approaching the point from which crosscutting will begin. This winze has been in ore for over 100 feet.

WHITE PINE COUNTY—WARD

Nevada United Mines—Eight 4-horse teams are hauling ore from Ward to Ely for shipment to the Salt Lake smelters. The ore comes from the 180-ft. level of the new shaft, and is a lead carbonate carrying 40 to 50 per cent. lead and about 6 oz. silver. The vein is 20 ft. wide; the ore is rich enough to ship without sorting.

New Mexico

GRANT COUNTY

Comanche—This company which went into bankruptcy a few weeks ago has paid almost all its debts.

Hachita District—There is considerable excitement due to the discovery of tellurium ores in paying quantities in this district. Three properties are now taking out shipping ore, and a townsite has been laid out by Camp & Ish, of Hachita.

Tyrone Copper Company—It is reported that on claim No. 2 in the town of Tyrone, good copper carbonate ore has been cut by the diamond drill at a depth of 185 feet.

Whiteside Exploration Company—At the Golden Link group of mines in Wilcox district, it is reported that rich gold ore has been discovered.

Pennsylvania

The commission to revise the mining laws of Pennsylvania has held its final session in Pittsburg. Manufacturers and those interested in mining machinery were

heard at this session. The commission will present its report to the legislature, which meets next January.

ANTHRACITE COAL

United States Commissioner of Labor Charles P. Neill, has been appointed umpire to settle certain points of dispute between the Delaware & Hudson Company, and some of its employees, the Conciliation Board being deadlocked over the question at issue.

Philadelphia & Reading Coal and Iron Company—This company is installing rescue apparatus of the helmet type at all its collieries. The device is equipped with a tank of oxygen to supply the wearer for two hours. The directors of this company have abolished the office of first vice-president, held by the late Thomas M. Richards, and created the office of vice-president and general manager. W. J. Richards, who has been second vice-president, has been elected to this position.

BITUMINOUS COAL

Pittsburg-Buffalo Coal Company—This company is increasing its capacity, and has plans for extensive additions to its plants. When its new town of Mariana is completed it will have one of the finest independent coal and coke plants in this section. Three shafts have been sunk and plans are ready for 1000 coke ovens. This is merely a start on what may prove to be one of the largest coal and coke plants in the vicinity of Pittsburg. The property of the company is situated in Washington and Greene counties on the verge of what is known as the Pittsburg district; it adjoins the great Vesta mine of the Jones & Laughlin Steel Company.

Philippine Islands

BENGUET

Benguet Consolidated Mining Company—In July this company produced 205 oz. gold, besides 366 lb. cyanide bullion, valued at \$6588.

Paracale Dredging Company—This company's return from its dredge at Paracale in July was 779 oz. gold.

CEBU

Insular Coal Company—This company, according to the *Far Eastern Review*, is making progress in developing its property on Cebu island, and the management expects to have an output of about 100 tons a day within six months. The coal is now being supplied to the vessels calling at Cebu. The railway connecting the mines with Danao, the terminal of the Philippine railway in Cebu is to be completed soon.

Tennessee

CAMPBELL COUNTY

Jelico—A strike of about 300 union miners is on at the Wooldridge company's

coal mine at Wooldridge. The company refused to employ miners other than men who are tenants of its houses. The miners claim that this is a violation of the contract with the union. The company's proposal that the question be submitted to arbitration was refused by the miners' union. President Lewis will decide the dispute.

Wisconsin

PLATTEVILLE ZINC DISTRICT

Empire—The old mine is improving to the east, where the former management thought the ore pinched out. The mill is making 30 to 40 tons of concentrates daily and a second roaster is being installed. Its central electric power plant is proving a great coal saver. A dividend of \$4 has just been declared on the old stock.

Mitchell Hollow—This mine is erecting a mill that is being moved from the adjoining lease of the Royal mine.

Carson—The mill has been completed and will start soon.

Platteville Separator Company—The company has completed its repairs and alterations, after a month's shutdown. It has been treating 60 tons a day, but expects to raise the capacity to 100 tons. It is now marketing iron pyrites as a by-product that assays 44 to 45 per cent. sulphur.

Sunset—This mine has been taken over and reorganized as the Union Zinc Company.

Calamesis—This mine is still sinking its shaft where the water is unusually heavy, requiring two 16-inch Cornish pumps and a 12-in. Cooke pump.

Forcite—The mine has been equipped with a pair of 16-in. lift pumps and has again begun shaft sinking.

Bureau Mining Company—The company is building a mill that formerly operated at the old Ida mine, at Benton.

Canada

ONTARIO-COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Oct. 3 were as follows: Coniagas, 63,400 lb.; Chambers-Ferland, 61,800; City of Cobalt, 191,600; Drummond, 60,000; La Rose, 253,390; McKinley-Darragh, 121,200; Nipissing, 176,900; O'Brien, 127,700; Silver Queen, 63,000; Townsite, 40,000; Temiskaming & Hudson Bay, 240,000. Total 1,398,990 pounds.

Chambers-Ferland—The new ore house for shaft No. 2 is nearly completed. A 5-drill air-compressor has been purchased from the O'Brien mine and it is expected that 13 drills will soon be in operation. More than 155 ft. of drifting has been done at the 100-ft. level of No. 1 shaft.

Cobalt Central—A contract has been let for 2000 ft. of diamond drilling.

Crown Reserve—The crosscut at the 100-ft. level has been driven for 80 ft. to the north; its course will be changed to the east and will run down the center of the lake in order to tap No. 7 and No. 9 veins from the Kerr Lake mine.

Little Nipissing—On Oct. 9 a promising 6-in. vein of solid smaltite was discovered on the corner of the property adjoining the Temiskaming & Hudson Bay and Right of Way locations.

Nancy Helen—A rich strike has been made at the 100-ft. level 160 ft. north of the main shaft, where the vein is 4½ in. wide and rich in native silver.

Nova Scotia—At the 140-ft. level of the main shaft a little way in the crosscut, a vein formerly encountered has widened from 3 to 6 in. to 2 ft. The ore is very rich. The company will shortly erect a concentrating mill with a capacity of 100 tons daily.

Coniagas—A nugget of almost pure silver, weighing about 100 lb., was taken out recently at the 75-ft. level.

Kerr Lake Mining Company—The annual report gives the output during the year at 1,473,712 oz. of silver produced from 528 tons of ore, of which the gross value is \$787,554. The cost of production exclusive of the cost of surface plant, and including all the developments of the mine shows a total of \$139,530, leaving a net profit of \$648,023. The average gross value of ore per ton was \$1491. The cost of producing an ounce of silver was 9½ cents.

Nipissing—A gang of 100 men has been trenching and new veins when discovered have been marked and left for future working. The company has more than 100 veins, but is operating only about half of them at present.

Peterson Lake—A force of 20 men is employed on surface and development work. Diamond drilling has disclosed a promising orebody.

Red Rock Mining Company—At a meeting held Sept. 28, it was decided to go into liquidation, the company having liabilities of \$10,000 and no assets. The company is capitalized at \$1,000,000, and the stock was all issued.

Right of Way—At the end of the drift at the 70-ft. level a 4-in. cross-vein has been struck which carries 4000 oz. silver to the ton.

Silver Queen—This mine is having the ore on its dump treated at the Muggleby concentrator. At No. 3 shaft, 1000 ft. southwest of the main shaft, a 12-drill compressor and two 100-h.p. boilers have been installed.

University—In continuing the sinking of No. 3 shaft, which was down 22 ft. when operations were abandoned, two 2-in. stringers were found carrying 4054 oz. silver to the ton. They are in the conglomerate near a granite dike.

Arrangements have been made with the Shamrock to supply power for working No. 3 shaft.

Victoria Mine—A valuable discovery was made recently in a shallow pit about 50 ft. from No. 3 shaft, where five calcite stringers were found running parallel, and ranging from 1½ to 2 in. wide. They all carry native silver.

Mexico

CHIHUAHUA

Bullion Shipments—Recent bullion shipments passing through the Chihuahua branch of the Banco Minero include the following: Dolores Mines Company, 92 bars gold-silver, valued at 160,550 pesos; Lluvio de Oro, 8 bars gold-silver, 16,000 pesos; Watterson, 11 bars, 25,000 pesos.

Parral Output—The production of the Parral camp for the week ending Oct. 3 was 8460 tons, of which 5460 tons were treated at local mills and the balance sent to outside smelters. Increased shipments will be recorded during the month from the Hinds Consolidated and Minas Tecolotes properties.

Rio Plata—This company recently sent out from its Santa Barbara mine in the Guazapares district two carlots of silver-carrying concentrates of a value of 71,642 pesos.

Oxnam Prospecting Company—Important development work is being prosecuted at this company's Guerra al Tirano mine in the western part of the State. Percy J. Holmes is in charge.

Greene Gold-Silver—Reports emanating from both New York and Mexico City indicate that a new holding company with adequate funds is in process of organization to take over the properties of this company, as well as of the Sierra Madre Land and Lumber Company at Madera. It seems assured that the Greene interests will not remain in control. The company with mines and reduction works at Ocampo and Concheño and the Sierra Madre Land and Lumber Company, owning immense timber tracts in this and adjoining States, and a 250,000 daily capacity sawmill at Madera are both heavily in debt, but it is conceded that they can be made profitable enterprises. The bankruptcy of these concerns has put a damper on mining in this State and has handicapped industrial and mercantile enterprises generally. The funds derived from the sale of merchandise and machinery for the payment of wages are in control of Governor Enrique Creel since the misappropriation on the part of the trustee was alleged. The wages of the Mexicans have been settled in full, but there are still large sums due Americans and other foreigners. Judge A. B. Fall is still acting as the personal representative of Col. W. C. Greene and as attorney for both companies in all transactions.

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. 16—There seems to be a better feeling in the coal trade in the West, though actual progress is slow. There is more inquiry for steam coal, and the domestic demand is increasing, in consequence of cooler weather. While there is no special incident in the trade, more confidence is expressed.

The long drought is being felt by the Ohio and Indiana mines, as well as in Pennsylvania. In Indiana, especially, the operation of mines has been interrupted by short supply of water. The river trade of the Pittsburg district is at a standstill, no shipments down the Ohio having been made for an unusually long period.

In the East the coal trade is quiet and without any special feature, though the Coastwise trade is showing an improvement. Anthracite production in September was better than in August, but is still below that of last year.

The miners of the anthracite region are holding a convention this week. It is probable that some decision will be made as to the demands to be made when the present working agreement expires.

The Pocahontas Coke Company, it is stated, has closed a contract for 150,000 tons of coke to be delivered to the Algoma Steel Company at Sault Ste. Marie, Ont. Deliveries will extend over a year or more.

The appeal in the Shaleen case to the United States Supreme Court has been decided by default, the appellant in the case not putting in an appearance. This leaves the Pennsylvania miners' certificate law in force, in accordance with the decision of the State Supreme Court.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct. 3, in short tons:

	1907.	1908.	Changes.
Anthracite.....	4,296,066	3,826,497	D. 469,569
Bituminous.....	29,627,357	24,837,307	D. 4,790,050
Coke.....	10,693,281	5,168,371	D. 5,524,910
Total.....	44,616,704	33,832,175	D. 10,784,529

The total decrease this year to date was 24.2 per cent.

Coal receipts at Boston, nine months ended Sept. 30, reported by Chamber of Commerce:

	1907.	1908.	Changes.
Anthracite.....	1,535,009	1,274,144	D. 260,865
Bituminous.....	2,446,340	2,425,336	D. 21,004
Total domestic.....	3,981,349	3,699,480	D. 281,869
Foreign.....	403,458	289,850	D. 113,608
Total.....	4,384,807	3,989,330	D. 395,477

The foreign coal is chiefly from Nova Scotia, with a little from Great Britain.

Anthracite coal shipments in September were 5,211,047 long tons, being 611,953 tons more than in August, but 301,670 tons less than in September, 1907. For the nine months ended Sept. 30 the total shipments were, in long tons:

	1907.	1908.	Changes.
Reading.....	10,308,070	8,827,388	D. 1,480,682
Lehigh Valley.....	8,571,590	8,049,249	D. 522,341
N. J. Central.....	6,469,784	6,181,431	D. 288,353
Lackawanna.....	7,719,669	7,341,801	D. 377,868
Del. & Hudson.....	4,907,552	4,704,767	D. 202,785
Pennsylvania.....	4,560,018	4,386,946	D. 173,074
Erie.....	5,355,118	5,424,335	I. 69,217
N. Y., Ont. & West.	2,023,528	2,104,171	I. 80,643
Total.....	49,915,329	47,020,088	D. 2,895,241

Only two companies—the Erie and the New York, Ontario & Western—increased their shipments this year; all the others show smaller tonnages than last year. The total decrease was 2,895,041 tons, or 5.8 per cent.

New York

ANTHRACITE

Oct. 14—Prepared sizes are active and in fair demand both in the all-rail and tide-water trades. Among the small steam sizes buckwheat No. 2 or rice is in better demand than the other sizes. Schedule prices are \$4.75 for broken, and \$5 for egg, stove and chestnut. Small steam prices are: Pea, \$3.25@3.50; buckwheat No. 1, \$2.35@2.50; buckwheat No. 2 or rice, \$1.60@2; barley, \$1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

There seems to be a stronger demand in nearly all quarters except New York harbor. In the far East and along the Sound the demand has picked up and consumers are beginning to call for coal. In the interior, not reached directly by the main lines, an increased demand is also felt. In New York harbor there is little improvement and good grades of coal fetch \$2.50@2.65; poorer qualities sell around \$2.40. Transportation is good and there is no scarcity of cars.

In the Coastwise vessel trade rates are firm although unchanged from last week. Rates for large vessels from Philadelphia are: Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Portsmouth and Bath, 60@65c.; Newburyport, Gardiner and Bangor, 65@70c.; Saco, 90c.@\$1; Providence, New Bedford and the Sound, 45@50c. per ton.

Birmingham

Oct. 12—There is a constant addition to the force of men employed in the coal

mines and the output is improving. There are, however, a number of men waiting to be given employment in the coal mines in this State. The railroads are exerting themselves and so far there has been no complaint of a car shortage.

During the past week foreign mining experts, under the guidance of J. A. Holmes, of the Federal Bureau of Mines and Mining were in the Birmingham district looking over the collieries in this section of the country.

Other visitors to this district during the past week were members of the American Institute of Mining Engineers who held their annual convention in Chattanooga, Tenn. These gentlemen looked through some of the coal mines and at the steel and iron plants in the Birmingham district.

Chicago

Oct. 12—Domestic coals continue to find increasing sale, the average retailer and consumer having apparently decided that it is good policy to lay in an early stock. The movement of such coals is not large yet, however. Steam coals are still sluggish, though aided somewhat by the approach of winter conditions and by increasing railroad consumption. The market is fairly free from forced sales to escape demurrage, on nearly all coals, smokeless run-of-mine being the chief exception. Occasionally the market becomes overstocked with western coals, notably screenings, but this condition does not last long and there is no chronic depression of prices from this cause as in former years.

Lump and egg from Illinois and Indiana mines finds a steadily better market because of the increase in demand for domestic coal; car prices remain \$1.85@2.25. Run-of-mine is not quite so strong at \$1.65@1.75, and screenings are weak at \$1.20@1.40. Brazil block is steady at \$2.25@2.35.

Hocking is in better demand and firm at \$3.15. Pittsburg No. 8 has a fair sale at \$2.75@2.85 for 3/4-in. Youghiogheny moves chiefly on contracts, in fair amount at \$3@3.15. Smokeless is firm as to lump and weak as to run-of-mine, lump being scarce and readily sold at \$4.20@4.30 and run-of-mine \$3.05@3.45.

Anthracite finds increasing demand in both city and country, with nut coal in largest requirement.

Indianapolis

Oct. 13—Indications that the mining conditions in Indiana are returning to their

normal state were apparent during the past week. The railroads decreased the number of their idle coal cars by 50 per cent. and the growth of coal traffic has been perceptible. The operators say although orders are somewhat irregular, owing largely to varying weather conditions in different sections, nevertheless substantial progress has been made.

The Indiana Railroad Commission has been upheld by the court in its effort to enforce its joint rate order. The Southern Indiana and the Big Four railroads could not agree between themselves as to the division of joint rates. The result was that the Southern Indiana refused shipments of coal which were to be transferred to the Big Four road, and the latter refused to take shipments from the Southern Indiana. The Commission brought suit to compel the roads to accept shipments at the joint rates fixed by the commission and the court sustained the commission by issuing an order to compel the railroads to obey the orders.

Pittsburg

Oct. 13—Production in the Pittsburg district shows no increase and prices continue nominally on the basis of \$1.15 a ton for mine-run coal at the mine. Slack seems to be a trifle firmer at 50c. a ton at mine. The Pittsburg-Buffalo Company, which until this season has been disposing of its Lake coal through the Pittsburg Coal Company, has entered into a long term contract with the M. A. Hanna Company for all of its surplus coal. It will go to the northwestern market.

Connellsville Coke—The coke trade is unchanged. A few new contracts are being taken occasionally, and prices remain practically the same on contract; furnace coke quoted at \$1.65@1.85 and foundry at \$2.10@2.25. Lower prices may be secured for prompt shipment. The *Courier* in its weekly report gives the production in both fields at 199,074 tons. Shipments amounted to 7680 cars as follows: To Pittsburg, 3188; to points west of Pittsburg, 4009; to points east of Connellsville, 483 cars.

Foreign Coal Trade

Nova Scotia Coal Shipments—Shipments from Nova Scotia mines, eight months ended Aug. 31, long tons:

Companies:	1907.	1908.	Changes
Dominion	2,110,222	2,251,846	I. 141,624
Nova Scotia Steel ..	404,877	424,644	I. 19,767
Acadia	202,045	223,948	I. 21,903
Cumberland	213,409	247,082	I. 33,673
Inverness	154,150	172,943	I. 18,793
Intercolonial	181,571	171,368	D. 10,203
Total	3,266,274	3,481,131	I. 214,857

All the companies but one show increases. The total gain was 6.6 per cent.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 3: Best Welsh steam, \$3.78; seconds, \$3.54;

thirds, \$3.30; dry coals, \$3.60; best Monmouthshire, \$3.30; seconds, \$3.12; best small steam, \$1.92; seconds, \$1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 14—The market continues to be in great part a waiting one; neither buyers nor sellers are disposed to be active. This condition seems likely to prevail for at least a month yet. Buying of finished material is only fair, and is mainly in small lots for immediate necessities. The only department at all active is structural steel. Several good contracts have been taken for buildings, and others are under negotiation. From the quotations made by fabricating companies, it is evident that prices are being cut by the mills, though they deny that they are doing so. The railroads are still out of the market for rails and other work. Upon the whole, the market must be called a dull one.

In pig iron not much business has been done. There is some call for basic iron, but it is not urgent. In foundry iron the only people who have been buying more than small lots are the pipemakers, who seem to have considerable work on hand. Foundry stocks are generally light, but there is no disposition to increase them at present.

L. M. Bowers, it is reported from Denver, has been chosen treasurer of the Colorado Fuel and Iron Company; he also succeeds R. C. Clowry as a director of the company. The change is important, as Mr. Bowers is understood to represent the Rockefeller interest, while Mr. Clowry was a Gould representative.

Pig Iron Production—Reports from the furnaces on Oct. 1 show 188 coke and anthracite stacks in blast, having a total weekly capacity of 337,900 tons; an increase of 26,800 tons over Sept. 1. Taking the estimate of the *Iron Age* and making allowance for the charcoal furnaces, the production of pig iron in the United States in September was approximately 1,435,000 tons; for the nine months ended Sept. 30 it was 10,951,000 long tons.

Baltimore

Oct. 12—Exports for the week included 895,300 lb. steel billets to Liverpool and 479,015 bales tin scrap to Rotterdam. The imports included 6100 tons manganese ore from India, and 5800 tons iron ore from Cuba.

Birmingham

Oct. 12—There appears to be just enough activity in the pig-iron market in the Southern territory to warrant a good feeling and confidence. There is very little buying being done by consumers outside of the home territory. Quotations hold strongly, the furnace companies not seeing any reasons why concessions

should be made. The minimum price for pig iron quoted in this section is \$12.50 per ton, No. 2 foundry, with \$13 per ton as the maximum. The sales for delivery during the balance of the year take care of considerable of the probable make.

Alabama is given credit for 128,425 tons of pig for September. The largest previous month's production was in July when 124,870 tons were made. The output at the furnaces this month promises to be larger. One furnace had gone into blast already this month and two will start up this week.

A number of hands have been laid off at the steel plant at Ensley, of the Tennessee company. The official statement is made that the conditions are only temporary and have no significance whatsoever.

The rolling mills of the Tennessee company at Bessemer, near here, are again to resume operations this week. This will give employment to about 250 men. These mills have resumed operations and closed down again three times in the past two months.

Chicago

Oct. 12—Very little business is being done in the iron market, the attitude of melters and furnace agents alike being a waiting one. The uncertainty of political results is most commonly given as the cause for hesitancy, but in addition to this the revival of business is slow. Melter buy only as much iron as they can see a clear disposition of within the next 30 to 90 days; most orders, indeed, are confined to 1907 deliveries. Inquiries for deliveries next year are not numerous nor are they for large quantities. Under such conditions it is difficult to say at what price any good-sized order for future delivery could be placed. For hand-to-mouth business standard quotations are \$13 Birmingham (\$17.35 Chicago) for No. 2 Southern, and \$16.50 for No. 2 Northern, but these are cut as much as 50c. on desirable orders. Such business as is being done is chiefly with Northern furnaces, whose increased output has made their iron promptly available.

Business in nearly every line of iron and steel products is holding its own, though the volume of trade is not large and orders for the future are scarce. Coke is firm at \$4.90 for the best Connellsville, with the demand light but steady.

Cleveland

Oct. 12—Shipments of iron ore from the Lake Superior region for the season to Oct. 1 were as follows:

	1907.	1908.	Changes.
Escanaba	4,473,417	2,006,192	D. 2,467,225
Marquette	2,342,149	871,107	D. 1,471,042
Ashland	2,722,331	1,521,146	D. 1,201,185
Superior	5,571,918	2,264,443	D. 3,307,475
Duluth	9,406,283	6,201,121	D. 3,205,162
Two Harbors	6,043,108	3,766,951	D. 2,276,157
Total	30,559,206	16,630,960	D. 13,928,246

Total decrease this year was 45.6 per cent. The shipments in September were

4,646,024 tons. Notwithstanding the light shipments, the stock on lower Lake docks at the close of the season will be very large.

Philadelphia

Oct. 14—The pig-iron industry is in better shape than a month ago. So far as eastern Pennsylvania furnaces are concerned it is held down to a certain extent by Central Pennsylvania and by Virginia furnaces. The scramble for business continues. Buyers who are obliged to be particular as to brands are favoring Lehigh and Schuylkill furnaces. At present there is call for some of the cheaper makes. Most of those who use special brands are fairly well supplied for the rest of the year. The range of prices is wider than for months. Orders with one or two exceptions, are small. Forge iron is extremely dull. No. 2 is \$16@17; forge, \$16; basic about the same.

Steel Billets—Small orders came in this week at full prices and inquiries came to hand for large blocks of billets from buyers who are sounding the market with a view to 30-day options.

Bars—Everything drags, manufacturers are impatient. Buyers who ordinarily at this season order freely are taking hand-to-mouth lots. Best refined bars delivered are 1.50c.

Sheets—The week has developed an enlarging demand for both early and later delivery, but the orders are small. Sheets are going into consumption better than for months, but there is no present disposition to make contracts ahead.

Pipes and Tubes—There is a further moderate improvement in shop work.

Plates—A source of encouragement is the repairing activity recently stirred up. None of the orders placed last week were large. Local demand for small lots is better.

Structural Material—One feature this week is the appearance of orders to furnish material ordered months ago. The amounts are not large but the disposition to complete old contracts is encouraging. Considerably more activity prevails in structural plants.

Rails—Agents in South America are keeping in close touch with railroad prospects there and report favorably to Pennsylvania rail makers of large contracts.

Scrap—Dealers either have in stock or have control of large quantities of material which they are holding at prices which forbid more than hand-to-mouth purchases.

Pittsburg

Oct. 13—There are no signs of an early improvement in the iron and steel trade. A number of inquiries have been received for late delivery in several important lines, but these are merely for the purpose of getting options and may not result in business. Some orders have been

received, particularly for structural material, but all are contingent on the result of the election. The only new business placed for any finished product is for small lots, and in most instances the prices must be shaded to get these little orders. There is no material change in new business and the mills in this district are running at about the same capacity as a week ago, the National Tube Company leading, its operations being around 70 per cent. The American Sheet and Tin Plate Company is not doing so well and the officials will not admit that its plants in both sheets and tinplate are running to more than 50 per cent. of capacity. The sheet mills, however, are doing a trifle better than the tinplate mills, and there is no reason to doubt that the company is maintaining its regular prices, the cutting of rates being done by the independent mills. Shading also is reported in plates and structural material; iron and steel bars are unchanged as prices are now at the bottom. This was shown at the bi-monthly average last month. While the "official" price of bars is uniform at 1.40c. the result of the examination of the sales sheets for two months indicated that 1.35c. is being done by the large producers. No particular significance is attached to the action of the Carnegie Steel Company in giving notice of a readjustment of wages at all of its plants on Jan. 1. This has been customary for both the company and employees, but often when the notice is given there is no change and at some times the readjustment meant a slight advance for the workmen.

Pig Iron—There really are no prices for pig iron and it is now classed as a "consumers' market." Producers and dealers are ready to sell Valley iron at almost any price, although quotations remain practically unchanged. The only important inquiry this week is from the Allegheny Steel Company and calls for 5000 tons of basic iron for delivery this year. It is believed someone will take the order at between \$14 and \$14.25, at furnace, possibly at the lower figure. The United Steel Company, Canton, Ohio, came into the market last week for 12,000 tons of basic iron for delivery during the first and second quarters of next year. Furnaces hesitate about quoting so far ahead. Some are inclined to quote \$14.25 for first quarter on about 6000 tons, but do not care to take a chance on the larger tonnage. Of the 21 merchant furnaces in the two valleys 13 are in operation this week. Pig-iron prices are nominally as follows: Standard bessemer, \$15; malleable bessemer, \$14.50; basic, \$14.25; No. 2 foundry, \$14.50; gray forge, \$13.50, all f.o.b. Valley furnaces. These prices, however, may be shaded.

Steel—There is a little inquiry for crude steel, but no sales of any consequence. Bessemer and open-hearth steel continue at \$25. Pittsburg. Tank-plate

prices remain on the basis of 1.60c., but some shading is done. Merchant steel bars remain at 1.40c.

Sheets—But little change outside of the cutting of black sheets about \$1 a ton and galvanized \$2 a ton. The regular price remains on a basis of 2.50c. for black and 3.55c. for galvanized for No. 28 gage.

Ferro-Manganese—There is but little doing and prices continue at around \$45. Pittsburg.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the eight months ended Aug. 31, are valued by the Bureau of Statistics of the Department of Commerce and Labor at \$129,400,247 in 1907, and \$105,258,962 in 1908; a decrease of \$24,141,285. Leading items of export in long tons:

	1907.	1908.	Changes.
Pig Iron.....	54,031	26,452	D. 27,579
Billets, ingots & blooms.....	59,044	80,015	I. 20,971
Bars.....	65,501	37,860	D. 27,641
Rails.....	218,570	138,787	D. 79,783
Sheets and plates.....	86,066	67,162	D. 18,904
Structural steel.....	90,039	81,910	D. 8,129
Wire.....	103,850	90,081	D. 13,769
Nails and spikes.....	40,661	26,730	D. 13,931

The only increase this year was in billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, into the United States for the eight months ended Aug. 31, are valued at \$28,795,578 in 1907, and \$13,407,611 in 1908; a decrease of \$15,387,967. Leading items of exports, long tons:

	1907.	1908.	Changes.
Pig iron.....	420,117	56,941	D. 363,176
Scrap.....	22,563	3,262	D. 19,291
Ingots, blooms, etc.....	10,374	6,653	D. 3,721
Bars.....	27,039	14,316	D. 12,723
Wire-rods.....	12,674	6,653	D. 6,021
Tinplates.....	43,243	49,078	I. 5,835

The only increase shown here is that in tinplates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the eight months ended Aug. 31 are reported as follows, in long tons:

	1907.	1908.	Changes.
Exports.....	112,755	140,562	I. 27,807
Imports.....	865,657	424,963	D. 440,694

Imports of manganese ore, 124,611 tons in 1907, and 119,255 in 1908; decrease, 5356 tons.

Foreign Iron Trade

British Iron Trade—Exports of iron and steel and their products from Great Britain for the eight months ended Aug. 31 valued by Board of Trade returns as follows:

	1907.	1908.	Changes.
Iron and Steel, £31,988,221	£25,381,994	D. £6,606,227	
Machinery.....	20,534,224	20,791,607	I. 257,383
New Ships.....	7,014,164	5,981,915	D. 1,032,249

Total..... £59,536,609 £52,155,516 D. £7,381,093
Total quantities of iron and steel, 3,602,035 long tons in 1907, and 2,779,528 in 1908; decrease, 822,507 tons.

Imports of iron and steel, and of machinery into Great Britain for the eight months were:

	1907.	1908.	Changes.
Iron and steel. £	4,515,769	£ 4,877,406	I. £ 361,637
Machinery....	3,706,498	3,373,675	D. 332,823
Total.....	£ 8,222,267	£ 8,251,081	I. £ 28,814

Total quantities of iron and steel, 580,071 tons in 1907, and 688,574 in 1908; increase 108,403 tons.

German Iron Production—The German Iron and Steel Union reports pig iron production in August at 935,445 tons, which is 75,325 tons less than in July. For the eight months ended Aug. 31 the total make was, in metric tons:

	1907.	1908.	Changes.
Foundry iron....	1,473,339	1,486,623	I. 13,284
Forge iron.....	526,878	451,592	D. 75,286
Steel pig.....	676,627	632,989	D. 43,638
Bessemer pig....	319,116	269,402	D. 49,714
Thomas(basic) pig	5,601,504	5,155,330	D. 446,174
Total.....	8,597,464	7,995,936	D. 601,528

Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. The total decrease this year was 7 per cent.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Oct. 14.

At all U. S. Ports in August and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1908..	\$ 6,597,101	\$ 4,257,255	Exp. \$ 2,339,846
" 1907..	4,596,879	3,223,772	" 1,373,107
Year 1908..	64,960,348	33,614,330	" 31,346,018
" 1907..	48,375,977	28,103,201	" 20,272,776
Silver:			
Aug. 1908..	4,130,853	3,194,426	Exp. 936,427
" 1907..	6,748,085	4,882,622	" 1,865,463
Year 1908..	34,576,144	27,375,355	" 7,200,789
" 1907..	41,922,336	30,665,458	" 11,256,878

Exports of specie from New York week ended Oct. 10: Gold, none; silver, \$876,222, to London and Paris. Imports: Gold, \$128,421, chiefly from Cuba; silver, \$96,400, from Mexico and Central America.

Specie holdings of the leading banks of the world, Oct. 10, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	\$306,469,500
England.....	\$184,690,015	.....	184,690,015
France.....	651,275,820	\$178,917,565	830,193,385
Germany.....	185,670,000	76,765,000	262,435,000
Spain.....	78,675,000	167,270,000	245,945,000
Netherlands....	38,849,000	20,106,000	58,955,000
Belgium.....	20,640,000	10,320,000	30,960,000
Italy.....	185,185,000	22,500,000	207,685,000
Russia.....	602,005,000	35,560,000	637,565,000
Aust.-Hungary..	243,075,000	64,080,000	307,155,000
Sweden.....	20,955,000	.....	20,955,000
Norway.....	8,145,000	.....	8,145,000
Switzerland....	23,165,000	.....	23,165,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Treasury estimate of amount and kinds of money in the United States on Oct. 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury).....	\$ 185,690,399	\$ 615,955,118
Gold certificates.....	36,378,105	805,667,764
Silver dollars.....	201,835	75,064,147
Silver certificates.....	12,364,058	475,843,942
Subsidiary silver.....	21,746,013	124,024,077
Treasury notes of 1890..	16,191	4,750,809
U. S. notes.....	5,490,551	341,190,465
Nat. bank notes.....	39,829,288	635,783,039
Total.....	\$301,706,440	\$3,078,299,361

Population on Oct. 1 estimated at 87,852,000; circulation per capita, \$35.04. Total circulation Oct. 1 was \$892,453 more than on Sept. 1; and \$272,444,987 more than on Oct. 1 of last year.

Gold and silver movement in France, eight months ended Aug. 31:

	Imports.	Exports.	Excess.
Gold....	Fr. 634,711,000	F. 16,969,400	Imp. Fr. 617,742,000
1907..	310,870,000	83,723,000	Imp. 227,147,000
Silver..	108,499,000	119,418,000	Exp. 10,919,000
1907..	118,582,000	121,659,000	Exp. 3,077,000

Silver Market

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver.		Oct.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
8	4.8650	51%	23 1/8	12	4.8650	51%	23 1/8
9	4.8700	51%	23 1/8	13	4.8650	51%	23 1/8
10	4.8675	51%	23 1/8	14	4.8650	51%	23 1/8

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The silver market has remained very steady, and without special feature, closing at 23 13/16d. bid in London.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 1:

	1907.	1908.	Changes.
India.....	£9,116,254	£7,324,168	D. £1,792,091
China.....	.....	516,400	I. 516,400
Straits.....	625,950	112,385	D. 513,565
Total.....	£9,742,204	£7,952,948	D. £1,789,256

Imports for the week were £7000 from Mexico and £139,000 from New York; £146,000 in all. Exports were £441,250 to India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

Oct.	Copper.			Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
8	13% @13%	13% @13%	59 1/2	29 1/2 @4.40	4.40	4.75	4.60
9	13% @13%	13% @13%	59 1/2	29 1/2 @4.45	4.45	4.75	4.60
10	13% @13%	13% @13%	59 1/2	29 1/2 @4.45	4.45	4.75	4.60
12	13% @13%	13% @13%	59 1/2	29 1/2 @4.45	4.45	4.77 1/2	4.62 1/2
13	13% @13%	13% @13%	59 1/2	29 1/2 @4.45	4.45	4.77 1/2	4.62 1/2
14	13% @13%	13% @13%	59 1/2	29 1/2 @4.40	4.40	4.80	4.65

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 quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market remains essentially unchanged, but while the optimistic feeling among the producers still exists, there appears to be more willingness to make concessions upon such important business as offers. Domestic manufacturers are getting more orders but they are still using supplies previously bought and have not yet come into the market in a general way. More or less the same conditions prevail in Europe, but some considerable quantities are reported to have been sold for export thither. During the week, Oct. 8-14, domestic business was done at about 13 3/4c., while sales for export have been made at prices netting about the same or a little less, with some tendency to shade prices further at the close. The market closes at 13 3/8 @ 13 5/8c. for Lake and 13 1/8 @ 13 3/8c. for electrolytic in ingots, cakes, and wire bars. The average for casting during the week has been 13 @ 13 1/8c.

The lowest bids for about 2,000,000 lb. of copper required by the U. S. Government, opened on Oct. 14, were 13 3/8c. for Lake copper, and 13 1/2c. for electrolytic, these prices being for the metal delivered at various navy yards throughout the country, and navigated to be equivalent to about 13 1/2c., cash, New York for Lake and 13.3c. for electrolytic.

The London market for standard copper has been very dull, fluctuating within narrow limits. It closes at £59 3/4 for spot and £60 5/8 for three months. Refined and manufactured sorts we quote: English tough, £63 1/2; best selected, £62 1/2 @ £63 1/2; strong sheets, £74 1/2 @ £75 1/2.

The American Smelting and Refining Company is to sell the copper of the Nevada Consolidated and Cumberland-Ely companies under contract with those companies.

Exports of copper from New York and Philadelphia for the week were 5546 long tons. Our special correspondent states the exports from Baltimore for the week at 687 tons.

Manufactured Copper—Sheets, cold-rolled, 19c. per lb.; hot-rolled, 18c. Copper wire, 14 3/4c. base carload lots at mill.

Tin—The London market under heavy transactions suffered a decline, no doubt brought about by the closing out of a bull account. The contango between spot and three months tin is getting larger again, and stands now at almost £2. The close is cabled at £132 1/8 for spot and £134 for three months.

Business in the domestic market was confined among dealers, who traded in fairly large quantities. The market closes at about 29 1/2c. for spot, October and November deliveries.

Shipments of tin from the Straits in September are cabled as follows: United States, 545; Great Britain, 2765; European continent, 845; total, 4155 long tons, an increase of 250 tons over September of last year.

Visible stocks of tin Oct. 1, in long tons:

	In Store.	Afloat.	Total.
Great Britain.....	8,391	4,088	12,479
Holland.....	1,808	183	1,991
U. S., exc. Pacific ports.....	2,159	1,480	3,639
Total.....	12,358	5,751	18,109

The total was 852 tons more than on Sept. 1, and 5611 tons more than on Oct. 1 last year.

Arrivals of tin at Atlantic ports for the first half of October are reported at 1105 long tons.

Lead—The pressure to sell Missouri lead continues. The market has been weak and declining, and closes at 4.35@4.40, New York, and 4.20@4.25c. St. Louis.

The London market for Spanish lead is £13 6s. 3d., and for English lead £13 8s. 9d., the squeeze for spot lead reported last week having been relieved meanwhile.

Spelter—Consumption of this metal appears to be increasing, and more business was reported this week. The market closes strong at 4.80@4.85c., New York, and 4.65@4.70c., St. Louis.

The London market is unchanged at £19 12s. 6d. for good ordinaries, £19 17s. 6d. for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is stronger both in New York and abroad. There are few offerings and cheap lots of the metal have disappeared. Quotations are 8¼@8½c. for Cookson's, 7¾@8¼ for Hallitt's and 7½@7¾c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Some foreign metal is reported as offered at lower prices.

Cadmium—In 100-lb. lots, \$1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 40@50c., New York.

Quicksilver—New York price is at \$46 per flask for large lots; small orders depend on size and condition. San Francisco nominal, about \$43 for domestic orders, and \$41 for export. London price is at £8 10s. per flask, but £8 9s. is done with jobbers.

Platinum—While leading interests continue to ask \$20 per oz., refined platinum is still offered at lower prices, and business can be done at \$16@18 per oz. The market is inactive and uncertain, and dealers, hesitating to commit themselves, will accept the metal for sale only on commission.

Missouri Ore Market

Joplin, Mo., Oct. 10—The highest price paid for zinc ore was \$39.50, on an assay base price of \$37 per ton of 60-per cent. zinc. A \$37.50 base price was made on three cars of 60-per cent. zinc. The

greater bulk of sales were made on a \$36.50 base, while considerable ore sold as low as \$36 base. Zinc silicate sold on a base of \$18 per ton of 40-per cent. zinc, the highest price being \$24.50. The average price, all grades, was \$33.26 per ton.

Lead sold as high as \$55 per ton, though the ruling prices were \$53 to \$54 per ton. The average price, all grades, was \$52.38. With the higher offering some of the producers who have been holding their lead ore for two or three weeks put it upon the market greatly enlarging the shipment of this mineral, especially in proportion to the reduced sales of zinc ore. Some producers declined the offerings on zinc ore, but the purchasing agents claim they secured all the ore wanted on the prices offered.

Following are the shipments of zinc and lead ore from the district for the week ended Oct. 10:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.....	2,785,970	843,260	\$70,362
Joplin.....	1,801,070	289,760	40,179
Galena.....	689,110	124,770	14,807
Spurgeon.....	486,170	110,600	9,907
Granby.....	762,990	40,500	9,875
Alba-Neck.....	424,060	9,680	8,853
Badger.....	361,970	.....	6,605
Quapaw.....	387,890	.....	6,399
Miami.....	501,770	.....	6,020
Aurora.....	372,970	.....	5,863
Duenweg.....	155,500	113,380	5,696
Prosperity.....	114,820	80,320	4,152
Oronogo.....	192,260	4,210	3,625
Carthage.....	130,270	.....	2,409
Zincite.....	132,970	.....	2,325
Sarcoite.....	55,950	.....	977
Stott City.....	38,250	.....	716
Totals.....	9,433,990	1,596,480	\$198,770

41 weeks.....391,611,190 59,526,300 \$8,253,683
Zinc value, the week, \$156,944; 41 weeks, \$6,608,805
Lead value, the week, 41,826; 41 weeks, 1,644,878

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	\$46.90	\$37.60	\$45.84	\$35.56	\$83.58	\$46.88
February.....	48.30	36.63	47.11	34.92	84.58	49.72
March.....	49.75	36.19	48.66	34.19	82.75	49.90
April.....	49.25	35.40	48.24	34.08	79.76	52.47
May.....	46.90	34.19	45.38	33.39	79.56	56.06
June.....	47.00	33.06	44.82	32.07	73.66	60.48
July.....	46.80	34.55	45.79	31.67	58.18	59.90
August.....	44.56	36.53	43.22	33.42	59.54	60.34
September.....	41.00	37.43	40.11	34.44	53.52	54.59
October.....	41.75	.....	39.83	.....	51.40	.....
November.....	38.60	.....	35.19	.....	43.40	.....
December.....	31.50	.....	30.87	.....	37.71	.....
Year.....	\$44.36	.....	\$43.68	.....	\$68.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Wisconsin Ore Market

Platteville, Wis., Oct. 10—This week \$37.50 was the highest price paid for zinc ore on a basis of \$36.50@37 per ton of 60 per cent. zinc. One choice car of lead brought \$55.50 per ton; the base price paid for 80 per cent. lead varied from \$52.50 to \$54 per ton.

Shipments for the week ended Oct. 10:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	1,013,200	70,000	160,000
Benton.....	454,848	96,400	.....
Hazel Green.....	317,350	.....	.....
Cuba City.....	182,450	88,700	.....
Livingston.....	160,000	.....	.....
Harker.....	154,470	.....	.....
Galena.....	136,300	.....	.....
Highland.....	120,200	59,950	.....
Days Siding.....	105,000	.....	.....
Linden.....	63,170	.....	.....
Mineral Point.....	41,030	.....	.....
Total.....	2,748,018	305,050	160,000
Year to Oct. 3.....	77,198,819	8,375,575	2,048,504

In addition to the above there was shipped to the electrostatic separator, at Platteville, from Livingston, 58,000 lb.; from Benton, 235,732 lb.; from Days Siding, 183,000 lb.; from Linden, 113,550 lb.; from Potosi, 148,000 lb. Shipped to the Joplin Separator Works, at Galena, from Rewey, 48,000 lb.; from Benton, 85,400 lb. Shipped to the Enterprise roaster, at Platteville, from Strawbridge, 264,600 lb. zinc concentrates.

Chemicals

New York, Oct. 14—The general market is quiet and business is not active. Prices, as a rule, are steady and buyers are holding off for the time being.

Copper Sulphate—The market is quiet and buyers seem to be waiting for some decided change in the metal situation. Prices are unchanged at \$4.65 per 100 lb. for carloads and up to \$4.90 for smaller lots.

Nitrate of Soda—The situation is firmer and higher prices prevail. There is considerable buying abroad, especially by Germans. Prices are 2.12½c. for spot and 2.15c. for the rest of 1908. For 1909 the quotations are 2.15@2.20c. Dealers are looking for higher prices.

Phosphates—Shipments of phosphate rock from Charleston, S. C., in September are reported by Paul C. Trenholm, as follows: Coastwise 1060 tons; by rail 5725; total, 6785 tons.

Mining Stocks

New York, Oct. 14—There has been a gradual improvement in the general stock market this week, based upon no special conditions except that the war scare on the European bourses is passing over, and the excited selling of American securities there has almost ceased. The better tone prevailing here now, which has sent up leading stocks, is apparently based on little else. The public is still very much out of the market.

On the Curb business has been active, especially in the low-priced shares. Cobalt stocks were in some demand, and Nevada stocks sold better than for some time. Coppers were fairly active, Nevada Consolidated and Miami being the leaders.

Boston

Oct. 13—Mining shares have been both weak and strong at times. The strength

of Arizona Commercial, Boston & Corbin and Old Dominion and the weakness of Utah Consolidated have been the special features in trading. Arizona Commercial touched \$35, and the convertible bonds made a high record at \$145. Profit-taking in the stock clipped off \$2.50 of the price. Boston & Corbin rose \$2.75 to \$18.75 on speculative buying, although the price has not reacted much. Old Dominion rose \$3.12 1/2 to \$46.12 1/2 on favorable reports, holding most of the advance. The receipts sold for \$1 on the Curb. Utah Consolidated sold off \$3.50 to \$39.50, with the close \$40.50 tonight. The smelting controversy has brought rather free offerings of the stock. It is estimated that New York interests have reduced their stock holdings in this company very materially the past year. Franklin sold up \$1 to \$13. A special meeting of this company has been called for Nov. 16 when stockholders will be asked to consider an increase in the capital for the purpose of purchasing adjoining lands. Negotiations are said to be in progress for disposing of the old Franklin mine and mill site.

Amalgamated slid off \$3.75 to \$7.25, but has recovered the loss. Adventure is off \$1.25 to \$7.37 1/2 on light offerings, Atlantic, \$1.25 to \$17. Copper Range has varied from \$73 to \$74.50, and North Butte went off \$3.25 to \$79.50, rallying to above \$83.

On the Curb, Superior & Boston rose almost \$2 to \$10.50 on buying for Western account. The general offices of the Davis-Daly company have been removed from this city to New York.

N. Y. INDUSTRIAL table with columns: Name, Price. Includes items like Am. Agri. Chem., Am. Smelt. & Ref., Am. Sm. & Ref., Bethlehem Steel, Colo. Fuel & Iron, Federal M. & S., Inter. Salt, National Lead, National Lead, Pittsburg Coal, Republic I. & S., Republic I. & S., Sloss-Shoefield, Standard Oil, U. S. Red. & Ref., U. S. Steel, U. S. Steel, Va. Car. Chem.

BOSTON CURB table with columns: Name, Price. Includes items like Ahmeek, Black Mt., East Butte, Hancock Con., Keweenaw, Majestic, Raven, Shawmut, Superior & Pitts., Troy Man.

ST. LOUIS Oct. 10 table with columns: Name of Com., High, Low. Includes items like Adams, Am. Nettle, Center Crk, Cent. C. & C., C.C. & C. pd., Cent. Oil, Columbia, Con. Coal, Doe Run, Gra. Bimet, St. Joe.

LONDON Oct. 14 table with columns: Name of Com., Clg. Includes items like Dolores, Stratton's Ind, Camp Bird, Esperanza, Tomboy, El Oro, Oroville.

NEVADA STOCKS. Oct. 14. Furnished by Weir Bros. & Co., New York.

NEVADA STOCKS table with columns: Name of Comp., Clg., Name of Comp., Clg. Includes sections for COMSTOCK STOCKS, BULLFROG STOCKS, MANHATTAN STOCKS, MISCELLANEOUS, and COLO. SPRINGS.

STOCK QUOTATIONS

STOCK QUOTATIONS table with columns: NEW YORK, BOSTON, Name of Comp., Clg. Includes items like Alaska Mine, Amalgamated, Anaconda, Bataklala, British Col. Cop., Butte & London, Butte Coalition, Colonial Silver, Cum. Ely Mining, Davis Daly, Dominion Cop., Douglas Copper, El Rayo, Florence, Foster Cobalt, Furnace Creek, Giroux, Gold Hill, Goldfield Con., Granby, Greene Gold, Greene G. & S., Greenw'r & D. Val., Guanajuato, Guggen. Exp., Hanaph, McKinley Bar, McInaac, Mines Co. of Am., Mitchell Mining, Mont. Sho. C., New Utah M. & S., Newhouse M. & S., Nipissing Mines, Old Hundred, Silver Queen, Stewart, Tennessee Cop'r, Tri-Bullion, Union Copper, Utah Apex, Utah Copper, Yukon Gold.

*Ex. Div. †Ex. Rights.

!Last quotation.

Monthly Average Prices of Metals SILVER

SILVER table with columns: Month, New York, London. Includes months from January to December and a Yearly average.

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

COPPER table with columns: NEW YORK, LONDON, Electrolytic, Lake. Includes months from January to December and a Yearly average.

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

TIN AT NEW YORK table with columns: Month, 1907, 1908. Includes months from January to December and an average for the year.

Prices are in cents per pound.

LEAD

LEAD table with columns: Month, New York, London. Includes months from January to December and a Yearly average.

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

SPELTER

SPELTER table with columns: MONTH, New York, St. Louis, London. Includes months from January to December and a Yearly average.

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

Assessments

Assessments table with columns: Company, Delinq., Sale, Amt. Includes items like Bald Eagle, Cal., Birchville, Cal., Brunswick Con., Cal., Bullion, Nev., Caledonia, Nev., California, Cal., Colo. Hydraulic, Cal., Con. Imperial, Nev., Gould & Curry, Nev., Highland, Utah, Lady Washington, Nev., Little Chief, Utah, Massasoit, Utah, Nonpareil, Utah, Oro Cobre, Cal., Overman, Nev., Seg. Belcher, Nev., Sierra Nevada, Nev., Wheeler, Utah.