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Metallurgical Practice at Hacienda de la Union

Barrel Amalgamation Is to Be Replaced by Cyaniding with Tank Agitation, the Same Improved Chilean Mills Being Used for Fine Grinding

BY FRANCISCO NARVAEZ*

The Hacienda de la Unión in the city of Pachuca is a custom mill which treats 100 metric tons per day. The fact that in the last five years it has divided among its 3000 shareholders the sum of 730,000 pesos in dividends besides spending for new machinery 100,000 pesos, should lend interest to a brief description of our present system of treatment. Perhaps there may also be points of interest to the cyanider in Mexico, where this system is making rapid progress, as well as to those active in this process in other countries.

In the many articles which I have read in American journals referring to our system of amalgamation, commonly known as the "patio process," I have noticed that great prominence is given to the exotic or poetic features, superficial reference only being made to the chemical reactions; scarcely any attention is called to the all-important part that the grinding plays. The chemical reactions have been developed according to the natural, elementary principles of the science. The reactions which take place in pan and barrel amalgamation (the system used in this mill) are, in my opinion, entirely the same. The pan process is better adapted to relatively poor ore on account of its greater rapidity, the suppression of some secondary reactions, more nearly perfect contact with the reagents and a higher temperature. These conditions obtain more or less in each system; they are best realized in the barrels, in the pans to a less degree and in the patio but imperfectly.

The patio, pans and barrels all require fine grinding; the material must be as fine as that which in the cyanide process is called slime. Even though there are some pan-amalgamation mills where grinding is somewhat coarse, their results are not satisfactory except when the ore is free milling. In the old Hacienda de San Francisco built by M. P. Boss, the installation of regrinders proves that fine grinding is necessary to obtain the best results. It is well known that the primitive system of grinding ores in the arrastre for the patio process gives a very fine, almost impalpable product; although mechanically a poor grinder, yet I do not think that there can be found another machine which does such fine grinding as the old arrastre. The cost of the old system is, however, so high that it has been replaced by more economical machines, generally Chilean mills of which there are many makes and classes, each maker, as in the case of watches and pistols, claiming to have the best.

When treating ore by either of the amalgamation systems named which require fine grinding, or by an all-slime cyaniding system, it is necessary to have a mill which will give a sufficiently fine product. Although Chilean mills are well known, the following description may perhaps prevent the choice of a type that would give trouble.

The wheels of a Chilean mill in general are subject to two principal movements, one around their horizontal axes and the other around a vertical axis that lies between the vertical planes of the wheels. The movement of the wheel around its horizontal axis serves to break the ore; and its efficiency depends upon the weight of the wheel and the time that the ore is subjected to the action of that weight; so that the greater the weight and the lower the velocity the greater the efficiency. The movement of the wheel around the vertical axis exerts a rubbing action on the ore owing to the fact that the part of the tire nearest the vertical axis has to travel in a given time a shorter distance than the outer part of the tire, thus making the interior part of the tire "kick back" the distance that the travel of the outer part exceeds that of the interior, and producing a pivoting motion with an imaginary pivot in the center of the tire. This action is more energetic as the wheel approaches the vertical axis and diminishes with increasing distance from this axis, for it is plain that if the radius of the die were enlarged infinitely the die would become a straight track upon which the wheels would only rotate.

This rubbing action is what slimes the ore, and its efficiency increases as the weight of the wheel is increased, and diminishes as its velocity is decreased and its distance from the vertical axis is reduced, as demonstrated above. The natural conclusions to be derived from the arguments already stated are that a Chilean mill appropriate for sliming should have besides a simple mechanism little subject to breakage, heavy wheels and very slow speed. To what point the mill here described and illustrated will fill the

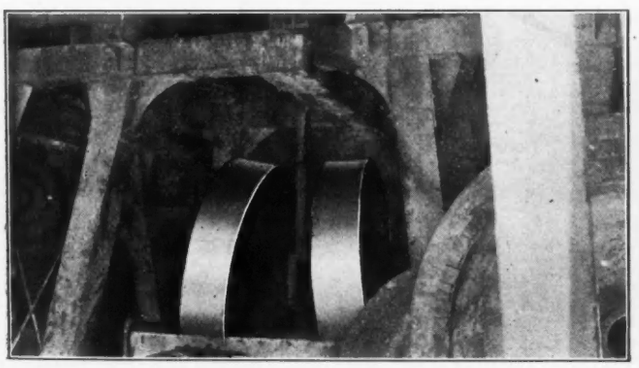

FIG. 1. OLD CHILEAN MILL

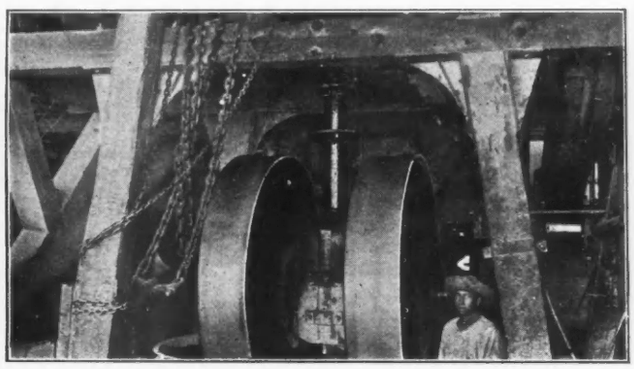

FIG. 2. IMPROVED CHILEAN MILL

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requirements I leave for my reader to judge from the work that it does.

In the mill shown in Figs. 1 and 3, the wheel is secured by its shaft *N* in its horizontal axis to the hub *M* by a vertical pin, *N* being fitted in a hole so that it has no play. The hub *M* has a square hole through which the vertical shaft passes allowing the wheels an independent vertical movement, the hub slipping down on the vertical shaft as the tires and die are worn. The vertical shaft terminates in a step bearing *G*. The wheels are 8 ft. in diameter; they have a 16-in. face and weigh about eight metric tons when the tires are new. The mill is fed ore 1½ in. in size from a feeder and discharges by means of an overflow 23 in. high on the opposite side from the feed of ore and water.

This mill has various defects. With such heavy wheels it will be easily understood that the pin *N* is not strong enough to prevent the development of too much play almost immediately, even though the hub be reinforced. As the ore falls on the outer circumference of the die of the mill the outside of the tire must crush it first, and owing to the play of the horizontal shaft in the hub, the wheel has a tendency to incline toward the center, a tendency which is more marked as the pin *N* wears. After a month or so the wheels take the position shown in the illustration, Fig. 1. This position does not permit total contact between tire and die, thus reducing the useful surface of the tire and the capacity of the mill. In this condition, also, the mill requires much more power, and a horizontal shaft frequently breaks causing a stoppage of two or three days. This mill has also the inconvenience of using conical gearing. As the step bearing wears down the gears, little by little, get out of mesh. Even though the mill is started by a clutch, there is great risk of breaking teeth in the pinion or crown wheel, the latter costing 300 pesos, to say nothing of the lost time.

The New Mill

All these troubles have been overcome in the mill shown in Figs. 2 and 4. The two wheels are joined by one 8-in. shaft upon which is formed an eccentric *C*. The shaft moves in a square box in the vertical shaft which is a bearing for the eccentric. This eccentric is secured in the vertical shaft by two plates bolted on the sides of the box *b*, which permits a vertical play for this bearing of about 14 in. The mill is driven by spur gear, and the gears have teeth of sufficient length to be always in mesh as the step wears. It will be easily understood that when the two wheels are joined together as in the mill, it is impossible for one to lean toward the center without making the other lean toward the outside; consequently, they remain vertical, the full surface of the tire works on the die, and the capacity of the mill does not diminish as in the case of the mill shown in Fig. 1.

At the Hacienda de la Union we use no screen with this mill but discharge by an overflow 23 in. above the die. As the wheels make only 10 r.p.m. the agitation is so slight that the pan of the mill acts as a classifier, permitting the heavier particles to sink and allowing only the fines to be discharged. The water facilitates the discharge; and my experience has been that the more water we use, the greater the capacity of the mill. We now use about ten of water to one of ore. This mill consumes 10 h.p. and its shafting requires 3 h.p. The accompanying table gives the average of more than 30 screen tests.

SCREEN ANALYSIS OF NEW CHILEAN MILL PRODUCT.

Original assay of ore, 1102 grams silver per metric ton.

	Per Cent. Ore.	Silver, Grams.	Per Cent. Ore Value.
Original assay of ore.	.....	1102	.....
Finer than 200 mesh.	80.0	1290	93.65
Between 200 and 150.	4.75	626	0.27
" 150 and 100.	13.45	385	0.47
" 100 and 80.	1.50	355	0.48
On 80.	0.41	346	0.01

Such grinding is practically sliming. It will be noticed that the coarse material assays much less than the fine, that passing 100 mesh carrying more than 94 per cent. of the value. This is to be expected for the ore carries mostly silver sulphide in anorthite gangue.

Cost and Capacity

This mill costs 15,000 pesos installed, its rather high price being one of its drawbacks, although we have worked one for 12 years, and aside from its wearing parts it looks as though it would last another equal period. In calculating the cost-per-ton-ground in this mill, we will charge the original cost of the mill off in 10 years, and as the tires of a mill always last, in good condition, two years (we have had them last two years and eight months) we will divide the expenses over 730 days. Including a 10-per cent. annual depreciation all costs for two years are as follows:

Mill	3,000.00 pesos.
Power, 10 h.p.	3,433.92
Belt, 15 meters at 8 pesos	120.00
One peon at 2 pesos per day	1,360.00
Lubrication	156.00
Sundries	100.00
Total	8,269.92 pesos.

The mill grinds at least 15 tons of ore every 24 hours (it can be made to grind 20 tons per day) so that in 730 days it grinds 11,950 metric tons. Dividing 8,269.92 pesos by 11,950 tons, we have a cost

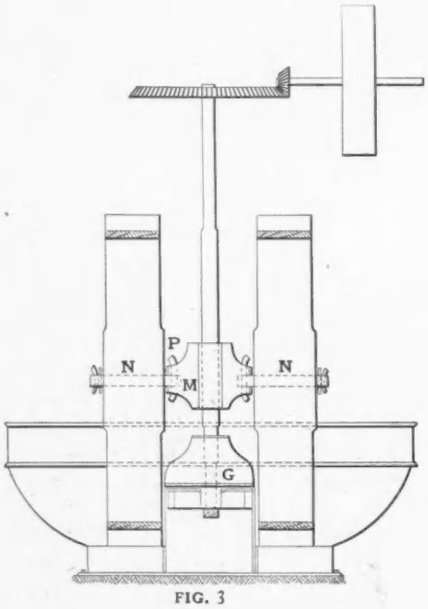


FIG. 3

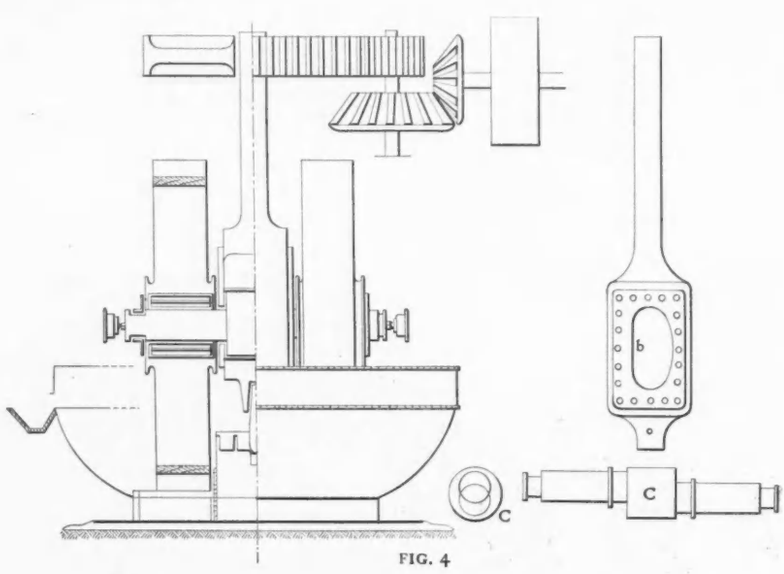


FIG. 4

per ton of 69 centavos or 35c. gold. To this cost must be added the breaking of the ore to 1.5 in., which is the best size of feed for this mill. The ore is ordinary quartz with about 25 per cent. fines, and has the usual hardness of quartz.

Present Method of Treatment

Under our present system of treatment the ore after being ground is run to settling tanks, and when the weather permits taken out and sun-dried in patios. When the weather is unfavorable, the pulp is dried in tube-driers after which it is sampled and weighed before treatment in the barrels. After drying it is elevated in cars to hoppers above the barrels where it is fed in five-ton charges. The barrels are first charged with a boiling solution of protochloride of copper and brine. After agitating three hours in this solution we add from one to two kilos of zinc shavings, according to the assay value of the ore. The silver, now converted from silver sulphide to silver chloride, is then precipitated by the zinc and amalgamated with the mercury which has been previously added in sufficient quantity. The results of this treatment are very satisfactory; we obtain from 90 to 95 per cent. of the silver from ores assaying 1000 to 1800 grams per ton. Our gold extraction is much lower, being only 45 to 50 per cent. in the amalgamation, with an additional small percentage obtained by a final concentration made in a very primitive way.

One of the great inconveniences of this system is the necessity of drying the charge before treatment in the barrels. This drying is necessary for two reasons, one physical and the other chemical. When the ore is not dried sufficiently, it forms compact lumps that are broken up with great difficulty by contact with the agitators in the barrel. The interior of the unbroken lumps has no contact with the chemicals, these being shut out by a covering of fine slime which makes the lumps impervious. As I said before, the chemical reaction is more active the higher the temperature. Now, in order that the mercury may become perfectly distributed, the ore under treatment must not have more than about 27 per cent. moisture; and in order that this boiling solution may heat the charge as much as possible, the ore should be as dry as possible. I have found that a choice of 5 to 6 per cent. moisture in the charge is the most advantageous practice.

I have not found an economical system of drying. What we use at present is a revolving tube with interior longitudinal blades. These take up the ore and allow it to fall as the tube revolves, while through the latter passes the flame of the drying fire. An inconvenience met in the use of this drier is the sticking of the slime to the sides, forming a lining which little by little hardens and impedes the good work of the drier. It also acts as a separator of sand and slime which causes difficulty in determining the moisture of the charge for treatment in the barrels. This drying of the pulp requires much handling, and costs about 1.80 pesos per ton, making the whole treatment cost from 13 to 14 pesos.

In view of these difficulties, to which has now been added the prolonged low price of silver which up to a certain point obliges us to lower our cost of treatment, we seriously considered the cyanide process which was giving good results at Guanajuato and was at that time being installed at the Hacienda de San Francisco, in Pachuca.

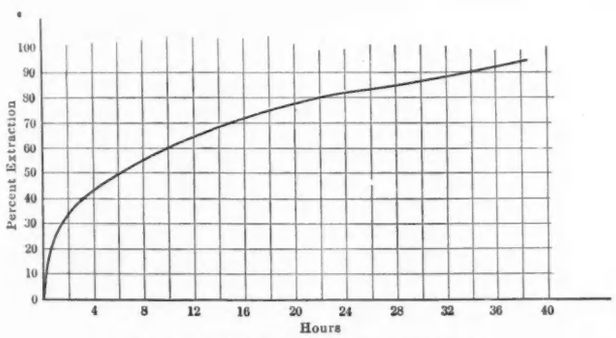


FIG. 5. DIAGRAM OF SILVER EXTRACTION

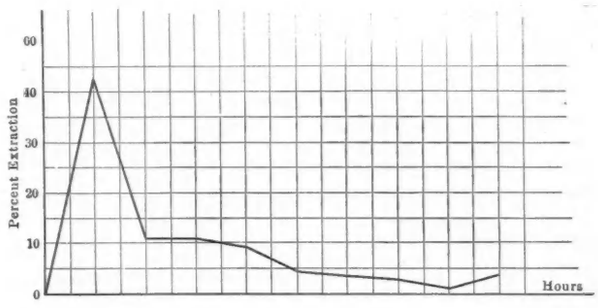


FIG. 6. PROPORTIONAL VARIATION IN SILVER EXTRACTION

All-slime Cyanide Process

A series of experiments was made on a small scale using 400 grams of ore in flasks to decide on the proportion of solution to ore and on the strength of cyanide solution as well as its proper alkalinity. Later, seeing the advantages of the Brown tank agitation system we considered using it and experimented with lots of 50 kg. in a small experimental tank. We confirmed our bottle tests, and found that in 36 hours we could extract all that it was reasonable to expect. We did not need to consider replacing our grinding system, as its product was sufficiently fine and economical, the only change necessary being the changing of seven of the old type mills into the new type and the arrangement of a system of bins, elevators, etc. (the site of our plant being level), in order to place the ore cheaply in the mechanical feeders.

These points decided, we made a number of tests with slime produced by the new type mills of which the results are given in the accompanying table which shows the average results obtained during 20 tests which we made to obtain sufficient solution for precipitation tests as well as to give our employees practice in assaying solutions. The samples weighed 50 kg. and we used three parts of solution to one of slime, the solution carrying 0.10 per cent. of KCN and a protective alkalinity of 0.15 per cent. lime (determined by Clennel's method). We took samples every four hours, and observed that by replacing the lost cyanide each time our results were better, so we followed this practice in all the tests.

As will be observed, the ore of the tests represented in the table assayed 1200 grams silver and 5.4 grams gold per ton. We did not concentrate and still we extracted 90 per cent. of the silver and 94 per cent. of the gold, consuming 700 grams of cyanide (1.55 lb.) per ton of solution, or 4.65 lb. per ton of ore. The curve in Fig. 5 is a diagram of the results tabulated, showing the extraction of the silver; the curve of Fig. 6 is a diagram of the variation proportional in the silver extraction, taken from the last column of the table. The first is a section of a parabola. This was to be expected since the ore is hard, compact and impermeable. The extraction will be proportional to the surface of the silver mineral exposed to the action of the solution. It will also be inversely proportional to the square of the varying diameters of the ore particles as they dissolve, so that the curve in Fig. 5 must be a parabola.

Progress of Extraction

It is curious to examine the second curve in which it is seen that in the first four hours in contact with the solution an extraction in excess of 40 per cent. is made, and that in the second and third period of four hours there is no more than an additional extraction of 10 per cent. in each lapse of time. The extraction is, of course, much less in the succeeding intervals of four hours. This result also should be expected. If we consider the particles of mineral as spheres of very small diameter, these particles in the beginning present to the action of the

solution a certain surface which we may call "active surface." Now, if we suppose that the particle is dissolved in superficial spherical layers, and if, as we have seen, 40 per cent. is dissolved in the first four hours, we must not expect to dissolve another 40 per cent. of the whole value in the second four hours, since the ore does not present, in this time, the same active surface to the action of the solution. If by any means it were possible to expose the same active surface during the second and succeeding periods, the curve of extraction would not be a parabola, but would be a straight line. Shall we ever be able to obtain a result like this?

As a result of the study of these results we decided to install an all-slime plant without interrupting the actual present operations which give us life. Taking part of an ore-drying patio, we are now building Brown agitation tanks, Moore vacuum filters and installing zinc precipitation equipment. We have reason to expect the best of results from this plant, and I give these data to the public with the hope that they are of interest, and that they may arouse some discussion from my worthy colleagues in the profession.

Transvaal Mining Notes

SPECIAL CORRESPONDENCE

In previous correspondence it was mentioned that two new producers were likely to appear upon the list in the Bantjes Consolidated and the Vogeltruis Consolidated Deep. Meetings have been held by the shareholders of both these financially allied companies and provision made for the prosecution of development operations, preparatory to milling. The former mine has not been touched since the war, while the latter was closed down—to await "better times" —in 1906. Orders have been put out for two batteries to serve these mills and, as a further indication of the recognition of the merits of heavy-stamp practice, they are to be equipped with stamps of 1650 to 1750 pounds.

The reader who learns of the rapid growth of the Rand industry today—of new mills commencing operations and others placed under construction—may well inquire about the unskilled-labor problem, which we were told was the great obstruction to Rand progress a little while ago; and of the Chinese repatriation, which was to constitute a final blow to full expansion. The abnormal influx of Kafir laborers, following exceptional circumstances, has for the time being placed the question out of the sphere of anxious concern and the fears of investors are discreetly not raised by its revival.

FAULTS AND LOSSES

The long list of favorable developments reported in mines extending from the far east to the far west of the Rand has provided good cause for the greater hopefulness now prevalent in all mining circles. There is scarcely a single mining interest without some new center of special promise. But a complete absence of disappointments could not be expected in a field of such wide activity. Because, therefore, the dropping away of the French Rand mine from the profit-makers has occasioned considerable comment, it is clear that features of a regretable nature are neither serious nor abundant. This mine, situated in the West Rand upon a greatly faulted section immediately beyond the great Witpoortje Fault, has paid dividends for 1906, 1907 and 1908, but has now fallen upon evil days. Substantial losses have been declared for July and August. The cause of this relapse can only be found in those vicissitudes of fortune to which even the best Rand mines are at times liable. An impoverishment of the average grade and a corresponding enrichment of perplexing faults are generally understood to be the features of recent development.

By the beginning of next year there will be over 9000 stamps in operation upon the field. With the Simmer Deep, Cinderella Deep, Knight Central and West Rand Consolidated mills nearing completion, one takes small risk in advancing this estimate. As all these new plants are equipped with tube mills the significance of the increase in number of heads dropped is greater than is at first apparent. The number of stamps at work on a property ceases to be a satisfactory basis for rough estimate of crushing capacity, as it was in pre-tube-mill days of 5- to 6-ton stamp duties. For instance, we may contrast the neighboring Luipaardsvlei Estate and French Rand mines, the former putting through over 17,000 tons per month with 60 stamps and tube mills, and the latter about 16,500 with 120 stamps. The new 60-stamp mill of the West Rand Consolidated, to be started in a week or two, should represent a crushing capacity almost equal to that of the Luipaardsvlei.

TIN MINES

A new alluvial tin proposition of payable value appears to have been opened up in Swaziland, near the producing area of Eckstein & Co's. venture. This is called the McCreedy. The tin occurs in hill deposits in ragged and sharp-edged aggregates, varying in size from a 1/16 in. to 1 in. or more. Arrangements are being made for the treatment of 800 to 1000 tons of dirt per day, and according to the estimate of the consulting engineer a yield of $120 per ton is to be expected. The experience of South African tin mining to date, however, has been unfortunate.

The report upon the results of the State tin-mine experiment has been published and the cost of the failure indicated by the showing that the ore produced (61½ tons) was worth £1947 and the cost of production £7000. In addition 200 tons of 5 per cent. ore were sold for £420 on condition that the purchaser installed a small treatment plant for use in the district.

NEW SHAFTS

The seven-compartment shaft of the South Rand, on the dip of the Crown Deep, is now well under way, and over 100 ft. has been made. At present buckets are being used, but sinking will shortly be performed with skips. Work will be directed by W. Sauer, who sank the Turf mines (unfinished) and Village Deep shafts and who is a steadfast supporter of skips in deep sinking.

Another sinking record has been established upon the Brakpan mines. During August no less than 261 ft. were sunk in No. 1 incline shaft, with six 3¼-in. Holman drills. This shaft measures 19x7 ft. from rock to rock. Even making full allowance for the good breaking qualities of the deep ground exploited and for the shallow dip of 13 deg. which allows the rock to be blasted clear of the face, this record is wonderful in the light of all previous Rand experience. Records both in vertical- and incline-shaft sinking have been established upon this property.

NEW MINES

Some little excitement has been caused by a remarkable development in the far West Rand upon the property of the South Randfontein Deep—which, as its name suggests, was considered a deep level of the Randfontein outcrop line. It has been found, however, that the Leader and West Reef worked by the Randfontein mines take a sharp turn eastward from Stubb's Randfontein into the property of the company mentioned. So far very little has been done to prove the new strike, but a favorable report upon the occurrence, based upon some high assay values, has been issued by the consulting engineers of the Newmann and Goerz groups, which are interested in the holding.

A company with the alluring title of the "New Rand, Ltd.," which holds extensive properties to the south of the Vaal river, and about 50 miles to the south of Johannesburg, has managed to obtain the funds for further prospecting its ground by diamond drilling. It is the opinion of the responsible engineers that the lower and upper Witwatersrand beds have already been located beneath the flat and comparatively recent sandstone and shale beds of the Karroo system and that it only remains for them to locate the Main Reef horizon (at the southern edge of the Sycline) by further boring in the light of evidence already obtained. The enterprise is a hazardous one in the extreme, but not without highly attractive features to those fully prepared for a daring geological gamble.

Improvements at the Oronogo Circle Mill No. 5

The Introduction of Equipment for Settling and Treating Fine Material Has Increased the Recovery by about 10 Per Cent

BY OTTO RUHL*

In addition to the ordinary chert or flint gangue found in the "sheet ground" belt in the Joplin district, there is in a number of mines a peculiar black secondary chert which, when occurring as the prevailing gangue matter, makes the concentration of the ores a problem of more than ordinary importance. It is to the solution of this problem that the milling practice of the Oronogo Circle Mill No. 5 brings some entirely new features.

The Oronogo Circle Mill No. 5 is operating upon a sheet orebody found at a depth of 212 ft. The ore carries a varying percentage of zinc blende running from 4 per cent. to as high as 20 per cent., the usual daily run varying from 4 to 6 per cent. There is considerable free ore and also some blende which acts as the cementing agent of a blue flint breccia. However, the prevailing gangue is a hard, black chert, with which the blende is very intimately mixed. This mixture acts as the cementing substance to the brecciated blue and white chert and limestone, making a highly complex ore.

The specific gravity of the black secondary chert is much higher than that of ordinary blue or white chert. It is also tougher and fractures less easily. Some of the ore must be crushed extremely fine to effect the saving of a clean concentrate with little loss in the tailings. This crushing means a loss in fines unless a careful sizing of the ore and a complete settling of all the water used in the milling operations are accomplished. These two features distinguish the milling practice of this mill from that ordinarily found in the sheet-ore belt.

The mill was built to handle 300 tons of ore daily per 10-hour shift. It consists of three buildings, the main milling plant, tailings mill, and power house. The power equipment consists of four 150-h.p. high-pressure boilers which furnish power to two air compressors of a capacity each of 1,500 cu.ft. of free air per minute, and one 185-h.p. engine which drives the machinery in the main milling plant. In addition these boilers furnish steam for a 60-h.p. engine which drives the machinery of the tailing mill and also steam for the hoisting engine.

ORONOGO CIRCLE MILL NO. 5

First Part of the Process

The ore on being hoisted from the shaft is dumped into a hopper holding 600 tons, or enough for two 10-hour shifts. An automatic feed allows the ore to pass from the hopper over a grizzly. The undersize goes directly to the dirt elevator while the oversize goes to a 24-in. Blake crusher. This reduces the ore until it is ready for the first set of 36-in. rolls. These crush the ore so that a large proportion of it will pass a ½-in. screen. From this set of rolls the ore goes to the dirt elevator which dumps into a separating box, half of the ore going to each of two trommel screens, 36x72 in., with ½-in. perforations. The oversize is sent to two sets of 30-in. rolls, whence it is returned to the trommels.

The undersize goes to the rougher jig, which is a double jig consisting of two ordinary jigs built back to back. Each jig has four cells, each cell being 34x48 in. in size. The undersize from each trommel furnishes the ore for its corresponding jig. These roughers make four products: The hutch from the first two cells goes to a second jig called the "first cleaner;" the middlings, together with the hutch from the last two cells from each rougher go to a third set of rolls 24 in. in size, which is the introduction to what might be termed the second of chat mill;

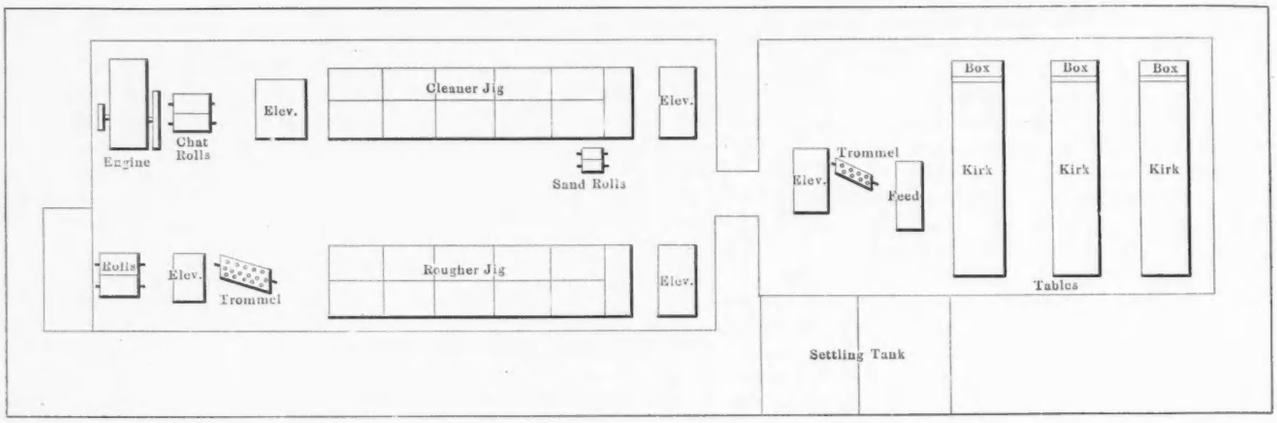
*Webb City, Mo.

the tails go to a settling box from which the overflow goes to a general settling tank for the fines for the first sludge mill; while the hutch goes to the tailing mill.

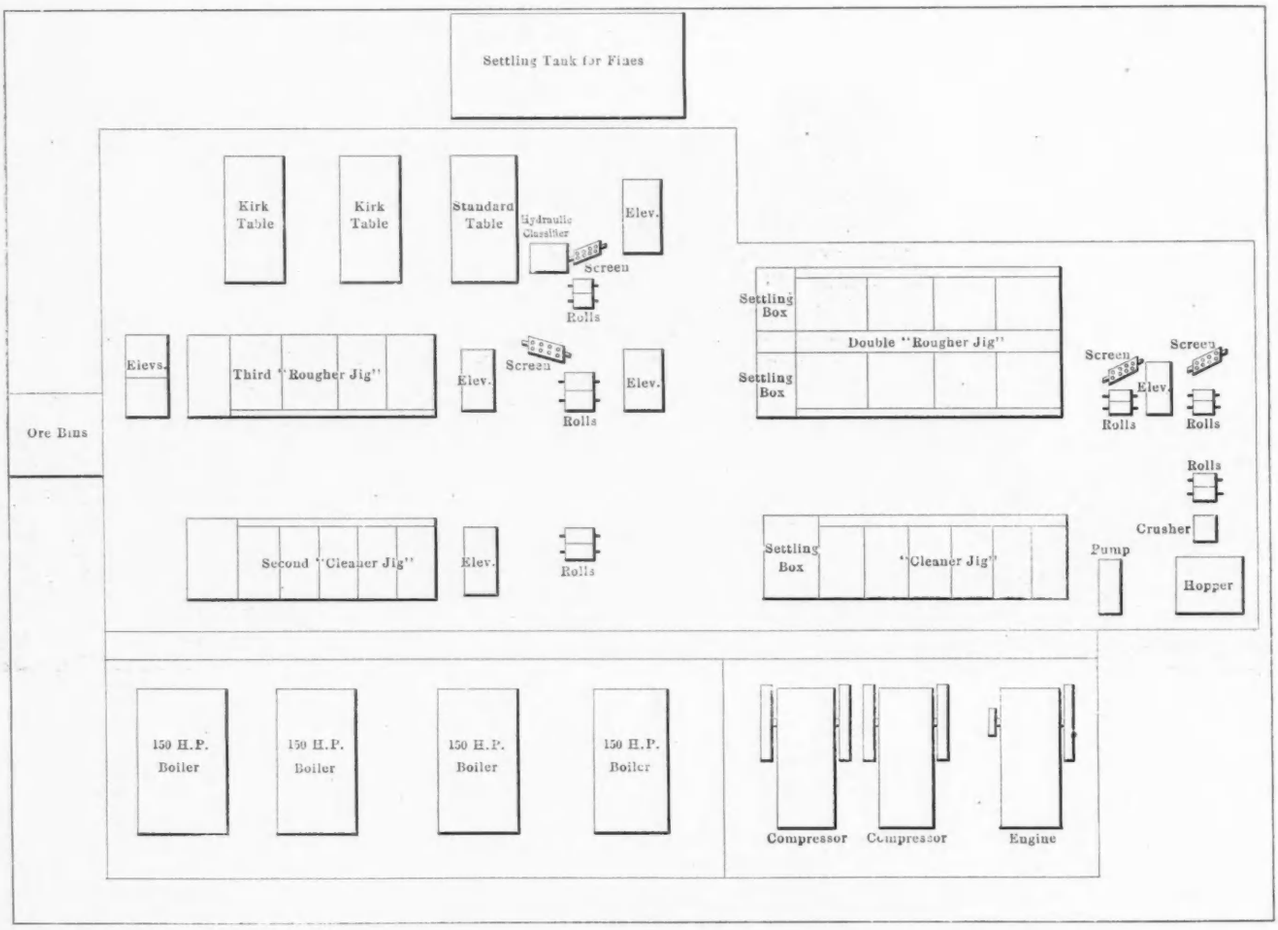
The cleaner jig has six 28x42-in. cells. the middlings and hutch from the last cell go to a third set of rolls.

Jigs and Settling Boxes

To this set of rolls, the first process in the chat mill, is fed the hutch from the undersize passing to the third rougher jig. This jig has four 30x42-in. cells. The hutch from the first two cells goes to the second cleaner jig; the middlings and hutch from the last two cells are sent to



TAILINGS MILL, ORONOGO CIRCLE MILL NO. 5



GROUND PLAN, MAIN BUILDING, ORONOGO CIRCLE MILL NO. 5

This jig makes four products. The hutch from the first five cells is concentrate, and goes to the ore bins, the product of the first cell being lead and the other four blende. The tails go to the general settling tank of the first sludge mill, while last two cells of the double rougher and the hutch from the last cell of the cleaner, together with the middlings from both roughers and the cleaner. These are now crushed to pass a 3/8-in. screen, the oversize being returned to the rolls and the a set of chat rolls and are returned over the same rougher jig. The tails go into a settling box, the hutch from which passes to the tailings mill and the overflow to the settling tank for the first sludge mill.

The second cleaner jig has only five cells, each of which is 24x36 in. The hutch from the first four is blende concentrate, and is sent to the ore bins. The tailings enter a settling box from which the hutch, together with the hutch from the last cell of the cleaner is returned to the third rougher. The overflow from the settling box goes to the settling tank for the first sludge mill.

This settling tank consists of two compartments, the floor of each sloping toward the elevator boot leading to the table room. At the lowest point the sand is drawn off through a spigot. Each compartment is 13x35 ft., and each serves its turn as a settling tank and as a supply for the tables. The overflow from five sources goes into this general settling tank for the fines used in the first sludge mill. From this tank the sand is elevated and is passed over a 1½-mm. screen. The oversize goes to a set of sand rolls and returns to the elevator boot. The undersize passes into a hydraulic classifier from which the slimes are sent to a Standard table, while the coarser sands are sent to two Kirk tables. These tables make three products: clean blende, galena, and tailings.

The Tailings Mill

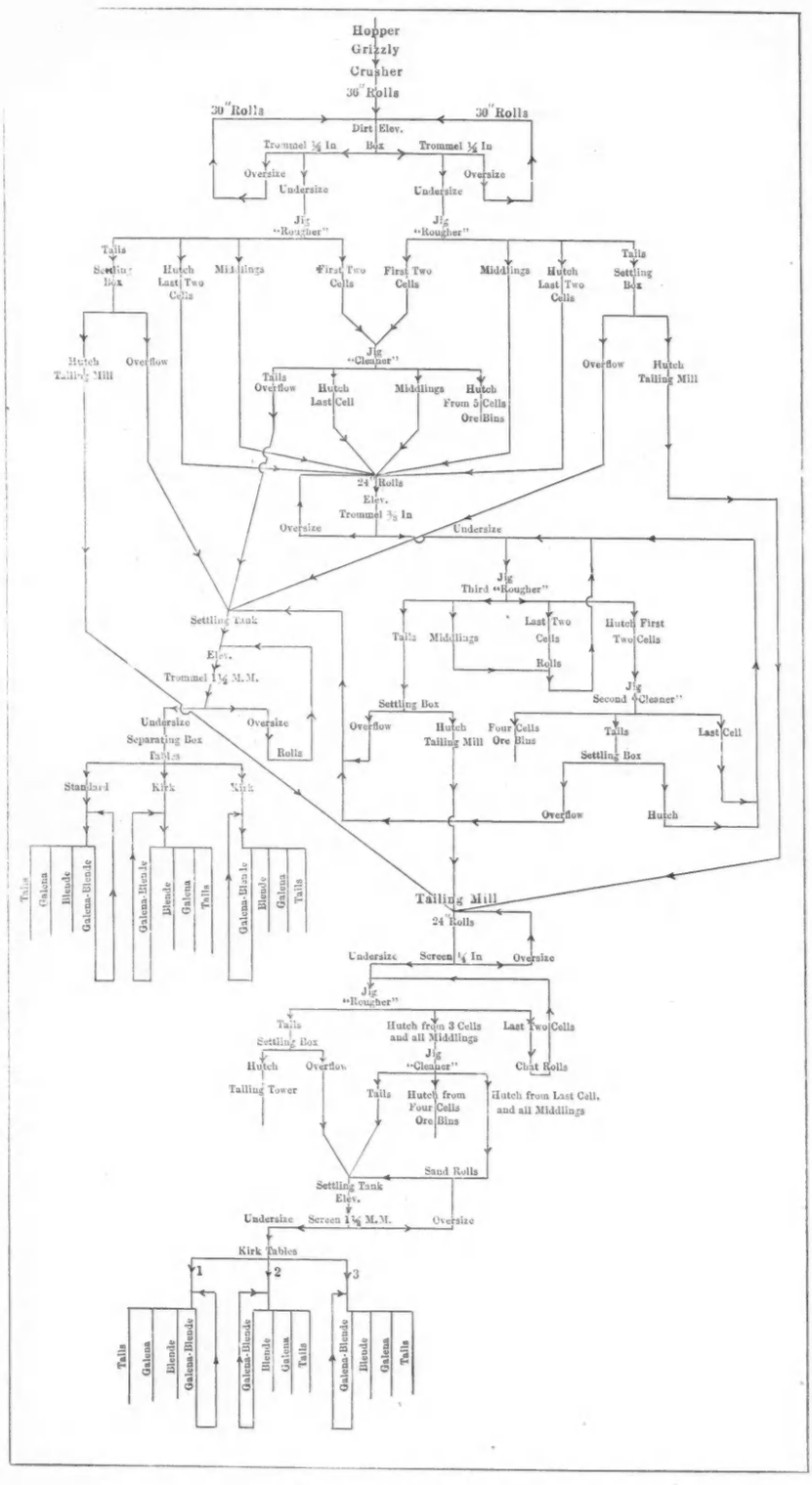
The tailings from the three rougher jigs of the main mill enter a tower and are flumed across to a tailings mill, in a separate building for further treatment. The tailings are passed through 24-in. rolls, reducing them so they will pass through a ¼-in. screen. The undersize goes to a rougher jig from which the hutch from the first three cells and all the middlings are sent to a cleaner jig, while the hutch from the last two cells goes to chat rolls and is returned over the rougher. The tails go to a settling box from which the hutch is drawn as final tailings, and are sent to the waste pile, while the overflow goes to still another settling tank for the second sludge mill.

From the cleaner jig of the tailings mill four products are made. The hutch from the first four cells goes to the ore bins. The tailings go directly to the settling tank of the sludge mill, while the hutch from the last cell and all the middlings go over a set of sand rolls and then to the settling tank. The sands and slimes from this settling tank are then elevated to the second sludge mill, which is a duplicate of the first sludge mill in all respects except that there is no hydraulic classifier, and the tables are all Kirk tables.

Relation of the Mill Departments

An analysis of this mill practice develops the fact that there are five separate concentrating plants utilized as one unit in handling this ore. There is a general plant analogous to the Joplin-type mill through which all the ore passes and which is designed to save only the free ore and that resulting from the crushing to ½-in. size. There is a second mill analogous to the first which handles only the chats and middlings from the first mill, reducing them to ⅜-in. size. In these two mills the crushing produces a large quantity of fines, and in the tailings of the first cleaner a large amount of sandy ore is found, all of which is settled in one general settling tank for use in what may be termed the first sludge mill. The tailings of all the roughers on account of their size still contain some ore, and these are still further reduced in a tailings mill where the crushing brings the size down to ¼ in. To provide for the fines resulting from this process a second sludge mill is required.

This mill is the only one in the district

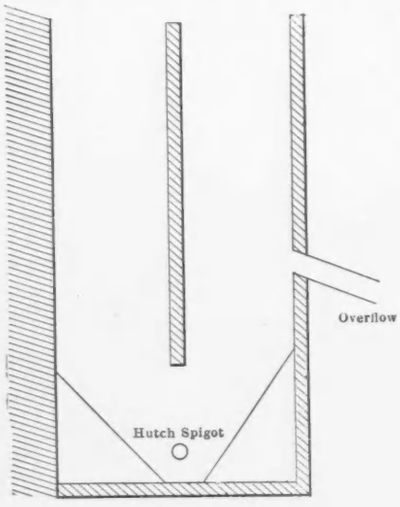


FLOW SHEET, ORONOGO CIRCLE MILL NO. 5

utilizing the division of the mill into units, not only to increase capacity, but also to effect a better saving of the ores, by handling different sizes and kinds of ore in the different units.

The well known Cooley jigs are used throughout the mill. The settling devices adopted are a special feature of its construction. A settling box at the end of each rougher effects a separation of all sandy and float ores from the heavier tailings. This overflow is then settled in a general settling tank. The overflows from the cleaners are settled in the general settling tank, there being no separation of the coarse tailings from the fines, all being reduced to fines.

The exact saving made by each department of this milling practice is hard to estimate as the daily change in the character of the ore makes such an approximation unreliable. Some days when the percentage of free ores runs high, the first mill produces by far the greater quantity



SETTLING BOX

of concentrates, but on other days the chat mill will be taxed heavily on account of the abundance of the peculiar black secondary chert in the mine run on those days. For the same reason the outputs of the tailings and sludge mills vary. However, the difference in the quantity of ore saved in the two sludge mills offers a good criterion of the relative savings of the two main divisions of the mill. The output of the second sludge mill is often less than half that of the first, owing to the thinness of the material by the time it reaches this last process. The final tailings from the rougher jig of the tailings mill still contain some blende, but the practice in vogue at this plant saves 87½ to 90 per cent. of all blende in the ore. This saving is made, too, in the face of the worst gangue conditions in the field. No mill in the Missouri-Kansas district exceeds this record, for the best practice hitherto known has done well to obtain 75 to 85 per cent. of the mineral content of the ores.

Absorption of Gold Amalgam by Copper Plates

Edward Halse, in a paper read before the Institute of Mining and Metallurgy, discusses "accumulation," gradual formation of a hard scale of amalgam on the surface of a battery plate which can only be removed by the use of steel scrapers, by "burning," "sweating," "buckling," or other special means; and also "absorption," The amalgam that has actually been absorbed by, or has soaked into, the plate, and which, after the removal of all scale, can only be recovered by melting down the plate.

While in Colombia, South America, he carefully ascertained the amount of gold scale which had accumulated on three sets of electro-silvered apron plates during a period extending over six years. The plates were of copper ⅛ in. thick, electroplated, 1 oz. silver per square foot, the total area of each set of four plates being 93 sq.ft.

The ore milled consisted chiefly of quartz, with some free gold, which was rarely visible, and charged with from 1 to 5 per cent. of sulphides, namely gold-bearing pyrite, with some galena, which was highly auriferous and also silver-bearing, and argentiferous blende; calcite, chalcopyrite, arsenopyrite, marcasite and pyrrhotite were occasional ingredients. For a pyritic ore, it was unusually "free."

The four plates of the first set were taken up at the end of 26 months and "burnt." During that period 7915½ tons of pulp had passed over them, yielding an average of 18.82 dwt. of bullion, or 11.32 dwt. of fine gold, per ton; or 4462 tons of high-grade ore with an average yield of 32.6 dwt. of bullion, or 19.62 dwt. of fine gold; and 3453½ tons of tailings, with an average yield of 4.3 dwt. of bullion, or 2.58 dwt. of fine gold per 2000-lb. ton.

The gold scale from the four plates weighed 937 oz. and the average rate of accumulation was 2.36 dwt. of bullion, or 1.269 dwt. of fine gold per ton of ore milled.

The four plates of the second set were taken up at the end of a similar period, during which 3347 tons of pulp passed over them, yielding on an average 10.01 dwt. of bullion, or 6.02 dwt. of fine gold, also 1172 tons of tilings, with an average of 1.95 dwt. of fine gold, followed by 2175 tons of low-grade ore, with an average yield of 11.31 dwt. of bullion, or 6.80 dwt. of fine gold per ton.

The gold scale amounted to 568 oz., which is equal to an average rate of accumulation of 3.39 dwt., or 1.823 dwt. of fine gold per ton milled.

The four plates of the third set were allowed to run 24 months only. The ore crushed during that period amounted to 2869 tons of medium grade, yielding 18½ dwt. of bullion, or 11.13 dwt. of fine gold per ton. The gold scale from these plates weighed 553.68 oz., giving an average rate of accumulation of 3.85 dwt. of bullion, or 2.071 dwt. of fine gold per ton.

While working under normal conditions the average rate of accumulation of hard amalgam was found to be as much as 2 dwt. of fine gold per ton. The average fineness of the bullion (32 bars) obtained from the mill was Au 602; Ag 362; total 964. The average fineness of the scale (8 bars) was Au 538; Ag 429; total 967. Although there was a slight increase in the total fineness, as was to be expected, the gold-fineness of the scale was 64 less, and the silver-fineness 67 more, probably due to the silver originally on the plate.

In regard to the absorption of gold by copper plates, it was found that the plates in the Drum Lummon mill, Montana, retained, when the scale was removed, 8.96 oz. of gold. This corresponds to an average rate of absorption of about 0.288 gr. per ton and approximates to the returns from some other American mills.

On removing some old plates from the Sucre mill, Colombia, they were found to be only 1/16 in. thick. They were thoroughly saturated with mercury and very brittle. They had, also, a white fracture. After all the amalgam was scraped from them they were broken up and shipped to England to be melted. They yielded 4.243 oz. of fine gold. It is estimated that their rate of absorption of gold was under 1 gr. of fine gold per ton of ore milled.

It may be concluded that the absorption of gold by copper plates may generally be ignored by the mill-man in his estimates. The average rate rarely exceeds the fraction of a grain per ton milled. Where the gold is coarse it may be practically nil.

Iron Ore in Great Britain

The total iron mined in Great Britain in 1907, according to the amended returns, was 15,731,604 long tons. Ore imported was 7,641,934 tons, making a total of 23,373,538 tons. Exports were 21,877 tons, leaving a net balance of 23,351,661 tons. To this is added 576,856 tons of pyrites residue and 1,195,242 tons of forge and mill cinder, making a total of 25,123,759 of material for the furnaces. The pig iron made was 10,114,281 long tons, showing an average of 2.47 tons ore used for one ton of pig. The coal used for all purposes at the blast furnaces—including coal converted into coke—was 21,119,547 tons; an average of 2.09 tons of coal to one ton of pig iron.

Cyanide Mills, Guanajuato Development Co.—II

At Pinguico the Slime Is Concentrated on an Immense Cement Table; at Peregrina Slime in Discharging Washes away the Accumulated Sand

BY CLAUDE T. RICE

The Pinguico Mill

The Pinguico mill is treating 250 tons of ore per day, all of which comes from the Pinguico mine, but it is the intention to increase the capacity materially by replacing with a tube mill the Bryan mill now used for regrinding the middling from the concentrating tables. The Bryan mill will then be placed on the Chilean-mill floor to serve as a reserve in case of accident. The ore is wet and clayey, so that considerable trouble is experienced in handling it at the crushers and grizzlies, for the ore will not run over the grizzlies but must be raked over the bars in order to separate the fine and the coarse. There is now being installed a new ore bin with complete sampling plant, shaking grizzlies, a 24x15-in. Blake crusher, Vezin automatic samplers, disk pulverizers, small crushers and a return belt for distributing the ore in the bins. The mill is built on a side hill in several terraces, and was completed in November, 1907, being the newest mill in the district.

The ore is first broken in two 9x12-in. Blake crushers to 1½-in. size, and then goes to the 600-ton bin above the 40 stamps. The battery frames are of wood, with the sills and braces butted up against the mill bin, being held by long bolts anchored in the country rock behind the battery bins, vertical tension rods also helping to steady the battery frame.

The mortar blocks and foundations are built of cement and concrete placed on solid rock. The stamps weigh 1050 lb. and drop 104 times per minute through a hight of 6½ in. in an Allis-Chalmers No. 120 mortar. The stamps are arranged in units of 10, each run by separate belt, there being a line shaft driven by separate motor for each set of 20 stamps. On the batteries coarse screens are used, for the ore is reground in two Chilean and one Bryan mill. In order to keep the ore distributed evenly in the battery bin the two five-stamp batteries in front of the crushers crush through 2-mesh screens, the battery on each side through 4-mesh, and the two end batteries through 8-mesh screens. This practice is modified to suit conditions, according to the amount of ore in the bins, condition of treatment tanks, etc. Suspended Challenge feeders are used and crushing is done in cyanide solution titrating 0.2 per cent. KCN.

The pulp from the batteries goes to two 6-ft. Akron Chilean mills; these make 31 r.p.m., and crush through 30-mesh Tyler rolled-slot screens. The pulp then goes to two large spitzkasten.

The Cement Table

The overflowing slime from the spitzkasten is sent to the cement table, 35 ft. long (in the direction of the flow) and 6 ft. wide, being divided into 29 sections and having a grade of 1½ in. per ft. This table was made by terracing the hillside and covering the terrace with a thin layer of concrete and then grouting the surface with a thin layer of clean cement. This cement surface was then roughened into riffles ⅜ in. deep and 1¾ in. wide. Across the surface at distances of 8.5 and 10 ft. have been placed slats 1 in. high in order to help retard the flow of the fine sand and slime if the table should receive a sudden, exceptionally heavy feed of pulp. The pulp is allowed to flow over the table until a good load of concentrate is caught in the riffles; then the flow is shut off from one section at a time, and the concentrate washed by means of a hose into a collecting box, which feeds to a 1½-in. Traylor sand pump that sends the pulp to a classifying cone. This cone has a bottom discharge to one of the Wilfley tables and a side discharge, 12 in. above the bottom, to a Johnson table; the overflow returns to the Dorr classifier. The tailings from the cement table goes direct to the slime collecting tanks,

THE PINGUICO MILL

but the tailings from the Johnson table is returned to the Dorr classifiers.

The underflow from the two spitzkasten goes to 12 Wilfley tables. The middlings from these tables are recrushed through a 40-mesh, No. 36 wire screen in a Bryan mill making 27 r.p.m., and is reconcentrated on four Wilfley tables, on which only concentrates and tailings are made. The sand tailings from all the Wilfley tables then goes to two Dorr classifiers, where the pulp is finally separated into sand and slime, the slime going to the *planilla* or cement table, and the sand to the sand-leaching tanks.

Sand Treatment at Pinguico Mill

The sand is charged by means of Butters-Mein distributors into one of 14 sand tanks, each 29½ ft. diameter by 58 in. deep (charging depth), holding 110 tons of dry sand; previous to charging the tanks are filled with mill solution so as to completely separate any slime which may have passed the Dorr classifiers. The tanks take 20 hours to fill; they are then allowed to drain 6 hours; after that they are leveled off and solution run on them. Three washes, 8.5 tons each, of strong solution titrating 0.5 per cent. KCN are added, 4 hours draining being allowed after each of the first two washes. The first two washes are returned to the mill solution so as to increase the value of the head solution going to the zinc-boxes.

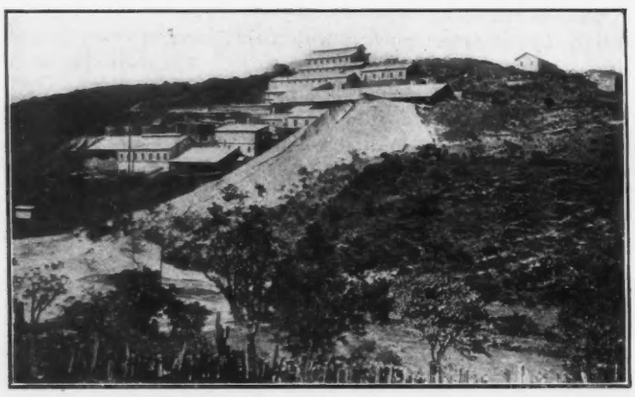
During the third wash 5 kg. of lead acetate are added, then the valves closed and the sand allowed to stand in solution for 12 hours. This wash is sent to the strong solution for precipitation. Next, washes, 8.5 tons each, of strong solution are added every 3 hours for 5 days, the sand being turned over once in the same tank during this time and all the washes sent to the strong-solution zinc-boxes. Then the charge is washed with weak solution, titrating 0.2 per cent. KCN for 72 hours; the outflowing weak solution is sent to the strong boxes for precipitation. After this the tanks are washed with water for 12 hours, 6 tons being added every 2 hours. Finally the tank is allowed to drain 12 hours on night shift so that it can be discharged next day by sluicing or by shovel and conveyer belt.

Slime Treatment at Pinguico Mill

The slime is collected in one of three thickening tanks, 30x11½ ft. deep. The pulp enters through a central tube (shown in one of the accompanying illustrations) which extends 4 or 5 ft. down into the tank. A clear overflow is obtained which is returned to the mill, while the thickened slime is drawn off continuously at the bottom through three 3-in. pipes (the inlet orifice being reduced to ¾ in.) extending along the bottom to a center line through the tank.

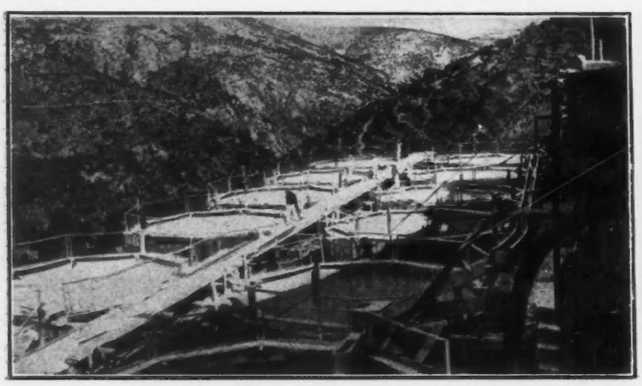
The thickened slime flows to one of two collecting tanks, also 30x11½ ft. deep, which hold about 40 tons of slime. The tank is charged for ten hours during which time sufficient slime is collected. At the end of this period 30 kg. of sodium cyanide and 20 kg. of lead acetate are added to the charge; after agitating for 6 hours the slime is transferred by a 6-in. centrifugal pump to one of the agitation tanks of the same size, where a further agitation of 24 hours is given by means of five air jets placed in the bottom of the tank. This agitation is also assisted by the use of a 6-in. centrifugal pump. This system of agitation, however, will soon be replaced, and agitation will be accomplished by means of agitating arms carrying an air pipe such as is used at the San Próspero mill. The tank is allowed to settle for 8 hours, and is then decanted in a period of 2 hours; the decanted solution goes to a series of three storage tanks through which it flows and from which it is finally decanted to the weak zinc-boxes.

The slime is next given three agitations each lasting 4 hours, with weak solution titrating 0.2 per cent. KCN; the intervening periods of settling and decantation last 12 hours. Sometimes all this treatment is given in one tank, but usually the pulp is transferred from one tank to another. The degree of dilution during each agitation is maintained at about six parts water to one part dry slime. At the end of the last decantation the pulp is trans-

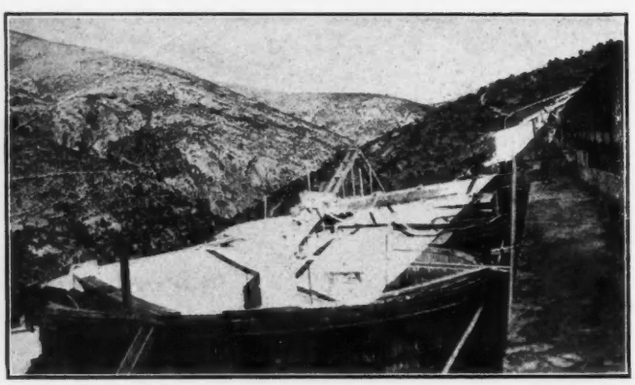


PINGUICO MILL

CEMENT TABLES, PINGUICO MILL



SLIME TANKS, PINGUICO MILL

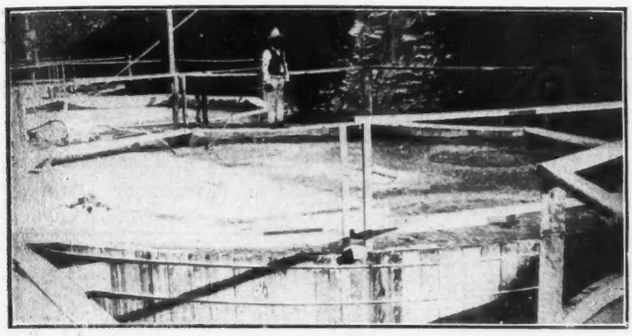


SLIME COLLECTING TANKS, PINGUICO MILL

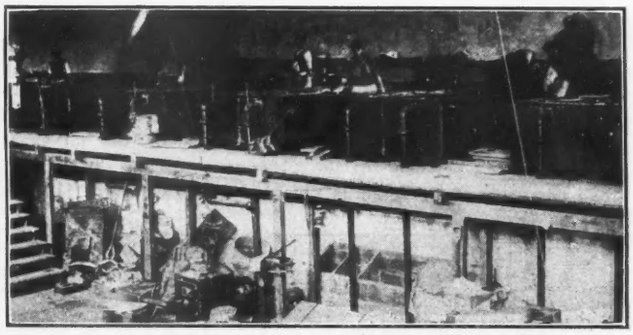
ferred to the tank feeding the Butters filter. The slime is given a treatment of about 100 hours, this varying somewhat according to tank capacity, but the total time of contact from the batteries to the filter inclusive is at least 120 hours.

On the Butters filter, containing 80 leaves, a 20-in. vacuum is used, and a cake 1 in. thick is formed. The cake, discharged by compressed air, contains 40 per cent. moisture. The filter solution is returned to the mill circulation. The air pressure used in discharging is 5 lb. per sq.in., for, if the pressure were greater, the sewing on the filter leaves would be broken. The leaves, which coat with lime rather quickly (within 7 to 10 days), are cleaned with a brush made of roots; this method of cleaning saves considerable acid. Ten leaves are cleaned daily. About 35 h.p. is required to operate the Butters filtering system. Approximately 70 tons of slime are filtered each day, for only 8 cakes can be formed.

The cycle used in filtering requires three hours, divided as follows: Charging, 10 min.; forming cake, 50; pumping back pulp (with 6-in. pump), 20; charging water, 10; washing cake, 60; pumping back water, 20; discharging cake, 10 min.; total 3 hours.



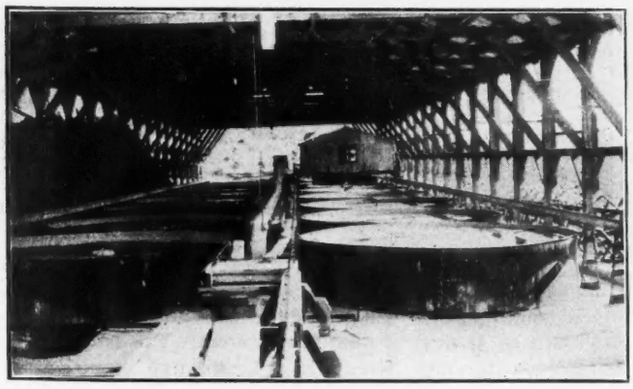
SLIME TANK IN AGITATION, PINGUICO MILL



PRECIPITATION ROOM, PINGUICO MILL

PEREGRINA MILL

PEREGRINA MILL



SAND PLANT, PEREGRINA MILL

SLIME TANKS, PEREGRINA MILL

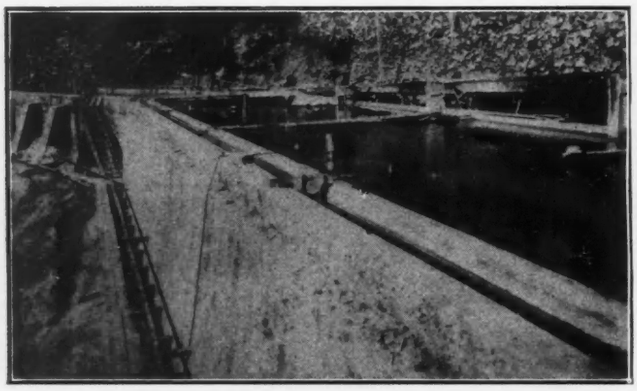
The Precipitation Room

The precipitation room contains 8 weak-solution and 4 strong-solution zinc-boxes, each having six compartments, and each compartment holding 75 kg. of zinc. About 1000 tons of weak solution and 500 tons of strong solution are precipitated each day. The room is conveniently arranged with cement launders between each pair of boxes so that a clean-up can be made quickly. It is said that all the zinc-boxes can be cleaned, and the precipitate melted into bullion in 24 hours; a clean-up is made twice a week. The precipitate is washed through 100-mesh screen to catch the short zinc; then it flows from the first sump tank to the second whence it is pumped to a Shriver filter-press having 20 frames, each 24 in. square, and making a 2-in. cake. The cakes are dried in pans and mixed loose with the flux. The charge is melted in graphite crucibles. The first bars are remelted and poured into bullion bars which are shipped. The short zinc is placed on screens and returned to the first two compartments of the strong-solution boxes, and finally when the zinc

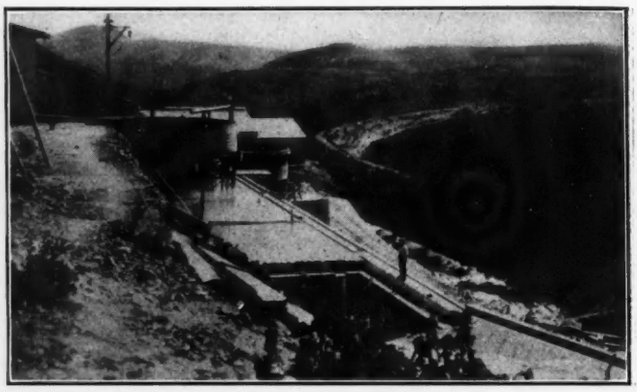
will not "cut" further it is treated with acid in a small agitation vat.

The mill is at present treating 250 tons of ore per day, about 40 per cent. of which, when crushed, becomes slime and 60 per cent. sand, but, as before mentioned, it is the intention of the company to install tube mills so as to give a larger percentage of slime and a finer sand product. The Dorr classifiers work admirably and make a very clean sand product. These have been working nine months and the repair bill is small, for the repairs consist mainly in replacing worn-out scrapers.

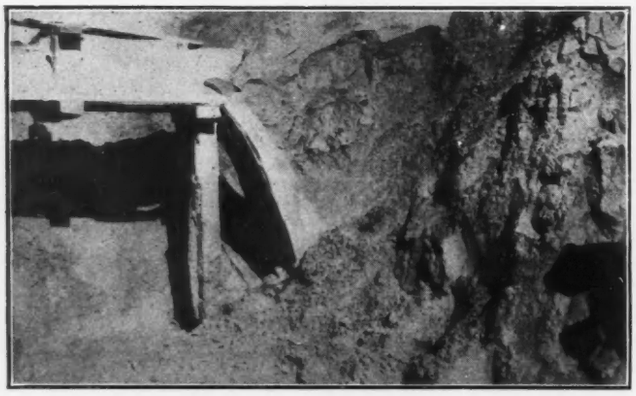
The extraction on silver is 92.7 per cent. and that on gold 88.8 per cent.; of this extraction 24.5 per cent. of the silver and 36.9 per cent. of the gold is obtained by concentration; the remainder is recovered in the cyanide plant.



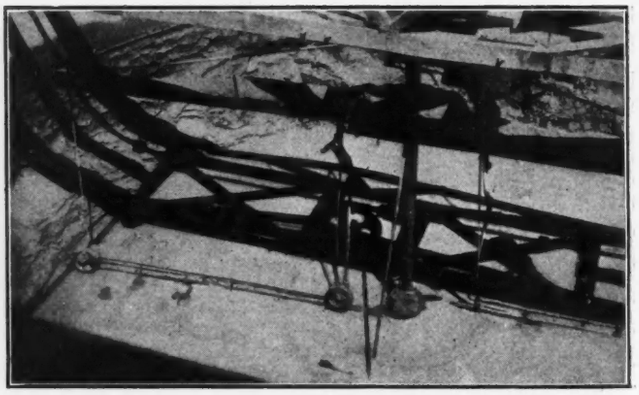
SLIME COLLECTING TANKS, PEREGRINA MILL



SLIME COLLECTING TANKS, PEREGRINA MILL



WASHING AWAY SAND TAILINGS WITH SLIME DISCHARGE, PEREGRINA



MECHANICAL AGITATOR USED AT PEREGRINA MILL

The Peregrina Mill

The Peregrina mill, which began to run in 1906, was designed by Francis B. Hobson. It treats 400 tons of ore per day, most of which comes from the Peregrina mine, but considerable ore also comes from the Barreno and the San Francisco dumps. All ore is hauled by mules in 2-ton cars; that from the Barreno dump is trammed to an incline chute that conveys the ore to the crusher bins; that from the mine and the San Francisco dump is hauled directly to the crusher bins. The ore from the bins goes to grizzlies made of rails 1½ in. apart. The undersize goes directly to a Robins belt conveyer, while the oversize is crushed by two No. 4D Gates gyratory breakers to 2-in. size, and rejoins the undersize on the 16-in. Robins belt which passes up an angle of 17 deg., and then over the 1100-ton battery bins, into which the ore is dumped by a Robins tripper.

The ore is fed by suspended Challenge feeders to 100 stamps weighing 1100 lb. each and making 106 drops, 7 ft. high, per min. An Allis-Chalmers No. 120 mortar is used, and at present Tyler soft-iron 20-mesh No. 32 wire screens on the batteries. The stamps are arranged in units of 20, each 10 being driven by a belt from the line shaft that is run by a 50-h.p. motor. "El Oro" guides and Koppel steel dies and shoes are used. The battery frame is similar in design to the one used at the San Próspero and Pinguico mills; the order of drop is 1, 3, 5, 2, 4. The stamps crush in solution titrating 0.035 per cent. KCN, and about eight tons of mill solution are used per ton of ore crushed.

The pulp from each 10 stamps goes through a 3-in. pipe to a double 2-ft. classifier, which feeds a thickened pulp to the two Wilfley tables treating the pulp from 10 stamps. The tailings from the tables go to four 5-ft. pulp-thickening cones, each two of which take the pulp from one-half the Wilfley tables and feed a thickened underflow to an Allis-Chalmers tube mill. One tube mill is 22x5 ft., the other 26x5 ft. Both use Danish pebbles for grinders, and El Oro liners; both revolve at 27 r.p.m. About one ton of pebbles is fed once a week to each tube mill, the charge of pebbles filling the mills. The discharge from each tube mill is raised by a bucket elevator to a small cone and the coarse sand returns to the tube mill. These bucket elevators, as at the San Próspero mill, are run by a pulley, bolted to the rear trunnion of the tube mill.

The overflow from the cones feeding the tube mills goes to the separating cones, one 6-ft. and two 9-ft. cones, from which a slime overflow and a sand underflow is obtained.

Sand Treatment at Peregrina Mill

The sand is charged by a two-arm Blaisdell pulp distributer to one of two sand-collecting tanks 28x6 ft. deep, having a 6-in. filter bottom. The sand is transferred through a central opening in the bottom by Blaisdell machinery to one of the 18 sand-treatment tanks, the same size as the collecting tanks, arranged in two rows of nine each. The tanks are discharged by a Blaisdell excavator onto a belt conveyer, which takes the tailings to the dump.

It takes about 15 hours to fill a collecting tank; during collecting the overflowing slime is returned by a 4-in. centrifugal pump to the separating cones. After being filled, the collecting tanks are drained before being transferred to one of the treatment tanks, where, after 50

COST OF CYANIDING, GUANAJUATO DEVELOPMENT COMPANY'S MILLS.

Mill.	Period 1908.	Wet Tons Milled Per Month.	Crushing.			Concentration.	Classifying.	Treatment.		Filtering and Precipitation.	Pumping Solution.	Water Supply.	Surface Expense.	All Costs.				
			Coarse.	Fine.	Regrind.			Sand.	Slime.					Labor and Bosses.	Supplies.	Power.	Miscellaneous.	Grand Total.
Peregrina	Average of 4 months	12,356	$0.079	$0.395	$0.185	$0.061	$0.011	$0.346	$0.253	$0.189[1]	$0.067	$0.022	$0.020	$0.453	$0.748	$0.415	$0.003	$1.619
	Minimum monthly tonnage	11,324												0.485	0.910	0.425	0.005	1.825
	Maximum monthly tonnage	13,593												0.440	0.665	0.380	.....	1.485
Pinguico	Average of 8 months	6,188	$0.075	$0.305	$0.235	$0.080	$0.020	$0.460	$0.405	$0.415	$0.050	$0.080	$0.040	$0.720	$1.090	$0.355	.....	$2.165
	Minimum monthly tonnage	5,820												0.825	1.140	0.365	.....	2.330
	Maximum monthly tonnage	6,168												0.675	0.975	0.325	.....	1.975
San Próspero	Average of 7 months	4,014	$0.055	$0.340	$0.100	$0.050	$0.025	$0.390	$0.360	$0.310	$0.065	$0.040	$0.015	$0.470	$0.875	$0.395	$0.010	$1.750
	Minimum monthly tonnage	5,820												0.510	1.100	0.470	.....	2.080
	Maximum monthly tonnage	6,168												0.465	0.860	0.335	.....	1.660
Nayal	Average of 6 months	1,347	$0.115	$0.600	.....	$0.135	$0.205	$0.595	$0.430	$0.290[1]	$0.045	$0.035	$0.045	$1.020	$1.045	$0.420	$0.010	$2.495
	Minimum monthly tonnage	1,168												1.065	1.350	0.535	.....	2.950
	Maximum monthly tonnage	1,477												0.950	0.915	0.285	.....	2.150

[1] No filtering plant at this mill.

kg. of sodium cyanide has been added, the first wash of strong solution (stored in two 100-ton tanks), titrating 0.28 KCN, is run onto the sands. As soon as the solution begins to flow through the charge the valves are closed and the tank allowed to soak. At the end of 30 hours the valves are opened and the tank drained. Then 5 to 8 tons of strong solution are added every six hours. This leaching with strong solution is continued for 7½ to 8 days, and then the tank is given from 3 to 5 water washes before being discharged. The water washes go to the weak-solution zinc boxes for precipitation, and the strong solution to the strong-solution boxes. In order to protect the strong solution from fouling 15 kg. of lead acetate are added each day to the strong-solution storage tank.

Slime Treatment at Peregrina Mill

The slime, overflowing from the separating cones, goes to nine masonry tanks, about 3 m. deep and having a total capacity of 1050 cu.m., which act as storage tanks in case of accident as well as settlers. These tanks have slanting bottoms and discharge through a 6-in. pipe to a launder running between the slime treatment tanks. At the upper end of this main pipe, a connection is provided so that in case of stoppage the main pipe can be washed out by water under high pressure. Each settling tank is charged by a drop pipe extending about one-half way to the bottom of the tank, and the pulp overflows from one compartment to another until finally clear solution overflows from the end compartment. The slime is run through all these settling compartments until one of them is filled, then the feed to that compartment is cut off, and the pulp is allowed to settle; and the solution is decanted. Finally the tank is sluiced out with weak solution, the pressure being applied by a 5x12-in. triplex pump.

The slime from the settlers goes to one of the 16 slime tanks, 36x12 ft. deep, arranged eight in a row with an agitator shaft running over the center of each row. Both shafts are driven by one 40-h.p. motor. The agitating device, as is shown in an accompanying illustration, consists of a central vertical shaft (driven by a worm and gear at ⅔ r.p.m.) and cross-arm (fastened to the shaft near the top) from which by means of eye-bolts and rods, two angle irons, one on each side, are flexibly suspended. An air-hose leads down to a tee in an air-pipe which is placed in the angle of the angle iron so as to be protected by it. From this air-pipe extend ⅜-in. nipples, 2 in. long, tapered to a 1/32-in. hole, through which compressed air blows.

These agitation tanks discharge at the bottom near one side into a cross canal that leads to a central canal running below and between the two rows of slime tanks. This permits the foundations to support the entire bottom of the tank. The slime discharges against the sand residues that have accumulated on the dump between the different dischargings of the slime tanks, and carries them down the cañon so that there is no accumulating tailings to cause bother in the future. This scheme works well for a good grade is available, and only occasionally, when there has been an unusually long time between the discharging of slime, is it necessary to use men to aid the water in starting the accumulated sand.

The slime tanks hold about 90 tons of dry slime per charge. Weak solution titrating 0.06 per cent. KCy is added to the slime in the tanks until the dilution is about 3 to 1; then 10 kg. of lead acetate and 25 kg. of sodium cyanide are thrown into the tank and the charge is agitated for 30 hours. The pulp is next allowed to settle for 12 hours, and is then decanted for about 2 hours through an ordinary swinging decanting pipe. Next, the charge is agitated for 10 hours, settled 12 hours, and decanted 2 hours. Six washes of weak solution are given to each charge, and finally one or more water washes. The water washes are pumped to the mill solution, and the weak-solution washes to the weak-solution zinc-boxes.

In the precipitation room there are 18 zinc-boxes, each having four 4x4x4-ft. compartments. Six of these boxes are for strong solutions, two for mill solutions, and the rest for weak solutions, but at present only four boxes are used for the strong solution, and eight for the weak solution. About 440 tons of strong and 700 tons of weak solution are precipitated each day. The solutions are returned by Aldrich "Allentown" triplex pumps, all being in duplicate. The strong solution pumps are 9x9in., the weak solution pumps 14x10 in., and the mill solution pumps 11x10 inches.

There are four smelting furnaces; at present these are fired with coke, but in the near future these are to be replaced by furnaces burning oil. When making a clean-up the precipitate from the boxes is washed through 60- and 100-mesh screens so as to separate the short zinc. This short zinc is dumped on top of the zinc shavings in the first compartment of the strong-solution boxes. The precipitate is pumped from the sump to a 24-in., 30-frame Shriver filter press. The cakes are partially dried with air in the press and then in a wood-press. The precipitate is charged loose into the pots. The first bars are remelted to make the final bullion bars.

The slimes are not filtered at this mill, and experience has shown that the washing with the water in the tanks gives such good results that the small amount of solution left in the slime is so poor in metals that the installation of a filtering system will not pay.

The itemized cost per metric ton wet (U. S. currency) at these different mills is shown in an accompanying table.

Manhattan, Nevada

SPECIAL CORRESPONDENCE

The renewed activity in the Manhattan district in both mining and milling is full of promise for that section of the country which had such a boom three years ago.

Manhattan is situated on the western slope of the mountains which border the Big Smoky valley on the east. It is 55 miles north of Tonopah, from which point runs the Government daily mail stage and two lines of automobiles which also run daily each way. The automobile makes the trip one way in about 1½ hours, and the fare is $15, or $25 for the round trip.

MINERAL BELTS

There are three distinct belts in the mining district. The southerly one is granite, which contains many large fissure veins with quartz filling. The ore found here has thus far been of low grade, but very little effective prospecting or development has ever been done. In this belt are several valuable springs and water rights which have been developed to some extent.

The middle belt is composed of flat-lying sedimentary rocks, consisting of slates, shales, schists and some limestone. This belt is the scene of the camp's mining activity at present. The producing zone is more than a mile in length. Besides the company work going on, many leases are at work, and together they keep four mills in constant operation.

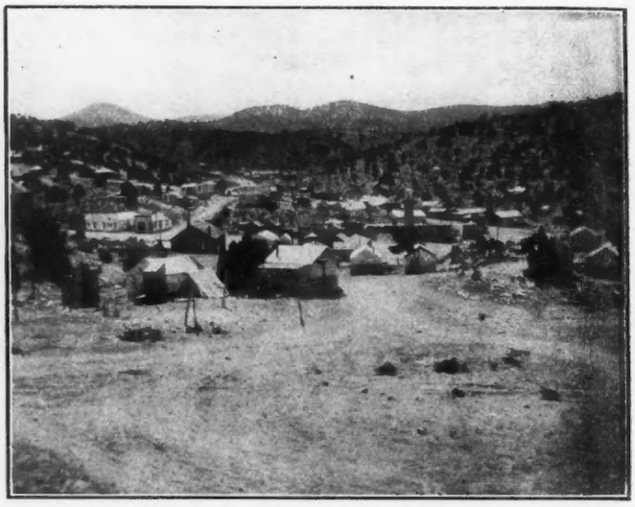
North of this is a porphyry belt of which Bald Mountain is the backbone. Considerable development work is going on here in a very promising fracture zone. The veins are the results of faulting, and are filled with quartz. The value is wholly in gold which almost always occurs associated with brown hematite spotted through the matrix and evidently the source of the ore though subsequently oxidized. All the work here has thus far been done by tunneling with the double object of developing the veins and of gouging out enough ore to pay for development, with the usual results.

REDUCTION PLANTS

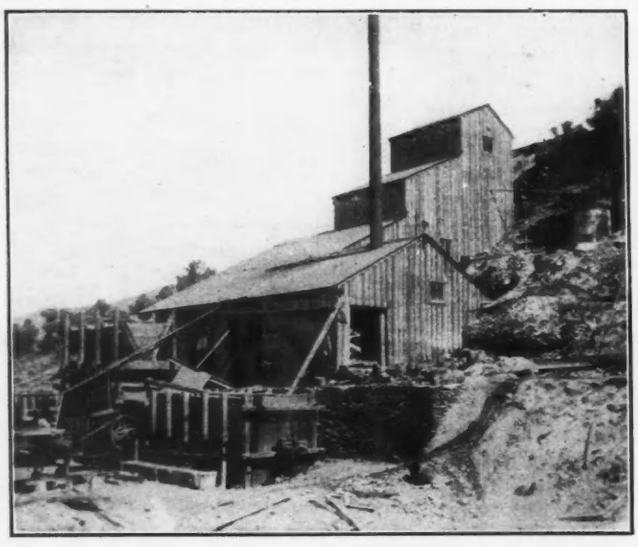
There are four operating mills in Manhattan, and one under construction. The latter is a five-stamp mill on the Wild Bill property in the Bald Mountain section. It will be driven by steam. The mine has sufficient ore to keep the mill busy for a considerable campaign. In the town itself are located the four operating mills.

The Cañon mill is a custom mill of 40 tons capacity, which crushes its ore in a 6-ft. Huntington mill, concentrates on two Overstrom tables and cyanides the

PETERSON MILL, MANHATTAN



MANHATTAN, NEVADA, LOOKING SOUTH



CANYON MILL, MANHATTAN

LEMON MILL, MANHATTAN

slimes. The cyanide plant is equipped with V-box classifiers, rectangular agitation tanks with mechanical agitation and a small Butters filter. The plant is run by steam, and the fuel used is wood, of which there is a copious supply in the district.

A quarter of a mile farther down the cañon is the Veith mill, owned by a leaser and running exclusively on his ores. It has two stamps driven by a 12-h.p. gasolene engine. The ore is free milling, and the pulp, after passing over the plates, is put through an amalgamating pan and then discharged to the tailings dam.

The Peterson mill, which will treat the ores from the Sullivan properties, held under a five-year lease, is a modern well equipped mill of 40 tons capacity. It has 10 stamps, a tube mill, settling tanks, mechanical agitation tanks and a 40-frame Butters filter. Zinc-dust precipitation is used for the gold solution, and the sludge is put through a Merrill filter press which produces zinc cake carrying all the gold and a barren clarified solution of cyanide. Wood fuel is used and the plant is driven by a tandem compound McEwen high-speed engine.

The Manhattan Milling Company has acquired the Lemon mill which had a short and unhappy career, has remodeled it and made the first preliminary run. About $28,000 was recovered on the plates from 132 tons of ore with $2300 left in the tailings. These latter are now being cyanided. The equipment consists of a Blake crusher; 10 stamps; a Dorr classifier; five 50-ton sand tanks; three 30-ton and two 70-ton agitation tanks, where the pulp will be agitated by circulating pumps; and the regular zinc-box precipitation apparatus.

Transportation

Manhattan has abundant water and timber. It could be readily connected by rail with the Tonopah & Goldfield railroad main line by a branch about 35 miles long. This would assist the development of the camp greatly.

Platinum at the Cracker Jack Mine, Douglas County, Oregon

By H. B. Pulsifer*

The Cracker Jack mine in Douglas county, Oregon, lies on a point of a range of hills known as Middle Creek ridge. On three sides the ground breaks precipitously to Cow Creek valley, about 600 ft. below. Most of the ground having a greater elevation than the mine lies to the east, but owing to the fact that the gravel bank is situated so high on the ridge a ditch 5½ miles long is necessary to supply the water for hydraulic operation; even with this length of ditch, owing to the small water-shed, the supply is available only during periods of rain.

The mine has been operated without marked success for at least nine seasons. Originally the property contained approximately 18 acres of gravel, but two-thirds of this area has been already worked. So far as known no systematic saving of the platinum had been made until the season just past.

During the Lewis & Clarke exposition samples of black sand from this mine were tested at the testing plant of the United States Geological Survey. The two samples from this mine were among the richest in platinum that were received; not only platinum but also osmium and iridium were present.

With special reference to determining the occurrence of these valuable metals the property was obtained by men from Kansas City early in 1907 and during the hydraulicking season of 1907-8 the mine was carefully operated to save both the gold and the platinum metals. As the shortness of the season precluded operations on more than small sections of the bank, the whole face of gravel was carefully and completely sampled; other samples were obtained from the tailings of former operations. The hydraulic equipment consisted of a small reservoir, supplied by about six miles of mountain ditch, and furnishing water to one giant under a head of 125 ft. through an 11-in. pipe.

Method of Saving the Platinum

Last season was, in general, favorable for hydraulic mining in southern Oregon, yet this particular catchment area, lying so high in the mountains and not being especially favored locally, gave water fitfully and in scant amount. Only 8750 24-hr. miners' inches of water were available; with this nearly 14,000 cu.yd. of dirt were washed through the sluices. Unfortunately, the grade of the sluice boxes was becoming inconveniently flat, and caused much hand labor and delay.

The usual Hungarian riffles were used, some sheathed with iron, others not; pole riffles were used in one section of a 300-ft. cut. As no special provision could readily be made to gather the concentrate near the head riffles, grizzlies were placed at the mouth of the cut above the 300-ft. dump, and the fine material was led to one side through a supplementary sluice. The riffles in these boxes were kept in especially good order, care being taken that the riffles did not pack with the excessive amount of clay passing over them. The concentrate was removed and sacked at frequent intervals.

At the close of the season the concentrate, saved from all parts of the gravel bank during the whole period, amounted to about 10 tons. This was screened with plenty of water over a screen having ⅛-in. openings, the quicksilver and amalgam being caught in a trap directly beneath the screen.

Treating the Platinum-bearing Black Sand

After screening, the concentrate was twice jigged in a hand jig of large capacity. This reduced the material to about 1500 lb., leaving it rich in black sand. In the tailings was found a very fine black sand amounting to about 10 lb. per ton, yet this caused no appreciable loss of the metals, for on panning this fine sand it showed no colors and assayed only a trace in metals of the platinum group.

The 1500 lb. of medium sand were washed over a series of steep mercury troughs to remove the rusty gold and the last of the quicksilver; then it was passed through a very small jig having a 10x12-in. screen area. The concentrate after this treatment weighed 400 lb., being almost pure black sand; again the tailings panned free from platinum colors, while the hutch product showed abundant white grains.

As scaly gold is with great difficulty separated from such sand as this by panning, it was expected that it would be impractical to remove the platinum grains by simply panning with water. But, on the contrary, it was found that the rare metal grains settled readily; consequently, when the final concentrate had been panned twice it was quite free from platinum metals, and ½ oz. of clean white metallic grains had been obtained. The loss of gold, as observed and as followed with assays, was more considerable in proportion than the loss of rare metals.

Eighty-five samples from the gravel bank averaged 0.9 lb. of black sand per ton of dried material. These samples grouped into a few composite samples were assayed by Prof. Bugbee, of the Massachusetts Institute of Technology, and agreed closely with the results of the actual work.

Although this work only confirmed the previous estimate of the gold in the gravel, it showed that the samples sent to the United States Geological Survey must have been highly concentrated. It also demonstrated that a high saving of these rare metals can be made fairly easily.

The jigs used were of the simplest design, requiring but a few hours to construct from material that happened to be at hand. The operation of jigging required only a few hours. Where the rare metals occur as metallic grains in the gravel, by using sluice-boxes with false bottoms so that periodically the black sand can be removed quickly and completely, and then treating the black sand by means of such concentrating apparatus as has been described, a recovery of more than 90 per cent. of the rare metals should be made at a very small cost.

The proper lubrication of machinery has an important bearing on the cost of producing a ton of coal or ore.

*817 Oak street, Kansas City, Mo.

Geographic Distribution of Lead and Zinc Deposits of the Mississippi Valley

By Charles R. Keyes*

From the usual descriptions of the lead and zinc regions of the Mississippi valleys the impression is gained that the distribution of the ore deposits is relatively limited, very local, and confined to a bare half-dozen indifferent areas known as districts. This conception is in many ways misleading, not only to the scientist, but to the seeker after new mines. Industrially the effects of a prevalence of such a notion are particularly unfortunate. Perhaps no one factor has contributed so largely as this one to placing limitations upon exploratory work and retarding the expansion of local mining generally.

Contrary to general opinion the ore deposits of the Ozark region are not limited to a few circumscribed areas. They extend far beyond the boundaries of the present recognized mining districts. It is probable that the orefields outside of the limited districts now operated will prove to be much more extensive than the fields already developed up to the present time.

The general tectonics of the Ozark uplift are of peculiar interest. For the present the features of the Dubuque lead and zinc district may be passed over; and consideration confined more particularly to the Ozark region of southern Missouri, northern Arkansas, southeastern Kansas and northeastern Oklahoma. In their direct genetic bearing upon ore deposition the larger features of the geologic structure have a significance that does not appear to have been made the most of during past exploration in the region.

The Ozark Uplift

In its simplest form the Ozark uplift, which is practically the only metal-mining region of the great Mississippi valley, may be regarded as a huge quaquaversal dome 400 miles long by 200 miles broad. The central portion rises 1400 ft. above the level of the plains country about the margins. It is a region that has been repeatedly upraised and planed off by erosion, until in the middle part only the oldest known rocks are exposed. The last complete planation, apparently down nearly to sea level, occurred during late Tertiary times. The present uplift is evidently the result of very recent and very rapid crustal movement, perhaps as fast as mountain building ever does take place. This is a feature that has been wholly overlooked in the many discussions of the ore deposits of the region. It appears to be one of the most important factors contributing to mineral concentration and ore deposition.

The lead and zinc deposits of Missouri and Arkansas are not scattered promiscuously throughout the Ozark uplift, but are confined to a well-defined belt of greater or less width which borders the basal margin of the dome and completely encircles it.

The productive mineral-bearing belt is rather sharply delimited on its outer border by the margin of the Coal Measures. Its inner border is somewhat more irregular owing to local peculiarities which need not be referred to in detail at this time. There are some unimportant deposits within the main ore ring in positions suggesting former locations of the belt, before the Coal Measures margin had moved so far as it is at present down the slope of the dome.

The character and position of the Ozark ore ring are most significant features bearing upon the genesis of the ore deposits. Were the Ozark dome a segment of a perfect sphere, the distribution of the ore materials at its base would be doubtless quite uniform. But the effects of crustal deformation have been unequal. In consequence of this the accumulation of the ore materials is also more or less unevenly disposed. At some points in the basal ring there have been localized extensive deposits of workable character. These are separated by barren tracts, or rather sections in which the orebodies are not, as yet at least, very important, or in which mining is carried on only in a small way.

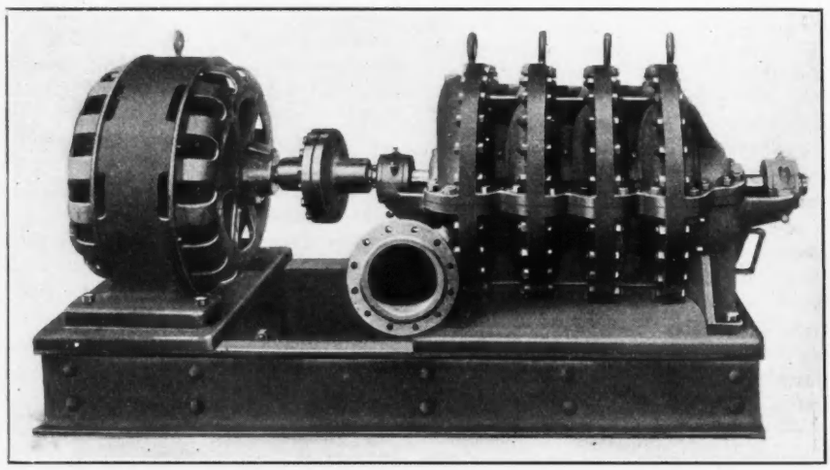


FIG. 1. FOUR-STAGE LEA DEGEN HIGH-DUTY TURBINE PUMP

Mining Districts

In the usual descriptions of the lead and zinc mines of the Ozark region it is customary to regard them as forming more or less isolated "camps." These are segregated, in Missouri for example, into three principal groups. The general recognition of these mining districts, according to accidental political boundaries rather than along geologic lines has entirely obscured whatever genetic relationships might possibly exist between the various orebodies of contiguous camps. The title, Southwestern district, for instance, has no further real significance than that of direction; it refers merely to a vaguely defined area lying somewhere in the southwestern part of the State of Missouri.

In a rough way mining men have come to recognize in the several districts tracts of more productive ground separated from one another by more or less broad strips of poorer country. Many miners, moreover, have associated the ore deposits with the present stream valleys. Thus far, also, all attempts of the scientists to associate the orebodies with lines of faulting have been unsuccessful. Nevertheless, there is discernible in the local distribution of mine developments certain definite lines along which orebodies are more abundant and closer together than along other lines. Miner, layman and scientist alike who have worked in this region are in accord with the idea that there must be some dependence of ore occurrence upon geologic structure, even if it take some of the refinements of investigation which the latter employ to determine what those relationships are. These structures which most influence the localization of the orebodies appear to be the syncline, trough, or, more broadly speaking, the basin.

A noteworthy and significant fact is that these synclines or troughs pitch radially down the slope of the great dome. At their lower ends the chief workable orebodies are found. The reason for this peculiar distribution of the ore deposits is not hard to seek. So prevalent is the presence of orebodies in the vicinity of the Coal Measures that many persons have associated the ore deposits directly with the reducing action of the carbonaceous shales. There really appears to be small ground for this deduction. A more critical examination into the relationships of location of the orebodies and the geologic structure clearly indicates that in nearly every instance the impervious shales have acted as a dam or barrier at the margin of the Coal Measures area, and have raised the local groundwater level. As a result empounding conditions

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are, as it were, produced which in turn impose well known conditions favorable to extensive ore deposition.

The phenomenon appears not to be uncommon. It has been recently described in connection with certain western lead and zinc deposits, notably those of Lake Valley and Magdalena in New Mexico and elsewhere. This seems to be a common, if not a general mode of ore localization in the vadose zone particularly where the rocks have undergone recent tilting. On the geological map of Missouri a band of 20 miles wide bordering the Ozark margin of the encircling Coal Measures contains over nine-tenths of the workable ore deposits.

The Lea-Degen Turbine Pump

The Lea-Degen high-duty turbine pump, built by the Lea Equipment Company, 136 Liberty street, New York, is designed for heads of from 7 to 1000 ft., or higher, with capacities ranging from 100 gal. to 30,000 gal. per minute. The general design of the pump consists essentially of shrouded pump-wheel runners mounted on the same shaft in a case. The case is so partitioned that the water is drawn from the source of supply and put under pressure by the first wheel and delivered to the suction chamber of the second wheel, this operation being repeated as many times as there are runners. In passing from the first to the second wheel the water passes through passages formed in the casing by means of ribs, or deflectors, which take the water from the first wheel in the direction in which it leaves such wheel, conveys it by an easy spiral path to the second wheel, and so on to each succeeding wheel.

The passages or nozzles from one stage to the other gradually increase in area in the direction of the flow of water, so that the velocity of the water imparted by the first wheel is gradually transferred in these passages into pressure and little, if any, energy is said to be lost through eddy currents in the passage of the water from one impeller to the next. The combined effect of giving the water the spiral direction in the passages, and at the same time gradually decreasing its velocity and transforming it into pressure, has much to do with the efficiency of this pump.

By means of bolted circumferential divisions of the case, provision is made for either using the suction and discharge end of a case together as a single-phase pump, or for adding as many intermediate sections as may be necessary to afford any desired pressure at any first speed. From this it will be seen that additional stages can be installed after a pump has been in operation without wasting any part of the original case.

The packing consists of right-angled cup leathers held in place by springs in such manner that they are tight under all conditions and allow the shaft to oscillate throughout any distance necessary. It is believed that the packing will not be affected by the wear of the shaft or sleeves. The leather cups are designed to be held against a flat collar on extended pump sleeves so they will counteract any wear of the cups or collars, while the shaft may be shifted at will in either direction, with the leathers following, without changing the location of the leather with relation to the shaft collar, thus making a practically water-tight joint. To insure the leathers seating against the collars before pressure is put on the pump, a spiral spring is used between each pair of cup leathers. Provision is also made for setting out the leather packing on the suction end of the shaft by the water pressure of the high side of the pump.

A ball thrust bearing, with adjustable collars, for shifting the shaft endwise to balance the end thrust of the pump runners, is placed on the outside of the main bearing at each end. The balancing is accomplished by means of variation in the width of the water space on both sides of the wheel between the rim of the wheel and the case. Both suction and discharge connections are placed below the center line of the pump, thus allowing the renewal of the top without breaking the water line, and at the same time they are in such shape as to give practically no obstruction to the easy flow of the water.

The following show the results of a test under conditions of maximum efficiency, which was carried out by James E. Denton, professor of mechanical engineering, Stevens Institute of Technology: At 400 r.p.m. 77.7 per cent. efficiency with a capacity of 2296 gal. under 43.6-ft. lift. At 500 r.p.m., 77.6 per cent. efficiency with a capacity of 2794 gal. under 67.4-ft. lift. At 600 r.p.m., 77.9 per cent. efficiency with a capacity of 3235 gal. under 100.7-ft. lift.

The design of this type of pump is very compact. A 10-in., four-stage, turbine pump, connected to induction motor, having capacity of 2400 gal. per minute to 568-ft. head, is 5 ft. 6½ in. long from end to end of main bearing, 3 ft. 9 in. in width from suction flange to delivery flange, and 3 ft. 3 in. in hight from top of bedplate to top of pump.

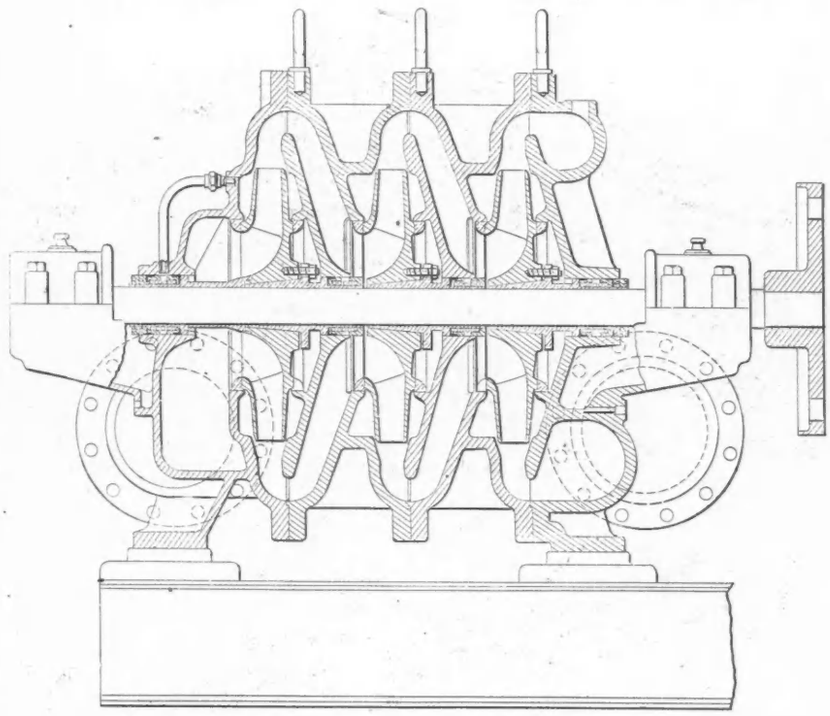


FIG. 2. SECTIONAL VIEW OF LEA-DEGEN TURBINE PUMP, THREE-STAGE

Ankylostomiasis

Ankylostomiasis is an intestinal disease due to the presence of a worm called *ankylostoma duodenale* in the upper intestine. This disease is not confined to miners but is common in tropical countries among laborers. Even field laborers suffer from it.

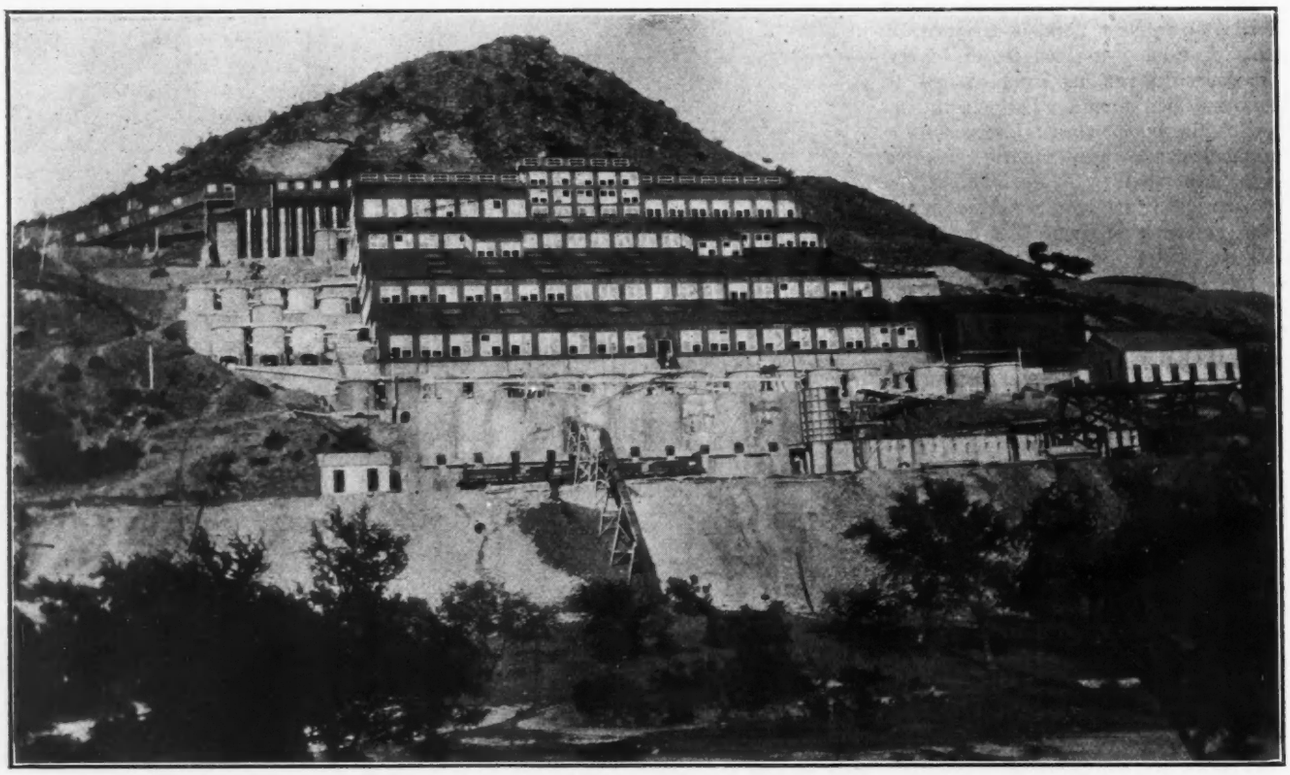
The disease may be contracted in the mines where in the damp, dirty conditions and the warm air underground this parasite rapidly increases in numbers, when once introduced. High temperature favors the development of the ova but the eggs hatch in as low a temperature as 48 deg. F. The disease is acquired by miners while eating by swallowing the larva which get on the miners' hands, and by the worms passing through the skin causing a temporary eruption. The symptoms of the disease are quite similar to those of anaemia.

Las Chispas Mines, Sonora, Mexico

Rich Silver Veins of the Minas Pedrazzini Company. Their History, Geology and Operations. Mining and Ore Treatment. Ore Stealing

BY B. E. RUSSELL*

During the early eighties the Santa Maria Mining Company was operating a small gold-silver prospect a few miles south of Arizpe in the northern part of the State of Sonora, Mexico; but an inefficient management and an efficient corps of Mexican "high graders" contributed to its undoing; and after some years of effort marked by failures the company closed down, leaving in charge its clerk, an Italian-Swiss named John Pedrazzini. Taxes fell in arrears, as well as the wages of Mr. Pedrazzini, and finally the company turned over to him the property in lieu of the money due, and upon payment by him for the machinery on the ground. When the property thus fell to him he raised sufficient capital, on his representations to various Mexican merchants of Hermosillo, to undertake exploration work. During this period a tunnel was driven into the hill about 4000 ft., tapping the Las Chispas vein at a depth of about 600 ft. below the outcrop, and opening up the orebodies below the surface pockets. Early in 1907, the properties were incorporated under the name of the Pedrazzini Gold and Silver Mining Company, and E. L. Dufourcq, of New York, was retained as general manager and consulting engineer. At that time the real history and development of the property may be said to have commenced. Underground work has been pushed; much needed surface improvements have been made during the year that will reduce the cost of handling and treating the ore; and an efficient corps of employees has been recruited at the mines.



LAS CHISPAS MINES, MEXICO

Geology of the District

The geology of the district is complex, and only a careful and exhaustive study will reveal information of value to the student. The productive area is limited to a belt of rhyolite traversing the country in a general northerly and southerly direction and lying in almost horizontal beds, the lines of which are very plainly marked. This rhyolite is cut off on the surface by a flow of volcanic tuff, which marks the northern boundary of the developed area. At the contact with this flow the zone of the mineralization is less than a half mile wide; but to the south and east it gradually diverges, losing its identity in the andesites and limes of the section; although the continuation of this belt can be traced, in a general way, southerly along the Sonora river through the old camps of Los Gijos, Sta. Elena and others formerly worked by the *antiguos*. To the west, and lying between Las Chispas and the Sonora river, are beddings of a sedimentary deposition of the igneous rocks that have probably been eroded from the original cap-rock of the country. At the contact with the rhyolite these sedimentaries are in the form of conglomerates and lie at nearly the elevation of the top of the range. From here the country drops away rapidly in the direction of the river and the conglomerates lose their identity as such, giving way to a fine-grained sedimentation resembling kaolinized rhyolite or tuff.

Ore Occurrence

The ore occurrence is chiefly remarkable for the extreme richness and beauty of the high-grade *chispas*, or crystals of silver, from which the most fully developed property—Las Chispas—takes its name. This ore occurs in boulders,

*Mining engineer, Nacozari, Sonora, Mex.

stringers and lenses in a series of 14 nearly parallel fissure veins in the rhyolite which follow the same general trend as the belt. The vein filling is a rhyolite breccia carrying the values in the cracks and seams which vary from the merest crack to 2 ft., or even 3 ft. in thickness. The values occur in the form of nearly all known silver ores, but those predominating are argentite, polybasite and stephanite, which in addition to their silver content carry approximately 1 oz. of gold to each 100 oz. in silver. The values in gold are considerably lower in the argentite ores and decrease with the increase of the silver content. The walls show very little kaolinization or other important alteration although the stringers of ore extend so far into them as to render it necessary to carry the stopes from 12 ft. to 18 ft. in width for considerable distances.

Development

Development work on the various properties belonging to the company has been confined to a comparatively small portion of the ground, although the management laid out and commenced a comprehensive system of work which was started during the past year, but was dropped with the fall in the price of silver. Prospect tunnels were started on the Dolores and San Miguel veins, but this work was stopped early in the year on account of the above-mentioned fall, and of the fact that they had not responded to development as soon as was expected. On El Dorado and Puertecitos veins tunnels are being driven to tap at depth the orebodies worked by the old company. On the Granaditis and El Carmen—the latter being the mine formerly held by the Santa Maria Mining Company—properties which lie at a considerable distance to the south of Las Chispas, sinking is now in progress, and the old workings are being caught up preparatory to resuming mining operations. At El Carmen the mill has been repaired, and it is expected to have it running on ore from the two mines not later than the first of the year. The main source of ore at the present time is in the territory opened up by the San Gotardo tunnel, which taps Las Chispas vein at a depth of about 600 ft. In this tunnel the workings are confined to the Chispas and William Tell veins, but it will be extended to tap the known orebodies of La Central and San Luis regions. As far as known the longest continuous shoot of ore at the present time is about 400 ft., with an average hight of about 250 ft. It has been the policy of the management to treat these shoots of ore as lying almost horizontal and more or less overlying each other in the veins; but in the face of a comparison of the conditions here and at El Tigre mine, where there is a marked similarity, it would seem that what are now considered separate orebodies will, after more development work has been done, be found to be practically continuous, although not connected up by the bonanza ore.

Operations and Results

A resumé of the operations at the property for the past year[1] show a development account considerably in excess of that of most mines of this size; but the large amount done on the ore—all but 655 ft. out of 3435 ft. of total new work—is somewhat out of the ordinary. Operations for the year were productive of 928 tons of first-class ore running about 565 oz. in silver and 4.2 oz. in gold; 4232 tons of second-class ore, of which 3286 tons carrying about $7 in gold and 50 oz. in silver were treated at the San Gotardo mill; and 955 oz. of picked sulphide of silver. The shipments aggregated about $430,000 in value, of which half was net profit, and on which dividends to the amount of $150,000 were paid. The ore reserves at the end of the year were estimated at $859,000 in value.

Treatment of the Ore

The second-class ore is treated by a combined concentration and pan-amalgamation process, by which from 70 to 75 per cent. of the values are saved and shipped as concentrates or bullion. The San Gotardo mill is equipped with rock breaker, 10 gravity stamps, two Wilfley tables and three amalgamating pans with two settlers. The water supply is sufficient only for 10 months in the year, but it has been found more economical to handle the small amount of second-class ore piled on the dump during the dry season twice than to install an expensive pumping plant. Owing to their isolated situation a small mill was installed at El Carmen to treat in a similar manner the ores from El Carmen and Granaditis mines.

Situation and Transportation

The mines are nearly at the top of the range between the Sonora and Yaqui river drainages, about two miles east of the Sonora river, and about 1000 ft. in elevation above it. The country is rugged, and the lack of transportation facilities has held back the entire district. All heavy freighting is done by wagon road to Cananea, some 75 miles north of the mines. The Mexican ore packers, however, prefer to take their trips out to Querobabi on the Sonora railroad some 90 miles to the west. The completion of the Nacozari branch of the Cananea, Yaqui River & Pacific railroad offers a possible solution of this problem. Surveys have been run, and bids are in for the construction of an aërial tramway to cross the range—some 4½ miles—to the east and connect at the terminal with a 20-mile wagon road to the railroad. This will materially reduce the present cost of freighting in and out—40 pesos per ton—as well as serve to bring in the wood for boiler purposes.

Labor

The mine bosses are entirely Mexicans, as are the miners and laborers with the exception of a few Chinese and Japanese. Drilling is done both by machine and by hand, and is contracted as far as possible. The hand drillers are paid about 50c. per ft., and the machine runners from 4 to 5 pesos per day. Drifting and sinking is generally paid for by the foot and the contractors get from 12 to 40 pesos per ft. The prices range rather higher here than in neighboring camps, but the rock is generally tough, and many of the working places are very hot. Practically all of the rock broken in mining, which is done entirely on stulls, is taken directly to the surface, where it is screened and sorted on the *plania* by men and boys.

The first-class ore is double-sacked, sewed and sealed, then stored in the ore-house; while the second-class ore is either taken directly to the mill, or stored on the dump for future treatment.

Ore Stealing

The chief problem with which the management has had to contend thus far has been the dishonesty of the employees in the face of the extremely high-grade ore; and the difficulties of holding labor under the severe measures necessarily taken. All employees passing to and from the works are rigorously searched, and the underground laborers pass through a change-room. Even then a small proportion of the ore finds its way into the hands of the American and Mexican ore buyers. As a whole, the Mexican officials endeavor to put down this evil so far as possible, but convictions are few.

Amusing instances are related of the efforts of the tenderfoot to get rich quick buying this high-grade ore. A Cananea ore-purchasing company had its representative proceed with much secrecy to a secluded spot and bargain for a large lot of ore which he bought on sight. Unfortunately for their plans it proved to be from a mine in the immediate vicinity, and while similar in appearance, the supposed brittle silver was specular hematite. Others who have gone out to buy this ore under similar circumstances have had their money taken without being even presented with its useless equivalent. One well known character, who carried his purchases from the vicinity of the mines to Cananea in a water barrel set in the back of his wagon, stopped with some Chinamen in Arizpe, who substituted cobble stones for the ore and refilled the water barrel—as he found much to his chagrin on reaching home.

[1]The Engineering and Mining Journal, May 23, 1908, p. 1038.

The Scott Gasolene Rock Drill

A rock drill, operated entirely by gasolene has been designed by L. L. Scott, Joplin, Mo.

The complete drill, mounted on its tripod, is shown in Fig. 1. In general appearance it resembles an ordinary air drill. The machine operates on the two-cycle principle and the mixed air and gas is drawn in at the upper and lower ends of the drill, through ports on the top of the cylinder. A spark plug and timing device explode the charges alternately and these act on the inner faces of the pistons; an explosion occurs on each up-stroke and on each down-stroke. The pistons are solid steel castings, the upper ends being connected to the crank-shaft through the connecting rod; the lower ends are connected by a swivel to the drill rod. The cushions are in the interior of the lower piston and the rotating mechanism is in the lower receiving chamber. Fig. 2 shows the crank-shaft, pistons, rotating device, chuck and drill steel. In this drill the explosion chambers are so arranged that the heat will not affect the rotating device or drill rod.

The rotation of the drill rod is independent of the piston. The steel is held by the usual form of U-bolt chuck, and the drill is fed by an ordinary feed screw. In the oiling system, the oil is mixed with the gasolene and the mixture is sucked in with each charge, thoroughly oiling every moving part of the machine. In the Scott drill the piston and rod momentum is taken up by useful work in compressing the charge. The crank-shaft, while extremely heavy, has practically no work to do, and simply acts as a guide to insure the proper opening of the ports.

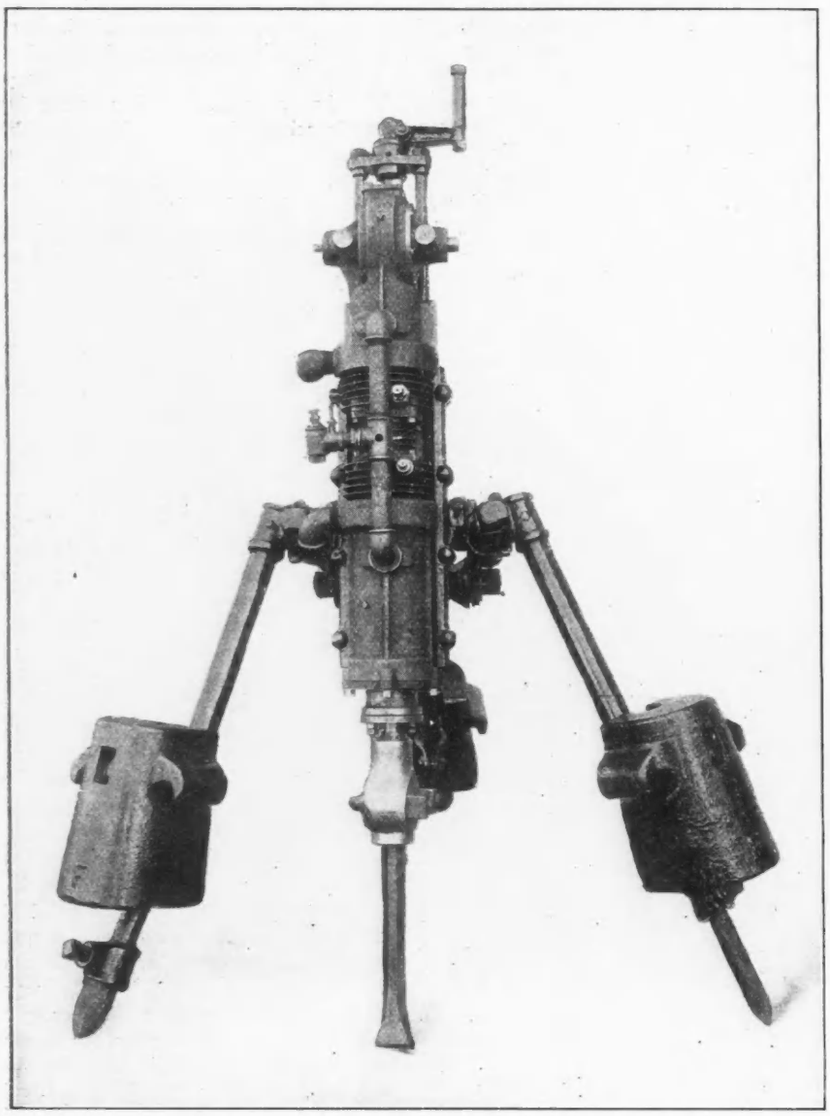


FIG. 1. COMPLETE DRILL WITH SELF-CONTAINED POWER PLANT

The Kafir in the mines of South Africa is, according to T. Lane Carter, a spasmodic worker, and never remains long enough at any class of work to become expert.

Rhodesian Mines

The gold output of Rhodesia for September is reported at 48,573 oz. fine; making a total for the nine months ended Sept. 30 of 454,600 oz. fine, or $9,396,582. For the corresponding period in 1907 the output was valued at $7,874,101; showing an increase this year of $1,522,481, or 19.3 per cent.

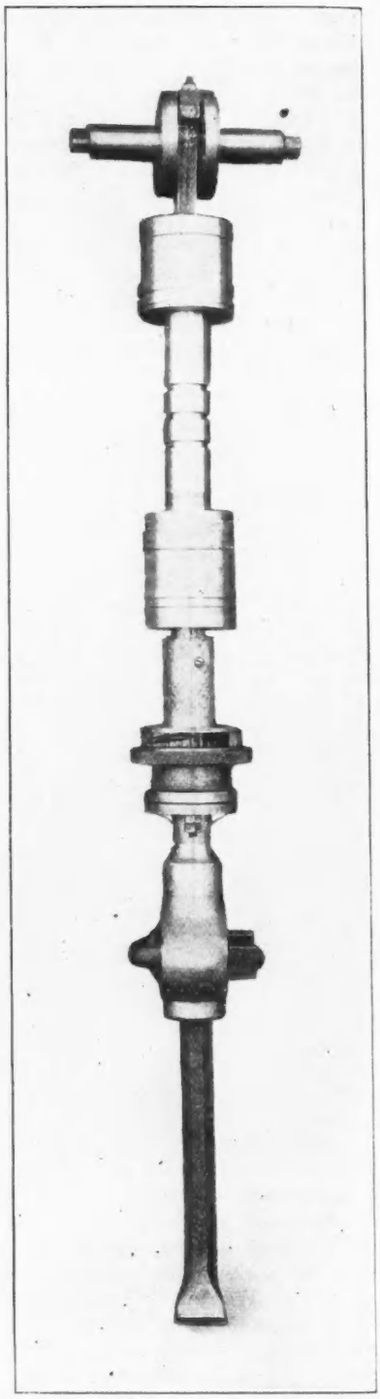


FIG. 2. CRANK-SHAFT, PISTONS, ROTATING DEVICE, CHUCK AND DRILL STEEL

Other production reported in September included 24,506 oz. silver, 39 tons lead, 10 tons copper, 2 tons wolframite, 6 tons scheelite, 1480 tons chrome ore, 3 tons of asbestos and 14,357 tons coal.

Device for Shaking Bags in Smelter Baghouse

SPECIAL CORRESPONDENCE

Baghouses as ordinarily built for smelting works consist of a number of apartments provided with floors dividing each apartment into a bag room with a dust cellar below. The bags are usually of muslin or wool and are suspended in the bag rooms with their upper ends closed and their lower ends connected through the floor with the dust cellar. The dust-laden fume is conducted into this cellar under a pressure of approximately 1 in. of water and thence up through the lower ends of the bags and through the meshes of the cloth, the dust being filtered out during the passage. From the space surrounding the bags in the bag room the fumes are conducted by an outlet flue to a stack.

It is necessary to shake down the bags from time to time so that the dust adhering to the inside of the bags may drop to the floor of the dust cellars. Ordinarily these bags are shaken by a man who enters the bag room for the purpose, taking hold of the bags near the bottom and shaking them as vigorously as possible. The man who does this work must be well protected from the fumes. According to the general practice at present he wears a rubber suit, and over his head he bears a helmet carrying a supply of compressed air for respiration. These precautions are necessary to avoid injury from the large percentage of arsenic found in the fumes caught by the bags.

In order to avoid the necessity of entering the bag room with its attendant disagreeable features, H. E. Benedict, of the United States Smelting, Refining and Mining Company has invented a mechanical arrangement by means of which the bags may be shaken more efficiently than by hand from the outside without opening the room. The apparatus also permits the shaking of a large number of bags at one time, thus saving much time and labor. Furthermore a very efficient movement is given to the bags by shaking them at the top with a wavy motion which travels from the top to the bottom and frees the dust much more effectively than the motion imparted by a man on the floor; the bags being rigidly tied at the bottom, it is difficult to shake them well from a point near the bottom. The advantages gained by being able to shake efficiently a large number of bags at once without the necessity of entering the bag room are obvious.

METHOD OF OPERATION

In ordinary practice the bags are tied to hooks suspended from beams laid across the roof trusses of the baghouse. In the new device a large number of shafts are carried across the baghouse on bearings placed on channel irons carried by the bottom chords of the roof trusses. Each shaft corresponds to a row of bags. Hanging downward are levers attached to the shafts, one lever for each bag. The end of the lever is provided with a loop in which the bag may be tied. Oscillation of the shafts causes the loop ends of the levers to move backward and forward with a wavy motion. This motion is imparted to each individual bag, traveling from top to bottom in a manner somewhat similar to that in which waves are caused to travel along a rope shaken at one end.

Several shafts are joined together by levers and links attached to the ends. By this means the oscillation of one shaft causes the oscillation of all the other shafts connected with it. One of any group of shafts is extended through the walls of the baghouse and provided with a hand lever on the projecting end. When it is desired to shake down the bags the attendant simply takes hold of the end of this lever and rocks it back and forth as in the operation of a shaking grate. This causes all the shafts in the group to oscillate inside the baghouse and the loop ends of the levers to move in the arc of a circle. Thus the group of bags attached to these levers and shafts are shaken simultaneously.

ADVANTAGES OF THE SYSTEM

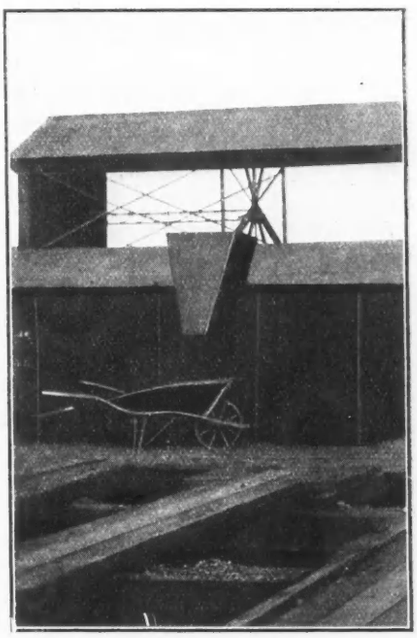
When this device was planned the primary object was to avoid the necessity of entering the bag room. Not only has this purpose been accomplished, but a most remarkable increase in the efficiency of the baghouse as a whole has also been brought about by the use of the device. Before its introduction it was necessary to shut off the blast from the section of the baghouse when the bags were to be shaken down. This limited the capacity of the baghouse to a certain extent. With the new arrangement it is not necessary to shut off the blast at all, the bags being shaken from the outside. It is also possible to shake the bags much more frequently than before the abandonment of hand shaking.

The recording charts of baghouse pressures showed most graphically the effect of shaking the bags by the old method. Starting in with a supply of clean bags the pressure would be comparatively low, say 3/8 in. of water; gradually this pressure would rise as the bags became more heavily laden with dust, making it more difficult to force the gases through the meshes, until finally the pressure reached the maximum capacity of the fan blowing the gases into the baghouse. If at this time the bags were shaken down the pressure would immediately drop, the fall being indicated by an almost vertical line on the recording charts. Naturally the freer the bags are kept from dust the greater the quantity of gas which can be forced through them. It is, therefore, readily seen that frequent shaking of the bags greatly increases the capacity of the baghouse and diminishes the required area of filtering surface for any given quantity of gas.

Letters patent upon this device have been granted to the United States Smelting, Refining and Mining Company, the assignees of Mr. Benedict's rights.

A Hopper for Unloading Railway Cars

The accompanying engraving from a photograph shows a useful device employed at the works of the United States Smelting Company, near Salt Lake City, Utah, for unloading gondola cars. No extensive description is required. The hopper is made of sheet iron, with a simple arrangement to hook upon the side of the car. It assists in unloading into a small car or a wheelbarrow, which may be placed under the hopper. The men working in the railway car shovel into the hopper, knowing that the material is bound to go just where it is intended to go. Moreover, dust is to some extent prevented from flying off.



CAR UNLOADER

When turn sheets are necessary to reach certain workings, but when cars are not being constantly run out of that working, J. Bowie Wilson (*Aust. Min. Stand.*, Sept. 16, 1908) recommends bridging across the turn sheet by means of bars having lugs on the under side that fit into holes in the turn sheet. When the turn sheet is required the bridging bars can be removed.

Rapid Hoisting

In considering the statement of Tom Johnson, made in his paper, "Notes on Rand Mining," that 5000 tons of ore can be hoisted in 24 hours from deep mines through a shaft having two hoisting compartments, A. Richardson discusses (*Journ.* Chem. Met. and Min. Soc. of South Africa, July, 1908) the subject of rapid hoisting. The quantity of rock that can be hoisted through a shaft depends upon quick loading from large, well equipped skip-chutes, to which ore comes from several levels; fast winding with powerful engines; well maintained shafts, and expert hoisting engineers.

With regard to speed in hoisting Mr. Richardson stated that as far back as 1878 the California Gold and Silver Mining Company was hoisting from a depth of 2500 ft. in 45 sec., an average speed of 3333 ft. per min.; No. 3 Tamarack has done 4800 ft. in 1 min. 15 sec., or 3880 ft. per min., the maximum speed during the wind being over 5000 ft. per min.; this hoist has made 40 trips in 1 hour with 3 tons of ore per trip; the Calumet & Hecla has hoisted from a depth of 4900 ft. at an average speed of 3500 ft. per minute.

At Kimberley 4000 short tons have on several occasions been hoisted in a little over 11 hours from 1560 ft.; with this engine the acceleration period occupies 16 sec., the retardation period 13 sec., the maximum and constant speed period 13 sec., equivalent to 3770 ft. per min., the average speed being 2230 ft. per min. for a winding period of 42 sec.; the loading and dumping together occupy 5 sec., so that each trip takes 47 sec. Taking some of the leading British collieries, which show fast work under normal conditions, the following represent good practice: Dowlais Cardiff, 2220 ft. in 52 sec., an average winding speed of 2562 ft. per min.; Ashton Moss, 2850 ft. in 1 min. 25 sec., or 2010 ft. per min.; Lady Windsor, 1500 ft. in 35 sec., or 2571 ft. per min.; Bolsover, 1116 ft. in 28 sec., or 2388 ft. per min.; Denaby & Cadeby, 2289 ft. in 55 sec., or 2497 ft. per min.; Rhodes Rotherham, 1650 ft. in 45 sec., or 2358 ft. per min.; while at the Rosebridge colliery a maximum hoisting speed of 5100 ft. per min. has been recorded; such an excessive hoisting speed as this, however, does not represent sound work; for considerations of safety, it should not exceed 4000 ft. per min. From the above, and in view of regularity of output, an average hoisting speed of 3000 ft. per minute may be assumed to represent the best modern practice.

Now the time in seconds of each complete wind is:

$$\frac{\text{depth of shaft in feet}}{\text{speed of winding in feet per second}} + \text{number of seconds occupied in loading and dumping.}$$

Assuming the last term to be 10 sec., the time of each complete wind from an average depth of 3000 ft. will then be 70 sec., giving 51.4 winds per hour, or an hourly output of 205.6 tons with four-ton skips. If this is maintained for 20 hours out of the 24, a very excellent performance, the output will be 4112 tons. With five-ton skips this figure would be 5140 tons. This estimate is on a very favorable basis, and outputs of such magnitude would be considered phenomenal in any part of the world. In South Wales, for instance, an output of 1000 tons through one shaft in a daily shift of 10 hours is considered good work, and 1500 tons exceptionally so, and this from depths which in only one or two instances exceed 2000 feet.

With regard to the balancing of the load, there is no doubt that a tail-rope is the most perfect method known, as conical drums will balance completely only when winding from one fixed depth; unfortunately the use of these balance ropes is attended with many disadvantages. With them independent trips in either compartment are impossible, and the changing of levels leads to much loss of time; the sump also has to be extended to accommodate the sheave and slide, and there is much extra weight thrown on the capping, and also on the safety catches should occasion ever arise for them to act. It is a dangerous device to install at depths greater than 2500 ft., because the swaying or whipping action of the rope tends to destroy the guides and timbering.

With regard to guides, the general opinion in England is that steel rails are the safest for fast winding from deep shafts with heavy loads. It is worth noting that in Germany the winding of men on rope guides is prohibited; their use also necessitates a skip which cannot turn over but must discharge through hinged doors, and a bend is out of the question.

As to the speed at which men are hoisted in shafts the following recent statement of W. H. Pickering in interesting: "Already there are instances where 80 men ride in the shaft at one time, and at a speed of 40 miles an hour." This means a speed of 3520 ft. per min., or 59 ft. per second.

Deep Gold Mines

Until recently the Morro Velho mine in Brazil, belonging to the St. John del Rey Mining Company was the deepest gold mine in the world, being 4264 ft. deep (*Min. Journ*, May 2, 1908). But now ore has been found in the Victoria Quartz Company's property at Bendigo, Australia, at a depth of 4504 ft., in a winze 250 ft. deep sunk from the 4254-ft. level. Apparently this ore is the cap of a saddle reef. The vein is 4 ft. wide, being quartz with a little pyrite in it and containing some visible gold. The shaft is 4300 ft. deep.

Steel Shaft Guides

C. O. Schmitt (*Journ.* Chem. Met. and Min. Soc. of South Africa, July, 1908), in discussing the paper on "Rand Mining," by Tom Johnson, suggests that in shafts sunk in rock that stands so well that close timbering is not required, much timber can be saved by using substantial steel guides and placing the sets at 8 ft. centers, instead of at 6 ft. or less.

Steel guides should be of T-section, similar to those put in at the Simmer Deep (Fig. 1), for the reason that this type of guide gives plenty of metal for wear, promising a comparatively long life. The wear on the guides should be reduced by using rollers on skips and cages instead of shoes as at present. Such rollers have been in use at the Robinson Deep mine

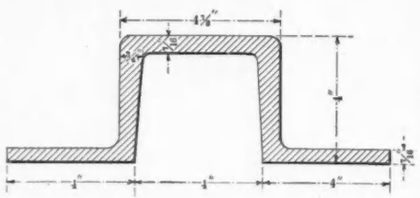


FIG. 1. STEEL GUIDE, CHANNEL-SECTIONS TYPE

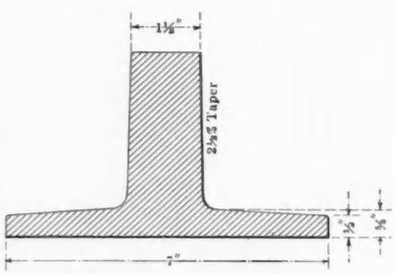


FIG. 2. STEEL GUIDE USED AT SIMMER DEEP MINE, SOUTH AFRICA

for some time with conspicuous success. Steel guides of channel section (Fig. 2) do not seem to give the same life against wear as those of T-section, although they are stronger in the axis parallel to the base, thus rendering the shaft timbering more rigid. The weight of either type need not exceed 30 lb. per linear foot.

British Guiana Mines

Gold production for the nine months ended Sept. 30 is reported at 49,014 oz. bullion in 1907, and 48,769 oz. in 1908; a decrease of 245 oz. The bullion reported this year was equal to $863,516, or 41,786 oz. fine gold.

Exports of diamonds for the nine months were 3369 carats, valued at $26,274; an increase of 1584 carats over last year.

A heavy rail is an essential to good mine track.

Development of Electric Power in Coal Mines

By George E. Walsh*

The development of electricity in the anthracite coal mines as an efficient and economical power in recent times has been coextensive with refinements in the application of steam and compressed air, and the rivalry of these different powers has greatly stimulated improvements in nearly all kinds of mine hoisting, pumping, ventilating, drilling and machine operation. Coal mining in the anthracite and bituminous fields is rapidly becoming a mechanical proposition, and the engineer who solves the problems presented in any individual case must select electricity, steam, or compressed air according to the showing either one makes on the balance sheet of the company.

Some recent installations where coal breakers and pumping machinery are operated with electrical motors have demonstrated the economy and efficiency of the central-station idea. This, in fact, is the field in which electricity in the coal mines must make its greatest showing if it is to supersede steam and compressed air to any great extent. This is, moreover, possible with the big companies where a combination of many collieries permits the wide distribution of electric power from one large central station. With the collieries situated within a comparatively restricted area, it is thus possible to distribute the electric energy to them at relatively small cost.

Transmission of Electric Power

The question of economical transmission of electric power over considerable distances enters into the problem, but under modern methods of wiring mines and collieries from one central station, such loss is inconsiderable. On the other hand, the loss of steam power through long pipes by evaporation is apparent, and lengths upward of 1000 ft. prove quite wasteful. At the Hampton plant of the Delaware, Lackawanna & Western coal-mining department, near Scranton, Penn., a large boiler plant of 5000 h.p. has been in operation for some time, and more recently a 2000-h.p. plant was installed for generating electricity for mine purposes. This company operates 15 collieries around Scranton, and they are so situated that they offer excellent conditions for a test of the central-station idea. The electric power is transmitted from the Hampton station to the Bellevue colliery some two miles distant, and oil-cooled transformers step the line voltage from 2300 down to 104 volts. At present this colliery is supplied with steam power, but it will eventually be equipped entirely with electric power for the operation of all the machinery.

At the power house of the Bellevue mine, there is a slow-speed engine belted to a 100-kw., 275-volt, direct-current generator, and a 150-kw. rotary converter. Both of these will be replaced by better types as soon as the extension of the present plant has been accomplished. The new plant contemplates a 300-kw. six-phase rotary converter. This converter will receive the current from the Hampton power house, and furnish it to the various motors in and about the mines.

The electric power will be employed for driving mine pumps, mine hoists, ventilating fans, drills, breakers, and for lighting the buildings and shafts. It is estimated, when completed, that nearly 250 electric horsepower will be required to drive the drainage pumps of the mine, and altogether upward of 2000 h.p. for miscellaneous purposes. The mines will also be completely lighted by electricity, and a system of electric signaling will be installed between the different shafts and the engine house so as to afford complete protection against accidents.

Electrically Operated Breakers

The Lackawanna company has been one of the first to experiment with electrically operated breakers. For several years an experimental breaker has been installed at the lower end of the Wyoming valley. Individual motors are used for driving the different parts of the breaker, and the results have so far proved satisfactory. The complicated machinery required to operate a breaker by steam has always necessitated a certain amount of loss of energy and time. Indeed, the location of the gears, belts and shafts requires a nice designing to eliminate, so far as possible, loss of efficiency. The electric motors simplify the designing and make the operation of the different parts easy. One of the largest electrically operated breakers in the anthracite region was installed by the Delaware & Hudson company, and the saving obtained so far shows a considerable economy of operation. The saving is not only of fuel and time, but of operative labor. The elimination of workmen is one of the greatest gains that electricity makes. One man can generally do the work of two or three where machinery is operated by electricity. The perfect control of the machines by one guiding hand always produces higher and better results.

The Delaware & Hudson company has developed its collieries along the central-station idea to some extent, but the work is less extensive than that of the Lackawanna. Indeed, the latter has adopted every form of electrical device and machinery for improving output and lessening cost of work. While the Hampton central-power station transmits current to eight different collieries, and represents the best type of the central-station plan, it does not by any means indicate the full extent of the electrification of the company's mines. There are altogether 18 stations and collieries belonging to the Lackawanna company, operated by electricity, and these have been installed with a great variety of machinery and motors.

At the different collieries and stations there are 22 generators and five rotary converters. The former have a total capacity of nearly 5000 kw., and the combined capacity of the converters is upward of 860 kw. The power generated by the central station, or by the individual power houses scattered throughout the mining regions is carried to the different mines by high-tension wires, and the current stepped down for the individual motors. These latter range from 10 up to 200 h.p. Twenty-eight motors are used for operating 21 different hoists, which have a total capacity of 1915 h.p. Twenty-three motors of different sizes are required to drive the pumps of the different mines, and they consume a combined energy of 1571 h.p.

Electric Haulage Used

The Lackawanna company has been one of the foremost of the anthracite companies to adopt the electric locomotive for mine hauling, and for some time now it has been committed to this type of machine. The steam and compressed-air locomotives have gradually been withdrawn from the mines of the company, and today, 56 electric locomotives are doing the work. Nearly 4000 h.p. are required to operate these different engines, and their total capacity is enormous. Their earning power has amply demonstrated to the satisfaction of the company their value.

The number of smaller motors owned by the Lackawanna company for miscellaneous use in its mines range from those employed for driving small drills and electric fans up to the larger ones for running drainage pumps. Altogether there are nearly 25 of these smaller motors, and they have a total capacity of 318 h.p. The mines are lighted by thousands of lamps, and every part of the larger collieries is equipped with telegraph and telephone signal stations to simplify the work of communication.

The power stations of the modern central generating plants for the anthracite coal mines are important parts of the whole subject, for it is often here that the economy of utilizing power is to be obtained. At the Hampton station, the generating units are four 500-h.p. Curtis turbines. They run at 1800 r.p.m. with steam at a pressure of 150 lb. per square inch, superheated 200 deg. F. The turbines are direct connected to alternating-current generators of the three-phase, 60-cycle, 120-amp. type. They generate current at 2300 volts. This high-tension current is transmitted direct to the mines where it is handled by the different con-

*Mining engineer, New York City.

verters installed at the entrance to the collieries for that purpose.

Steam is brought to the turbines by pipes from the boiler house located some 25 ft. distant. The equipment of the boiler station consists of fifteen 300-h.p. Babcock & Wilcox boilers operated at 125 lb. pressure. Automatic stokers and fuel economizers are installed to lessen the cost of operation and increase the working efficiency of the plant. A superheater is attached to each boiler so that the steam can be superheated to 200 and 245 deg. F. Steam is also supplied from this station to several of the collieries in the vicinity which still use steam engines for work. One line of steam goes direct to the turbines, and several others branch out to the different collieries. Some of these steam-pipe lines are nearly 2000 ft. long, and the loss of steam through evaporation and condensation has been so great in the past that the present plans were drawn up to reduce it. By the electric system this loss of energy is almost entirely eliminated.

The nearest station to the Hampton plant operated exclusively by electric power is the Sloan mine. This is a typical substation of the company's works, after which most of the others will be modeled in time. There is located at this mine a 200-kw. rotary converter which runs at 900 r.p.m. Three 75-k.w. oil-cooled transformers are also installed here which receive the 2200-volt current from the main line, and step it down to 104 volts. The rotary converter converts the alternating current at 60 cycles and 104 volts to a direct current of 275 volts. The current thus stepped down and converted into direct current is carried into the mines for driving the different motors.

Induction Motors Employed for First Time

At the Nanticoke power house of the Lackawanna company, about three miles from Wilkes Barre, even further improvements upon the Hampton station are contemplated. Three 500-kw. Curtis turbines are installed here also, and each turbine is direct-connected to a revolving field, three-phase, 60-cycle, 4150-volt alternator. The four-wire system is installed, and the plant in time will be extended to include five large turbines. Induction motors will be employed here for the first time in the anthracite field, both for operating the breakers and the mine machinery in the collieries. The four collieries which are to utilize the electric current are located from two to four miles from the power station. The current will be transmitted as in the other cases to the collieries without transformers, and at a voltage of 4150.

One of the important features of this new equipment will be the operation of mine pumps by induction motors. Thirty-, 60- and 90-h.p. induction motors will drive the pumps. One of the breakers to be driven by the power from this station will be equipped with a 50-h.p., 500-volt, direct-current motor for operating the car hoist, and 13 smaller motors for other parts of the work. At the Bliss colliery a 200-h.p. induction motor, operating at 440 volts, will drive the mine hoist, and another will drive a centrifugal pump with a capacity of 1000 gal. against a head of 100 ft. A 40-h.p. motor will drive this pump.

Induction Motors to Operate Breaker

At the Truesdale colliery, a large breaker has recently been built and equipped with electric power. Fifty induction motors will operate this breaker when complete. It is expected to represent the extreme advance in modern breakers, and everything to simplify the work and increase the output has been done. The final outcome of the equipment and operation will be a matter of interest to mine engineers all through the anthracite region.

The Eyesight of Coal Miners

Special Correspondence

The most practical and convenient method of detecting the gases in coal mines is by noticing the variation and coloration of the safety-lamp flame. This method which is universally employed, is simple and easily learned by the men. It, however, requires a good vision to use it accurately. But few superintendents recognize this fact, with the result that many colliery disasters are attributed to such neglect.

The president of the British Medical Association, Dr. Simeon Snell, has investigated the vision of British coal miners and reported the results of his observations at a recent meeting of the association in Sheffield, England.

Doctor Snell's investigations were carried out with the assistance of A. H. Stokes and other officials of the mines department. It was found that miners suffering from nystagmus and other visual complaints are quite unreliable as gas detectors.

A miner with nystagmus when looking at a safety lamp gets the impression that the object looked at is in motion. This is caused by the oscillations of the eyeball, and is due to the weariness of the elevators of the eyes caused by working in constrained positions in the mine.

Miners Failed to Detect the "Caps"

Forty-eight miners were tested in the ophthalmoscopic dark room in the Sheffield hospital. These men were brought from 13 different collieries and were examined with regard to their capacity to detect the "caps" of safety-lamp flames. All of these men failed to detect a "cap" until a dangerous amount of gas was present. One could not see a large "cap" at all. He said his lamp was "spinning too much;" another could not see a "cap" until he steadied his eyes. He then saw a 1-in. "cap." One who had nystagmus in a marked degree reeled like an intoxicated man when rising from the floor from the kneeling position he had assumed in reading the lamp. The lamp was full of gas before he detected a "cap."

The results of the experiments were so astonishing that members of the association now advocate the periodical medical examination of all officials whose duty it is to make the daily gas tests in coal mines. Each inspector should be tested for vision as carefully as locomotive drivers and signalmen. Gas tests with the safety lamp are almost useless unless the testor has good vision. It might be valuable if the question of vision would be investigated by the Accident in Mines Commission now sitting in Pennsylvania.

Coal in the Polar Region

The difficult proposition of mining coal in the far north is being undertaken by J. M. Longyear, of Marquette, Michigan, and other mining men. The coal beds are located in Spitzbergen, considerably to the north of Iceland and within a few hundred miles of the Pole itself. The scene of the mining operations is within a day's run of the bay where Dr. Andre soared into the air on his ill-fated ballooning expedition to the North Pole, and where more recently, Walter Wellman had for two seasons endeavored to make a start for a polar dash in a dirigible air-ship. It is in the land of the "midnight sun" and a region of constant ice.

Mr. Longyear's attention was first directed to the possibilities of the Spitzbergen coal deposits when on a trip to "No Man's Land" a few years ago. Although exploratory operations are by no means complete, the work so far accomplished shows that there are large coal beds which can be made to produce an enormous tonnage.

It has been determined that the product of the mines can be shipped during the open season to the European markets and disposed of in competition with other coals. The seams produce a fine steaming coal of high efficiency and of excellent physical structure.

When sinking a three-compartment shaft, put in the permanent partition between the manway and the hoisting compartment while sinking; the manway can then be used for ventilating purposes, it being used for the time being as the upcast. A fire basket hung in the shaft will heat the upcast current of air and promote ventilation.

Steam Winding Engines in English Coal Mines

By J. Hinton*

It is one of the ironies of industrial fate that just as a machine or process seems to have arrived at nearly practical or working perfection, it is often subjected to unrelenting competition by a new rival in the field, and after a hard fight in which it surpasses all previous performances, it sometimes gradually loses its hold and has to make way for the more modern equipment. Thus, after many improvements, the steam-winding engine is entering a fight with the electric-winding engine. Aa present the steam winder holds the field, and we may profitably note the principal characteristics of its modern form in England.

In most places, and particularly at collieries, very little attention was formerly paid to steam consumption. In the colliery districts it was held that with coal all around them, they surely had no need to worry about the small amount that the winder required; it was, therefore, thought to be unnecessary to seek for high efficiency. Such ideas are now changed, and it is recognized by English engineers that it is not only possible to attain efficiency far in excess of that secured in the old days, but also it pays to so economize.

High Efficiency Now Sought

Generally speaking, increases in efficiency due to improved methods of design or working are obtained as certain percentages of the original efficiency, in England. Thus, compounding reduces the steam consumption per horsepower-hour by a certain percentage of the original consumption and not by so many pounds of steam. Hence the saving in the actual weight of steam used or coal burned under the boiler is greater, the more wasteful the conditions under which the engine works. Further, all mines are not collieries, and even at a colliery coal has value. Colliery slack sells for 72c. per ton at the pit mouth, so it is evident that every ton of coal unnecessarily burned is 72c. thrown away.

Modern steam-winding engines have not developed into such a distinct type in England as the modern cotton-mill engine in Lancashire. It is, indeed, hardly to be expected that they should, since the conditions under which different winding engines have to work vary so much. In the first place, the price of fuel at mines varies within wider limits than in the case of cotton mills and this greatly influences the extent to which steam-saving devices can properly be incorporated in the design. Then again, the nature of the winding load varies; in some cases steady winds from great depths are the rule, while in other localities the winding is restricted within comparatively short limits of distance. In all cases the load on the engine is variable and in practically all cases the engine has to reverse. The conditions of working are unfavorable to high economy.

The Double-cylinder Simple Engine Gives Best Acceleration

The modern winder is usually a compound engine in England; rarely is the triple-expansion engine employed. This is not merely on economical grounds, but also because of the extra complication of valve gear, of by-pass steam pipes and the like, which are complicated enough in the ordinary English compound engine; further, the triple-expansion engine does not lend itself to a symmetrical design. Then, too, in the opinion of English colliery managers, the type of engine should depend upon the length of a wind between stops. In most winding engines, high acceleration of speed at starting is considered desirable. There can be no question that the double-cylinder simple engine gives the best acceleration; however, the comparative slowness of a compound or triple engine in getting away can be partly overcome and the method is regularly employed in England by feeding live steam at a somewhat reduced pressure direct from the boiler to the low-pressure cylinder. This, however, complicates the engines, necessitates increased strength in the low-pressure cylinder, and is even then not quite as rapid in its action as the double-cylinder simple engine. Also this admission of boiler steam to the low-pressure cylinder is obviously uneconomical, and if it is done frequently, as when the stops are frequent, all the increased economy of the compound, or the triple-expansion system is wiped out completely.

In England at the present time and in many other European and foreign countries, the tendency is strongly in favor of the cross-compound engine as giving the best all-round results under the usual winding conditions.

As an aid to economy, steam jackets are commonly fitted. If they are properly arranged so that the steam is not merely fed into the jacket space, but which is far more important, is continually being drained away, together with all entrained moisture and air, and if the jacket is as hot as possible, consequently not at reduced pressure, considerable economies are obtainable by the addition of jackets to the engine. Frequently also a reheater is placed in the steam receiver between the cylinders, but unless superheated steam is used for reheating, the reheater is not necessary.

Equally good, or even better, results can be obtained without it, provided that the entrained moisture in the receiver steam is drained away and is not allowed to enter the low-pressure cylinder. That is to say, the receiver between the high- and the low-pressure cylinders should be a steam separator rather than a reheater. The condensed steam should, of course, be returned to the boiler. It is doubtful, in the opinion of English mining experts, whether it pays to have a reheater, even when using highly superheated steam. It must be remembered that the reheater merely re-evaporates the moisture in the steam at the expense of steam (often at a reduced pressure) from the boiler. To do this is uneconomical for two reasons: First, condensed moisture in the steam gives a more efficient result, if when re-evaporated it is at full boiler pressure. In the case of receiver steam the pressure at which re-evaporation takes place is necessarily much below the boiler pressure; second, if the condensed steam be returned to the boiler and there evaporated, it receives its heat direct from the furnace.

In the alternative method of using a reheater, the heat of re-evaporation is received from the furnace through the medium of the boiler steam, obviously a thermally uneconomical process. It may be asked why it pays to employ jackets but not receivers. English engineers answer that the functions of the two are quite different. The jacket should keep the cylinder walls hot and dry so as to reduce condensation and leakage in the working steam due to its necessary fluctuations of temperature. The function (which, however, is incorrect) of the receiver is to evaporate condensed steam.

Most winding engines in England have a Corliss valve gear, usually of the Reynolds type, using a wristplate. The ordinary direct-driven gear is not so suitable. The gear has to be capable of giving a wide range of cutoff, usually from nothing to full stroke on the high-pressure cylinder and rather less on the low-pressure. In addition, some sort of link motion (usually the Stephenson) has to be provided to enable the engine to reverse. The reversing gear on all, except very small engines, is operated by a special steam cylinder with an oil-dashpot cylinder, and is under perfect control.

The whole of the variation of the power and speed of the engine is not, however, safely effected by the cutoff gear. Both cylinders are usually provided with throttle valves worked from the engine-man's platform. In many cases speed-limiting devices are fitted, and these cut off steam and apply the brakes whenever the speed exceeds a certain predetermined limit.

The Winding Drum

A parallel winding drum is most commonly employed, although a conical drum, or a combination of the two types, is fairly common in England. The object of the conical drum is to enable a higher initial acceleration in engine speed to be obtained. The drums are, of course, fitted with brakes controlled from the engine-

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man's platform. Frequently the drums are so arranged that by means of a special clutch they can be rotated somewhat on the shaft independent of the engine, thus allowing the relative positions of the cages on the two ropes (each having a separate strain), to be exactly adjusted.

A good deal has been written lately about the difficulty of preventing accidents due to overwinding with a steam engine under the more or less uncertain control of a man. There is, however, nothing to prevent devices being fitted which will cut off the steam and apply the drum brakes should overwinding occur, whatever the man may be doing. Such devices have indeed been often fitted, and in some cases are regularly used to control the engine. In others they are adjusted for emergency action alone.

The Modification of Illinois Coal by Low Temperature Distillation

In conjunction with the extensive experiments being carried on by the chemical department of the University of Illinois, Professor Parr and C. K. Francis have continued their research work on Illinois coals. The bulletin dealing with the work, and issued by the University Experiment Station, says:

"In the consumption of fuel for industrial purposes, two fundamental considerations must be kept in mind: First, there must be economy in the use of material; second, there must be regard for the comfort and health of the community. Modern practice has made marked advances in recent years in the observance of the first consideration. As might be expected, the initiative in any matter involving economy comes largely from the user, the impulse being the very natural one of self-interest. For results under the second consideration, obligatory measures, in the main, have predominated, the pressure coming from without by mandate rather than from within by preference, and advancement has been at a slower rate."

Results thus far Obtained

It is stated that the work is by no means complete but is of sufficient interest to warrant publication in its preliminary form. Aside from the gases evolved, the by-products have received but little attention.

"In the residual liquors, there seem to be no tarry compounds present but oils, phenols, ammonia, etc. Some quantitative results on the latter show as the highest result obtained from the wash liquors, about 11 per cent. of the total nitrogen present in the coal. In most instances, the yield was less than 1 per cent. This matter is receiving further attention.

"Concerning the coal residue, enough has already been developed to indicate that it would have a special value for domestic use and such industrial operations as require a smokeless fuel. While much of the volatile constituent remains, it has undergone a change which makes it not difficult to carry on combustion without the production of smoke. This fact is, perhaps, suggested by the rather close resemblance in composition to the so-called smokeless coals. Because of the great ease with which this material may be broken down, it would require, in all probability, to be subjected to the briquetting process.

"As a rule, finely pulverized coals in contact with oxygen either diluted as in the case of air or in the pure state, begin oxidation at a temperature between 120 and 135 deg. In some instances, however, this temperature of oxidation is higher, though in none of the tests did it exceed 155 degrees.

"The ignition temperature varies with the type of coal and to a certain extent also with the fineness of division. Finely divided bituminous coals ignite in oxygen at a temperature not far from 160 deg. Buckwheat sizes ignite at about 260 to 300 deg. Semi-bituminous coals ignite at about 200 deg. and anthracites at about 300 degrees."

A New Development in Hoisting

The best development of the Kœpe system of winding is that known as Whiting's method, which is especially adapted to hoisting from different levels. Instead of the single pulley, it has two which are set one in front of the other, the front pulley having a slight lead for the rope to clear itself. The two pulleys are coupled together by connecting rods, the back pulley is coupled to the engine. The winding rope from the cage passes over the shaft-head pulley and underneath the front driving pulley. After several turns around the two pulleys, it passes back to a tension bogie, then under a fixed pulley and over the shaft-head pulley to the other cage.

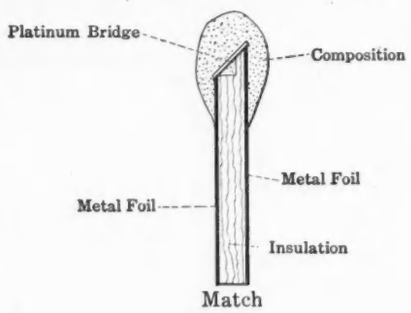
As the driving pulleys wear out rapidly, they are constructed with renewable rings. The bogie is capable of running backward or forward to facilitate hoisting from different levels. If the hoist is from one level, the bogie is dispensed with. The chief advantage of this system, aside from its adaptability to winding from different levels, is that overwinding is impossible, for as soon as the bottom cage has reached the bottom, most of the weight is off the rope and the rope no longer bites on the pulley. There is no angling of the rope as occurs where a drum is used for winding.

An Improved Method of Blasting Coal

It is claimed by some authorities that even common black powder can be used with comparative safety if the proper method of firing is adopted. Where exploders are used for black powder shooting, it often occurs that the powder is scattered without causing an ignition.

One of the latest improvements that pertains to shot firing is known as the "Star" electric safety fuse. A section of this little device is shown in the accompanying illustration and is constructed as follows: A match, consisting of an insulating sheet covered on two sides with a metal foil, is made; the end of the match carries an incandescent wire bridge; this latter end is dipped into a fulminating composition like that used in making matches. This is afterward tested to its exact and uniform electrical resistance and is then soldered to wires of various lengths, according to the depth of the hole which is to be fired.

The upper end of the wire holding the



SECTION SHOWING SAFETY FUSE IN DETAIL

match is then fastened into a paper tube by sulphur cementing, and the match is thereby protected from injury, which it otherwise might receive during transportation, handling and loading into holes. The paper tube is closed with a small cork and the whole is dipped into a wax to make it moisture proof.

Among the several advantages claimed for this style of electric fuse are: (1) they mine more lump coal; (2) they avoid premature blasts as well as hung shots; (3) they avoid blown-out shots; (4) they lessen the liability of gas explosions.

As compared with the cost of using double-tape fuses, the electric safety fuse shows a considerable saving. Any kind of an ordinary battery can be used to generate the current.

It is not necessary to take gate valves apart to clean out the mud carried in with the steam when a boiler foams. It can be done by opening and shutting the valve several times while the water is running through it and the boiler is not under pressure.

Colliery Notes

A large volume of air does not always require a high water-gage; the same water-gage will pass a larger or a smaller volume of air, according as the resistance offered by the mine airways is less or greater.

Illinois contains the largest area of bituminous coal within any single State. Coal-bearing rocks underlie 85 of the 102 counties in Illinois. The coal area may be estimated at from 36,000 to 42,000 square miles.

The use of too quick a powder or an explosive of too fine grain, often results in blow-out shots. The other principal causes of blow-out shots are, seating the shot too deeply, and drilling a hole of too large diameter.

In testing Illinois coal for occluded gases, a drill hole was driven and the dust from the first 2.5 ft. was collected in one flask, while that from the last 3 ft. was sealed in a separate container. The sample farther from the exposed face contained more occluded gas.

Estimates place the original tonnage of coal contained in the Illinois field at about 137,000,000,000 tons. At the close of 1907, the producing companies of the State had mined 645,868,309 tons, while the coal that had been wasted and lost in mining operations amounted to about 396,000,000 tons.

Chemical fire extinguishers have been found effective in fighting underground mine fires, and being always ready for immediate use, are particularly serviceable in stopping an early blaze before serious damage can be done. Several of these ready fire extinguishers should be included in the surface and underground equipment of every coal mine.

In tail-rope hoisting, the rope length may be easily adjusted by changing the position of the transfer wheel. This method of winding is most practicable for hoists 1000 ft. and deeper where the loads are hoisted alternately by both cages from the bottom. The best results are not obtained from this method when it is used for hoisting from intermediate levels.

In pure air with a normal proportion of oxygen, the least percentage of carbon monoxide producing fatal results when breathed by healthy persons for about one minute, is stated as 0.5 per cent.; it is true, however, that when the oxygen is reduced to 10 per cent. in the air breathed, 0.05 per cent. of carbon monoxide will likely produce fatal results.

The explosion of black powder produces 33 volumes of nitrogen; 51 volumes of carbon dioxide; 10.5 volumes of carbon monoxide; 3 volumes of water, and 2.5 volumes of hydrogen sulphide. It is easy to see, therefore, that in a mine where there is in excessive use of powder in blasting, these poisonous and irrespirable gases soon vitiate the air and render it unfit for breathing.

It is impossible to detect violations of the law in reference to the use of powder, when the miners are permitted to charge and fire their own holes; the foreman can keep an exact account of the number of holes fired and the powder used by each man, but even a record of this kind will only show the average charge of powder used. The employment of special men to inspect, load, and fire the holes is the only safe way.

Tests on the weathering of coal in Illinois gave the following results: 1. Submerged coal does not lose appreciably in heating value. 2. Outdoor exposure results in a loss of heating value carrying from 2 to 10 per cent. 3. Dry storage has no advantage over storage in the open, except for high-sulphur coal. 4. In most cases the losses during storage appear to be practically complete at the end of five months.

The anthracite mine law prohibits the storing of gunpowder or other explosive in a mine, and limits the quantity of powder a workman shall have at one time in one place, to 25 lb., except where more is required for a day's work; this law also requires that such explosive shall be kept in a locked box 10 ft. from the tracks, in all cases where room at such a distance is available. A workman in handling such an explosive shall place his lamp not less than 5 ft. away, and in such a position that the air-current cannot convey sparks to the explosive.

In mines where naked lights are used, the question of a proper grade of oil for the miner's lamp generally receives too little attention. Rape oil of good quality maintains an intense flame of fairly uniform hight, but the wick chars quickly and must be trimmed often; good clear seal oil is far superior to the refined vegetable oil, such as rape and colza, with respect to the hight of flame without recourse to trimming the wick. The investigation recently carried on by the English Mines Commission also suggested the admixture to seal oil or to the vegetable oils, of petroleum, having a flashing point not lower than 80 deg. F., in the proportion of not more than one volume of petroleum to two volumes of vegetable or animal oil.

The principal causes of waste and losses in mining coal at present are due to the cheapness of "coal in place," and to the low market prices, resulting from extreme competition. The average total cost per ton of coal loaded on cars, including general and selling expense and amortization, but not capitalization interest charges, is from $1.20 to $1.30 for the coal produced in the longwall district, and from 70 to 95c. for the other districts. It is safe to say that the average net profit per ton throughout the State of Illinois for a whole year does not exceed 20c., and if the interest on the capital be taken out the average profit will be reduced to 10 or 15c. per ton. The Illinois operator, therefore, claims that if he were to carefully conserve the coal he owns or leases, he would undoubtedly wreck his business.

Each succeeding mine accident, such as the one that has just occurred at the Radbod mine in Germany, calls our attention more forcibly to the necessity of providing rescue stations and hospitals underground. A station of this sort should be connected with an air-compressing plant on the surface by adequate pipe lines, which latter should be designed to supply sufficient air to keep alive a large body of men who might find their way to such stations, in case of accidents shutting off all other avenues of escape and destroying the circulation of air in the mine. The pipe for carrying such a supply of air should be laid just beneath the floor of the mine road, to protect them against roof falls. The end of each pipe line should be provided with a trap, which should be kept closed, and opened only by those occupying the station at the time of accident. Many experienced engineers also suggest that each safety station should be reached by drill holes sunk from the surface, a single hole for each station, and of sufficient size for passing food and water to the imprisoned men. The supply of air should be sufficiently strong to drive back the damp from entering the inclosed area.

The question is often asked as to whether or not the breaking of an incandescent lamp underground will ignite the surrounding gas in a fiery mine. One authority states that the danger from this cause depends on the character of the lamp, the manner in which it is broken, and to some extent, on the character of the gaseous mixture and the temperature of the mine air. It is also stated that if the filament is not broken, but remains intact when the glass is shattered, it becomes almost dark for a moment immediately after the glass is broken. This is due to the cooling effect of the expanding air and gas that rush into the vacuous space of the broken globe. In a few seconds, however, the filament again glows and burns out, with a spark that is certain to ignite the gas. It is seldom, however, that the filament remains unbroken when the glass is shattered. If the filament is broken at the same moment the glass is struck, there is no sparking, and consequently no ignition of the gas. Considering this subject further, it is explained that the long slender filament of the high-voltage lamp is safer that a lamp constructed for a low voltage and strong current, which latter lamp has a short thick filament. The reason for this belief is that the slender filament is more sensitive to the cooling effect, and also less liable to remain unbroken when the glass is shattered.

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Contents

The Situation in the Aluminum Industry

We have foretold many times in our annual reviews that aluminum would soon become one of the ordinary commercial metals. During 1908 the making of history in that direction has been rapid. At the beginning of the year the producers in Europe, still bound together by the terms of a convention, reduced their price from 33c. per pound to 22c., the decline in the demand for consumption, along with that of all the other metals, leading to this reduction. At about the same time the American producer reduced its price from 38c. per pound to 33c. Previous to the panic in 1907 the American price was 42c.

It has been the policy of the Aluminum Company of America to make the price for its product all that the trade would bear. This has excited more or less adverse criticism and also has aroused dissatisfaction and dislike on the part of the consumers, so that the latter have been looking anxiously forward to the time when competition might develop after the expiry of the patent monopoly. From the standpoint of the producer the policy was probably sufficiently wise. Consumers were willing to pay a price yielding nearly 200 per cent. profit for all the metal that the company could produce; indeed the company was strained to the utmost to increase its capacity; consequently why not make hay while the sun was shining?

If the Aluminum Company is open to any criticism, it is for failing to bow more quickly to adverse conditions. Toward the end of 1907, demand having dwindled to a comparatively small rate, the company made a rather grudging concession in price and shut down two-thirds of its smelting capacity, rather than attempt to revive consumption by a sweeping reduction in price. At this time the management was imbued with the well known policy of the U. S. Steel Corporation, which Judge Gary expounded on several occasions, that the cutting of prices does not stimulate consumption, wherefore prices are best maintained. Thus the Aluminum Company of America maintained its price steadily at 33c. until a few weeks ago.

On Sept. 30, the convention among the European producers was dissolved, and immediately there was a scramble for business in a market which had suffered severely by the enormous falling off in orders from automobile manufacturers, and from competition of ferrosilicon in the iron trade. Aluminum immediately passed upon the footing of the staple metals, like copper, tin, lead and zinc, wherein there is free competition and the establishment of prices in which the buyer as well as the seller has a part. The price for aluminum in Europe fell consequently to as low as 13½c. per lb., which rules at present. The American producer is protected by the duty of 8c. per lb. upon ingot aluminum, but in spite of that preposterous duty, the slump in Europe was so great as to compel successive reductions in price here. The last quotation is 25½c. per lb. nominally, but probably considerable discounts from that price are made to well informed customers, inasmuch as high-grade European aluminum has been freely offered here at 22c. per pound.

The present price puts aluminum on a basis comparable with those of tin and copper. Weight for weight it is cheaper than tin, but bulk for bulk it is cheaper than either tin or copper. This level of price ought to stimulate greatly the consumption of aluminum, especially when the revival in general trade goes a little further. We look upon aluminum as having now fallen to somewhere near its natural level, around which the price will hover, rather than as having suffered a slump to a very low price from which there will be a recovery. The producing capacity of Europe is increasing, while in the United States the Bradley patent will expire early in 1909, permitting free competition in the business just as there is now in Europe. Even at present prices there is a good profit to the Aluminum Company of America, the manufacturing cost of which is probably in the neighborhood of 15c. per lb. Indeed, except for the tariff, there is no reason why aluminum should not sell as cheaply in the United States as in Europe. According to a recent writer in the Frankfurter *Zeitung* the average cost of production in Europe is 17¼c. per lb. (higher than the present selling price), but undoubtedly there are important differences in the positions of the various European smelters, and, of course, the market price is established by the most favorably situated under the present condition of over-supply. However, it is probably safe to say at least that the cost of making aluminum in Europe is no lower than in the United States.

To What Extent are Our Zinc Resources Known?

The article by Doctor Keyes, published elsewhere in this issue, is particularly suggestive. If there be any of the principal metals of which the known supply is suffering such exhaustion in the United States as to cause a higher range of prices, zinc is the one. The Joplin district for several years has been reduced to a large extent to the mining of ore which yields only 3 per cent. of mineral (blende, plus galena). Leadville began as a zinc producer by shipping the tailings derived from the concentration of ore containing lead, but that kind of ore was soon exhausted and the producers were obliged to turn to ore consisting chiefly of blende and pyrites, which had to be worked for the zinc content alone, whereas zinc had previously been a by-product.

Ever since the zinc industry in the United States has been important, the Joplin district has been the chief source of supply. If it be the only great source of ore supply, and if it be approaching exhaustion insofar as the richer ore is concerned, the outlook will be for an increasing scarcity of spelter and consequently a higher level of prices for it so long as foreign spelter is excluded by a tariff.

Doctor Keyes now points out that the concentration of attention upon southwestern Missouri and the general acceptance that the term "Joplin district" is synonymous with the zinc-producing capacity of that region have created erroneous ideas, and he remarks that contrary to general opinion the ore deposits of the Ozark region are not limited to a few circumscribed areas, but extend far beyond the boundaries of the present recognized mining districts. He expresses the opinion that the ore fields outside of the limited districts now operated will prove to be much more extensive than the fields developed up to the present time.

In this connection it is interesting to note that the recent developments in the Quapaw and Miami districts of Oklahoma already are showing the existence of large deposits of ore. By courtesy these new districts of Oklahoma are included with the Joplin district in the statistical reports of production, but as a matter of fact they are a good many miles away, are different in some important respects as to character, and are confirmatory of the opinion which Doctor Keyes has expressed.

Coal Production in 1908

An accompaniment and also an indication of the business depression of the past year is found in the decreased quantity of coal mined. While no returns from the mines can be obtained, those from the railroads and other transportation agencies cover nearly all the more important coalfields east of the Mississippi. In these fields nine-tenths of the coal used in the United States is mined.

It must be assumed that the consumption of coal for domestic purposes does not vary greatly from year to year. A mild winter, reducing the consumption in one part of the country, is generally balanced by more severe weather in another section. The quantity consumed by the average family is only slightly reduced in hard times, and the aggregate remains nearly the same. The difference in consumption is entirely in the quantity used for raising steam and for manufacturing purposes generally.

The railroad returns available for this purpose cover, generally speaking, the western Pennsylvania district, West Virginia, Ohio, Indiana and the southern part of Illinois in the West; the central districts of Pennsylvania, and the State of Maryland in the East; and finally the anthracite region, which alone furnishes full returns of shipments. A comparison of the railroad traffic statements shows a remarkable approach to uniformity in the decrease of coal shipments in the present year, as compared with 1907. The falling off in coal traffic has been from 20 to 25 per cent., and leads to the conclusion that there must have been a corresponding decrease in consumption. In coke, which finds its chief use in the iron trade, the decrease has been much greater, fully 50 per cent. or in parallel ratio to pig-iron production. This is corroborated by the statements of production in the Connellsville region, the greatest coke-producing district, which show an output only about one-half as great as last year.

The exception to this general reduction is found in the anthracite region, where shipments have been only about 6 per cent. less than in 1907. Anthracite, however, is used in very large part as a domestic fuel, its sales for steam purposes being only a minor part of the total. Moreover, anthracite will stand storage, and the companies handling it have large facilities for storing it and thereby equalizing work at the mines. Shipments, therefore, are not an exact guide to consumption.

The conclusion to be drawn is that the production of bituminous coal in nine months of the present year has been from 20 to 25 per cent. less than in the corresponding period of 1907. For the remaining three months the reduction will probably be less, since business is now improving, and the comparison will be with a poor quarter last year, when the depression had already set in. The total production of bituminous coal in the United States in 1907 was, in round figures, 388,222,000 tons. In 1908 it is doubtful whether it will exceed 320,000,000 tons; but even this is a great figure, far exceeding the output of any other country in the world. The anthracite figures will bring the total up to slightly over 400,000,000 tons for the year.

THE FORTHCOMING ANNUAL statistical number of the JOURNAL, which will present the statistics of the production of the important metals and minerals in 1908, will be the issue of Saturday, Jan. 9, 1909. It has been the custom heretofore to make the first issue of the year the annual statistical number, but the first issue of the coming volume of the JOURNAL falls on Saturday, Jan. 2, 1909, and inasmuch as the last form of the JOURNAL regularly goes to press on the preceding Wednesday, it is impossible this year to collect the statistics in time for the issue of Jan. 2, wherefore the change.

THE PAPER BY SENOR NARVAEZ, published in this issue, will surely excite interest, being an excellent illustration of the great progress in metallurgy in Mexico. Particular note should be directed to the milling cost reported by him. So far as we know, it is not equalled, nor even approached, anywhere else. Although Señor Narvaez conservatively gives 15 tons as the capacity of the mill with a feed of 1½-in. ore, we understand that he is doing better than that with much of the ore as large as 4 in. It is particularly interesting to chronicle the advances of metallurgists of the country which gave to the world the patio process, that for upward of three centuries afforded the major part of the production of silver and gold.

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

Sampling by Machine

John A. Church's remarks in the JOURNAL of Nov. 14 about the selective action of the scoops in sampling machines upon a stream of falling ore pleased me more than a little. I had been waiting for some one to put his finger upon that weak spot for several years, ever since I took a laborious part in an exhaustive test of an automatic sampler at a large custom smelting works.

The machine was one of the earlier examples of the type now extensively used, and it did not differ in any essential detail from those now said to give entire satisfaction. It removed a slice from the ore stream cutting entirely across, and the chances for segration during the transfer from one spout to another were at least as small as in machines of later types. It did not recrush and mix the material between cuts, but the size of the particles was kept well within Brunton's limits, so that this alone does not account for the failure of the machine.

Every lot of ore which came to the smelter yard during two or three months was passed through this machine after having been sampled by the old method of quartering, ringing and coning. The hand sampling was done by a corps of trained men under the direction of the most skilful sampling foreman I ever met. The machine gave samples in duplicate. The two machine samples and the one hand sample were assayed separately, five scorifiers being run on each for silver, two crucibles for lead, two crucibles for gold and two 0.5 gram tests for copper analysis.

It would no doubt be possible to dig enough comparative results out of the old records of that smelter to fill page after page of the JOURNAL, but I fear they would not be very instructive. They were studied carefully enough at the time; for if there was any prejudice at the works it was in favor of the machine. Of course, in the great majority of cases the results were as like as two peas, as was to be expected; but on really difficult lots the machine samples varied in every conceivable manner from those obtained by the despised and expensive hand method; and the umpires invariably gave the decision in favor of the shovel-and-broom process. The machine was abandoned reluctantly but definitely. Reason and economy seemed to be in its favor, but practice had no respect for the beautiful theory upon which it was constructed. Its samples were unreliable.

Later I performed some experiments of my own, and reached certain conclusions which agree rather well with those of Mr. Church, and probably also with those of others who are less outspoken than he. Machines which take a sample by slicing a stream of ore exert a selective action upon the ore particles; they are merely modifications of the old pipe sampler in which the ore fell, as it happened to fall, in the various deflecting spouts. We shall never have a sampling machine which approximates the truth as closely as the old quartering method, until we abandon the falling stream principle.

DEFECTS OF THE FALLING-STREAM PRINCIPLE

Practically all the automatic samplers thus far constructed proceed upon the false assumption that a stream of falling ore is in all respects like a stream of liquid, that its particles are uniform, that they fall with the same velocity and have no dimensions; also that the walls of the scoops and dividing diaphragms are mathematical planes with no thickness and no deflecting edges. The designers assume a free fall for the mineral particles, and a free fall is impossible for 100 per cent. of the ore so long as the particles are larger than the theoretical mathematical point. As Mr. Church explains, the edges of the scoops bring into the stream a disturbing zone, its width depending upon the size of the largest particles, and its proportion to the entire area depending upon the width of the scoops and the frequency with which they enter the stream. The cutting edges invariably discriminate against the larger particles. By experiment I have found it possible to eliminate all the larger particles from a sample of ore simply by pouring repeatedly upon an assayer's sampling scoop; and the ratio between the maximum size of the particles and the width of the scoop seemed to have nothing whatever to do with the results.

Sampling deserves a great deal more attention than it has hitherto received. It is sufficiently important, expensive and difficult to merit the best that science can give. In the nature of things an absolutely accurate sample of a heterogenous ore is an impossibility. The best that any sampler can do is to respect certain laws of chance; and when the selection of a small portion is complete, the most that can be said for the sample is that it probably represents the whole. Sampling is a nonproductive operation; its expense is a burden for which there is no return; and expense will always determine how near the approximation to probability shall be carried, certainty being unattainable.

BASIC ASSUMPTIONS

The art of sampling is based upon the theory of averages. It is assumed that however heterogeneous an ore may be, it is still more or less uniform and that such variations as occur will be "averaged" by taking a sufficient number of cuts. In spite of the fact that repetition does not invariably produce an average either in mathematics, in the sampling mill or on the roulette table, in a great majority of cases the results based upon this assumption are sufficiently accurate for all practical purposes. Some of the Lake Superior iron ores are so uniform that any bucketful will fairly represent an entire shipload; at the other extreme we may imagine a $20 gold coin lost in a ton of barren quartz. Ores received at smelting works lie somewhere between these two extremes, sometimes approaching the one, sometimes the other. Calculations and tables showing the size of crushing, the proportion of the first cut, etc., can be of no use whatever in the case of an ore at all resembling the last extreme given. On the other hand refinements of sampling in the case of the iron ore are a useless expense.

The theory of averages requires that any given particle in a lot of ore shall at the time of each division have equal chances of finding its way into the sample and into the reject; also that there shall be no discriminating conditions likely to impair the equality of the chances. This requires that no cut shall be smaller than one-half of the whole, and that all selective factors shall be strictly eliminated. These conditions are fulfilled, at least theoretically, in the old method of quartering, ringing and coning by hand, which represents a result of centuries of bickering and squabbling between ore buyers and miners. The ore is divided, while at rest, into equal parts, and before the operation is repeated, the material is mixed by coning, in which the selective effects of gravity are reduced to a minimum. In practice, however, carelessness and stupidity on the part of the shovelers may introduce errors far more serious than the shortcomings of the most imperfect automatic sampler. The method is not entirely satisfactory, but there is nothing yet in sight to take its place. Friends of the automatic samplers profess to be glad that the old hand method is rapidly passing. Yet very few indeed will

trust the final division in the bucking room to a machine.

The desideratum in sampling has always been a machine which shall retain the advantages of the old hand method and eliminate the element of human fallibility. According to several of the JOURNAL'S correspondents this result has already been attained, although all of the machines embody the defects pointed out by Mr. Church. In sampling it is necessary in any case to be satisfied with "good enough," and if both parties are content to accept the results obtained, the search for improvement is not likely to be keen. But the first step toward improvement is a thorough comprehension of the principles involved, and in this respect Mr. Church has performed a real service.

WHAT A MACHINE SHOULD DO

The division of a falling stream of ore is so convenient and may be done with apparatus so simple and inexpensive that the reluctance to give it up is easy to understand. When inventors begin by adopting another principle, we shall soon have an automatic sampler which will do at least as good work as the old hand method, which is none too good at best. The machine required will divide the mass of ore, while at rest, or at least without segregation, repeatedly into two equal parts.

There are several ways in which this can be effected. A scraper or a series of scrapers removing sections from a uniform ribbon of ore carried upon a traveling belt should meet the requirements, and the cost of an installation of this sort would not be prohibitive. Other methods will suggest themselves to those who have given the matter thought. Whatever system may be adopted, especial care must be given to secure a fair representation of the fines and coarse ore, for that is the secret of sampling, if an art which is no better than a series of guesses can be said to have any secrets.

The shaking-tray feed will have no part in the perfect sampling machine, for it involves the principle employed in innumerable concentrating devices to produce segregation; and segregation of coarse from fine ore is to be avoided like the plague in sampling, unless the divisions are made by weight instead of by time or volume. It is no doubt possible to construct a machine that will remove a definite proportion of the weight of a lot of ore, but the complications would be many and expensive.

When we see mechanical sampling devices used in the bucking room to make the final division of the pulp, we shall be convinced that the automatic sampler has won its way into the confidence of those most concerned. That will serve as a final test of efficiency.

The ideal sampling machine, which violates none of the laws of chance, cannot entirely eliminate sampling as a cause of dispute between miners and smelters. No mechanical device could possibly remove a representative pound from the ton of barren quartz containing a gold coin. The best sample is merely the nearest practicable approximation to the probable; the element of chance will never be eliminated. It would be a good thing if the impossibility of getting a really accurate sample were more generally understood. The best work of the assayer and the chemist amounts to nothing at all so long as the sample does not fairly represent the material tested, and how often does the blame for discordant results rest where it belongs?

A. VAN ZWALUWENBURG.

New York, Nov., 16, 1908.

I have read Mr. Woodbridge's letter on "Sampling by Machine" in the JOURNAL of Nov. 7, 1908, with interest; but I do not think his facts or arguments controvert my assertion that modern sampling mills are not equipped properly. He described a feed by perforated shaking aprons put in a Cripple Creek mill under Mr. Argall's management "several years ago." This is an excellent device and gives the double advantage of retarded feed and separate sampling of sizes that are wide apart. How is it that it has not been introduced into any of the "modern" mills? Mr. Woodbridge does not point to any mill that has copied it nor does anyone else mention it.

Mr. Woodbridge joins the other correspondents who have discussed the subject in the JOURNAL in intimating that if I knew what is done in sampling mills I would not criticize their work; but he advances the discussion by one step by confining my presumed ignorance to *public* sampling works, and he makes a distinction between these and mills working on home ores. He says: "The public sampling works, having to maintain a standard different from that of mills directly connected with a smelter or reduction plant, make a business of hunting down causes for differences which may appear through the daily comparisons of their work, etc." I cannot see what difference there is between a smelter that buys 300 tons a day on samples taken in its own mill and the same purchase on samples taken by a public sampler, nor do I believe that our great smelting establishments would put up with poor sampling in their own works if they knew how to get good results. What does Mr. Mathewson think of Mr. Woodbridge's opinion of sampling mills in smelting works? In my first article I mentioned two bad mills in large smelters.

I have criticised the general condition of sampling in this country (and elsewhere), and most of the JOURNAL'S correspondents have criticized me on the ground that they knew of some one or two mills where good work has been done. They intimate that there are others and I have no doubt of it, but I think the general state of machine sampling is about as I have represented it.

I have examined the blueprints of 15 sampling mills, all modern in the sense that they have been designed within the last five years, a period, let me remark, which follows or is contemporaneous and certainly does not precede the plans of good mills mentioned by my critics. The 15 mills can be classified as follows:

Nine had one mixer or one shaking-apron feed in the whole mill.

One had a screen above the first sampler, the oversize going to rolls and the fine to the sampler but no other feeder.

One had a shaking apron at each step of the process. That is a mill for sampling purchased ores and the same concern has a similar mill for its own ores.

Four had no provision of either kind, but trusted absolutely to haphazard feed from the top to the bottom of the mill.

My impression is that more faulty mills are built than good ones, and until my critics show that this is not the case, I must insist that the general practice is faulty, although an occasional engineer with the reputation of an Argall or a Klepetko builds a proper mill.

Mr. Woodbridge has done us all a service by joining the ranks of those who do not accept the mechanical sampler as an infallible machine, but puts his trust in its judicious management, as he should. He recognizes that there are certain rules, or combinations of good sense and the laws of nature, which must be observed and which may be called the principles of sampling. So far as he discusses these principles he repeats or runs parallel to what I have written.

Most of the JOURNAL'S correspondents have contributed something that was surprising to this discussion. Mr. Woodbridge's contribution is simply astounding. He says: "I have examined mills where differences of 30 per cent. and more have often occurred in cutting duplicate samples from the few hundred pounds finally delivered to the sample room by the mechanical samplers." Such a mill could hardly be more *modern* in its machine part than in its hand sampling for the same intelligence, or lack of it, presided over both departments.

JOHN A. CHURCH.

New York, Nov. 9, 1908.

Donald McLeod, minister of mines and forests for Victoria, reports that in 1907 the Victorian Syndicate, Ltd., at Costerfield produced 3900 long tons of antimony ore from which was obtained 830 tons of concentrates valued at £12,450, and assaying 45 to 50 per cent. antimony, and 35 to 38 dwt. gold per ton. The Heathcote Syndicate, Ltd., at the same place, produced 600 tons of ore yielding 70 tons of concentrates valued at £840. The concentrates from both companies were smelted in England.

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.

Candles in Coal Mines

Are candles used to any extent for lighting purposes in coal mines in the United States?

F. S.

Candles are not used in any of the large or important coal mines in America. The general means of illumination in coal mines is the ordinary miner's lamp, burning oil, and made of tin, with a cotton wick. The miner carries a ball of cotton from which he makes his own wick. Naked lights of this sort are often prohibited in gaseous mines, and in such workings safety lamps are used.

Refining Lake Copper

Does the copper produced at Lake Superior have to be refined after smelting?

S. A. G.

It is "poled," a simple process of furnace refining, chiefly to bring it to the right pitch. A comparatively small percentage of Lake Superior copper is refined electrolytically in order to secure the silver which it contains.

Terne Plate

What is terne plate? Does it necessarily contain tin? Is corrugated sheet iron coated with tin and lead sold as a substitute for galvanized iron? What is the relative cost of terne plate and galvanized iron?

A. B. C.

1. A strict definition of terne plate would be an iron or steel sheet or plate coated with a mixture of tin and lead.

2. Terne plate necessarily contains tin Sheet coated only with lead would be designated as such. Such a sheet is not produced commercially so far as we know.

3. We do not know of any instance of corrugated sheets coated with tin and lead being produced and sold as a substitute for galvanized iron.

4. For equal gage, cost of common ternes is about the same as galvanized iron. The cost of pure lead-coated sheets, if practicable to produce such, would be higher than galvanized, owing to temperature and coating difficulties.

Thickest Coal Seam

What is the thickest coal seam in the United States? What is its width? Is it being worked at present, and what kind of coal does it produce?

W. O. K.

The thickest seam of coal in the United States, of which we have record, is a bed of lignite coal in the vicinity of Hebron, in North Park, on the line of the Denver, Northwestern & Pacific railway, in Colorado. This seam is in the Tertiary formation, and has been opened at several points. The bed is from 40 to 65 ft. in thickness, and outcrops on the surface. At the Little Grizzly mine, its thickness was proved by a shaft 90 ft. deep driven through the seam. The coal from this bed is used for domestic purposes by the settlers, who pay $1.25 per ton for it at the coal bank. An analysis of a sample from the Grizzly opening gives: Moisture, 17.80 per cent.; volatile matter, 36.40; fixed carbon, 43.10; ash, 2.70 per cent. Other samples taken at various points show as high as 48 per cent. fixed carbon.

American Copper Smelters

What smelters in the United States produce ingot copper? Who are the chief exporters of copper from the United States?

J. R. M.

Assuming the above inquiry to refer only to refined copper, the following is a list of the electrolytic refiners:

Nichols Copper Co.	Laurel Hill, N. Y.
United Metals Selling Company	Perth Amboy, N. J.
American Smelting and Refining Company	Perth Amboy, N. J.
U. S. Metals Refining Company	Chrome, N. J.
Baltimore Copper Rolling and Mfg. Company	Baltimore, Md.
Balbach Smelting and Refining Company	Newark, N. J.
Boston & Montana Copper Company	Great Falls, Mont.
Tacoma Smelting Company	Tacoma, Wash.
Mountain Copper Company	Oakland, Cal.
Chicago Copper Refining Company	Blue Island, Ill.
Calumet & Hecla Mining Company	Buffalo, N. Y.
North American Lead Company	Fredericktown, Mo

Most of the producers of electrolytic copper also turn out casting copper. The latter is produced by the Tennessee Copper Company, Isabella, Tenn., and by several refiners of old junk. The following are producers of Lake copper:

Ahmeek Mining Company	199 Washington St.,	Boston,	Mass.
Calumet & Hecla Mining Company	12 Ashburton Pl.,	"	"
Mass. Consolidated Mining Company	6 Beacon St.,	"	"
Franklin Mining Company	15 Congress St.,	"	"
Isle Royale Copper Company	303 Washington St.,	"	"
Osceola Consolidated Mining Company	303 Washington St.,	"	"
Tamarack Mining Company	303 Washington St.,	"	"
Victoria Copper Mining Company	539 State St.,	"	"
Atlantic Mining Company	15 William St.,	New York	City.
Michigan Copper Mining Company	"	"	"
Mohawk Mining Company	"	"	"
Wolverine Copper Mining Company	"	"	"
Adventure Consolidated Copper Company	32 Broadway,	"	"
Quincy Mining Company	"	"	"
Copper Range Consolidated Company	27 State St.,	Boston,	Mass.
Baltic Mining Company	"	"	"
Champion Copper Company	"	"	"
Trimountain Copper Company	"	"	"
Winona Copper Company	199 Washington St.,	"	"
Centennial Copper Mining Company	60 State St.,	"	"
Allouez Mining Company	"	"	"

The chief exporters of copper are:

United Metals Selling Company	New York
American Metal Company	"
Phelps, Dodge & Co.	"
American Smelting and Refining Company	"
American Smelters Securities Company	"
L. Vogelstein & Co.	"
Calumet & Hecla Mining Company	Boston

Garnet

Is garnet produced in the United States? If so, please state the chief localities in which it is found, the amount produced yearly, its value, and any other information of interest on the subject.

F. A. R.

New York is the chief source of supply of garnet in the United States. Following is the production and value in the United States for the last three years: 1905, 3694 short tons, valued at $114,625; 1906, 5404 short tons, valued at $179,548; 1907, 6723 short tons, valued at $209,985. During 1907 the Adirondack region in New York contributed 5709 short tons of the above total.

Metallics in Samples

Just what am I to do when I find metallic masses in sampling ores and smelter products?

J. E. B.

It is almost impossible to determine accurately the value of an ore by sampling and assaying when some of the metals separate out in malleable masses. The matter is complicated by the fact that when this condition is encountered the main sample will always retain some metallic particles and the separated metallics will always be contaminated with ore. Fortunately the proportion of separated malleable material is usually small, so that a rough estimate is commonly close enough.

Since the value of an ore is always determined by the weight of metallic contents, the relative weight of ore and metallics must be determined at each stage of sampling. At the end the metallic masses are assembled and treated separately. Malleable metals cannot be sampled in the usual way. They must be converted into bars or buttons by fusion with the proper fluxes and then assayed, the relative weight at each stage being carefully determined. The bar or button is then assayed and the proportion of metal in the metallics found during the various steps in sampling calculated and apportioned.

The main sample of nonmetallic material is treated in the usual way, especial precaution being taken to guard against error due to minute metallic particles which have a constant tendency to segregate, especially in fine, fluffy pulp.

An Important Dredge Decision

SPECIAL CORRESPONDENCE

An important decision has been handed down by Presiding Judge W. C. Van Fleet, of the United States Circuit Court in San Francisco, which is of great interest to manufacturers and users of gold dredges in this country and throughout the world. The suit was that of the Risdon Iron and Locomotive Works, of San Francisco, against the Western Engineering and Construction Company and the Central Gold Dredging Company, of Oroville, Butte county, Cal. The issue involved concerned the details of construction and operation of gold-dredging machinery, and the validity of the Postlethwaite patent owned by the Risdon works, which, it was claimed, had been infringed upon by the defendants named, the Western Engineering and Construction Company, acting as agents of the Bucyrus Company, of South Milwaukee, Wis. The two types of dredges most commonly in use are those built by the Bucyrus Company and the Risdon works. The latter company has built 56 of these machines, sending some as far as the west coast of Africa. The Bucyrus Company has also built a large number of gold-mining dredges for different mining regions of the world, many of them being in use in California. The Western Engineering and Construction Company was sued for selling the infringed device and the Central Dredging Company for using it. The verdict of the court is in favor of the Risdon Iron and Locomotive Works.

Operators of gold-mining dredges will be interested in some of the details of this decision, which upholds the validity of the Postlethwaite patents. The gist of the whole matter lies in the use of the rotary grizzly or separator, instead of shaking tables, but in combination with other parts, to carry out the functions of drying the gravel, elevating it, washing it and saving the gold.

The suit was for infringement of claim No. 3 in the Postlethwaite patent of 1897 for a gold-dredging apparatus. The claim involved is "a combination with a boat, or platform of a rotary grizzly or separator mounted thereon, devices for imparting rotation thereto, means for excavating, and elevating the excavated material, and discharging the same into the rotary grizzly, or separator, or grizzly, a pump for forcing water into said pipe and through its perforations and under disintegrating pressure onto the material fed into the grizzly or separator, collecting tables arranged below the separator or grizzly, and by means of which the separated metal from the dredge material is recovered."

It will be noted that this is a very broad claim indeed, giving the elements of the combination and not the details of the elements. In holding that this claim of the patent was valid and had been infringed, the court laid particular stress on the fact that the combination of devices set forth in the claim were not anticipated by any prior patented device, and that the combination of the claim sued for was not disclosed in any prior publication. The court also held that although a large number of dredges of the character of the patented apparatus were disclosed in the evidence, none of such devices disclosed the invention of the involved claim of the Postlethwaite patent. After discussing at some length the question as to whether the claim was a mere aggregation of elements and not a true combination, the court held that the claim in the suit disclosed a valid combination. In passing on this question the court commented as to "the great value which had undoubtedly resulted from the device patented, and the great success it has had," which undoubtedly was a material factor in connection with the decision.

The combination claim in the patent was for a device made up of various elements which are, under the law, assumed to be old, but a combination of old elements which, it is claimed, required inventive genius for their assembling in such a way as to produce a unitary whole—an instrument patentable under the laws of the United States.

It may be stated that the allowance of the original patent had a very long and hotly-contested passage through the patent office, and the claim involved in this suit was taken on appeal to the Commissioner of Patents. That official finally decided that the claim for the combination involved was patentable, and that the patent should issue. In passing on the commissioner's decision in this respect, Judge Van Fleet expressed the opinion that the ruling was correct.

The contest on this patent right has been pending before the courts for the past five years, and testimony has been taken throughout the country. The defendants argued strongly that the device was anticipated by the use of gold-dredging machines which had been worked at Bannack, Mont., Prescott, Ariz., and Pascoe, Wash., all of which had been made by the Bucyrus Company. The testimony was not sufficient, however, to convince the judge. The patented device has virtually revolutionized the art of mining the class of material which it handles. A few machines still use shaking tables combined with the other features referred to, but lately numerous applications have been made to the Risdon people to put rotary grizzlies or separators in their place.

Undoubtedly the result of this decision will be the beginning of many suits for infringement of the patent involved against a number of manufacturers and users of gold-dredging devices. There are even some in California who manufacture dredges for their own use only, and do not sell them, and these people can hardly escape litigation. Royalty will doubtless be demanded from users of the machines in the future, even in the case of old dredges which they bought in good faith without thought of any patent infringement. What steps will be taken toward manufacturers of gold-dredging devices who have been using this patent, none but the Risdon people can say.

Revising the Tariff

Hearings before the Ways and Means Committee began at Washington, Nov. 10. So far the wishes of producers concerned in the mineral industry have been expressed as follows:

The Semet-Solvay Company, of Syracuse, N. Y., wants the duty increased on the by-products of coke manufacture; 0.5c. per gal. on crude tar, 0.75c. per gal. on pitch, and higher rates on the derivative products.

The Henry Bower Chemical Company, of Philadelphia and Baltimore (bichromate manufacturers) wants increased duties on the articles it manufactures.

The New Jersey Zinc Company thinks that zinc oxide needs more protection. Lithopone, not mentioned in the present tariff, should be mentioned; it is now taxed 1.25c. per lb. as sulphide of zinc. The new duty should be the same.

The barytes miners of Missouri and the South wish the present duty of 75c. per ton on barytes to be raised to $5.

South Australian Production

The production of metals in South Australia for two years past is officially reported as follows:

	1906.	1907.	Changes.	
Gold, oz.	8,037	5,609	D.	2,428
Silver, oz.	801	5,845	I.	5,044
Copper, lb.	18,385,920	17,765,440	D.	620,480
Lead, lb	112,000	.....	D.	112,000

The gold production of the northern territory, so far as reported, was 449 oz. last year.

The production of ores and minerals was as follows, in long tons:

	1906.	1907.	Changes.	
Silver-lead ore		1,000	I.	1,000
Ironstone flux	75,226	84,600	I.	9,374
Limestone flux	31,940	31,100	D.	840
Phosphate rock	5,850	8,000	I.	2,150
Salt	55,000	75,000	I.	20,000

The production of miscellaneous minerals of various kinds, in small quantities was valued at $10,780 in 1906, and $12,167 last year.

The bulk of the manganese ore produced in North Wales comes from a bed of ferruginous manganese, intercalated among the Lower Silurian shales near Aberdaron in Carnarvonshire, and yields an average of 30 per cent. manganese and 10 per cent. iron.

Calumet & Hecla Copper

In the testimony in the recent suit of A. S. Bigelow against the Calumet & Hecla company, T. L. Livermore, of the latter company, made the following interesting statements:

"Electrolytic wire bars have increased gradually until during the last three years much more electrolytic copper has been sold in competition with the Calumet copper in that shape than the Calumet itself has sold, and as I have every reason to believe, more than all Lake copper in the shape of wire bars.

"Of Calumet copper I can say that sometimes it has been of the same price as electrolytic and sometimes higher. When electrolytic copper did not have the good reputation for excellency and uniformity that much of it has today, it was more common to get a better price for Calumet than it is now, but today while on a rising market for copper we ordinarily command a little better price, ranging from ¼ to ½c. per lb., than is commanded by electrolytic copper, yet on a falling market we are obliged to take the same price in order to dispose of our product, and do take it.

"I think that the reputation of Calumet copper established in the early days of which I have spoken, when electrolytic copper, as a rule, was not as good as it is today, has descended to the recent period with some users and they have preferred Calumet copper on account of that actual difference which once did exist; but for the most part today, I believe from all I have learned from our customers that it is the uniformity of quality of the Calumet copper which gives it the preference over electrolytic copper where it does do so, and that as a matter of fact there is no absolute necessity of Calumet copper for the uses of consumers which gives it a preference over electrolytic. The reputation of superiority I think has been for the benefit of my company and I should be very glad to have it maintained."

Mr. Livermore was asked what degree of conductivity the Calumet & Hecla copper possessed and he replied that that portion of it which was put into wire bars had an electric conductivity of 99.5 per cent., or more, frequently more.

"I think at one time Tamarack and probably Osceola sold in competition with us and brought as high a price, but in recent years I think they have brought lower prices than ours." Mr. Livermore was questioned as to whether the product of the Copper Range mines was known to the trade as being copper carrying a high percentage of arsenic. Mr. Livermore replied that it was clearly distinguished from Calumet & Hecla copper. He said he thought it was regarded as a different and lower grade than the Calumet and the Quincy product, but as compared with Tamarack and Osceola he was not so confident. He said he was under the impression that sometimes the product of the Copper Range mines sold as high as that of the Tamarack and Osceola and he thought that it had done so within the last year in large quantities.

The Burma Ruby Mines

The reports of the Burma Ruby Mines Company for the past three years show progress in the exploitation of the Mogok valley deposits, though with some fluctuations from various causes. The leading data for the years ending with February, 1906, 1907 and 1908 are as follows:

	Trucks of Earth Washed.	Cost per Truck.	Final Net Profit.	Balance to New Account.
1906	1,773,129	8.4 d.	£8,190	£16,705
1907	1,890,944	7.7 d.	15,160	24,390
1908	2,033,666	7.6 d.	9,466	18,906

The fact is noted that the actual output, in truckloads of ruby-earth washed, for the first time exceeded two millions during the last year.

The net profit, as above given, is that remaining after paying the Government its stipulated share of 30 per cent. on the actual profit over all other expenses. The company's agreement involves an annual rent of R.200,000 (about £13,400), plus 30 per cent. on the general profits, and the same percentage on all that the company receives from license fees, or royalties, on land granted to native miners, above R. 200,000. These royalties vary much, from unknown or uncertain causes affecting the native industry; the figures are given as follows: For the years 1904 to 1907, inclusive, 1904, £23,460; 1905, £14,691; 1906, £12,595; 1907, £18,185.

It may be noted that this source of revenue amounts, on an average, to somewhat more than the regular rental of the mines; beyond that sum, 30 per cent., as above stated, also goes to the Government.

The company declared a dividend on its ordinary shares of 6d. a share, in 1906, amounting to £7475, and of 1s. a share in 1907, amounting to £14,950. In 1908, however, the depression in the market for gems had been felt for some months, and, although the output had increased and the costs somewhat lessened, it was thought best to defer the dividend until the demand for rubies should revive. The semi-annual payment of rent, due in February, 1908, was also deferred, with consent of the Government, although it was deducted, as usual, from the statement above given in the table.

The directors, in 1907, petitioned the Secretary of State for a reduction in the requirement of 30 per cent. of the net profits, on the ground that the Government has thus received nearly thrice the amount that has been paid to the shareholders since the formation of the company. Nothing is said in the 1908 report as to any action upon this request.

The drainage tunnel, which has been under construction for several years, and which will greatly reduce both risks and expenses, is fast nearing completion and is expected to be in operation by the end of 1908.

Mineral and Metal Production of Sweden

According to the official Government report the production of minerals and metals in Sweden during 1906 and 1907 was as follows:

PRODUCTION OF MINERALS AND METALS IN SWEDEN.
(In Metric Tons.)

Material.	1906.	1907.
Minerals:		
Alum	167	131
Coal	296,980	305,338
Copper ore	19,655	21,957
Feldspar	21,014	20,244
Iron ore	4,501,656	4,478,917
Lead ore	37	33
Manganese ore	2,680	4,334
Pyrites	21,827	27,113
Silver-lead ore	1,938	1,987
Zinc ore	52,552	50,884
Metals:		
Copper	1,209	1,577
Gold (Kg.)	20.3	28.1
Pig iron	604,789	615,778
Steel	397,525	420,216
Lead	753	813
Silver (Kg.)	938	929

The production of blooms was 174,405 tons in 1907 against 178,298 tons in 1906.

Transvaal Gold Mines

The gold production of the Transvaal mines in October is reported at 617,744 oz. fine. This was 30,110 oz. more than in September and 64,191 oz. more than in October, 1907; it is the largest production ever reported for a month in the history of the Transvaal. For the 10 months ended Oct. 31 the total was 5,418,335 oz. in 1907, and 5,777,603 oz. in 1908; an increase of 359,268 oz. By values, the total was $111,996,984 in 1907, and $119,423,054 in 1908; the gain being $7,426,070, or 6.6 per cent. These figures indicate an approximate output of $145,000,000 this year for the Transvaal.

Magnesium is now being employed to some extent as a deoxidizer in brass manufacture, having the advantage over phosphorus that an excess may be used without harm, and indeed may improve the quality of the brass. (Magnesium is a metal which belongs to the same family as zinc.) Ordinarily the addition of 0.05 per cent of magnesium to the brass is sufficient for deoxidizing purposes.

Personal

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

James Moffet, of Oakland, Cal., is examining an iron-ore deposit in Colima, Mexico.

John Rutz, of New York, has been inspecting the Catharine-Rudisill gold mine near Charlotte, North Carolina.

Dr. A. R. Ledoux, of New York, has gone to Missouri to examine copper-nickel mines in Madison county.

C. D. Grove is in change of the work of the Skagit Queen Consolidated Mining Company at Marblemount, Washington.

W. H. Landers has been appointed manager for the Standard Consolidated Mining Company, at Bodie, Cal., succeeding Arthur Feust, resigned.

Bertram Hunt, of San Francisco, has been conducting some metallurgical tests for the Hillabee Gold Mining Company at Alexander City, Alabama.

W. F. Ferrier has been appointed mining geologist for the United States Smelting, Refining and Mining Company. He is at present at Mammoth, Shasta county, California.

Robert W. Hunt & Co., of Chicago, engineers, have been selected to inspect the structural steel to be used in the large new terminal station of the Chicago & Northern at Chicago.

Harvey R. Hunter, North Braddock, Penn., has been appointed assistant superintendent of the Edgar Thomson Steel Works of the Carnegie Steel Company, succeeding James M. Rinard.

H. H. Knox, mining engineer, of Knox & Allen, New York, left New York for London on Nov. 4, for an absence of three months. After a brief stay in London, he will go to the Urals in Russia.

Frank H. Crockard, vice-president and general manager of the Tennessee Coal, Iron and Railroad Company, left Birmingham, Ala., for Hot Springs, Va., Nov. 9. He expects to be absent a month.

Prof. Bradley Stoughton, of the department of metallurgy, Columbia University, New York, delivered an illustrated address on "Iron and Steel," at the section meeting of the Franklin Institute, Philadelphia, on the evening of Nov. 12.

Governor Stuart, of Pennsylvania, has appointed the following State delegates to the American Mining Congress: John H. Jones, W. W. Keefer, Pittsburg; George Whyel, Fred C. Keighly, Uniontown; W. H. Clingerman, Scotland; W. W. Jamison, Greensburg; H. H. Stoek, Scranton; W. J. Richards, Pottsville; Morris Williams, Philadelphia.

John Fulton, the well known mining engineer and geologist, left Johnstown, Penn., a few days ago for Augusta, Me., where he has been summoned as a witness in the suit of the Bon Air Coal and Iron Company, against a New York syndicate, which involves the purchase of 200,0000 acres of coal and iron lands in Tennessee.

Obituary

George W. Schwartz died at Hancock, Penn., Nov. 7, aged 55 years. He was for many years an operator of iron mines in eastern Pennsylvania.

Dewitt Clinton Hart, who died at Foxburg, Penn., Nov. 12, aged 67 years, was born in Canastota, N. Y., but passed most of his life in Pennsylvania. He was among the last survivors of the pioneer operators in the Oil Creek district in the early sixties.

William Edward Ayrton, a noted electrical engineer and inventor, died in London Nov. 8, aged 61 years. He held professorships in various institutions, including that of natural philosophy and telegraphy in the Imperial College of Engineering in Japan.

Societies and Technical Schools

Appalachian Engineering Association—Dr. Henry M. Payne, Morgantown, W. Va., secretary, gives notice that the regular December meeting of the association has been postponed until February, on account of the large number of mining and engineering meetings during the month of December. The February meeting will be the annual session and will be held at Frostburg, Maryland.

Mining and Metallurgical Society of America—The first meeting of the Chicago section was held at the Engineers' Club, Oct. 31, and was preceded by a dinner. Only out-of-town members were present, all the resident members being detained at a distance by business engagements. It was the opinion of the gathering that, for the present, the councilor should call meetings quarterly, or upon such special occasions as when a number of resident members were certain to be present, or some visiting members might be entertained. It was also suggested that the next meeting in the district might be held in St. Louis.

Massachusetts Institute of Technology The office of president, vacant since the resignation of Dr. Henry C. Pritchett, has been filled by the election of Richard C. Maclaurin, now head of the department of physics at Columbia University, New York. Dr.Maclaurin is a young man, only 38 years old, but has a high reputation as an instructor. He was born in Scotland, educated at Cambridge University, England. After graduating he spent some time in the United States and Canada. In 1898 he became professor in the University of New Zealand, and remained there until 1907, when he was called to Columbia. He is the author of a number of scientific papers.

Alabama Coal Operators' Association—This association has appointed a committee on Safety and the Prevention of Mine Casualties. The members of this committee are: Guy R. Johnson, vice-president and general manager, Alabama Consolidated Coal and Iron Company; Erskine Ramsey, vice-president Pratt Consolidated Coal Company; Edward H. Coxe, general superintendent coal mines and coke ovens, Tennessee Coal, Iron and Railroad Company; A. H. Woodward, vice-president Woodward Iron Company; Priestly Toulmin, president Lehigh Coal Company. This committee represents the largest coal operators of the State. Guy R. Johnson, Birmingham, Ala., is chairman of the committee.

American Mining Congress—A formal call has been issued for the eleventh annual meeting, to be held in Pittsburg, Penn., Dec. 2-5 next. It includes an invitation to appoint delegates as follows: The President of the United States, 10 delegates at large; foreign nations, 10 each; governors of States, 10 each; mayors of cities and towns, according to population. Counties, commercial bodies, mining bureaus and associations, scientific and engineering societies and State mining schools are also asked to send delegates—two each—to the meeting.

A meeting of the members of the American Mining Congress, as incorporated, will be held at Pittsburg, Dec. 3, to elect three directors, to serve three years, in place of E. A. Colburn, Alexander Dempster and L. W. Powell, whose terms then expire. The American Mining Congress is an incorporated body and only members of the organization can legally vote upon such matters as relate to permanent business affairs, the control of which is lodged in a board of directors consisting of nine members, three of whom are elected annually to hold office for three years. The Congress is composed of members and duly accredited delegates. The distinction between the rights of members and delegates has caused discussion at previous sessions, and it has been thought best to make this statement of the situation in order to avoid any misunderstanding. Delegates will not exercise such powers as under the law can be exercised by members only, as such acts would be illegal and would jeopardize the powers of the congress as a corporation. Delegates will exercise all the powers of delegates to such bodies, and their suggestions will be put into effect as far as may be possible, by the permanent organization, the expense of which is maintained by the members, who have equal rights with the delegates in the deliberations of the congress.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Denver, Butte and Goldfield, Mexico and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 10—A mining ditch built in 1851 to carry water to the old North San Juan gravel diggings in Nevada county is to be put in order to become part of a new electric-power plant. Water rights have been located by North Bloomfield men, who have also located a new dam site on the Middle Yuba river, a mile above the old dam. The ditch is seven miles long and terminates at North San Juan. Another power scheme is that where water locations amounting to 60,000 in. have been made in Plumas county, on Nelson creek, Union Valley creek, and the South Fork of Feather river. A canal through Bald Rock cañon is an important part of the project. These power plants will supply electric power not only to miners, but also to towns and villages in that vicinity.

The general committee on tariff revision of the State Board of Trade has received the report of its sub-committee on minerals, which recommends that an effort be made to have Congress place a duty on manganese, chrome and soda imports. These minerals are mined in California but not elsewhere in the United States in commercial quantities. A few thousand tons of crude magnesite, a few thousand tons of crude soda and a few hundred tons of chrome are about all that California produces annually, though the output could easily be made much larger were there sufficient demand on the Pacific Coast, or were the freight rates lower to points of Eastern consumption. It will, however, be a very difficult thing to get a duty placed on these substances simply because a few California miners are to be in any way benefited. The large consumers in Pennsylvania and elsewhere are apt to oppose the plan vigorously since they now use foreign material which they can obtain at a much lower price than if their supply was derived from this State.

Wallace, Idaho

Nov. 10—Suit for the possession of the Wardner lead-silver vein from which millions of dollars worth of ore has been extracted, and for the recovery in actual cash of $7,300,000, has been started in the district court of Wallace by the January Mining Company against the Bunker Hill & Sullivan Mining and Concentrating Company.

The plaintiff claims to be the owner of the Republican Fraction lode claim in the Yreka mining district by virtue of a transfer of the said claim by the Federal Mining and Smelting Company to Frank T. Post, that company's attorney in Spokane and by Mr. Post to the January company. In this claim it is alleged that the Wardner vein has its apex and extends through it in an easterly and westerly direction. It is further claimed that this vein is the same as that which outcrops within the Bunker Hill lode claim, the Stemwinder, the Emma, the Last Chance, and the Tyler lode claims, and which is generally known as the "Wardner vein."

The plaintiff company claims to be entitled to the ownership of this vein throughout its entire length, including that part of it in the claims mentioned. The claims of ownership of the Bunker Hill company are said to be groundless and false.

Nov. 17—Mass meetings were held in every town in Shoshone county last night for the purpose of organizing opposition to any attempt to reduce the tariff on lead and zinc. Committees were appointed to draw up protests, and delegates to attend a conference of business men and mine operators, to be held here today. A delegation will go to Washington.

Goldfield, Nevada

Nov. 10—With the exception of the periods when the mines have been tied up by strikes, the production of Goldfield is the lowest that it has been since Goldfield began to produce ore. There are three main reasons for this. The Consolidated, the largest company in the camp and which already has 1,000,000 tons of ore blocked out, is only producing enough ore to keep the 20 stamps at the Combination mill busy, while the Florence, the second largest producer is not mining any ore on company account, as the main working shaft is being enlarged and the 20-stamp mill is being completed. The second reason is that the production from leases is diminished for the Consolidated has ceased to grant leases or to extend those now about to expire; many leases on other properties have expired and, owing to the financial depression, others that have not been developed to take their places. A third reason is that the Combination Fraction has been shut down owing to an accident to its machinery.

For reasons which are not wholly obvious the ore-purchasing companies at Goldfield have declined for the past two weeks to give out any figures regarding production. In some quarters these companies are accused of combining to suppress competition although they themselves indignantly deny this and attempt to throw the blame for it upon certain producers who desire to manipulate their respective stocks. This latter may be the reason, for while wildcatting has almost died out at Goldfield, there are still a few and one particularly flagrant instance of very yellow methods on the part of prominent operators.

Butte

Nov. 12—The trouble between the coal miners and operators of Montana was settled last week at a conference at Helena between the Montana Coal Owners Association and the United Mineworkers. The miners working for the Spring Creek Coal Company, near Lewiston, are to receive $1.28 per ton as a compromise. The trouble at the Chicago, Milwaukee & St. Paul Railroad's mines at Roundup was also settled at the conference.

In the suit of L. Wilton Strong against the Butte Central and Boston Copper Corporation, Samuel McConnell, the trustee in bankruptcy of the defendant corporation, has filed an answer in which the corporation sets up a counter-claim for $11,000 for money alleged to be owing from Strong's assignor to the bankrupt corporation.

Denver

Nov. 14—In the Central City gold mines, the resumption of work on the Newhouse tunnel is still a question of the future, but Jan. 1 next is the date now set for starting the work.

In a former issue of the JOURNAL details were given of the finding of very rich ore in the War Dance mine, in the Russell district, and the local papers have since then been repeating the usual twaddle about "picture rock" and "fabulously rich ore that startled the mining world," etc. It is now reported that Eastern parties were negotiating for the purchase of the property at $100,000, but a one-tenth owner has secured an injunction against the sale, and applied for a receiver, on the grounds that the lessees are hiding the ore and other charges of crookedness. The ore was a fluorine-stained rock containing calaverite, and being unknown in that district had been thrown over the dump for some time prior to the discovery of its real value.

In the Cripple Creek district, the suit of the Jennie Sample Gold Mining Company, against the owner of the Ophir mine, for the alleged illegal extraction of ore, has been settled out of court by the payment to the Jennie Sample company of $20,000, and the right to use some of the workings on the Ophir mine.

The Camp Bird dividend of 24c. a share, amounting to $196,800, is due this week, and, of course, will be paid, as the company has a very large sum in the treasury. This will make over $4,500,000 paid by this great Colorado mine since 1901, seven years.

Indianapolis

Nov. 16—The Indiana Steel Company at Gary will begin the actual manufacture of steel Jan. 1. The first blast furnace will be blown in on Dec. 15. The gas developed in the furnaces will be utilized in the production of power. At the docks there are piled up 750,000 tons of ore and in the coal bins an immense quantity of coal. The number of men employed is 4000 and this number will be increased as the work progresses.

There is a stong movement on foot to improve the waterways of Indiana. A number of meetings have been held, and it was pointed out that improved rivers and harbors are necessary especially as to the shipment of coal. The low stage of water in the Ohio river due to the continued drought has been felt more than ever before. Millions of tons of coal have been transferred from barges to the railroads at a higher rate.

The improvement of White river, which is included in the list, would, it is said, enable the mine owners to ship coal to consuming centers now cut off by prohibitive freight rates. Both the National and State legislatures will be appealed to for aid in the enterprise.

Mexico City

Nov. 10—The new mining law, with the revisions made at the recent meeting of the cabinet, has been presented to Congress by the Minister of Fomento. If contains 150 articles. The most important feature of the new law is the abolition of the special prospecting permits, which Minister Molina explained have not given satisfactory results. The law will probably be put into force on July 1, 1909.

In the revised law the article forbidding foreign companies to acquire mines in Mexico does not appear, and the provisions which conditioned the acquisition of mines by individual foreigners in frontier States has also been relaxed. These conditions are to apply only to an 80-kilometer zone along the frontier, but in this zone the disqualification of foreign companies is complete. The articles bearing on this feature are as follows:

"Art. 134. No title deed to mining property can be issued to foreigners denouncing claims in a zone 80 kilometers wide along the boundary line with foreign States, unless they previously obtain a special permission from the executive of the Union. The same formality is necessary when the denouncement is made conjointly by foreigners and citizens.

"If the permission be refused the ground denounced will be declared free."

"Art. 135. The permission to which the foregoing article refers will be necessary to enable foreigners to acquire by any other method mining properties or liens thereon within said 80-kilometer zone.

"Art. 137. Foreign companies are incapable of denouncing or acquiring by any means mining properties or liens thereon within the zone mentioned in Art. 134.

"Art. 138. All acquisitions in contravention of Articles 134 to 137 of this law are null and void. Suits for their nullification can be instituted either by a party in interest, or by the federal prosecuting attorney acting under instructions from the Department of Fomento.

"Art. 139. When by inheritance or judicial award in payment of a debt, a foreigner acquires property coming within the scope of Articles 134 and 135, he will be allowed a year to alienate such property, unless before the expiration of that time he shall have secured the permission referred to in the same articles.

"Art. 140. When a foreign company is the beneficiary of the inheritance or judicial adjudication, it must perforce alienate the property within the period of one year."

London

Oct. 31—The Russian Mining Corporation, Ltd., has presented its first report to its shareholders covering the period from Nov. 20, 1906, the date of the incorporation of the company, to June 30, 1908. This company, as its name implies, was formed to develop mining properties in Russia. The first subsidiary company floated was the Lena Goldfields, particulars of which were given in the JOURNAL of Aug. 1. The capital offered for public subscription does not appear to have been readily taken up, as the accounts of Lena Goldfields show a subscription of only 168,088 shares out of the 236,500 offered. The directors of the Russian Mining Corporation, however, expect great results from this flotation, reporting that "the profit to the corporation from this transaction promises to yield a substantial and lasting income, from which regular dividends may be expected." The corporation has also taken an interest in the Precious Metals Syndicate, Ltd., which was formed to acquire an option (since obtained) over certain platinum-bearing lands in Russia.

The investment of English capital in mining business in Russia has not met with much success so far; indeed the record, as regards Siberian mines at any rate, is unfavorable. The career of these new companies, backed as they are by the influential support of the Consolidated Goldfields of South Africa, will therefore be watched with interest. The information given in the reports is of a slender character; but probably fuller details will be given at the meetings of the two companies which are to be held on Nov. 4.

In a previous letter some information was sent as to the Victoria Falls Power Company whose report was recently issued. At the general meeting of shareholders held last week, the chairman referred to possible competition, and said that his company intended to fight any new power company, and would use every means in its power to prevent other people doing similar business to theirs on the Witwatersrand. This is a very foolish attitude to take up and one with which the mining public in the Transvaal will have little sympathy. The Victoria Falls Power Company would, no doubt, like to have a monopoly of the supply of electrical power on the Rand, but why it should be especially favored it is difficult to see. The company obtained a footing on the Rand by advertising a great scheme of long-distance transmission, which is now only talked about as likely to be installed in the remote future. Before it can be carried through, the consent of the Transvaal Government is required, a condition which one would imagine might have been foreseen before the flotation of the company. But the introduction of power from the falls is not solely delayed on this account. There are other reasons. "We are not ready," said one of the directors, "to bring in power from the falls, because we have not yet educated the Rand sufficiently to be assured of a continuous market for that power when brought in. But before we can do anything further some time must elapse, and your financial position and your views when we next come to you will very likely have experienced a change. For the present will you give us your support and let the future take care of itself?"

It is evident that the long-distance transmission is to be shelved for some time; and meanwhile the company will carry on business as an ordinary steam-driven electrical power company. It is preposterous that the company should demand a monopoly. The mines require cheap electrical power, and it is to their interest that there should be fair competition in its supply. The mines have had experience, and know what monopolies mean to them. They have not forgotten the dynamite monopoly, for example, and if they are wise they will do their best to encourage legitimate competition in the supply of electrical power for which there is a promising demand.

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

PINAL COUNTY

Ray Consolidated Copper Company—The stock of this company is now being traded in upon the New York curb at about $7 per share. The company has 800,000 shares of stock, par $10, of which 300,000 shares are in escrow for the conversion of $3,000,000 of 6-per cent. bonds, which are convertible into stock at par until July 1, 1914. There remains in the treasury $1,844,000 of bonds and 184,400 shares of stock. The treasury securities are under option to Hayden, Stone & Co. until July 1, 1909. The company is said to have approximately $275,000 in cash on hand. The mine is situated at Kelvin. The company is controlled by the same interests which developed the Utah Copper Company.

YAVAPAI COUNTY

Consolidated Arizona Smelting Company—The property of this company, sold in bankruptcy proceedings, realized $200,000, besides which mortgages amounting to about $250,000 were assumed. It is surmised that the purchase was for the benefit of the Nevada-Utah Copper Company.

California

AMADOR COUNTY

Gold Top—This hydraulic property, Pine Grove, was closed down last season by the Débris Commission, but necessary changes have been made, and the commission will permit it to work this year.

Mountain Queen—The mill of this mine at Pine Grove has been put in order to crush ore, after a few months idleness.

BUTTE COUNTY

Lava Beds No. 2—This gold dredge at Oroville, which was recently sunk, is being repaired.

EL DORADO COUNTY

Vandalia—This mine, near Shingle, now controlled by Louis Rosenfeld, is to be started up again after having been idle for some years.

HUMBOLDT COUNTY

Horse Mountain District—Considerable development work is being done on the copper properties in this district, and preparations are being made to ship some ore to the Tacoma Smelting Company. Some shipments have already been made.

INYO COUNTY

Bishop Creek Gold Mining Company—Some ore of good grade has been found in the deepest shaft of this property at Bishop Creek. Shaft sinking will continue all winter.

MARIPOSA COUNTY

Mariposa Commercial and Mining Company—This company has let six leases on the Pine Tree vein, one on the Josephine, one on the Greens Gulch, two on the Princeton, one at Stockton Creek, and seven on the Mariposa vein. Seven companies are leasing ground on the Mariposa or Fremont grant, owned by the company of which F. T. Maguire is manager.

MODOC COUNTY

Bidwell Consolidated Mines Company—Quantities of ore are being piled in the dumps, and mining work will be continued steadily until the milling facilities are provided early in the coming year.

NEVADA COUNTY

Ethel—At this mine, near Washington, the large ledge recently intersected continues to hold out. New levels are about to be run.

Greystone—At this mine, above Washington, George Hegarty, superintendent, a new hoist will shortly be installed, and as soon as the machinery is ready the water will be pumped out.

PLUMAS COUNTY

Gardner—A company has been organized to open up this mine near Poker Flat.

SAN DIEGO COUNTY

Escondido Mine Development Company—This company, at Escondido, which is working the Asmus mine, E. J. Garvin, manager, has low-grade ore at present, but the value is improving. It is the intention shortly to erect a quartz mill.

Colorado

LAKE COUNTY—LEADVILLE

B. P. Mining Company—This company has secured the Buffalo, Comstock, President and other claims on Rock hill and is now floating the stock in the East. The company is organized at Toledo, Ohio.

Coon Valley—From this mine, Rock hill, shipments of a good grade of lead ore are being sent out with due regularity, and development work is being pushed in virgin territory.

Coronado—In this mine, down-town section, lessees working at the 460-ft. level and 500 ft. from the shaft, recently opened a body of high-grade iron, and as work has proceeded it has turned into a bonanza shoot of ore from which 75 tons daily will be shipped. The ore found is fully 100 ft. above the water level, so there will be no chance of being flooded out. It is one of the largest bodies of iron ore opened in the down-town section since the Midas ore shoot was first discovered. The lessees are George Bennett and David Harris.

Gallagher Shaft—The work of cleaning out this shaft, Graham park, has been completed and exploration work is now being carried on from the bottom to the east and west.

Helena—Considerable difficulty has been experienced at this mine, Iowa gulch, by the heavy flow of water and the breaking of pumps. The machinery is now in good shape and sinking is progressing favorably. The shaft has already passed through mineralized formation, and before the contract of sinking 200 ft. is completed the orebody may be opened.

Iron Silver—With the advanced price of spelter and lead it is expected that this company will shortly resume work with a large force on the Tucson and Moyer.

Little Evelyn—With the resumption of work on this mine, South Evans gulch, the benefit of driving the Yak tunnel into the section has been felt, as the shaft is making but little water in comparison to what it did a year ago. Drifting to the east from the bottom of the shaft has been started to catch the ore-shoots that run alongside of the Bald Mountain fault.

Star of the West—In addition to the regular ore shipments from this mine, Iron hill, a drift is being run toward California gulch to catch a known orebody that trends in that direction.

LAS ANIMAS COUNTY

Rocky Mountain Fuel Company—This company has started up its coal mine at Piedmont, two miles from Trinidad.

LARIMER COUNTY

Northern Colorado Mining and Milling Company—This company has been organized to take over the placer and quartz claims, formerly owned by the Elk Mining Company in the Independence district in North Park, near the town of Pearl. The headquarters of the new company are at Fort Collins, Colo.; its officers are: President, S. H. Clammer; vice-presidents, C. A. Morell and Dr.

George L. Hoel; secretary, Dr. J. C. Van Slyke; treasurer, L. C. Woodford.

TELLER COUNTY—CRIPPLE CREEK

Henry Adney—Shipments from this mine continue steadily. High values are reported from an east-and-west vein recently encountered while drifting on the main vein north of the shaft. The new vein was found in the contact between the granite and phonolite, and is about 3 ft. wide.

Hoosier—This mine, on Tenderfoot hill, owned by the Grafton Gold Mining Company, has been secured under lease by a syndicate headed by A. J. Halter, of New York. J. S. Edwards is manager for the syndicate. The shaft will be sunk an additional 100 ft. from the present depth of 570 feet.

Modoc—Shipments of good smelting ore are reported from this mine.

Old Gold—Shipments are being made from an orebody lately opened on the 250-ft. level, by Joseph Brentlinger & Co., who have a lease on the main shaft.

Idaho

SHOSHONE COUNTY

Snowstorm—A dividend of $45,000 has been declared for the month of November, payable Nov. 20. This is the second dividend paid this year, the last being for the month of October and for a similar amount. With the declaration of the November dividend, which is at the rate of 3c. a share, the company has issued a statement to the stockholders to the effect that dividends at this rate will probably continue in the future.

Bunker Hill & Sullivan—This company has paid its regular dividend of $75,000 for the month of November making a total distributed by the company of $10,590,000, of which $780,000 has been paid this year.

Butte & Coeur d'Alene—Arrangements have been completed by which regular shipments of ore will commence to the Panhandle smelter at Sandpoint some time during the present month. Recently 3 ft. of gray copper ore, carrying all the way from 1000 to 2000 oz. of silver to the ton, was opened up.

Alice—A strike of 1 ft. of steel galena and 9 ft. of concentrating galena ore has been made on the 430-ft. level. The ore was encountered in the hanging-wall side and the footwall has not yet been encountered. Assays of the shipping ore run as high as 75 per cent. lead and about 70 oz. of silver per ton.

Idora—Leasers have begun shipping ore. The first shipment consisted of 40 tons of galena. The lease is on the basis of 87½ per cent. to the lessees and 12½ per cent. to the company.

Missoula Copper—An assessment of three mills a share has been levied. At the annual stockholders' meeting held in Mullan the treasurer's report showed that about $32,000 has been expended on the property during the year and that about $1000 was on hand. It was decided to explore the claims by means of diamond drilling.

Indiana

GIBSON COUNTY

According to report from Hazleton a vein of coal 6 ft. thick has been discovered by oil drillers, who are putting down test wells on the Wm. Johnson farm. The coal was struck at a depth of 150 ft. A company will be organized to sink a shaft and develop the find.

PIKE COUNTY

Ayreshire—Fire destroyed the fan-house of this mine near Oakland City, causing the mine to shut down for a week.

Winslow—John Mackler and Samuel Wulfman, have purchased this coal mine which has been idle for several years. They will install pumps and other equipment and resume operation on a large scale. A new shaft will be sunk at once. The headquarters will be in Petersburg.

SULLIVAN COUNTY

Vandalia—The north half of mine No. 9 will be closed and the indications are that the closing will result in a dispute between the Vandalia company and the miners' officials. The company contends that the coal on the north half is not so good as the other and that it is mined at a higher price. The miners contended a few weeks ago that it should be classed as "wet." At that time, the miners' officials say, the superintendent stated that he would close that part of the mine before he would pay the increased price for work. The dispute was not settled. The mine employs over 300 men.

Kansas

CRAWFORD COUNTY

Lone Oak—This tract of coal land, near Pittsburg, covering 656 acres, has been bought by William Lanyon, of Iola, Kan., and R. H. Lanyon, of St. Louis. It is stated that the purchasers will at once begin to open a mine on the tract.

Massachusetts

BERKSHIRE COUNTY

The old limestone quarry at West Stockbridge is to be reopened, and preparations are being made to clear out the accumulated débris. It is said that the quarry has been leased by the Atlas Cement Company, of Pennsylvania.

Michigan

COPPER

Elm River—The vertical exploratory shaft at this property is down about 175 ft., and has passed through an amygdaloid formation carrying small particles of copper, but the formation is badly shattered and broken. This shaft will be sunk further and a crosscut will be driven to intercept the approximated lines of the Adventure and Lake strikes.

King Phillip—The new electrically operated hoisting plant at this property has gone into commission and is working satisfactorily.

Ojibway—The new hoisting engine for No. 1 shaft of this company has gone into commission. This plant is a duplicate of the one at No. 2 shaft and is capable of hoisting from a depth of 1500 ft. The old hoist was operated by compressed air and its going out of commission will afford more power for drilling purposes. The crosscuts from the 500-ft. level of each shaft continue, and No. 2 will probably reach the lode in a few days.

Cliff—This property, under the management of the Tamarack Mining Company, is being explored in a thorough and systematic manner. The old Avery shaft is being unwatered and the surface equipment is being put in working order. The shaft will command the northern portions of the tract. No. 1 shaft, the present working shaft, is being opened on a fissure vein and is yielding a small quantity of good stamp rock.

Missouri

ZINC-LEAD DISTRICT

Cox Land—Clever & Co., of Joplin, have opened up a good prospect on the Root lease on this land near Turkey creek.

Gecke & Son—These operators have opened up a good strike of jack at 50 ft. depth, on the Roach land west of Joplin.

Montana—This company is building a second mill on its tract west of Joplin, and just north of the Bullfrog mine.

Opolis—Doctor Tyler and associates of Joplin, have drilled a tract at Opolis, Mo., two miles south of Pittsburg, Kan., and found 5 ft. of lead and jack at 202 ft. depth. This is the farthest north of any drill strike yet made.

Whitworth Land—This land, owned by A. M. Whitworth and brother, of Webb City, has been thoroughly prospected, and 11 drill holes have been put down on the 37 acres without a blank. Sheet ore 14 ft. thick was found at 150 ft. depth.

Marvel—This company has started its mill on the Cosgrove land at Duenweg. This mine has sheet ground claimed to be better than 10 per cent. dirt.

Royal Lead and Zinc Company—This company, at Joplin, has been incorporated with $200,000 stock. J. A. Hanway, Alphonso Munger and J. C. Aiken, of New York, and F. W. Kelsey, Arnold Cofer and O. E. Marshall, of Joplin, are the stockholders.

Montana

BUTTE DISTRICT

Red Metal Company—A deed from John Gillie and wife to the company, conveying a quarter interest in the Nora quartz lode claim has been filed.

Butte-Montana—Within the last month 75,000 shares have changed hands on the local stock exchange. Duluth capitalists have recently secured a large block of the stock and have options on other large amounts. R. A. Kerr, a mining engineer of Duluth, is expected in Butte shortly to take charge of the property in the interest of the Duluth stockholders.

Original Consolidated Mining Company—Wheelock & Abbott have conveyed to the company a portion of the Stewart quartz lode claim.

JEFFERSON COUNTY

Boston & Corbin—It is stated that the company will increase its capital stock from 80,000 shares to 90,000 shares. By this means the company expects to obtain money enough to erect a concentrator.

Alta—It is reported that the Kelly Smelting and Refining Company, which controls this property, will begin sinking the shaft next month. It is planned to sink 500 ft. The Alta is situated at Corbin and up to 1893 was ranked as one of the largest silver and gold producers in Montana.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Mushett Lease—This lease, on the Laguna property of the Consolidated, has been sold to R. L. Colburn and Eugene Amann by L. L. Mushett and Webb Parkinson, the former owners. There is milling ore of good grade at a depth of 480 ft. It is the intention of the new owners to increase the working force and immediately to resume sinking the shaft.

Florence—Work has begun in the main shaft of the Florence. The two-compartment shaft, 300 ft. deep, will be enlarged to three compartments and when this is completed the shaft will be sunk to a depth of 600 ft. At that depth connection will be made with the workings of the bonanza leases on the Florence ground.

Laguna—The Hazel Goldfield lease on the Third Chance claim of the Laguna has struck ore in its shaft at a depth of 718 ft. The hanging wall only has been cut and the ore assays from $4 to $31. Sinking will be continued until the vein is crossed; then a station will be cut in the footwall, and the development of the orebody will begin. This is the deepest shaft in the camp.

Florence Annex No. 2—The Annex lease has cut the Baby Florence oreshoot on the 150-ft. level. The crosscut will be extended to connect with the old drift in the Wallace workings for the purpose of ventilation; when this is completed, stoping will begin.

Gold Pick Group—M. J. Sullivan, of the Wood-Sullivan Company, has purchased the Gold Pick group of four claims on the east slope of Red mountain about eight miles northeast of Goldfield. Only the location and assessment work has been done. A thorough prospecting of the property has begun.

February Premier Mining and Leasing Company—This company has taken over a lease on the February claim owned by the Consolidated mines, on a block of ground, 400x600 ft. According to the terms of the lease a two-compartment shaft must be sunk to a depth of 300 feet.

Lone Star—The new shaft of the Goldfield Star lease on the Lone Star property is 150 ft. deep. A station is being cut at that depth, and drifts will be run to the orebody discovered in the old incline. On the 200-ft. level crosscuts will be driven to cut this orebody. The shaft is to be sunk deeper.

Baby Florence—At this lease on the Florence a new air compressor is being installed.

Gold Bar—The Goldfield chlorination mill has contracted for 500 tons of ore from the Gold Bar mine of which L. K. Koontz is manager.

Grizzly Bear—The Wilson lease on the Grizzly Bear has been assigned to the Grizzly Bear Mining Company composed of local operators who will resume work immediately.

Combination No. 3—The forfeited lease in the Combination No. 3, known as the Black Eagle and formerly as the Nevada Pearl, has been secured by George Vickers and has been transferred by him to the Denver Leasing and Mining Company which will re-equip the lease and resume prospecting.

Mushett Lease—In recognition of the efforts and expenditures already made the Consolidated has extended the Mushett lease to April 1, 1909.

ESMERALDA COUNTY—HORNSILVER

Great Western—Two more freight teams have been put on to haul Great Western ore to the railroad where it is shipped to the mills at Millers siding. Shipments now amount to about 10 tons per day. The mine manager is authority for the statement that mining costs $2 per ton; wagon haul, $4; freight and milling charges, $12.80; total cost, $18.80 per ton. The shipping ore averages $70 per ton.

Bonnie Claire—The annual assessment work on this property in the Gold Mountain range is being done. The property is well developed. There is an up-to-date mill for treating the ore at Bonnie Claire station on the Tonopah Tidewater and the Las Vegas & Tonopah railroads, but the mill has been shut down since the depression of a year ago.

ESMERALDA COUNTY—CUPRITE

Cuprite Sulphur Group—It has been found that the quartz mixed with the sulphur being shipped carries considerable gold. A recent shipment of sulphur is said to have assayed $120 in gold per ton.

NYE COUNTY—BULLFROG

Mayflower—The Mayflower has perfected plans for a 5-stamp mill. An oreshoot 11 ft. wide averaging $50 per ton has been developed sufficiently to require a mill of that capacity.

NYE COUNTY—TONOPAH

Production for the week ending Oct. 31 amounted to 5108 tons, valued at $129,275. The Tonopah Mining Company mined 3150 tons; Belmont, 600; Montana-Tonopah, 606; Tonopah-Midway, 100; MacNamara, 300; West End, 57; Jim Butler, 250; Tonopah Extension, 45 tons.

MacNamara—Production this week was handicapped by the lack of air for power, which is obtained from the Tonopah Extension compressor. This failure of air was due to a break in the water company's mains.

Tonopah Mining Company—During the week 451 ft. of new ground was opened up, 282 ft. being in the Mizpah and Red Plume claims and 169 ft. in the Silver Top. This is the largest amount of development work done in one week by this company. The station on the 1200-ft. level has been finished; crosscutting to the south on the level will be continued until the wiring and the piping for the hoist are completed; then sinking from the 1500-ft. level will be resumed. Owing to the difficulties experienced with the drill hole in the Red Plume shaft the contractors have given up the job, and for the time being the undertaking has been given up. The diamond-drill hole from the 740-ft level of the Silver Top shaft is 45 ft. deep.

Belmont—Owing to the importance of the new territory now being developed the company is preparing to open up the old Belmont shaft, about 1500 ft. east of the present working shaft.

NYE COUNTY—CLIFFORD

Broken Hills—The last carload shipment from the Broken Hills averaged $209 per ton. The ore carried 7.63 oz. gold and 112.7 oz. silver per ton. This ore was taken from the dumps left by the former owners.

NYE COUNTY—ROUND MOUNTAIN

Jefferson Mine—The old Jefferson, or as it is sometimes called the Charles Konrahat mine, has been sold to W. H. McBeth, Charles Brenneman and J. Flick, of New York, for $350,000. A 200-ton mill is to be erected immediately. This is one of the old mines at Round Mountain, having been crudely worked for years, only the high-grade ore being shipped. Considerable milling ore has been devel-

oped. The ore is free milling and carries mainly gold but also some silver.

New Mexico

GRANT COUNTY

Sylvanite—At this new camp 18 miles southwest of Hachita, there are at present 500 men. Ore was first found on the Broken Jug claim, belonging to Solomon Camp, a few weeks ago. A townsite is being laid out, and everything is booming, for the town already has a newspaper. The deepest shaft in the telluride belt is 60 ft. in depth. Ore is being sacked and shipped to the smelters at Douglas, Arizona. An automobile stage line is operating from La Playa to Sylvanite.

Silver City—A party of mining men, among whom was Sherwood Aldrich, Charles M. McNeil, D. C. Jacklin, Robert E. Grant, A. Chester Beatty, H. M. Blackmer, Eugene Shove, Spencer Penrose and Charles Hayden, has been inspecting mines near Silver City, Fierro and Santa Rita.

New York

ST. LAWRENCE COUNTY

Benson Mines Company—This company, which acquired the old Benson iron mines two years ago, and has since operated them, has been reorganized, several of the leading stockholders having sold their interests to others. The new officers of the company are: President, August Heckscher, New York; vice-president, T. I. Crane, Philadelphia; treasurer, W. A. Pilling, Philadelphia; secretary, F. A. Berthold, 43 Exchange place, New York. Pilling & Crane, Philadelphia, are selling agents. The mines are to be worked on a larger scale than heretofore. It has been decided to build a nodulizing plant at the mines, with several rotary kilns having a capacity of 150 tons each per day. The coarser ore will be shipped as mined, and the finer concentrates will be converted into nodules. The present capacity of the concentrating plant is 500 to 700 tons a day, though it has not been operated thus far at this rate. In mining two heavy steam shovels are employed. The average metallic iron content of the magnetic ores at Benson is 33 per cent. Concentrates from this ore finer than 50 mesh, have analyzed 64.18 per cent. iron, 1.58 manganese, 0.461 sulphur and 0.037 phosphorus. The phosphorus varies from 0.025 to 0.05 per cent. The nodulizing process brings the sulphur below the percentage noted.

North Carolina

CABARRUS COUNTY

Meadow Creek—A. M. Cox & Co. will add new equipment to this mine and enlarge the workings. Recently a nugget weighing over 10 oz. was found.

DAVIDSON COUNTY

Jones Mine—This gold mine at Thomasville, owned by Capt. N. L. Jones, is making regular shipments of gold to the United States assay office at Charlotte.

FRANKLIN COUNTY

Portis—This mine at Ransom's Bridge has been bought by A. J. Overton, of Salisbury, from Mrs. Lelia A. Sturges for $150,000, the transfer covering 933 acres of land. It is said that the mine will be operated on a large scale. The Portis is an old mine, having been first opened 80 years ago.

MONTGOMERY COUNTY

A gold discovery has been reported near Anvil. The claim has been bonded to C. A. Armstrong.

Ohio

Johnson Coal Mining Company—Negotiations are nearly complete for the absorption by this company of the Lorain Coal and Dock Company, of Cleveland. The Johnson company has its headquarters at Columbus, and owns about 12,000 acres of land in the Hocking Valley district, on which there are mines having an output of 400,000 tons yearly. The Lorain company owns dock property at Cleveland and coal lands in Belmont and other counties, on which there are several large mines. The consolidated company will have $3,000,000 capital stock.

Oklahoma

In the Oklahoma oilfield in October 246 new wells were completed; 230 producing oil and 1 gas, while 15 were dry holes. There were 232 new wells drilling on Oct. 31. The production of petroleum in October was 3,727,995 bbl., or 108,731 bbl. more than in September. Of the October output 3,258,332 bbl. were shipped and 469,663 bbl. added to stocks in tanks. The total estimated stocks on Oct. 31 were 51,336,027 bbl. crude oil.

OTTAWA COUNTY

Consolidated—This company is building a mill at Miami.

Dan Isley—This mill at Miami is nearly ready to start.

Emma Gordon—Staniford Brothers, of Miami, have leased this tract of 20 acres from Amos Halten, the owner.

Maxim—The building of a mill has been started at this mine, near Miami.

Waubillan—This company has installed the first set of hand jigs used in the Miami district.

Pennsylvania

ANTHRACITE COAL

Mount Jessup Coal Company—The machine shop and other surface buildings of this company at Jessup were burned down Nov. 14. By great efforts the breaker was saved, and the fire kept from extending into the mine.

BITUMINOUS COAL

Martin Coke Works—It is stated officially that control of the Martin Coke Works and Connellsville coal lands, heretofore owned and operated by the Bessemer Coke Company, of Pittsburg, has been acquired by the Republic Iron and Steel Company. The property consists of 196 coke ovens and 420 acres of Connellsville coking coal, together with the complete mine equipment, railroad tracks, houses and stores. The Martin coal lands immediately adjoin an undeveloped tract of 500 acres of Connellsville coking coal land known as the Woodside property, which the Republic company owns, but which has remained undeveloped owing to the cost of constructing a railroad which would be involved in opening it up. Through the control of the Martin coke works, the Republic company will now be able to develop the Woodside property, either by means of underground haulage through the Martin mine or by a surface-railroad switch over and through the Martin lands.

South Carolina

CHEROKEE COUNTY

Flint Hill Tin Mine—New machinery is being installed at this mine, near Gaffney.

Pacolet Mining Company—Machinery is being delivered at this gold mine, 12 miles from Gaffney. F. M. Farr, of Union, S. C., is president, and J. S. Lipscomb, is manager.

South Dakota

CUSTER COUNTY

Grantz—Stock enough to form a working capital has been sold by Otto P. Th. Grantz, of Deadwood, and the ground near Custer, including the Roosevelt and St. Elmo groups, is to be operated.

Ideal—Superintendent Conover, of Custer, has resumed work on the new 200-ton cyanide mill near Custer and hopes to have it treating ore soon. The old Bessie ground is to be reopened at once and used to supply the mill in connection with the other properties. The Van Camps of Indiana control the Ideal company.

Saginaw—Superintendent I. W. Herber, of Custer, reports the finding of high-grade material. A 7-ft. ledge is being opened up, the ore being amenable to treatment by the cyanide process used in the remodeled mill near Custer.

LAWRENCE COUNTY

Golden Crest—Workmen are busy on the new stamp and cyanide mill, which will be put into commission in the

spring. It will have a capacity of 400 tons daily and treat the same amount of slimes by the Moore process. Robert L. Bailie, of Detroit, the president, has active supervision of the property in the Two Bit district.

Golden Reward—Work has been commenced again on the Ruby Bell group at Terry and the force of miners is being increased each month. Henry Schnitzel, of Deadwood, has the management of the mines and mills.

Mogul—Superintendent William Mc Laughlin, of Deadwood, announces the completion of a new hoist at Terry in place of the one burned some months ago.

Queen Esther—Shaft work will shortly be resumed. The shaft is down 60 ft. and will be sunk to quartzite, about 350 ft., as soon as the sawmill is completed. Stewart Conners, of Tinton, part owner, is in charge of the property.

Tennessee

POLK COUNTY

Ducktown—This company is making good progress with the sulphuric-acid plant that it is installing along the lines of that of the Tennessee Copper Company.

Utah

SALT LAKE COUNTY

Utah Consolidated—Instead of building a new smeltery of its own, this company has made a contract with other interests which intend to build the works for general custom smelting business. The new syndicate has taken over the land options now held by the Utah Consolidated.

Boston Consolidated—The production of the porphyry mine in October was 696,850 lb. of copper, the extraction being 71 per cent. The amount of ore milled was 33,767 tons.

Utah Copper Company—The net profits in the quarter ended Sept. 30 were $501,392 against $493,694 in the preceding quarter. The twelfth section of the mill will be started in November. Copper production for the last quarter was 12,000,925 lb., an average cost of 8.73c. The underground ore sent to the mill amounted to 32 per cent., and the steam shovel ore to 68 per cent. of the total. Transportation difficulties prevented the mills from obtaining their maximum tonnage. The company will probably build its own line of railway from the mine to Garfield.

West Virginia

BARBOUR COUNTY

Luella Coal and Coke Company—This company recently organized by John T. Robinson, Herbert M. Crawford, Wiley L. Byers and others of Uniontown, Penn., has completed the opening up of a new coal plant near Philippi, on the Upper Freeport vein and is now shipping coal. The opening shows about 6 ft. of smokeless coal. The company owns about 1700 acres of coal land on the Tygart's Valley river, adjoining the properties of the Midland and the Overholt companies.

Midland Coal Company—This company, near Philippi, has all its coke ovens now fired. It is making foundry coke, and shipping it as fast as made.

Overholt Coal Company—The stockholders have voted to authorize the erection of a new plant at its mines near Cecil; also the building of a bridge across Tygart's Valley river, to connect the mines with the railroad.

Wisconsin

ZINC-LEAD DISTRICT

Benton—The Frontier has resumed working on a double shift. The Fox has subleased its No. 2 mine for a year to Bennett Brothers, at 20 per cent. royalty. At a recent election, B. F. Treuary was chosen president. The Benton Mining and Developing Company is vigorously operating the Pittsburg-Benton mine, which has a solid sheet of jack that is 2 to 4 ft. thick; the company has just declared another dividend. The Wilkinson is maintaining its largest output of lead and has declared another dividend. The Calvert is still under option to Smith & Newman, who are operating three prospecting drills on the property.

Cuba City—The Dall is putting in an 18x42-in. Corliss engine and building a tramway to the new shaft; the company has declared another dividend of 5 per cent., as against 10 per cent. last month. The Roosevelt will probably start up shortly, as the suit over the Trego roasting furnace has been decided in its favor. The Vandeventer expects to erect a 20-ton roaster magnetic plant, as its ore is too low grade to stand the long five-mile wagon haul to the railroad.

Galena—The Hoosier company, which has leased the Graham farm, has erected a sinking pump that is expected to be able to control the heavy water that is known to occur in this ground. The Black Jack mine, one of the largest producers in the district, is preparing to start up again.

Hazel Green—Work is being pushed on the 50-ton roaster magnetic plant for the United States Zinc Company, which is expected to start in December. The Cleveland Mining Company has begun sinking a 6x12-ft. shaft on the orebody under the Chicago & Northwestern railroad. The Scrabble Creek Mining Company has nearly completed the shaft to a depth of 150 ft.; water has been very heavy, amounting to 1500 gal. per minute.

Linden—The Ross mine, which has over 1500 tons of ore in its bins, has sold some of its ore to the Platteville electrostatic separator. The Dark Horse mine has declared another dividend.

Platteville—The Klaw-Piquette and the Kohinoor-Blende mines are again starting up, after a year's shutdown during the hard times, and the latter will shortly erect a mill. The Grant County mine is deepening its shaft to reach a lower run of zinc ore. The Cruson mine has become a regular shipper of ore since the recent completion of its mill, but it will have to add a larger pump, as the water is getting stronger.

Shullsburg—The Eva mine is preparing to start up after a year's shutdown, and will install a new power plant.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Nov. 7 were as follows: Buffalo, 104,000 lb.; Coniagas, 64,430; Crown Reserve, 120,000; City of Cobalt, 67,000; Foster, 140,000; La Rose, 197,000; McKinley-Darragh, 285,000; Nova Scotia, 40,000; Silver Cliff, 46,100; Townsite, 40,600; Temiskaming, 63,360; Temiskaming & Hudson Bay, 60,000; Trethewey, 60,000; total, 1,287,490 pounds.

Foster-Cobalt—At the annual meeting of the company, held in Toronto, Nov. 4, the balance sheet showed $41,527 cash in hand and due from smelters. The president's report stated that the year's development was extensive, but no high-grade ore had been found. The main shaft was carried to a depth of 225 ft., but it had been determined not to sink further at the present time. It was recommended that drifting under Glen Lake be continued from the 225-ft. level and crosscutting from vein No. 8 in the direction of veins Nos. 2 and 6 was also approved, one additional cobalt vein having been discovered. Prospects for high-grade ore were entirely uncertain, depending on the results of the proposed development. Large quantities of low-grade ore on the dumps will be sent to the concentrator during the winter.

Green-Meehan—A financial statement for the year ending Oct. 31, 1908, has been issued, which shows that the company is free from indebtedness and has on hand $27,926. Development work was carried on to the end of 1907, when it was suspended for the time being, the principal reason assigned being that the ore on the 100-ft. level of No. 1 vein had depreciated in value. Operations have now been resumed. Since the last statement 35,000 shares of treasury stock have been sold at par. There are upward of 2500 tons of concentrating ore on the dump and negotiations are under way for shipping it to concentrators during the winter.

Little Nipissing—On the Peterson Lake leasehold, operated by this company, a strong 12-in. vein of rich ore was encountered in drifting at the 100-ft. level.

La Rose—Two good strikes on this property were made recently. The Mc-

Donald vein, heading toward the Chambers-Ferland, was found to be rich in argentite and another calcite vein of equal richness was discovered running parallel to it. Each vein is about 5 in. wide, and the silver content of the ore is stated to be about 10,000 oz. to the ton. The preliminary report of production and earnings for the month of October states that 493 tons of ore were produced containing 195,438 oz. silver valued at $87,416. The cost was estimated at $23,207 leaving a profit for the month of $64,209. For the five months ending October 31, 1908, there were produced 1,230,180 oz. silver giving a net profit of $484,853.

Silver Cross—Active development is being done on this property, embracing 40 acres in the Kerr lake section of the camp, where several promising veins have been found. No. 1 shaft was temporarily abandoned at the depth of 45 ft. on account of flooding, and heavy pumps will be installed and sinking continued; the vein is 22 in. wide and contains silver. Another shaft is down 100 ft.

Temiskaming—This company has secured the Gans claim, a 20-acre tract south of its own location and west of the Cochrane. It is supposed that some of the rich veins of the Temiskaming run into the Gans property.

Victoria—Two parallel veins 3 or 4 ft. apart have been found in addition to a series of calcite veins in their immediate neighborhood. Assays show from 1000 to 2000 oz. silver to the ton. They will be worked from No. 4 shaft. The mine is in charge of Capt. John Harris. A plant comprising two 50-h.p. boilers and a six-drill compressor is in operation.

Deseronto Iron Company—The smelting works at Deseronto, owned by this company, which were struck by lightning and burned down last September, are being reconstructed, and the company expects to have them in operation next spring.

Northern Ontario Smelting and Refining Company—The smeltery at Sturgeon Falls is now in operation treating copper ore from mines in the neighborhood.

Ontario—Larder Lake

Larder Lake Proprietary Goldfields—A winding-up order against this company has been issued by the court in Toronto appointing Osler Wade as interim liquidator on petition of Henry T. Brooks, manager of the company, and Charles P. Brown. The company is capitalized at $3,000,000, and holds 37 claims, operations on which were stopped in October, 1907, for want of funds. The liabilities of the company were then stated at $19,559, with no available assets. The petitioners state that out of $160,000 received from the sale of stock and bonds not more than $50,000 was expended in development work, and charge John F. Marskey and N. V. Ulrey, directors, with having received $100,000, which has not been satisfactorily accounted for.

Nova Scotia

Nova Scotia Steel and Coal Company—This company made a new record in October, both in steel and coal production. The pig-iron output for the month was 5800 tons, and that of steel 7750 tons. The coal product for October was 70,160 tons against 57,480 tons for October, 1907; the total for the year to end of October was 574,670 tons, compared with 528,720 tons last year.

Dominion Coal Company—The output for October was 264,959 tons, compared with 339,573 tons for October, 1907. The production for the first 10 months of the year was 3,130,578 tons, compared with 2,927,484 tons for the corresponding period of 1907.

Mexico

Chihuahua

Rio Plata—A recent 29-ton shipment of concentrates from this company's Santa Barbara property netted 40,000 pesos. The 20-stamp concentration plant is handling 60 tons daily. Although there has been no rain in that portion of the Sierra Madres since early September water power is still ample, but the steam plant is being made ready for emergency use. The general manager, D. W. Shanks, is temporarily in New York and other eastern cities, but will be at the mine again in early December.

Parral Output—The production of the Parral camp for the week ending November 6 amounted to 7830 tons, of which 5040 tons were locally treated and the balance sent to outside smelteries.

Cuadras—A force of men, under the directon of C. M. Dobson, has been put to work at this Parral mine belonging to the Marina Mines of Mexico Company. It is also stated that the same London men are making a thorough examination of Los Remedios mines in the Veta Colorada section with a view to their purchase.

Tres Hermanos—A milling plant has been ordered for this gold property in the Batopilas section. The property is owned and operated by Ignacio Ramirez.

Cieneguita—These gold mines, situated in the extreme western part of the State are reported bonded to New York men for the sum of $150,000. They are a portion of the estate of the late Buenaventura Becerra of Urique.

Candelaria—This company is carrying on a large amount of work in the old San Pedro district along the line of the Sierra Madre railway, about 125 miles south of El Paso. The mines in progress of reopening are the Candelaria, San Pedro and Congress. Hoisting and pumping machinery is being installed. It is also stated that operations will be resumed at the San Nicolas, Leon, Santo Benigno and Porvenir. Smith & Laird, of Bisbee, are in charge.

Guanajuato

Guanajuato Development Company—E. A. Strout, until recently manager of one of the large mines on the Witwatersrand, Transvaal, has been appointed superintendent succeeding John Butter, resigned. Hugh Rose is general manager and will now give more time to special matters for the company.

Zacatecas

Outside of a few development propositions near the Veta Grande, there is little activity in Zacatecas, and to get new life into the camp a movement is on foot to form a board to stimulate the local mining industry. What Zacatecas needs is large capital. There is absolutely no doubt that such mines as the Veta Grande, San Rafaël, Quebradilla, San Barnaté and many others could be brought into the list of producers.

El Bote—Development below the 900-ft. level has proved very rich ore, and since the installation of a Cameron sinker, sinking has progressed steadily, enabling the company to open up its enormous orebody further. Development work under the El Refugio hill has been successful and large quantities of milling ore have been found running from 600 to 800 grams silver and from 8 to 12 grams gold. This ore is particularly adapted for the cyanide process. The Pattinson circulation cyanide tanks have been tested and seem to work as well as the Pachuca tank, and as soon as the old mill has been cleaned up, the Bote will commence cyaniding. The controlling interest in this company owned by Dudley H. Norris, has been bought out by C. O. Gilbert, who was elected president; Mrs. E. Mac Donald, vice-president; C. A. Heberlein, secretary and treasurer; F. M. Gilbert, commisario. The smelter will be blown in about Jan. 1, as by that time the siding of the Mexico Central will have been completed. The furnace is 48x150 in., and is rated at about 300 tons of charge per 24 hours. The Magistral ore is practically all coarse and is considered an easy smelting ore. The mine-run will average about 5 per cent. copper, 220 grams silver, and 1 gram gold.

Eden Mining Company—This company has started construction on a 70-ton concentrator to handle low-grade iron sulphides too low for shipping.

San Roberto—This mine, owned by the Cape Town Copper Company, is doing development work and still shipping sufficient ore to pay more than total expenses. The company is figuring also on installing a concentrator to make all second-grade ores marketable. The ore is practically a sulphide of iron carrying 1 gram gold to each 100 grams silver.

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, Nov. 18—Coal trade in the West continues to show steady, though slow, improvement. Railroad cars are finding better employment and shipments are increasing. As usual, there is a tendency on the part of many operators to over-estimate the improvement, and to rush coal to the markets in excess of requirements, with an unfavorable effect on prices.

Although Lake navigation is still open, shipments of coal to the Northwest are practically at an end, as the docks at the upper Lake ports are too crowded to receive more coal.

The Seaboard bituminous trade shows a marked improvement, especially in New England territory. Coastwise trade is good. The anthracite trade has been helped a little by a week of cold weather, but is not specially active.

The commission which has been taking testimony in the case against the alleged anthracite coal combinations, is in Scranton, Penn., this week, hearing evidence from a number of independent operators.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Nov. 7, in short tons:

	1907.	1908.	Changes.
Anthracite	4,834,797	4,371,983	D. 462,814
Bituminous	33,749,305	28,531,387	D. 5,217,918
Coke	12,016,697	5,959,811	D. 6,056,886
Total	50,600,799	38,863,181	D. 11,737,618

Total decrease this year to date was 23.2 per cent.

Chesapeake & Ohio shipments, three months of fiscal year July 1 to Sept. 30, short tons:

	Coal.	Coke.	Total.
New River	1,693,055	49,504	1,742,559
Kanawha	1,261,077	6,956	1,268,033
Kentucky	79,546	.....	79,546
Connecting lines	54,799	15,372	70,171
Total	3,088,477	71,832	3,160,309
Total, 1907	2,956,814	118,247	3,075,061

Deliveries this year to points west of mines, 1,606,995 tons coal and 41,899 coke; points east, 370,693 tons coal and 29,933 coke; tidewater, 1,107,888 tons coal; anthracite to line points, 2901 tons.

New York

Anthracite

Prepared sizes are in good demand but steam sizes seem to be plentiful. At Lake ports there is an accumulation of coal and the expected demand previous to the close of navigation has not set in.

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

New York harbor seems to be the only point which has not felt the increased demand that is prevalent throughout all other consuming territories. On the whole, business is good and the demand keeps up. In the far East the shoalwater ports are cleaning up their contracts, and to New England points considerable coal is going forward. It is reported that the mines are gradually approaching their full schedule. In New York harbor good grades of steam coal fetch $2.45@2.65 per ton. Transportation is good and cars are plentiful.

In the Coastwise vessel market boats are scarce especially light-draft vessels which make shoalwater ports. Large vessels also are in demand, and it is believed that many of the large craft will be tempted out of their winter berths by the rates now prevailing.

Freight rates are firm and higher. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, $1@1.10; Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

Nov. 16—There has been no change of any consequence in the coal production in this territory. There is, however, a better demand, and more men will be put to work at once in the mines. The railroads are doing well in furnishing all the cars necessary.

Considerable coke is being accumulated in this district; one of the larger companies is reported to have 15,000 tons on hand. There will be a need in the near future for all the coke that can be supplied.

Chicago

Nov. 17—The coal market continues to be troubled with a surplus of receipts of nearly every grade. Prices remain low, especially for such coals as are in overabundance.

Steam coals generally are improving; domestic coals are still sluggish, though the coming of colder weather has aided sales. Anthracite sells more evenly and in better relative quality than bituminous domestic. Bituminous coals from Illinois and Indiana mines find demurrage affecting screenings most; some consignments of screenings have sold at 95c. Chicago; others of similar grade have brought $1.10@1.20, and the highest grade $1.50@1.65. Run-of-mine brings $1.65@1.75; lump and egg weak at $1.75@2.65.

Of coals from east of Indiana, Hocking is strongest, having steady sales and receipts not too large. Smokeless is weak as regards run-of-mine, some of which sells for $2.70, though Pocahontas and New River hold well up toward the circular prices of $3.05@3.30. Youghiogheny is $3.15 for ¾-in. gas, selling almost wholly on contracts.

Indianapolis

Nov. 16—The Indiana Railroad Commission has issued an order establishing a joint rate on coal over a number of coal-carrying railroads from southern Indiana mines to designated markets. Action of the commission is due to petitions filed by mining companies, which alleged that discriminating rates were maintained against them.

Pittsburg

Nov. 17—A few more railroad coal mines have been put in operation increasing production this week to about 60 per cent. of capacity. This was partly due to the cold weather and to increased shipments to Lake ports. The lake-shipping season is about over. Current prices are based on mine-run coal at $1.15 at the mine. Slack is not quite so strong, some sales being made as low as 60c., although some of the large producers refuse to quote less than 75c. All of the river mines are still idle.

Connellsville Coke—The coke market is stronger. Furnace coke for both spot and first half is quoted at $2, and indications point to further advances. Foundry coke is $2.25 for spot, and for the first half $2.35@2.50 a ton at ovens. Stocks in the two regions are not large, and production is increasing slowly owing to the scarcity of workmen and also to the continued drought. It is estimated that the H. C. Frick Coke Company is operating its ovens at about 46 per cent. of capacity, and the independent producers at about 52 per cent. The *Courier* gives production in both regions at 230,559 tons. Shipments were 8090 cars as follows: To

Pittsburg district, 3165; to points west of Pittsburg, 4371; to points east of Connellsville, 554 cars.

Foreign Coal Trade

Natal Coal—From the returns made for 10 months, it is estimated that the total coal production of the colony of Natal, South Africa, in 1908, will reach 1,750,000 tons, an increase of 220,000 tons over last year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Nov. 7: Best Welsh steam, $3.54; seconds, $3.42; thirds, $3.24; dry coals, $3.36; but Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.86; seconds, $1.62. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Nov. 18—The markets have been more active than for many weeks past, and the improvement which was manifested last week has continued, though there is still some degree of hesitation.

Pig-iron selling has been active, with large transactions in foundry and basic iron. The foundries are apparently beginning to have confidence, and are ready to place contracts well into next year. Southern iron has been well absorbed, and some of the large companies are out of the market for the present. Northern furnaces are not too anxious to make future engagements at present prices.

In finished material increased demand is reported for plates and bars. In structural material no large contracts have been placed, but the small orders make up a considerable tonnage. There is likely to be some discussion over prices, owing to the number of contracts taken by fabricating companies at low prices. The railroads are placing some orders for equipment, but are still holding back on rails.

Lake Iron Ore Movement—It is reported that the leading shipper is providing for a much larger shipment of ore in November than had been anticipated. If this is correct, stock-piles will be drawn down to a low point. The change is due to the increasing demand for pig iron.

Baltimore

Nov. 17—Imports for the week include 2543 tons ferromanganese, 61 tons silicospiegel and 40 casks manganese ore from Liverpool; 8900 tons iron ore from Cuba. Exports include 2,150,600 lb. steel billets and 197,400 lb. zinc dross to Liverpool; 840,318 lb. tin scrap to Rotterdam.

Birmingham

Nov. 16—It is not any more a matter of desiring business, but how much more business can be accepted before the probable make for the first three months of the coming year has been covered sufficiently. Southern iron-masters are not anxious for business now, and in some offices the statement is made that care is being taken that there shall not be more iron sold than can be comfortably handled during the first quarter of 1909. The furnace companies in this district are not yet in the market for second-quarter delivery. There will be an advance in quotations in the near future. The rate of $13 per ton, No. 2 foundry, is being maintained. The make in this section has been improved recently, the Republic Iron and Steel Company starting up its No. 3 furnace the past week, making all three of the Thomas furnaces in blast. Other furnaces are being placed in readiness for operation. Attention is also being given in this district to the raw-material supplies. Ore mines which have been running on half or slack time will be put in full operation at once. Coke making will be improved and limestone quarries started up.

There is a good demand for basic and charcoal iron.

Chicago

Nov. 17—Strength continues in the iron market, the confidence of melters being shown in larger orders and inquiries generally. Sales of pig iron above 1000 tons are not exceptional now and contracts are freely made for delivery extending to the middle of next year. Prices show a firmness that is significant of improvement. No. 2 Southern holds to $13 Birmingham ($17.35 Chicago) on nearly all transactions, and No. 2 Northern to $17.50, with the most desirable sales from the seller's point of view made at 25@50c. less. Some iron, indeed, sells for 50c. above the higher quotations, the market showing something of its old-time state as regards premiums for early delivery.

The Illinois Steel Company opens for full operation this week its plate and slab mills; the open-hearth furnaces will start Dec. 1. Sales of iron and steel products show increases in nearly every line though not large anywhere. Coke sales have increased and are brisk at $4.90 for the best Connellsville.

Cleveland

Nov. 16—Shipments of iron ore, by ports, from the Lake Superior region for the season to Nov. 1 were, in long tons:

	1907.	1908.	Changes.
Escanaba	5,253,043	2,746,116	D. 2,506,927
Marquette	2,701,812	1,177,730	D. 1,524,082
Ashland	3,103,838	2,019,948	D. 1,083,890
Superior	6,747,945	2,908,619	D. 3,839,326
Duluth	11,908,539	7,931,568	D. 3,976,971
Two Harbors	7,326,684	4,946,091	D. 2,380,593
Total	37,041,861	21,730,072	D. 15,311,789

The total decrease this year was 41.3 per cent. The port figures show that there was a larger proportional decrease from the Old Ranges than from the Mesabi.

Philadelphia

Nov. 18—The past week has been an encouraging one for active buying for early delivery. Many large consumers suddenly appeared and bought. Prices are being held firmly in this territory. Negotiations are pending today for one or two very large lots for local delivery scattered over six months. A basis has at last been laid for stronger prices. Numerous small orders of special brands continue to come in. Forge iron is dragging, and is the weakest on the list. No. 2X is $16.50@17; forge, $15.50@16; basic, $16.25.

Bars—Bar-iron makers claim that they are booking more business than for months. Prices are in buyers' favor and business is being urgently sought for.

Pipes and Tubes—Large concerns are now extending their orders to cover winter requirements. Merchant pipe is more active and the extreme discounts to small purchasers have been withdrawn.

Plates—A general improvement in plates has set in, due to large orders for steel-car work.

Structural Material—A sharp improvement set in and mills report an influx of orders. Most of them are for early delivery.

Scrap—Large lots of scrap have been sold this week, cleaning out stocks in large yards. The chief demand is for railroad and No. 1 yard. Prices have hardened and scrap men are on the war path to obtain the kinds wanted.

Pittsburg

Nov. 17—Conditions in the iron and steel trade continue to improve slowly. A pronounced improvement is expected after Jan. 1. President W. E. Corey, of the United States Steel Corporation, who was in Pittsburg for a couple of days conferring with officials of the subsidiary companies, is not so optimistic. He declared that while there will be a steady improvement from now on he does not look for full operation of the idle mills before the coming summer. All differences between the railroads and the railmakers are said to have been satisfactorily adjusted and there is now nothing in the way of placing contracts for next year's requirements. Announcement was made last week of a reaffirmation of the $28 price for standard sections for 1909. It is understood the railroads will not insist on a greater discard from the ingot than has been customary and the railmakers will not ask more for rolling a heavier rail than has been usual in past years. Several roads have sent in inquiries and one or two have placed orders for next year. Mill operations continue about the same

as last week, although in some instances production has been slightly increased. The Carnegie Steel Company is operating at about 65 per cent. Preparations are being made to begin work on additional mills at the Ohio works, Youngstown, and the increasing of the capacity of the car-wheel plant acquired a few months ago. The improvements at the Duquesne works are being completed and the two new blast furnaces are almost ready to be blown in.

Pig Iron—There has been considerable activity in pig iron and many large sales have been recorded. As a result a number of furnaces have withdrawn from the market. One large interest is said to have sold 75,000 tons, most of which was at low prices. Others gave options for iron at the old prices which were promptly taken up after the election result was known. The stiff advance in pig iron prices noted last week checked buying to a certain extent but there were a number of transactions and within a week over 10,000 tons were sold. The leading independent producer today announced a further advance of $1 a ton in bessemer pig iron and is quoting $17, Valley furnaces, for first-half delivery. All interests are firmly adhering to the prices quoted a week ago and claim to have made sales at the top prices. These quotations are as follows: Standard bessemer, $15.50@16; malleable bessemer, $15.50@15.75; basic, $15@15.25; No. 2 foundry, $15.50@16; gray forge, $14.50@15, all f.o.b. Valley furnaces. It is said negotiations are pending for a heavy tonnage of outside iron for the United States Steel Corporation, but no confirmation so far has been obtained as to the truth of the report.

Steel—Several small sales of both bessemer and open-hearth billets are reported at the regular price of $25, Pittsburg. A sale of 2000 tons of sheet-bars is also recorded at $27.50, Pittsburg. Plates remain at 1.60c. and merchant steel bars at 1.40c.

Sheets—Production of sheets has increased and the demand seems to be improving. Prices are firm at 2.50c. for black sheets and 3.55c. for galvanized sheets, No. 28 gage.

Ferro-Manganese—Prices have advanced $1 a ton and some sellers are holding for a higher price. Sales of the week were at $47@48, Pittsburg.

Foreign Iron Trade

German Steel Syndicate—The German Steelworks Union reports sales for the nine months ended Sept. 30 as follows, in metric tons: Billets, etc (half-finished material), 1,027,309; railroad material, 1,567,643; shapes and other rolled steel, 1,054,728; total, 3,649,680. This is a decrease of 712,922 tons, or 16.3 per cent. from last year.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Nov. 18.

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

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1908..	$ 1,952,574	$ 3,782,705	Imp.$ 1,830,131
" 1907..	3,716,258	4,512,466	" 796,208
Year 1908..	70,889,954	42,210,678	Exp. 28,679,276
" 1907..	53,596,071	35,374,686	" 18,221,385
Silver:			
Oct. 1908..	4,378,015	3,744,163	Exp. 633,852
" 1907..	5,053,997	3,599,695	" 1,454,302
Year 1908..	43,159,395	34,536,867	" 8,622,528
" 1907..	53,024,790	38,087,919	" 14,936,871

Exports of specie from New York week ended Nov. 14: Gold, none; silver, $755,063, nearly all to London. Imports: Gold, $155,684, from the West Indies, South America and Japan; silver, $180,900, from Mexico and South America.

Silver

SILVER AND STERLING EXCHANGE.

Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
12	4.8575	50	23 1/16	16	4.8590	50 1/16	23 3/16
13	4.8580	49 7/8	23 1/16	17	4.8600	50 1/16	23 3/16
14	4.8585	49 7/8	23 1/16	18	4.8600	50	23 1/16

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

The market for silver continues steady, without any marked fluctuations. Large speculative operations have not materially affected the price. The market closes dull and steady.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
12	14 3/8 @14 5/8	14 1/4 @14 3/8	64	30 1/4	4.32 1/2 @4.37 1/2	5.07 1/2 @5.12 1/2	4.92 1/2 @4.97 1/2
13	14 3/8 @14 5/8	14 1/8 @14 3/8	63 5/8	30 1/2	4.32 1/2 @4.35	5.07 1/2 @5.12 1/2	4.92 1/2 @4.97 1/2
14	14 3/8 @14 5/8	14 1/8 @14 3/8	....	30 1/4	4.32 1/2 @4.35	5.07 1/2 @5.12 1/2	4.92 1/2 @4.97 1/2
16	14 3/8 @14 5/8	14 1/8 @14 1/4	63 1/4	30	4.30 @4.32 1/2	5.07 1/2 @5.12 1/2	4.92 1/2 @4.97 1/2
17	14 3/8 @14 5/8	14 1/8 @14 1/4	63 3/4	30 1/4	4.30 @4.32 1/2	5.07 1/2 @5.12 1/2	4.92 1/2 @4.97 1/2
18	14 3/8 @14 5/8	14 1/8 @14 1/4	63 1/8	30 1/4	4.30 @4.32 1/2	5.07 1/2 @5.12 1/2	4.92 1/2 @4.97 1/2

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The extraordinary activity chronicled in our last report ceased on Nov. 11, since when the market has been dull and transactions small in volume and few in number. So far as there has been business, it has been chiefly for export, domestic manufacturers having disappeared from the market. Under offerings from second hands and in certain cases from first hands, prices have yielded a little. However, some of the important agencies continue to ask a price above the present market. In general there is no pressure to sell, an early resumption of buying by manufacturers being expected, although views are not uniformly optimistic in this respect. The Calumet & Hecla is still out of the market, but probably will reënter next month. Following the heavy buying movement of the last few weeks, it was naturally to be expected that business would quiet down, as is usually the case after periods of that kind. The tone of the market has become uncertain, and perhaps more so than is usual under similar conditions on account of the heavy speculative commitments by interests not identified with the copper industry. The market closes at 14 3/8@14 5/8c. for Lake copper; 14 1/8@14 1/4c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 14@14 1/8 cents.

A noteworthy feature in the market for Lake copper recently has been the increased demand for the arsenical brands. Not long ago these sold frequently on the basis of prime casting copper, but now there is a demand which prefers them to prime Lake. Certain specifications call for Lake copper containing 0.5 per cent. arsenic, such copper having a conductivity of only 0.60 to 0.65. This copper is used for drawing heavy wire for trolley purposes, for which its superior tensile strength and durability are thought to offset the inferior conductivity. Anyway, practical tests in this direction are being made.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15 3/4c. base, carload lots at mill.

Realizing sales brought about a sharp break in the London standard market, which at one time declined to £62 17s. 6d. for spot and £63 15s. for the three months' option. The recovery at the close has only been slight, the quotations being cabled at £63 2s. 6d. for spot, £64 2s. 6d. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 1300 tons.

Refined and manufactured sorts we quote: English tough, £67 10s.; best selected, £66 10s.@£67 10s.; strong sheets, £78 10s.@£79 10s.

Tin—The London market has been depressed throughout the week and was no doubt manipulated on account of the impending Banka sale. Transactions were of moderate volume and the close is cabled as quiet at £136 17s. 6d. for spot, £138 15s. for three months.

The domestic market has also been reactionary. The decline in London has had a somewhat chilling effect on consumers, who have ceased operating as

freely as they did last week. The market closes quiet at 30¼ cents.

Lead—The market has eased off during the last week under some pressure to sell, refiners having no orders on their books beyond their current production, while buyers have withdrawn from the market. The situation has been rather unsubstantial in view of the position of the Smelting Company, of which the price has been 4.30c. all along. Unusual disparity between the prices at St. Louis and New York developed during the week, the closing price at St. Louis being 4.25@4.30c., on which basis Missouri lead would cost 4.40c. at New York. The closing price for lead at New York is 4.30@4.32½ cents.

The market abroad has also flattened out and closes at £13 12s. 6d. for Spanish lead, £13 15s. for English lead.

Spelter—A large business with consumers, both brass-makers and galvanizers, has been done during the week Nov. 11-18 at 4.92½@4.97½c., St. Louis, and some speculative business has been done at a slightly higher price. A noteworthy feature of the week has been large business in brass specials at 5.12½c., St. Louis, showing a restoration of the premium which disappeared when spelter was under great pressure to sell. The market closes at 4.92½@4.97½c. St. Louis, 5.07½@5.12½c. New York, for ordinaries.

The London market for spelter is unchanged at £21 for good ordinaries, £21 5s. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is steady and a moderate business is being done. Quotations are unchanged at 8¼c. for Cookson's, 8@8¼c. for Halletts' and 7¾@8c. for ordinary brands.

Aluminum—The Aluminum Company of America continues to quote nominally 25½c. per lb. base for No. 1 ingots, and 35c. base for sheets. Foreign aluminum is offered here at 22c. The range of the market is, therefore, 22@25½c.

The foreign market is demoralized, and sales are said to have been made at the equivalent of 13½c. It is reported that the Metal-Gesellschaft, Frankfurt-am-Main, is now handling exclusively the aluminum product of Froges, France.

Platinum—Dealers quote $23.25 per oz. for refined platinum, $26.25 for hard, and $18 for scrap. An advance is probable as business is good. We learn, however, that ingot is still offered for $18 and No. 1 scrap for the same price. In Europe prices declined slightly after the failure of the conference of the refiners held in Paris last week. Russian dealers are quoting crude platinum at 18,000 rubles per pood, on the basis of 83 per cent. The market is very sensitive, and any serious attempt to buy leads to an advance.

Quicksilver—The market is unchanged, with fair demand. New York price is $46 @47 per flask of 75 lb. San Francisco quotations are $44@45 for domestic orders, $42@43 for export. London, £8 10s. per flask, with 1s. 6d. less quoted by jobbers.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 14—This week $38.50 was the highest price paid for zinc ore, on a basis of $38 per ton of 60 per cent. zinc. For 80 per cent. lead ore $56 per ton was paid.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	744,533	.....	440,000
Highland	482,300	.....	.....
Livingston	313,000	.....	.....
Hazel Green	299,900	67,100	.....
Galena	272,400	.....	.....
Benton	267,130	37,750	.....
Linden	150,350	.....	.....
Mineral Point	132,700	.....	.....
Harker	118,000	.....	.....
Cuba City	84,140	.....	.....
Days Siding	76,000	.....	.....
Total	2,940,453	104,850	440,000
Year to Nov. 14	96,030,662	9,353,455	3,844,604

In addition to the above there was shipped to the Platteville Separating Company, 406,280 lb.; to the Joplin Separator Works 121,350 lb.; to the Enterprise roaster 322,000 lb. zinc ore.

Joplin, Mo., Nov. 14—The highest price reported paid for zinc blende was $41 per ton. The highest base price was paid for the heavy iron ore at Miami, of $40 base, while the best ores sold on a base of $39, ranging down to $37 for a few purchases early in the week. The bulk of the shipment was, perhaps, close to a $38 base price, while a considerable tonnage brought $39. Zinc silicate sold on a $17.50 base, the highest price being $25.30. The average price, all grades, was $34.30. The highest price for lead ore was $60 for a few bins purchased at the end of last week and loaded this week, quotations receding to $55 and $54 for this week's purchases. The average price, all grades, was $56.14 per ton.

Producers succeeded in bulling the market by a concerted refusal to accept price offerings and buyers were unable to fill large purchasing orders without meeting these demands.

SHIPMENTS, WEEK ENDED NOV. 14

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,933,690	1,325,530	$91,240
Joplin	2,062,290	282,780	45,939
Oronogo	1,046,250	285,000	27,364
Miami	284,490	338,120	11,972
Spurgeon	491,100	204,300	11,561
Galena	569,370	56,060	11,499
Duenweg	511,270	29,300	10,051
Badger	528,210	.....	10,035
Alba-Neck	431,170	.....	7,761
Prosperity	226,400	93,760	6,793
Aurora	436,160	22,420	6,555
Granby	485,000	26,000	5,730
Carthage	193,000	.....	3,667
Zincite	157,730	.....	2,996
Carl Junction	94,600	.....	1,797
Quapaw	109,890	.....	1,793
Cave Springs	86,880	.....	1,563
Playter	49,170	.....	884
Wentworth	65,280	.....	750
Sarcoxie	62,790	.....	690
Stott City	30,390	.....	577
Everton	38,600	.....	386
Totals	10,893,930	2,663,270	$261,603
46 weeks	443,934,860	69,152,070	$9,379,323
Zinc value, the week, $186,828; 46 weeks, $7,474,973			
Lead value, the week, 74,775; 46 weeks, 1,904,350			

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1907.	Zinc Ore. Base Price. 1908.	Zinc Ore. All Ores. 1907.	Zinc Ore. All Ores. 1908.	Lead Ore. All Ores. 1907.	Lead Ore. All Ores. 1908.
January	$46.90	$37.60	$45.84	$35.56	$83.58	$46.88
February	48.30	36.63	47.11	34.92	84.58	49.72
March	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.05
June	47.00	33.06	44.82	32.07	73.66	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.34
September	41.00	37.63	40.11	34.44	53.52	54.59
October	41.75	35.95	39.83	33.28	51.40	52.63
November	38.60	.....	35.19	.....	43.40	.....
December	31.50	.....	30.87	.....	37.71	.....
Year	$44.36	.....	$43.68	.....	$68.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Nov. 18—The general market is active and considerable demand is shown, especially for heavy chemicals. Business in October was good and the outlook is encouraging.

Copper Sulphate—The stronger metal market has caused an advance of 10c. per 100 lb. in the price of copper sulphate. Quotations now are $4.75 per 100 lb. for carloads and up to $5 for smaller lots.

Nitrate of Soda—The market is quiet and little demand has developed except in the fertilizer trade which has closed some orders during the week. Quotations are 2.15c. for spot and future delivery.

Mining Stocks

New York, Nov. 18—The general markets have continued active throughout the week, with many fluctuations, but on the whole with increased strength. Heavy foreign selling failed to have much effect here, and the market closes with rather an upward tendency.

The Curb market was active, with copper stocks showing well and prices fairly maintained, on a good volume of business. Other mining stocks were in considerable demand, and the total volume of business was good.

Sales of Homestake, of South Dakota, were reported at $92 and $95 per share.

The Standard Oil Company has declared a dividend of $10 per share, making $40 for the year.

Boston, Nov. 17—Copper shares have reacted and trading has quieted somewhat, although yet of good volume. Some specialties have sought new high levels. Calumet & Arizona took a $5 drop today, making $6.75 for the week, and touched $120. This was due to disappointment in the dividend declaration which was $1 quarterly, when $1.50 had been looked for in some quarters. North Butte really advanced slightly on declaration of the same amount. Nothing more was looked for. Franklin spurted $3 to $18. This company is going to adopt a policy of extension, which includes doubling its capital, and taking over the Rhode Island property on a basis of one share Franklin for three and one-half Rhode Island. It will buy additional land and sell the old Franklin mine to the Quincy company for $170,000.

Old Dominion came within a fraction of touching $60, and closed just above $58 tonight. A quarterly dividend of 50c. declared by Old Dominion of New Jersey will enable the Maine Corporation to distribute 50c. also. Offers of $4 per share are being made for options on the 6700 shares of minority stock at $100 per share before Dec. 15. Boston & Corbin touched $24.25. The 10,000 shares of treasury stock offered at $25 will probably have to be taken by the underwriters.

Mexico Consolidated rose over $1 to $5.75 on announcement of the resignation of President J. A. Coram and several other directors. Frederick Stallforth takes the presidency.

Trading has been active on the Curb,

STOCK QUOTATIONS

NEW YORK	Nov. 17	BOSTON	Nov. 17
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	½	Adventure	8¾
Amalgamated	86	Allouez	‡39
Anaconda	51⅞	Am. Zinc	27½
Balaklala	‡2 1/16	Arcadian	5½
British Col. Cop.	7⅞	Arizona Com	38⅜
Butte & London	....	Atlantic	18¼
Butte Coalition	27⅜	Bingham	‡.30
Colonial Silver	½	Boston Con	17
Com. Ely Mining	8 1/16	Calumet & Ariz	120
Davis Daly	3 1/16	Calumet & Hecla	690
Dominion Cop	1	Centennial	34½
Douglas Copper	3⅛	Con. Mercur	‡.39
El Rayo	4⅜	Copper Range	81½
Florence	4 7/16	Daly-West	10½
Foster Cobalt	.55	Franklin	17½
Furnace Creek	.16	Greene—Con	11¾
Giroux	4⅛	Isle Royal	24
Gold Hill	½	La Salle	14
Goldfield Con	6 1/16	Mass	7¼
Granby	107	Michigan	14¾
Greene Gold	⅛	Mohawk	70
Greene G. & S	9	Nevada	20⅛
Greenw'r & D.Val.	‡.75	North Butte	88
Guanajuato	1⅝	Old Colony	‡.60
Guggen. Exp.	187	Old Dominion	58½
Hanapah	.15	Osceola	‡124
McKinley Dar	1.07	Parrot	28⅞
Micmac	2⅝	Quincy	98½
Mines Co. of Am	1 3/16	Rhode Island	5⅝
Mitchell Mining	3/16	Santa Fe	2¼
Mont. Sho. C	1	Shannon	18⅜
Nev. Utah M. & S	3⅜	Superior	29⅞
Newhouse M. & S	6⅞	Tamarack	‡85
Nipissing Mines	11½	Trinity	18¾
Old Hundred	1⅝	United Cop., com.	14¾
Silver Queen	1.11	U. S. Oil	30¼
Stewart	⅝	U. S. Smg. & Ref.	46
Tennessee Cop'r.	50⅜	U.S.Sm. & Re.,pd.	47
Tri-Bullion	1	Utah Con	46¾
Union Copper	‡ 7/16	Victoria	5
Utah Apex	6⅜	Winona	6½
Utah Copper	48¼	Wolverine	153
Yukon Gold	4¼	Wyandotte	2½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem	31⅞
Am. Smelt. & Ref.	95⅞
Am. Sm. & Ref. pf.	107⅛
Bethlehem Steel	‡26
Colo. Fuel & Iron	39¾
Federal M. & S., pf.	88⅝
Inter. Salt	14¾
National Lead	84¾
National Lead, pf.	106
Pittsburg Coal	13⅝
Republic I. & S.	28⅜
Republic I. & S., pf.	88¾
Sloss-Sheffield	81¾
Standard Oil	673
U. S. Red. & Ref.	13
U. S. Steel	57⅞
U. S. Steel, pf	113⅜
Va. Car. Chem	39½

BOSTON CURB	
Ahmeek	‡125
Black Mt.	4 7/16
East Butte	8⅛
Hancock Con	9⅜
Keweenaw	5½
Majestic	.75
Raven	.93
Shawmut	.09
Superior & Pitts	‡14
Troy Man	.25

ST. LOUIS	Nov. 14		
N. of Com.	High.	Low.	
Adams	.40	.30	
Am. Nettie	.05	.03	
Center Cr'k	2.00	1.50	
Cent. C. & C.	70.00	68.00	
C.C. & C. pd.	77.00	75.00	
Cent. Oil	110.00	100.00	
Columbia	7.00	4.00	
Con. Coal	22.00	20.00	
Doe Run	131.00	115.00	
Gra. Bimet.	.25	.20	
St. Joe	16.00	13.00	

LONDON	Nov. 18
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 1 3
Camp Bird	0 14 9
Esperanza	3 3 9
Tomboy	1 0 0
El Oro	1 7 0
Oroville	0 8 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 18.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.12
Belcher	.30	St. Ives	.22
Best & Belcher	.49	Triangle	.04
Caledonia	.16	BULLFROG STOCKS	
Challar	.14	Bullfrog Mining	‡.03
Comstock	‡.24	Bullfrog Nat. B	‡.04
Con. Cal. & Va	.60	Gibraltar	.03
Crown Point	.40	Gold Bar	‡.03
Exchequer	.36	Homestake King	.15
Gould & Curry	.16	Montgomery Mt.	‡.05
Hale & Norcross	.43	Mont. Shoshone C.	.95
Mexican	.77	Original Bullfrog	‡.01
Ophir	1.90	Tramp Cons	.15½
Overman	.11	MANHAT'N STOCKS	
Potosi	.17	Manhattan Cons.	‡.05
Savage	.40	Manhat'n Dexter	‡.03
Sierra Nevada	.34	Jumping Jack	‡.03
Union	.29	Stray Dog	‡.03
Utah	.04	MISCELLANEOUS	
Yellow Jacket	.48	Golden Boulder	‡.05
TONOPAH STOCKS		Bonnie Clare	.08
Belmont	1.12	Lee Gold Grotto	..
Extension	.57	Nevada Hills	1.50
Golden Anchor	.01½	Nevada Smelting	1.00
Jim Butler	.21	Pittsburgh S. Pk.	.90
MacNamara	.50	Round Mt. Sphinx	.18
Midway	.26		
Montana	.73		
North Star	.06		
Tono'h Mine of N.	7.00		
West End Con	.48		
GOLDFI'D STOCKS			
Adams	.04		
Atlanta	.22		
Booth	.32		
Columbia Mt	.17		
Comb. Frac	1.39		
Cracker Jack	.06		
Dia'dfield B. B. C.	.14		
Goldfield Belmont	.05		
Goldfield Daisy	.95		
Great Bend	.34		
Jumbo Extension	.30		
Katherine	...		
Kendall	.12		
Lone Star	.08		
May Queen	.06		
Oro	.13		
Red Hill	.22		
Roanoke	...		
Sandstorm	.21		

COLO. SPRINGS	Nov. 14
Name of Comp.	Clg.
Acacia	7
Black Bell	....
C. C. Con	‡3½
Dante	6½
Doctor Jack Pot	7
Elkton	67
El Paso	48
Findlay	17
Gold Dollar	8½
Gold Sovereign	3½
Isabella	27
Index	....
Jennie Sample	4¼
Jerry Johnson	‡3⅞
Mary McKinney	30
Pharmacist	‡3⅝
Portland	1.03½
Un. Gold Mines	4
Vindicator	81
Work	8

Assessments

Company.	Delinq.	Sale.	Amt.
Amador, Ida	Nov. 20	Dec. 19	$0.02
American Fork, Utah	Oct. 28	Nov. 25	0.01
Cedar, Utah	Nov. 20	Dec. 10	0.03
Columbus Ext., Utah	Nov. 13	Nov. 25	0.01
Con. Cal. & Va., Nev	Nov. 24	Dec. 15	0.20
Confidence, Nev	Dec. 9	Dec. 30	0.20
Crown Point, Nev	Nov. 17	Dec. 8	0.10
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Gould, Mont	Nov. 7	Dec. 7	0.05
Imlay, Utah	Nov. 11	Nov. 28	0.01
Liberty, Utah	Nov. 5	Dec. 2	0.03
Lucky Dutchman, Nev	Nov. 21	Dec. 12	0.01
Mexican, Nev	Nov. 12	Dec. 3	0.10
Overman, Nev	Dec. 2	Dec. 23	0.05
Penn. Con., Cal	Nov. 2	Nov. 25	0.10
Seg. Belcher & Mides, Nev	Nov. 7	Nov. 28	0.03
Silver King Con., Utah	Nov. 4	Nov. 25	0.05
Utah-United, Utah	Nov. 10	Nov. 27	0.01
Wabash, Utah	Nov. 10	Dec. 3	0.08
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.10
Zeibright, Cal	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	.....	27.154	.....
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	.....	13.870	.....	61.226	.....
December	13.163	.....	13.393	.....	60.113	.....
Year	20.004	.....	20.661	.....	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	.....
June	42.120	28.024	December	27.925	.....
			Av. year.	38.160	....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	.....	17.281	.....
December	3.658	.....	14.500	.....
Year	5.325	.....	19.034	.....

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

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26 094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	.....	4.775	.....	21.438	.....
December	4.254	.....	4.104	.....	20.075	.....
Year	5.962	.....	5.812	.....	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.